ANALYSING SELF-REGULATION: ITS COGNITIVE AND EMOTIONAL FOUNDATIONS AND LINKS WITH SOCIAL UNDERSTANDING IN EARLY CHILD DEVELOPMENT

by

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Declaration

I declare that the thesis is my own work, and has not been submitted in substantially the same form for the award of a higher degree elsewhere.

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Date

Abstract

Self-regulation is the term referring to a set of abilities that we employ in order to engage in everyday activities. Yet its operational definition is difficult, since it involves several component skills, like the inhibition of prepotent responses and a need to control emotions. These skills each show rapid development in the preschool period and this thesis explores how the regulatory processes in cognitive and emotional domains unfolds. I start with a conceptualization of cognitive and emotional regulation, suggesting that the literature is beset with problems of differential labelling and measurement. For example, 'Inhibitory Control' (IC) has been claimed as unitary by some but involves two processes –Conflict and Delay – by others. The bridge between cognitive-regulation (CR) emotion-regulation (ER) has been less well researched and it stretches our conception of the link between regulation of thought, behaviour, and feelings. The assessment of emotionality has been approached from various angles such as the discrepancy between the control of positive or negative emotions and comprehension of emotionality. In 5 studies (with 421 children in total), I tested the association between cognitive and emotional processes in the development of self-regulation. A grasp of mental states and emotions was found to be associated with the regulation processes in both domains. The final three experiments attempt to explain the effect of 'understanding' over the ability of control in both domains. The direct observations of ER, which evokes both positive and negative emotionality, revealed inconsistent findings in terms of the associations that ER shared with IC. In contrast, an understanding of emotionality (EU) as found to relate consistently to conflict-inhibition and mental-state understanding. A scale was developed to cover the middle ground between ER and EU and is called SURE (a Scale of Understanding of Regulation of Emotions). Studies 4 and 5, which employed this measure, showed that the children were able to make prospective attributions of ER for story characters starting from the age of four. Children's

performance in this task was related to the control over their behaviour in rule-based situations (e.g. conflict-inhibition tasks). To observe children's control of emotionality, a novel measure was developed to assess their internalization of the necessity of control in a cognitively demanding task, which focuses on emotional changes. It is suggested that future research should investigate different forms of understanding of emotions and cognitive processes in more detail.

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Dedication

Babam'a

To My Father, Ramiz Pala

"I Loved My Father the Most in Life."

Contents

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List of Symbols, Abbreviations and Nomenclature

Symbol	Definition
CR	Cognitive (aspect of) Regulation
DoG	Delay of Gratification
EF	Executive Function
ER	Emotional (aspect of) Regulation
EU	Emotional Understanding
FB	False Belief
IC	Inhibitory Control
SU	Social Understanding
SURE	Scale of Understanding of the Regulation of Emotions
SR	Self-regulation
TEC	Test of Emotion Comprehension

Epigraph

"You can do what you will, but in any given moment of your life you can *will* only one definite thing and absolutely nothing other than that one thing (Schopenhauer, 1841/2005, p.24)"

Chapter 1 - Rationale

Analysing Self-Regulation: Its Cognitive and Emotional Foundations and Links with Social Understanding in Early Child Development

Being human is being accountable for one's behaviour and thoughts (Tomasello, 2014). To claim that individuals are accountable for their actions and consequences, the first crucial question that comes to mind is that '*are those individuals in control of their actions*?' This is an age-old problem that many philosophers and religious doctrines dealt with under the concept of the '*will*'. Each draws different conclusions on the limitations of the controlling '*self*'. There is a longstanding assumption that being aware of one's '*self*' and being in control are not only necessary to socialize with others, through engaging in reciprocal interaction, but also to achieve immediate and long-term goals to have a meaningful life.

Among all the other achievements in early development, young children are mostly characterized as being pleasure orientated[1]; they are thought to like to do things whenever they want to, not considering others' needs or wishes. This kind of description of early childhood might not be fair to children who, even when very young, demonstrate altruistic or helpful behaviour (Warneken, Chen, & Tomasello, 2006). Despite their emerging cooperative skills, the ability to remain calm when mum is not allowing them to go to the supermarket wearing their princess dress, or resisting the temptation of eating sweets before dinner, are still difficult. If these characteristic assumptions of young children prevail, should we still study their ability to control themselves? Thus, the old question can be reformulated

[1] Although it is not the purpose of this thesis, this kind of a description of a child may remind us of the explanations of human nature in most Western philosophical accounts (the doctrine of original sin and in e.g., Hobbes' philosophy). By pleasure-oriented, I only try to point out the child's eagerness to explore the world through his/her 'needs' in the early years of life.

as '*when and how do young children start to control their actions?'* Children develop skills to regulate their responses in the face of many different and demanding situations throughout the preschool years (Bronson, 2000). They do this in spite of the view profile that early childhood is characterised by pleasure- orientated and immediate, if not solipsistic, world views. The adaptation of those skills that makes the control of actions possible is defined under an umbrella term of '*self-regulation'* (Calkins & Fox, 2002; Mischel et al., 2010; Posner & Rothbart, 2000; Sokol & Muller, 2007).

The analysis of this umbrella term is necessary because the regulation of desires and/ or needs is not only limited to early childhood. It is a struggle that everyone faces when they need to exercise this skill in their daily lives. Some might find smiling difficult when they come across a disliked colleague, whilst others might struggle to prioritise the chores that they have in hand. Most of the time separating cognitive demands from emotional ones is not easy. Therefore, it is inevitable that many authors have employed the label of 'self-regulation' from the literature on the control of thoughts and actions, and another term, 'executive function', from studies on emotional development. There is a dichotomy between emotion and cognitive faculties in the literature. Despite their interaction, explaining them separately is practical for both the research and discussion in this thesis. The dichotomy is based on the fact that the developmental research has treated the growth of the abilities regarding emotion and cognition as separate constructs. This is not a necessary split, and the nature of each aspect of self-regulation might be investigated using the similar methodologies but without pointing out the commonalities among them. To avoid an in principle distinction I would like to address the question of how to approach the goal-directed nature of self-regulation.

A child is the 'regulator' of the inputs from the social surrounding and outputs that she or he displays to the same social surrounding. Preschoolers' growing understanding of himself or herself as a social agent is tied to their understanding that they are part of a social network. As processors of their needs and desires, they may have to adapt to the social network in order to tackle challenges that they face. Considering any challenge as a task in hand, '<u>choosing a strategy</u>' would be the first step. One way of doing this would be to use avoidance as a strategy, but this could be a poor plan of action if completion of the task is rewarded. The second challenge of self-regulation concerns '<u>engaging'</u> with the chosen strategy. When the task in hand is not pleasurable, but the strategy is to work on it, engaging with the chosen strategy requires self-regulation. If the task at hand is tempting/ pleasurable, it might be difficult to engage with the strategy of then avoiding the temptation. The third challenge for self-regulation often involves '<u>maintaining'</u> the chosen strategy throughout the task in hand. This requires remembering rules or imagining the desired outcome, which might be difficult due to the increased cognitive demand such a working memory or inhibitory control. Each one of these steps can be applied to challenges that are high in emotional or behavioural demands.

In childhood, self-regulation can be observed for external needs in the early years, such as the caregivers' holding and rocking an infant to soothe, but I am interested in the age that children start to reveal their intrinsic motivation to regulate their actions and feelings. The discrepancy between intrinsic or extrinsic motivation to self-regulate continues in each developmental period from infancy to adulthood.

Internalization of self-regulation strategies cannot be considered as a sign of maturation because individuals' motivation might be based on their needs for 'autonomy, competence and relatedness' (e.g. Ryan & Deci, 2000, p.71). Each of these motivational needs help to explain the theories on the life-span development of self-regulation. Previously mentioned steps of self-regulation strategies 'choosing', 'engaging' and 'maintaining' were labels that were borrowed from adulthood literature.

A framework that has been proposed by Baltes (1997, p. 371) focuses on an individual's ability to adapt to the social environment by following three strategies 'selection, optimization, and compensation'. Similar to the early occurrence of SR, adults also start with the necessary process of making a choice based on the limitations of their time and resources. In the cases of either children or adults, the accuracy of the formulation of such a strategy, or the flawlessness of the execution of this strategy, sparks a question that I will address in the next subsection. Selective Optimization with Compensation (SOC) in self-regulation explains the processes of control for setting goals and achieving them according to the developmental deadlines.

In a given self-regulatory dilemma, a young adult may, for example, like to exercise to maintain a healthy life-style but finds it very hard to go for a run instead of having a drink with friends. This dilemma occurs because both behaviours satisfy particular goals, and times may conflict. For example, the social exchange with friends also meets this person's motivation to relate to his or her peers and going for a run may fulfil the goal of healthy living but maybe difficult to pursue in the face of easier goals. Self-regulation processes continue for a 'grown-up' who has to select a strategy by optimizing it based on the resources one possesses (such as time and energy). The compensation comes when the strategy may require an adaptation for minimizing the cost and maximizing the gains. The three steps Baltes suggests as SR strategies for life-span development involve both cognitive and emotional elements. Regarding the step of optimization, Heckhausen, Wrosch, and Schulz (2010) introduce a similar theory in which to explain two processes that an individual must pursue. These involve changing, firstly, the environmental conditions and, secondly, adapting their goals or desires to the particular environment. Life-span theories of control deal with more complex dilemmas than the ones that we might want to address with young children and their complexity makes it more difficult to pinpoint the emotional or cognitive demands of the various challenges. Thus, adult self-regulation is claimed as intentional. Developed cognitive abilities lead the processes of goal-setting, planning the future, and allocation of both resource and expectations (see review of McClelland, Ponitz, Messersmith, & Tominey, 2010). From childhood to adolescence, the control of behaviour goes through a phase that has been claimed to depend more upon gut feelings, intuitions and affect than the analytical thinking, which was described by Piaget (1968). From adolescence to adulthood, both analytic and heuristic decision making processes are intertwined. In applying strategies that are inclined to be more analytical in adulthood, the neurological deficits in the frontal lobe have been considered to have an effect on both choosing a strategy and its execution (Shallice & Burgess, 1991).

Turning next to the motivational underpinnings of self-regulation, how strategies are formulated and identifying where the problem occurs can be traced to two categories that are the ‘execution’ of the strategy or the ‘formulation’ of control. Shallice and Burgess (1991) described the organization of behaviour in imitating daily activities, citing patients with frontal damage. Their conclusion focused on the bridge between intentionality and memory. These patients seemed to arise from their difficulty to recall their retrospective intention during multiple subgoal tasks. In planning or choosing a strategy to fulfil SR, the maintenance of the intention that sparks the action in the first place appeared to significantly contribute to self-regulatory difficulty. When trying to complete psychological tasks, they required social reinforcement throughout because their motivation tended to fade, because the intention indeed fades.

Children produce various strategies to cope with the challenge or remaining motivated. For example, in a situation a child was asked for an immediate versus a delayed but bigger reward, deciding on receiving the immediate reward might appear as a minimal gain but it is maximized for reducing the time that each child will invest in this reward. The theories regarding children's potential perseverance in inhibitory tasks will be examined in detail later in this chapter (also in Chapter 2) but when the findings derived from Shallice and Burgess (1991) are taken into consideration, the performance of children and their SR can be depicted in terms of the maintenance of intentions. The need to persist on a task provokes an explanation from memory, which will be addressed in the section 1.3 when addressing executive functions. In terms of the labelling goal formation, the early developing capabilities of the prefrontal cortex might be sufficient for young children to formulate the best outcome strategy for themselves. However, they might struggle more with keeping the chosen strategy in mind and follow it through in order to cope with a prolonged delay period. Thus, 'goal execution' might be considered as the label for the difficulty of children and/or patients with frontal lobe damage when they have been challenged with a SR task.

Researchers have examined self-regulation at each of the three stages of choosing, engaging and maintaining. Based on those explanations and that stage they were observing, psychologists tend to label their findings differently. This chapter aims to set the scene for how various self-regulation challenges in young children's development are experienced together. Although they often observe or measure the acquisition of self-regulation as an outcome of developing control of cognition and emotions, some researchers suggests 'trait' like explanations of this set of skills. However, the majority of researchers follow Vygotsky's (1978) claim in Mind and Society, that the necessity of such control is internalized by the child as the higher mental processes matures with the support of growing interpersonal relations.

Before continuing with an analysis of the development of self-regulation in early childhood, I will pause to describe how I became interested in the issues explored in this thesis. I started with an analysis of the philosophical background to the concept we call 'self-regulation' that is used today but which for a much longer period has been discussed under the name of ‘will’. My attempts at a brief analysis of the philosophical debates was derived from a close reading of James Russell’s (1986, 1996) thesis on the integration of children’s ability to control their experiences through developing early ‘agency’. Russell’s analysis was nested in Schopenhauer’s perspective on the will, suggesting a unique relationship between cognition and intentionality. For a comparison between the Kantian and Schopenhauerian explanations over the ability of regulating the behaviour through a mentalist or a holist (emotional-integrative) view, I invite the reader to address the account presented in Appendix 1.1. The philosophical analysis presented in the appendix explores the integration of an act of control and the mental faculties responsible for our action. I decided to keep this starting point apart from this, more psychological, chapter in order not to overcomplicate the thesis presented here.

To summarise Appendix 1.1: Schopenhauer’s description of ‘*will*’ constitutes the knowledge of desire itself. As simple as it sounds, an act of regulation depends on the awareness of the desire and the need for regulation. In the Kantian explanation of self-knowledge, intuitions are isolated from affective affiliations. In his critique of Kant, Schopenhauer inspires the investigation emotionally charged constructs (e.g. desire, feelings) with their cognitive counterparts that can be observed through behavioural assessment. Thus, in this thesis the following question was drawn from the philosophy and was attempted to be explained in the following chapters: what regulatory mechanism underpins an ‘understanding’ of both cognition and emotion?. I will start by defining self-regulation and outlining the different terminology in the literature that often leads to problems of comparing different accounts.

1.1 What is Self-regulation?

Self-regulation entails the integrated control of <u>cognition,</u> <u>emotion,</u> and <u>actions</u> (Bell & Deater-Deckard, 2007; Blair, 2002; Calkins & Bell, 2010, Karoly, 1993). The emergence and regulation of emotions is usually considered to be based on cognitive processes which are founded on the growth of representation, memory, and language (Kopp, 1982; 1989). From analyses of the observable outcomes of self-regulation, a division between the cognitive and social-emotional demands is often proposed (Bodrova & Leong, 2006). Even though these separate aspects appear to contribute to the same construct, such a separation shows how psychologists highlight either cognitive or emotional skills as in the core of self-regulation.

According to recent findings and evaluations from neuropsychology, when solving a problem there is a strong influence of emotionality on our volitional acts and this derives from entwined cognitive and emotional skills (Bechara, 2004; Immordino-Yang & Damasio, 2007). Since self-regulation requires a wide range of 'emotional' and 'cognitive' skills, each of which change rapidly in early childhood development, the conceptualization of this construct is not an easy task. Thus, two key issues need to be addressed. First, how can we conceptualise the control of behaviour in order to arrive at an operational definition of self-regulation? Secondly, how can we measure it when it involves developing cognitive to socio-emotional skills?

1.2 Labelling Self-Regulation

In a historical examination, Post, Boyer, and Brett (2006) suggest that Freud's theory is essentially one about the precursors of self-regulation. Some theoreticians have followed Freud's (1915/1957) belief in energy that drives the resolution of the tension between the conscious and unconscious mental faculties. He tried to establish equilibrium between the demand of the desires and the rule and regulations of life. For Freud, the control of the self is the responsibility of another faculty, which lies in between the conscious and unconscious. Freud's division of the needs and regulation as they are represented in mind is very similar to the Schopenhauer's united 'will'. Freud separates the basic instincts and desires as 'Id' from, the rules the society, and reality of life, which is the controlling mechanism 'super ego'.

Despite his division of these two processes, Freud (1923) also unifies the tension between them within the '*ego*.' The urge and complementary controller mechanism may be presented at the unconscious level, but the peacemaker of such tension is much more a conscious mechanism (Freud, 1966).

In the precursory period, Post et al. also mentioned Pavlov's behaviourist approach on *control*. Smith's (1992) evaluation of the history of control in Appendix 1.2 introduced that the concepts we deal in the context of self-regulation started from an automatic control of behaviour, as the behaviourist approaches would offer. The Pavlovian School identified a set of external drivers for the development of volitional behaviour, downgraded to conditioning (Pavlov, 1927; as cited in Post, Boyer, & Brett, 2006). This contrasts with Freud's construct, the 'ego' as a regulatory mechanism. The tension between rich accounts like Freud's and leaner ones like Pavlov's has permeated the literature over the past century. Wegner and Pennebaker (1990) built upon the idea of '*mental control*'. They focussed centrally on the logic of control at the centre of mental activity. This idea takes its meaning from Freud's legacy through dropping the analytical explanations but keeping '*cognitive control*' as a core for all behavioural outcomes (e.g. Gardner, Holzman, Klein, Linton, & Spence, 1959). Following from Freudian concepts related to the self-regulation mechanism of repression, suppression would be also named as a defence mechanism found its new line of formation. The developmental transition from a defenceless and impulsive child to an adult with complete ego control was also a part of that approach.

1.2.1 Self-Control.

The transformation of an impulsive baby to a self-controlled adult was conceptualized by Mischel, Shoda, & Rodriguez (1989) who used the term '*self-control*' (or *willpower* or *delay of gratification* in some cases). Mischel and his colleagues referred to this ability in terms of an individual difference. Some people are able to postpone the immediate pleasure for a greater gain, while others find this difficult. The *Delay of Gratification Paradigm* is one of the most well-known experiments in which Mischel et al. (1972) presented children with a desirable treat (a marshmallow) and gave them the option of immediate gratification or the option to wait (up to 15 minutes) to get a bigger reward (two marshmallows). This type of choice task was very influential from the start, and variations of this procedure have been adapted by many others. For example, Hongwanishkul et al. (2005) devised a choice task similar to the Mischel's paradigm using different objects (e.g. stickers, pennies) and varied the quantity of the reward (e.g. 1 now versus 4 later). The conclusion drawn by Mischel was that children who showed *resilience* to the immediate reward and waited for a bigger prize were demonstrating self-control. Recently, Mischel and his colleagues (2010) revealed some findings from a longitudinal study which suggested life-long individual differences based on the '*will power*' which was demonstrated in early childhood. They showed that the children who preferred a delayed reward in the preschool period scored higher performance in their standardized university entrance test, achieved much higher academic success, and had better social-cognitive and emotional coping in the adolescence (Mischel et al.,1988). In adulthood, their preschool choice to delay or take the marshmallow predicted higher academic achievements, higher self-worth, better coping with stress and less addictive behaviour (Ayduk et al., 2000).

Mischel's paradigm was very innovative in the late 60s, and the variations on the task still predict later individual differences. His team seemed to show that the ability to postpone a desired object or an activity, in the face of an immediate pleasure, was a mark of ego-resilience. The findings from 'delay of gratification' tasks were generalized to explain an overall performance of cognitive (e.g. executive functions) and/or emotional (e.g. effortful control) regulatory skills (see section 1.2.3 for effortful control). Mischel's experiment had the effect that 'self-control' was initially associated with the ability to 'delay' gratification. It focussed attention on a child's ability to postpone a pleasurable activity, but does only 'delay' represent or capture the development of self-regulation?

In a more recent study, Moffitt et al. (2011) also used the term, self-control, in a longitudinal study (from the Dunedin Study[2]) in which they based the self-control performance in observational data from parent, teacher and self- reports. Like Mischel, they also found that self-control in the first decade of life predicted income, saving behaviour, financial security, security, prestige (in job), physical and mental health, substance use and lack of criminal activity in adulthood. They suggested that, in regard to the power of prediction, early self-control had the same predictive power as general intelligence and family socioeconomic status. They suggested executive function underlies self-control of "impulsivity, conscientiousness, self-regulation, delay of gratification, inattention hyperactivity, executive function, willpower, intertemporal choice" (p.1). However, their study was not clear about the assessment of children's performance in those overlapping constructs. Although Moffitt et al. (2011) stated that self-regulation is a component of self-control; they did not define how those constructs related to each other. The cognitive demand of self-regulation is addressed within the executive function framework in section 1.3 of this chapter after the labels of 'temperament' and 'effortful control' are introduced.

The behavioural outcome of self-control is a reflection of inner mechanisms like any other psychological construct, but analysis of any developmental origins has been approached in terms either of cognitive or emotional development. On one hand, observing children's reactions toward immediate or delayed rewards tends to lead to an analysis of self-regulation in cognitive terms. This line of thought tends to lead to analyses of individual differences that also make overarching predictions for later in their lives. On the other hand, other researchers

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[2] The Dunedin Multidisciplinary Health and Development Study (also known as the Dunedin Study) is an in-depth study of human health, development and behaviour which was conducted by following the lives of 1037 babies born between 1972 and 1973 in Queen Mary Maternity Hospital, Dunedin, New Zealand.

define a regulatory skill in terms of behavioural reactivity during infancy. This research has pushed explanations towards accounts of temperament and emotional displays.

1.2.2 Temperament.

In the early 1980s, Rothbart and Posner introduced a temperament-based approach to the study of self-regulation. Temperament was proposed as an explanation for children's means of coping with conflict and as an indicator of the ability to regulate emotional arousal. Prior to the development of higher mental faculties that might be responsible for volitional decision-making, Rothbart suggested that temperament reveals individual differences of emotionality, activity and attention. Based on the evidence from infants aged 3-12 months (Rothbart & Hwang, 2005), three dimensions of temperament were proposed as surgency /extraversion, negative affect, and effortful control (Rothbart, Ahadi, & Evans, 2000). Each of these dimensions represents observable reactions of a very young child. Surgency /extraversion refer to: "activity level, smiling and laughter, (high) intensity of pleasure, impulsivity, shyness, and positive anticipation" (Rothbart & Rueda, 2005, p.2). Negative affectivity is represented by the display of emotions such as "fear, anger, and sadness" along with the way to cope with those such as display of "discomfort and soothability". These two dimensions were found to be in strong relationship with effortful control, as assessed in tasks of "attentional shifting, attentional focusing, inhibitory control, low intensity pleasure, and perceptual sensitivity". It is clear that each of Rothbart's dimensions is loaded with both affective and cognitive demands. The observations in surgency/ extraversion (which are usually summed to form a construct 'positive emotionality' in early development) and negative affect have been proposed as predictors of more complex control of action ('effortful control') in later development.

Children even as young as 10 months old are able to show longer attention during play (during a pleasurable activity) and also show less negative emotionality towards aversive stimuli (Kochanska, Coy, Tjebles, & Husarek, 1998). Kochanska, Murray and Harlan (2000) reported in a longitudinal study that sustained attention in infancy (at 9 months) was the essential component in later successful effortful control. Attention control as part of effortful control observed in stroop-like tasks (which I will refer under section 1.3 for executive functions) was claimed to be the underlying mechanism, a contributing element of emotional regulation (Derryberry & Rothbart, 1988; Kochanska, Murray, & Harlan, 2000); even when it was measured concurrently and over time (Kochanska et al., 2000)..

An infant who struggles to regulate emotionality would be claimed to be displaying a 'trait' but in later childhood similar behaviour might be explained by insufficient attentional control, or that their temperament-control that they may be lacking (i.e., due to individual factors) (Calkins, 1994). Among others who studied individual factors in emotional regulation or effortful control, Fox and Calkins (2003) used the labels of internal and external factors to explain the development of the control of emotionality. External factors can be summarized in terms of the social support that the child received from his parents, whereas internal factors refer to the developing cognitive abilities that serve as an aid for controlling emotions (Fox & Calkins, 2003). Although they share the same label in this categorization, they used abilities like attention or inhibition control to justify a change in other constructs such as temperament. Kochanska has also emphasized the relationship of the child with others in her analyses of child's compliance, and the development of conscience fits to justify this category (Kochanska, 1991; Kochanska, & Aksan, 2006). The term 'effortful control' was put forward as the mechanism responsible for the inhibition of salient responses It is addressed in detail in section 1.4 (particularly its overlapping features with executive functions and how it has also been used to explain emotion-related regulation of behaviour).

1.2.3 Effortful Control.

In studies of the child's ability to gain a control over her or his behavior, for example Rothbart, Derryberry and Posner (1994) used effortful control and self-regulation interchangeably. They reported that "inhibitory control, attentional focusing; low-intensity pleasure and perceptual sensitivity" (p.86) are internally operated behaviors. Since they also refer here to attention mechanisms that are described, the term 'effortful control' has also been used to refer sustaining and manipulating cognitive demands (e.g. alternating attention to different stimuli). Prior to Rothbart's explanation of attention systems in development, Luria (1973) made a distinction between early and later developing systems that children possess. He considered that early, involuntary attention is based on biological development. The maturation of such involuntary systems would facilitate the later development of the voluntary attention, or higher mental functions. Posner and Rothbart (1998) followed Luria's distinction but, contrary to his explanation, they suggested that a complex interaction between biology and socialization shapes both the involuntary and voluntary attentional systems. The emergence of attention based- effortful control is observed at the ages of between 6 and 12 months where its growth has also been associated with the anterior attention network (Rothbart, Derryberry, & Posner, 1994).

Kochanska and her colleagues focused on the issues of social-emotional development of children whose age ranged between 2 ½ to 6 (Kochanska, Murray & Coy, 1997; Kochanska et al, 1996) in their analysis of developmental origins of effortful control. Their sample was older than Rothbart's (mostly infant) studies. Their operationalization of effortful control was based on the assessments from age–appropriate batteries to capture the changes that occur throughout from late toddlerhood through the preschool period. They used 'inhibition control' to refer to effortful control to fit in with their conceptual approach. An explanation for the change of terms is that the second term captures the dual requirements of regulation behaviour as inhibiting and also sustaining the behaviour, and they wanted to focus only on the act of inhibition. Kochanska, Murray, and Harlan (2000) describe Rothbart's term as too close to other constructs within the regulation of behaviour and emotion, which can be active or passive. They also claim that although they locate the construct between temperament and motor behaviour, it also intervenes between these constructs. A child's ability to slow down at on-going activity (e.g. trying to walk a more slowly) and ability to lower their voice (e.g. whispering when asked) were examples of motor-control tasks, and there was 'inhibitory' demands in the core of these tasks called to assess effortful control (Kochanska et al., 2001).

Both Kochanska and Rothbart refer to effortful control to mean a combination of emotional and behavioural regulation. However, the way that they kept the cognitive process intact within the process deserves to be mentioned. Their weighting of affective systems as individual differences will lead me to look at a different account which is the executive functions account. Including emotional regulation, one of the main highlights of Kochanska's approach to effortful control, is that her grip on this construct includes all the range of domains of functioning, including cognitive, social, emotional, motor, and behavioural performance. Both Rothbart (Rothbart, Derryberry, & Posner, 1994) and Kochanska used the term effortful control to cover the two aspects of the self-regulation, which are inhibitory and excitatory. The excitatory aspect can be summarized as the initiation and maintaining of a subdominant option whereas inhibition refers clearly to a suppression of a prepotent action. Kochanska (Kochanska et al., 1996; 1997; 2000) places greater emphasis on the role of emotions. In her task development, she respects Rothbart's placement of the effortful control in the broad context of a comprehensive temperament framework. Therefore, Kochanska acknowledges the early affective response development, such as fearfulness or guilt proneness. In addition, she also addresses the child's compliance to the parent's agenda in different settings. In doing so, she adds another dimension, the active engagement of the child with the environment, as in reciprocal social relationships. The contrast between '*DO*' or '*DON'T*' commands face the child with input that challenges the primary affective systems. In one study Kochanska et al. (2001) presented different tasks for children from the ages of 14, 22, 33, and 45 months. Even the older children struggled more on the *DO* contexts. The performance in the *DON'T* context was correlated with a measure entitled 'committed compliance to parent' and also fearfulness.

Both Kochanska and Rothbart developed their behavioural and parent-reported measures of effortful control within the same theoretical perspective. Kochanska divides effortful control into five capacities where the core quality of suppressing a dominant response exists in each component as in regulation of motor, vocal, emotional, and cognitive responses and how long each is sustained. The capacities pertain to 'delaying, slowing down motor activity, suppressing or initiating the activity to signal, effortful attention and lowering voice' (Kochanska, Murray, & Harlan, 2000, p 11). The test battery for each domain of abilities that focussed on effortful control was taken as a composite profile for self-regulation (Kochanska, Coy, & Murray, 2001). These tasks that have been developed to tap each capacity demonstrated highly coherent underlying consistency.

The battery to explain underlying constructs of the effortful control (Kochanska et al., 2000) also has been demonstrated to be associated with children's development of conscience (Aksan & Kochanska, 2004), and it has be shown that it is related to individual differences in child's particular emotionality. By certain emotionality what it meant is their finding of fearfulness or guilt-proneness of a child that was again associated with the child's effortful control performance. This will be revisited in the chapter when I consider emotional-regulation section specifically. Clearly, the literature behind the label effortful control embraces both cognitive and emotional demands of a situation that requires self-regulation to be exercised. One aim of this chapter is to analyse each aspect of the construct. The unique association between the emotional and cognitive aspects of control is reported in the further each individual study that follows.

1.3 Executive Functions –or Cognitive Aspect of Self-Regulation

Executive function (EF) skills also form part of the self-regulation processes although, here, terms like inhibitory control or delay inhibition are used. EF was defined as 'general process control mechanisms that modulate the operation of various cognitive sub-processes and thereby regulate the dynamics of human cognition' (p.50) by Miyake et al, (2000). These are goal-directed, planned, inhibited behaviours and used synonymously with self-regulation by some developmental psychologists (Blankson et al, 2013; Sokol et al., 2010; Lewis et al, 2009; Carlson & Wang, 2007). The executive function skills were reported to be dependent on prefrontal neural systems, particularly the prefrontal cortex (PFC) and anterior cingulate cortex (ACC) (e.g. Cole, Usher, & Cargo, 1993; Pennington, & Ozonoff, 1996). These areas are associated with the emotional reactivity, the stress response and the autonomic function (for review Miller & Cohen, 2001). ACC is recognized for its association with processing both emotional and cognitive information and is thought to be where the affective and cognitive systems are situated (Blair, Zelazo, & Greenberg, 2005). EF is also an umbrella term that has been widely used in the past two decades in search of children's cognitive-control, the occasions listed where such control occurred, exercised or needed. As Diamond (1999) noted it occurs in: "(1) novel tasks and situations that require (2) concentration, (3) planning, (4) problem solving, (5) coordination, (6) change, (7) conscious choices among alternatives, or (8) overriding a strong internal or external pull " (p.70). Thus, EF embraces and represents the co-development of working memory, attentional flexibility, inhibitory control, planning, and goal-direction (Pennington, 1997; Welsh et al., 1991). Goal-directed activity and impulse inhibition are bound to self-regulation by the definition of its nature.

To exercise self-regulation by choosing a strategy to tackle a task (most require regulation), engaging in the chosen strategy and maintaining it, the skills that contribute EF need to be employed. Russell (1996, p.209), referred to "the ability to program and regulate the behaviour, specifically to program and regulate the judgements one is asked to make about situation". He argues strongly that such 'executive functioning' is so profound that it is an aspect of agency – how we become aware of ourselves as agents. Between the ages of 3 and 6, crucial improvements emerge in the ability of inhibitory control (Diamond & Taylor, 1996; Frye et al., 1995; Gerstadt, Hong, & Diamond, 1994; Kochanska et al., 1996; Reed, Pien, & Rothbart, 1984). This is the ability to suppress an impulsive response, or to delay this response when the task requires it (Diamond, 1999). Inhibitory processes can be simply defined as stopping a prepotent response or suppressing an impulse. Such control can be simple or complex dependent on the demand it makes (Garon et al., 2008) which may require *Delaying* a response or tackling a *Conflict,* respectively (Carlson & Moses, 2001). The separate demands within IC will be addressed in further detail in Chapter 2 when reporting Study 1 which specifically focuses on the dynamic within the inhibitory skills.

Here, the frameworks that explain EF as a unitary construct will be discussed because their explanations can also be used to explain self-regulation. Zelazo and his colleagues proposed the cognitive complexity and control (CCC) theory which depicts EF as a unitary construct (Zelazo & Frye, 1997, 1998; Zelazo & Muller, 2002). According to their theory executive skills occur through the ability to engage in increasingly complex representation of information. Such abilities change during preschool years, particularly the ability to grasp hierarchical or embedded rules. The CCC theory (Zelazo & Frye, 1997, 1998) argues that in order to shift from first rule to the second rule when the requirements of an activity change. Children must first realize that both (pre- and post-switch) rules apply to the same situation, and then they should construct a higher order, an embedded ''if – if – then'' rule for choosing the post-switch rule compared to pre-switch rules. A perseverance seen in three-year-olds in such activities is attributed to failing to formulate and use a higher order rule.

Children represent and use this higher order rule purposefully from the age of four, and they can come flexibly to choose between two different sets of rules. In the Dimensional Change Card Sort (DCCS) task, children are presented with some cards that share at least one dimension (i.e., colour or shape). Young children's performance in this task has revealed some systematic age-related change, as in 3-year-olds' perseverance on the same rule (e.g., sort by colour) even when they were asked to sort out the cards according to a different dimension (sort by shape). By 4-and 5-year-old participants follow the dimensional change rule and sort the cards according to the new set of rules (for a review, see Zelazo et al., 2003).

Miyake et al.'s (2000) explanation for the executive problem is 'shifting' and they argue that this as a core executive skill. Their definition of this term concerns the ability to shift between different set of rules, mind sets or tasks. It requires both working memory and inhibition. A shifting error, described by Anderson (2002), occurs where the new still shares one aspect of the first rule. Such overlap seems to identify children's limitations in the working memory. To observe the weight on the different demands of the switch rule flexibility Rennie, Bull, and Diamond (2004) reduced the behavioural (or attentional) demands of the DCCS task by matching the target and sorting cards along only one dimension. A target card contained a different shape on it than the sorting cards but was matched on colour. For example, a blue car and a red flower were used as targets, but the sorting cards were blue umbrellas and red stars. With such stimuli the child would sort them according to colour without getting confused by the shapes. In the switch condition, the target cards were a green boat and a yellow bird and the sorting cards did not match the colour but only matched the shape of boats and birds. When they reduced the attentional inhibition demand of the task, almost all children managed to switch to the second rule. Young children's perseverative errors may thus be due to lack of their attention control or both the combination of action and attention control.

The developing ability under the banner of 'inhibitory control' (IC) constitutes the cognitive aspect of self-regulation. I will be exploring whether the primary driver of self-regulatory processes is 'inhibitory control' and how distinct demands of inhibitory skills behave as regulatory mechanisms. The assessment of IC and its distinctive demands will be addressed in detail in Chapter 2, since Study 1 aims to clarify these dynamics prior to including emotional-regulation within my empirical framework.

1.4 Emotional-Regulation: The Emotional Aspect of Self-Regulation

Emotion-related regulatory behaviour is most likely to be described as a socialization process because of the importance of the effect of emotional reactions on others and vice versa. Emotional regulation is one of the terms that can be used for the inhibition of a proponent emotional response. Limiting its description to 'inhibition' would be to consider it as a simple dimension of other executive function skills. As reported earlier in this chapter, the term 'effortful control' has been used to explain the underlying mechanisms of both emotional- and cognitive-regulation (Rothbart & Bates ,1998), and both assume a fixed, even simplistic, explanation of temperament. They proposed that an attentional network is employed in how the regulation of both emotionality and mental control develops (similar to an EF explanation). Their summary of the findings overlaps with the accounts of Cole et al., (2004; 2008), Saarni (1984) and Kochanska et al. (2007; 2009) who focused on changes in the ability of emotional regulation on different age groups. All these authors claim that emotional aspects are important in the manifestation of self-regulation. Such an emotion-based explanation assumes that the affective skills are the crucial driver (as mentioned before in sections of 1.2.1 and 1.2.2). Such claim has been made under the labels of 'temperament and 'effortful control' which have been used interchangeably with self-regulation. The model of Campos, Frankel, and Camras (2004) describes emotion regulation as a process of generating an emotion in addition to managing emotions that have already been generated.

Management of emotions may be required since the situations they have been elicited in may or may not match with the expectations of social norms or individual relationships. Cole and his colleagues (2004) similarly proposed that the emotion regulation concept should be considered as a problem solving tool, which involves the organization of attention, activity and overcoming of complications with strategic, determined means. Evidence from 4-and 6-year olds has demonstrated that expressing and understanding emotions were significantly related to the abilities that requires online control of emotions like responding to a disappointing event or keeping a secret (Carlson & Wang, 2007).

Campos et al. (2004) defined the main driving forces of emotion regulation in terms of mastering the understanding of emotions and emotionality. In their unitary explanation, they argued that both regulation and emotion co-occur in development from the outset. By this they meant that there is very high variability in emotion and its regulation, and these two processes are key indicators of the flexibility of human problem-solving ability. Campos et al. (1978) created an emotion-eliciting situation with infants at the age of 2 to nine months, the visual cliff. A visually deceiving glass floor with a deep fall illusion (deep and shallow cliffs under the glass) was used, and infants were placed in a position where they were required to crawl across on this floor. They reported that, when getting close to deep side of the cliff, infants younger than 7-9 months showed decelerating heart rate (suggesting attention), whereas toddlers older than 9 months showed accelerating heart rate, apparently showing that they sense the danger. This has been interpreted as a bio-behavioural shift by Campos.

Developmental achievements in infancy cannot be directly related to toddlers' behaviour in different setting, but Campos (1994, 2004) suggests that the monitoring function mediates between the identification of feelings and expressions of emotional information in ways comparable to those of infants who experience disquiet. The Strange Situation is one such example, where a child's coping with the absence of a parent is emotion-eliciting and requires a goal of emotional stability. The skill of modulating the level of emotional arousal in a stressful situation can also be described purely in terms of emotional regulation (Saarni, Mumme & Campos, 1998).

The ability to cope with negative affect and its control goes through drastic changes in the first year of year life (Eisenberg, Fabes, Murphy, Maszk, Smith, & Karbon, 1995) and it continues to develop at the age of 6 (Eisenberg, Fabes, Guthrie, & Reiser, 2000). Rothbart's approach depicts attention systems as the driver of emotion development but the ability to develop these skills (effortful control) is constrained by the infant's temperamental characteristics (Rothbart et al, 1989). Posner and Rothbart (2000) claimed that attentional control is a neurological foundation. According to their explanation, as the anterior and posterior attention mechanisms mature, children gain increasing control of their emotions and actions. At the same time an increasing ability to organize input from the environment leads to the capacity for sustaining a calm state of mind, delaying gratification, accepting change and creating an appropriate cognitive and behavioural response to an environmental cue (Rothbart, Ellis, & Posner, 2004). In a stressful situation, young infants may turn their head as an act of shifting attention from a stressful situation or try to kick or pull with their legs and arms to avoid stress. Children have used the strategies such as disengaging from negative emotionality and self-soothing which are also categorized as self-regulatory skills (Rothbart, Ziaie, & O'Boyle, 1992).

The emotional trajectory of Kochanska's predictions of temperament and conscience was focused on the certain emotions that child experiences such as fearfulness and guilt-proneness (1995, 1997). She found a relation between the early emotionality and the later SR performance; according to her approach the negative emotionality of child in infancy such as highly fearful children were better at the internalization of moral values when they received gentle maternal discipline. Children were expected to continue to obey the rules when there was a strong temptation for them to cheat in a game and no surveillance was available from the experimenter who specified the importance of not violating the rules. The fearful characteristics of children were assessed by their being exposed to a novel (strange) situation, with a fairly scary mask, in a laboratory setting at around age 2-3 years.

Instead of children's experiences with certain emotions as such as guilt or fear; the goal of this thesis is to explore an emotion-based explanation of regulation that acknowledges the necessity of understanding social norms for manipulating one's emotions (Saarni, 1984; Cole, 1986; Liebermann et al., 2007). Saarni studied older children and her emotional-competence theory is fundamentally different, as she approached children's emotional abilities in socially constructed and emotionally manipulated situations. She also did not rely on parental reports of the child's experiences. Bridges, Denham and Ganiban (2004) conducted a detailed review of ER assessments in the literature. To identify the difficulty of defining the construct and suggest that authors' inferences are often simply due to the chosen measurement methods that the select or create. The example of Saarni's research, above, closely matches Bridges et al.'s analysis. Cole, Martin, and Dennis (2004) adapted Bridges et al.'s approach to acknowledge the methodological problems in this area. However, they felt that there is a resolution to the problem that methods appear to drive theory in the area. They argued that emotions must be understood in terms of their functions. Accordingly, when ER is identified as a as a *tool*, it would be expected to regulate arousal, so the inability to hide true emotions or desires would be considered as a failed attempt of ER. Keeping in mind that creating emotion-inducing situations for young children is going to be hard, to explore children's changing control over their emotionality, it is necessary to link such ability to goal-directed behaviours as observed in IC.

It has been claimed that, at around three years of age, children's ability to mask their feelings is related to their performance in a deception task (Lewis, Stanger, & Sullivan, 1989). Lewis et al. (1989) found that preschoolers peeked at a toy that they were instructed not to look at and they verbally denied their misdeed. Children who verbally deceived the experimenter also controlled their emotional displays, such as smiling more and appearing more relaxed. This result is a little surprising given that children's understanding of others' mental states or emotion is assumed to be under development at that age (see next section). They can deceive in order to achieve a goal even though this demands a level inhibitory control that they may have problems with (see section 1.3). The advanced manipulations of emotions seen in Lewis et al.'s (1989) study suggest that the studies in this thesis should consider not only the regulation of negative emotionality but also of positive emotionality as well. For example, a child who cannot contain his or her excitement with new activity in the classroom may not deliver the performance that she or he could have. I turn to such issues in Chapters 3 and 5.

Affective responses are necessarily inseparable from their context. For example, think about your own emotional reaction to a frustrating situation and how different your reaction would be whether you were with a close friend or an acquaintance/colleague. For adults as well as children, the audience of an emotional display may play a critical role. We therefore need to assess how a child attempts to control his or her display of emotions in a situation with a stranger. Carlson and Wang (2007) approached ER in a similar way as Saarni's paradigm. Their study is one of the few recent analyses of the critical role of ER in relation to cognitively driven explanations such as the executive functions. Although Carlson and Wang

(2007) used various measures of emotionality, the significant relationships they reported mostly relied on the parental reports of ER rather than online assessments.

To summarise the structure of what follows in my theoretical analysis in later chapters: the reader will become aware that I started by homing in on children's ER in relation to their execution of emotional display rules which are claimed to be related to both emotional development and the internalization of social demands. Saarni's Disappointment Paradigm is addressed in more detail in Study 2 which deals with the regulation of negative emotionality and its relations with inhibitory control and social understanding. Study 3 shows a move towards the 'understanding' of the child of emotions. It introduces the literature on emotion-comprehension and its influence on the performance of both aspects of self-regulation.

From a more applied perspective, a child who is unable to mask to true emotions may also fail emotional-regulation and this might lead to the development of negative social, emotional, and behavioural outcomes such as risk behaviours such as impulsivity or a lack of 'school-readiness' (Eisenberg, Fabes, Guthrie, & Reiser 2000). Although, the underlying mechanism of for controlling emotionality may be in evidence from infancy to toddlerhood, the starting point for this work is milestone of a child's ability to regulate the arousal of emotions successfully. This will allow us to investigate what lies behind any 'failure' to regulate emotionality or show emotions that may be not socially appropriate, as is often in evidence in the preschool period. The child needs to synthesize the rules of omission and commission by internalizing social values and norms.

Thus, instead of parental report, the initial aim is to explore, within similar circumstances, children mask their true emotions for the sake an adult that they have only just met and with whom they have not developed a close emotional bond. The assessment of ER is particularly addressed in terms of its certain qualities, concerning the control of negative or positive feelings. For example, the regulation of positive emotionality is addressed in more detail in Study 3 which includes the assessment of children's ability to control their reactions when facing an exciting situation. We continue to add the comprehension of emotionality in the coming chapters. Studies 3 and 5 examine this dimension.

1.5 Social Understanding

A more in-depth analysis of the literature on Social Understanding will be presented in the next chapter when I introduce the first study of this thesis. However, I would like to mention three key reasons for the inclusion of social understanding in the search of self-regulation here, in brief. Social understanding (SU) concerns children's grasp of different perspectives that people might have and includes a range of mental states like desires, feelings and beliefs. The well-known name for mental representation is 'theory of mind'. However, I adopt the term social understanding since it does not imply a theoretical orientation (e.g. simulation vs. theory approaches) and refers to a range of social skills that serve as a possible stepping stone to self-regulation. These skills encompass emerging self-awareness and perspective taking and they accommodate the notion of 'agency' that underlies a grasp of one's own and other's needs (Russell, 1996). According to this view, the child's 'agency' may be depicted as a prerequisite for the emergence of executive control. The term agency refers to child's ability to control his or her experiences; so using it assumes an inevitable link between our grasp of the self and the cognitive aspect of self-regulation (Russell, 1996). Russell's view differs from the perspective of most authors of the field, like Carlson and Moses. These rely on an individualistic perspective. As mentioned before, Zelazo et al. (1997) examine issue of control from a problem solving perspective and suggested that control necessitates analysing skills into four sub-skills: problem representation, planning, execution (intending and rule use), and evaluation (error detection and correction). Children's ability to represent an abstract problem in their mind is very similar to how they grasp others' ideas, feelings and beliefs. In the planning stage, children have to search the available knowledge reserve or listen to given instructions. Execution requires the need to keep memory strength in mind to retain information and the ability to apply a rule, or two opposing rules, in order to solve a task. It also may require inhibition of other distractions. Evaluation is the realization of that the task is finished, and problem is solved by detecting or correcting the errors. The performance of 3-year-old children in both executive function and social understanding tasks have been shown to be poorer than 4-and 5- year olds (e.g. Frye et al., 1995; Hala, Hug, & Henderson, 2003; for a review Moses & Tahiroglu, 2010).

1.6 Summary of Thesis

This chapter has introduced the reader to the labels that have been used to refer to different aspects of self-regulation and their findings that are relevant to cognitive and emotional development. I have tried to show that some accounts of the construct suggest that self-regulation has been described/defined using a diversity of terms. Some accounts treat emotional and cognitive control as being two sides of the same process, while others focus exclusively on the latter. Each chapter in this thesis will focus on a specific relationship to examine the dynamics within SR. I would like to give a summary of coming chapters and studies that will tackle the relationship between 'inhibitory control' and emotional-regulation in a consecutive order. In the next chapter, Study 1 focuses on the discrepancy among inhibitory demands and their association to social understanding within a small Turkish sample. In Chapter 3, a cross-cultural Study 2 compares Turkish and British children's inhibitory skills with their emotional-regulation in a negative situation. In Chapter 4, Study 3 widens the assessment of emotional-regulation by measuring positive emotionality and emotion-comprehension. The strong relationship between EU and in Study 3 sparked an idea of a different assessment of emotion-regulation. The Scale of an Understanding of the

Regulation of Emotions (SURE) is developed to measure children's understanding of emotional-regulation and is reported in Chapter 5. Finally, Study 5 was designed to bring each construct that was used in the previous studies together to examine the relationship between online measurement of regulatory behaviour and the complementary skill of 'understanding' self-regulation, in both its cognitive and emotional aspects.

Chapter 2 - Reciprocal Links between Social Understanding and Cognitive Regulation

As Chapter 1 laid out, the constructs that constitute self-regulation will be unpacked in a step-by-step manner and in this chapter the understanding of cognition (social understanding) in relation to the regulatory skills in cognitive domain will be addressed. Before entering the complex area of emotion, the inter-relationship between the cognitive domain and its assessment will be discussed.

The ‘regulation’ in cognitively demanding tasks and ‘understanding’ of others’ minds represent key changes in cognitive development, often characterised as the 3-4 shift (e.g., Frye, Zelazo, & Palfai, 1995; Wellman, Cross, & Watson, 2001). The relationship between these skills has been extensively studied within developmental psychology in the past two decades compared to other aspects of self-regulation (e.g. Carlson & Moses, 2001; Perner & Lang, 1999; Russell, 1996). There are two reasons that I started the exploration of self-regulation within CR and SU which is a well-studied connection in developmental psychology literature.

Firstly, I believe that addressing whether social understanding ignites the development of cognitive regulation, or vice versa, is necessary because the role of ‘understanding’ over ‘regulation’ remains unclear. Although theories on the development of both cognitive-control and social-understanding have found one responsible for the other’s emergence, the qualities that lie within inhibitory control was reported to differ in terms of their association to understanding (Carlson & Moses, 2001). Secondly, the conceptualization of cognitive-regulation requires a clarification in terms of its assessment. Thus, the literature of social understanding and why it might help children to regulate their behaviour in cognitively demanding conditions is presented in this chapter. The construct of cognitive-regulation is unpacked here and Study 1 was conducted with 39 Turkish preschool children whose performance in social understanding and cognitive-regulation is reported.

2.1 Assessment of Social Understanding

As the *"understanding of others' mind"* broadens, the competence of representing another's desire, belief, and emotions, is also known as the *'theory of mind'.* However, the interactions that an individual shares with other people lies at the core of understanding one's own or others' minds. Social Understanding (Henceforth SU; Hughes & Dunn, 1998; Carpendale & Lewis, 2004; Fernyhough, 2008) is the term that is preferred in this thesis. A growing understanding of one's own and others' mind is fundamental to engaging with the social world. Children come to distinguish between accidental and intended behaviours, between wishes and reality, between plans and outcomes, between truth and deception. In this respect, the understanding of mind is part of a larger understanding of human action, our everyday or common-sense psychology (Harris, 1989).

Social understanding, henceforth SU, embodies the three following qualities; [1] one's ability to see him/herself as the beholder of mental representations; [2] the ability to understand that other individuals are entitled to their own mental representations; [3] the ability to alter actions based on the understanding of others' different mental representations (e.g. Astington,1993; Perner, 1991). From an early age, children start to appreciate that a person's desire or belief of a situation might differ from the reality (Wellman, Cross, & Watson, 2001). The literature that I refer to regarding SU is one of the most studied areas of developmental psychology in the past thirty years. For measuring children's recognition of beliefs (or epistemic states) as the reason for an action, now well-known 'unexpected change' task was introduced by Wimmer and Perner (1983). In this task, a puppet protagonist- Maxi hides his chocolate in one location (e.g. in a blue box) prior to leaving the room. When he is absent, his mother places his chocolate in another location (e.g. in a red box). Children were asked on behalf of Maxi where he should look for his chocolate. The correct response (i.e. looking for it in the blue box) indicated the recognition of Maxi's belief that mismatched the reality. Children's appreciation of Maxi's lack of information about the change of events was reported to emerge between the ages of 4 and 6 years.

Perner, Leekam and Wimmer (1987) contributed to the methodology with the 'unexpected content' task which demonstrated children's attribution of false belief of their own mental states. Children were presented with a well-known package of an object (e.g. a candy box, a crayon box, a band-aid box) but not containing the known object (e.g. containing a pencil instead). The performance difference between 3- and 4- year - olds suggested that younger children were unable to refer to their earlier false belief in this task. Older children, on the other hand, were able to admit their mistaken belief that they reported earlier. Despite the popularity of the false belief performance to measure such mental representational skills, it has been considered a rather narrow test of the understanding of the mind (Astington, 2001; Chandler 1988). As a result, a measure of others' intentions, beliefs, desires, emotions and knowledge was scaled in a developmental sequence by Liu and Wellman (2004). In their developmental progression, they claim that children's desire reasoning is one of the earliest emerging abilities of SU which is followed by the understanding of belief and emotions.

According to the earlier findings from Bartsch and Wellman (1989), children as young as 2-year-olds were able to pass reasoning tasks when others' desires were in question but they fail to pass in the belief tasks. Although there are conflicting theoretical explanations for the source of the ability, false belief performance was found to be in consensus in the meta-analysis of 178 studies of Wellman et al. (2001). Children were able to pass false belief tasks, reflecting on both self and others, by the age of 4 or 5 year-olds (e.g., Astington & Gopnik, 1991; Gopnik & Wellman, 1994; Harris, 1994; Leslie, 1994; Perner, 1991; Wellman, 1990; Wellman & Liu 2004). Thus, understanding of desire emerges before false belief understanding and a grasp of conflicting emotions emerges even later. According to this scale, in Study 1, I only employed the false belief tasks. Later studies though will present a wider assessment of understanding of emotions (Chapter 4) and meta-understanding of emotionality in social situations (Chapter 5).

For the psychological qualities that play a part in the development of SU, there are a few theories that I need to mention, to clarify the position of SU in development of self-regulation. So far, the inclusion of SU in explaining self-regulatory skills may sound like an overambitious prediction. However, the theories defining how children are able to pass false-belief tasks have been used to guide the search for this relationship. From infancy to toddlerhood true voluntary control of behaviour and self-regulation emerge in a more active way (Kopp, 1982). In the first 2 years of life, children develop a grasp of orienting attention from others (Reddy, 2003). This can be seen in terms of emerging attentional abilities but it is also the beginning of the child's recognition of his or her own impact on other people. Recent theoretical analysis suggests that the ability to make a distinction between first-person experiences and third person observations is required for self-consciousness (Reddy, 2003). In addition to expanding an awareness of one's social surroundings, the development of regulatory skills goes through a change in the preschool years. The quality of this change has been based on the child's more general achievements in understanding symbolic representations (Bronson, 2000). Parallel changes in the ability to understand others and gain better control of self are generally observed at a similar stage of development around ages 3 to 5.

Since most of the studies have focused on children's better control under the lens of executive functions, two conflicting but intertwined explanations are in place. Young children's poor performance in the false belief tasks were claimed to stem from the limited or yet-not-emerged skills of cognitive control (e.g. Russell, 1996; Carlson & Moses, 2001). In contrast, children's better performance on being able to build an accurate mental representation was claimed to be the key to their better performance in executive function tasks (e.g. Perner, 1998; Perner & Lang, 1999). 'Executive functions' are considered to be multifaceted, consisting of three core components: Inhibitory control (IC), Working memory and Cognitive flexibility (i.e. shifting). Each of these components has been used to explain children's shortcomings in false belief tasks (these components were addressed in Chapter 1).

In a false belief task, the child is required to suppress his or her own perspective or true knowledge about the situation in order to give a correct response. Thus, a lack of IC may prevent children from suppressing their own perspectives. This assumption was supported by longitudinal findings in which early cognitive-control performance was found to predict later false belief performance (e.g. Carlson, Mandell, & Williams, 2004; Hughes & Ensor, 2008). Another assumption was that children's limited working memory prevented preschoolers from recalling the protagonist's newly acquired perspective and led to the failure of the false belief task (Davis& Pratt, 1995; Gordon & Olson, 1998). Limited working memory and/ or IC were reported as responsible for failing false belief tasks based on correlational findings (e.g., Carlson & Moses, 2001; Carlson, Moses, & Brenton, 2002; Frye, Zelazo, & Palfai, 1995; Hala, Hug, & Henderson, 2003; Hughes, 1998; Perner, Lang, & Kloo, 2002).

The alternation of the demands of both IC and WM were applied to false belief tasks to demonstrate the specifics of their contribution to SU. The increasing WM demands made it harder for 4 year-olds to pass the false belief task (Leslie & Polizzi, 1998). Nonetheless, in order to lower WM demand, Freeman and Lacohée (1995) simplified the response from verbal expression to the selection of a picture and showed that children were able to pass a false belief task earlier. However, rather than identifying a direct link between WM and SU, the association of IC and SU was explained through the combination of WM and IC (e.g.

Hala, Hug, & Henderson, 2003; Carlson, Moses, & Breton, 2002). Carlson and Moses (2001) acknowledged that the association that IC shared with SU was dependent on the demands of IC tasks. The IC tasks with low WM demand required the child to inhibit an inappropriate response for a period of time. They were categorized as Delay tasks and were found to be associated with SU. However, when other factors were taken into account, SU performance was not predicted by the Delay performance.

On the other hand, tasks that combined both inhibitory and WM demands required the child to hold (at least) two conflicting responses. One of those responses would be natural to the child such as imitating or labelling what she or he sees and this is considered as a dominant response. A task that requires the child to suppress an initially dominant response (e.g. imitating an action) and elicits an instructed respond (i.e., not imitating) creates a conflict between those salient and less salient responses. The performance in what are categorized as Conflict tasks was found to be a predictor of SU performance. In the next section, the assessment of Conflict and Delay will be addressed.

Although studies conducted in Western cultures found more robust parallels in the development of three executive components and social understanding, some of the evidence from other cultures demonstrated an early emergence of IC (Oh & Lewis, 2008) or SU (Lucas, Lewis, Pala, Wong, & Berridge, 2013) performance. The performance of children from Eastern Asian cultures in the executive function tasks is reported to be more advanced in the early years of development compared to children from Western cultures (e.g. Lewis, Koyasu, Oh, Ogawa, Short, & Huang, 2009) According to evidence from Oh and Lewis (2008), the performance of 3.5- and 4-year-olds Korean children in working memory and false belief tasks was similar to age-matched British children, although Korean children performed at ceiling in IC and shifting tasks. Similarly, Chinese preschoolers also outperformed their peers from the United States in IC and shifting tasks (Lan, Legare, Ponitz, Li & Morrison, 2011; Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Sabbagh et al. (2006) proposed a possible genetic explanation for children's advanced performance, yet they admitted that the difference might be grounded on a culture that promotes respect and compliance to the authority figures (e.g. elderly and/ or parents) and highlights the value of self-regulation (e.g., Chen et al., 1998; Tobin, Karasawa, & Yeh, 2009). Lucas et al. (2012) also reported that Chinese preschoolers were advanced in their performance in IC and shifting tasks compared to age – matched British and Turkish children.

From a cultural perspective, Turkish culture stands on a transitional state between the individualistic values of the West and collectivistic values of the East (see Kagitcibasi, 1995). Moreover, the use of evidentiality markers in the Turkish language might help children to grasp skills like source monitoring which promote an early success in false belief tasks (Aksu-Koc, Balaban, & Alp, 2009; Aksu-Koç, 2009). Prior to the cross-cultural comparison on both emotional and cognitive self-regulation performances in Turkish and British children (Chapter 3), Study 1 aimed to replicate the findings reported on the relationship between SU and IC.

2.2 Inhibitory Control (IC)

Even though IC has been introduced earlier in this chapter in terms of its relation to SU, the issue of its assessment ought to be addressed. Two categories of IC have already been introduced above. Garon, Bryson, and Smith (2008) categorized the conflict tasks as assessments of complex response inhibition and the delay tasks as simple response inhibition. As one of the earliest examples of a Conflict task, children as young as two and a half were found to be good at following a single instruction in Luria's light bulb task (1961). In this task, children were asked to squeeze the bulb when the signal light was on but not to squeeze it if the light was off or a different coloured light was flashing. Although young children were good at following the first half of the instruction, they persevered when the light was off or different. Around the age of 5, children were able to inhibit their action and also act according to the second half of the instruction - not squeezing when the signal light was off. As mentioned in Chapter 1, Mischel's Marshmallow test was one of the most well-known delay tasks. In the last two decades, though, many more tasks of IC were designed and longitudinal findings on the development of IC from 8-months to school age were provided (Kochanska et al., 1996; Kochanska, Murray, & Coy, 1997; Kochanska, Murray, & Harlan, 2000; Kochanska, Tjebkes, & Forman, 1998). Kochanska and her colleagues are responsible for the various tasks that have been widely used in the literature. Carlson (2005) also provided a recent review of the tasks that have been used to assess IC in preschool children with cross-sectional data.

2.2.1 Assessment of Conflict

As described in the example above, in a Conflict task the child is asked to inhibit his or her naturally salient response to the situation and alter his/her response according to a certain rule that she or he needs to represent in mind. The tasks that are commonly used in the assessment of Conflict performance of preschoolers were presented with the references to their developers in Table 2.1. What is presented here is a brief summary of the key tests that have been employed to assess these skills. Not only is the demand of WM in these tasks moderate (e.g. representing the rule in mind through the task), but also the verbal demand is moderately high in Conflict tasks. For example, Strommen (1973) used the" Simon Says" game that requires the child to understand complex verbal instructions. Compared to Luria's dual 'squeeze or not squeeze' response conflict, there are fewer motor responses to be engaged or inhibited in the Simon Says task. While the experimenter is engaging in motor actions such as 'clapping hands' or 'touching nose' in front of the child, the latter's natural response would be to imitate the experimenter's gestures. According to the rule of the game though, the child is supposed to respond only when the experimenter says 'Simon says'. If the experimenter does not use this expression, the child is supposed to remain still and not perform the gestures. Simon Says was reported as a difficult task to pass even for 4-and 5 – year-olds (Carlson, 2005). The children were supposed to refrain from performing an action that an adult demonstrates and articulates as an instruction simultaneously. Children were supposed to listen to the cue and act accordingly but in face of visual and verbal stimulation, a short cue must be difficult to catch. A similar but simpler initiation-suppression task, the Bear/ Dragon Game was developed by Reed, Pien, and Rothbart (1984). Children are asked to comply/ do the commands that are given by the Bear puppet but, refrain doing the ones given by the Dragon puppet. The studies that employed this task report age differences from 3 to 5 years (e.g. Carlson, 2005; Carlson & Moses, 2001; Carlson et al., 2002; Carlson, Moses, & Claxton, 2004; Cole & Mitchell, 2000; Diamond, 1991). Carlson (2005) specifically reports the changes occurring at the age of 3. The success rate of passing this task is 51% for the younger 3- year-olds whereas, 76% of the older 3-year-olds are successful.

The Stroop-like tasks are less verbally exacting but are demanding of the children's understanding of semantics in terms of engaging a game. In the Reverse Categorization task, Carlson, Mandell and Williams (2004) report an improvement on the performance of sorting small and large items into conflicting boxes (i.e. putting small items into a bucket with a large items label and vice versa) from age 2 to 3. Tasks like Grass/Snow and Day/Night mark a performance difference between 3-and 5-year-olds. In the Grass/Snow task, when the experimenter says, 'Grass', a child is instructed to point to the white mat and when the experimenter says, 'Snow', a child is supposed to point to the green mat. Children are unable to pass this task until around the age of 4.5 years (e.g. Carlson, 2005). In a similar task, Day/Night, children are presented with two sets of cards one depicting the sun and the other depicting the moon and stars. The prepotent response of the children would be to call out what they see on the cards but what is expected from them is to do the opposite. In a longitudinal analysis, children's performance was reported to improve significantly from 3.5 to 7 years (Diamond et al., 1997).

Table 2. 1

The List of Tasks for Assessment of Conflict Performance of Preschool Children

	Salient Response	*Desired Response*	*Reference*	*No. of Citation*
Simon Says	*Imitate every action*	*Only imitate the actions that starts with 'Simon Says'*	Strommen (1973)	*64*
Bear/Dragon	*Do all moves both Bear and Dragon instructs*	*Do only what Bear instructs and Do not do what Dragon instructs*	Reed et al. (1984)	*206*
Day/Night	*Label the cards according to the pictures on them. (e.g. call 'Day' when see the 'Sun' card)*	*Label/Name the cards as the opposites of the pictures on them (e.g. call 'Day' when they see the 'Moon' card*	Gerstadt et al. (1994)	*834*
Standard DCSS	*Sorting the cards according to the previous rule*	*Sorting the cards according to the new rule*	Frye et al. (1995); Zelazo et al. (2003)	*697/605*
Whisper	*Shout the name of the cartoon characters on the cards*	*Whisper the name of the cartoon characters on the cards*	Kochanska et al. (1996)	*617*
Hand Game	*Imitate the hand gestures of E's (e.g. gesture a fist when E was making a fist)*	*Do the opposite of E's hand gesture (e.g. gesture a fist when E was pointing an index finger)*	Hughes (1998), from Luria et al. (1964)	*470*

Multi-location Search	*Look for the previous location of the reward*	*Look for the new location of the reward*	Zelazo et al. (1998)	*74*
Shape Stroop	*Point at the large shape for sorting the large items*	*Point at the small shape for sorting the large items*	Kochanska et al. (2000)	*981*
Spatial Conflict	*Press the key on the same side as the target*	*Press the key that is opposite the target*	Gerardi-Caulton (2000)	*251*
Grass/Snow	*Point at the same colour with the cue word (e.g. point at the green mat when the E says 'Grass')*	*Point at the opposite colour as the cue indicates (e.g. point at the green mat when the E says 'Snow')*	Carlson & Moses (2001)	*1168*
Reverse Categorization	*Sort the items using matching labels (e.g. placing the baby animals in baby bucket)*	*Sort the items using conflicting labels (e.g. placing the baby animals in mommy bucket*	Carlson, Mandell, & Williams (2004)	*360*
Less is More	*To gain the bigger reward, pointing at the bigger reward*	*To gain the bigger reward, pointing at the smaller reward*	Carlson, Davis, & Leach (2005)	*136*

2.2.2 Assessment of Delay

The tasks that require suppressing the response altogether, or postpone it for a period, are named as Delay tasks. Common procedures used to assess preschoolers' performance are presented in Figure 2.2. There are two types of delay tasks. One of them observes the waiting period and how the child copes with the frustration of the situation. The performance is measured by the time until the participant stops waiting and engages with the desired activity.

The observation of the child's coping during the delay time can be unstructured such as in Mischel's (1971) Delay of Gratification paradigm (DoG). In DoG, the child is offered one marshmallow now but if she or he waits until the experimenter is back then she or he would receive two marshmallows instead. The participant has a bell to stop the waiting period and call for the experimenter to have one marshmallow. The interpretations of how the preschoolers cope with the delay are based on how much attention children pay to the reward in front of them. The time was increased when the child's attention was not focused on the consummatory properties of the reward, but when the child's focus was on the reward the time of waiting was decreased (Mischel & Ebbesen, 1970; Mischel & Moore, 1973). However, early studies did not provide any insight to age differences. Children's ability to wait before ringing the bell increased during the preschool years (Atance & Jackson, 2009). In a cross-sectional sample, Carlson (2005) reported that half of the 2-year-olds were able to delay around 20 seconds but at the age of 3 children were mostly likely (85%) to wait around a minute. At the age of 4, children (72%) were able to wait for the treat up to 5 minutes. The difficulty of the task was mostly determined by the naïve interpretation that all kids love sweets. The other properties of DoG that need to be mentioned are that the children are in charge of their choice of waiting or not and they can end the waiting whenever they want. The experimenter leaves the child alone with the temptation. The three varying properties of the task (presence or absence of the experimenter, the type of the reward and its size) seem to influence the child's performance.

A more structured version of this task was called Snack Delay and was developed by Kochanska et al. (1996). In their version, children were asked to wait until the experimenter ends the waiting period which varied from 10 seconds to half of a minute. McCabe and Brooks-Gunn (2007) modified the task by adding a 60 second trial. The evidence from the structured version of Snack Delay task was similar to the DoG findings in which Kochanska et al. (1996; 2000) reported an improvement of the performance from the ages of 22 to 56 months. McCabe and Brooks-Gunn measured the performance in a 10-point scale, based on how children behave during the delay period trial (i.e. moving towards, and/or touches the treat). They found that from the sample of 116 children whose ages ranged from 3 to 5, only 32% of them demonstrated high levels of performance, with a maximum of 10 points (out of 10), 68% of the children demonstrated some evidence of not being able to cope with the frustration of waiting and the average score out of four trials was 7.5. Snack Delay tasks are conducted with structured waiting periods involving the experimenter in the same room with the child having no control over when the delay is going to be ended. The Gift Delay task was also developed by Kochanska et al. (1996). There are two versions. In the Gift Delay/Wrapping version, children are asked not to peek in the experimenter's direction while it is getting wrapped for around 60 seconds. In the Gift Delay/Bow version, children are asked not to touch their wrapped present until the experimenter comes back with a bow to put onto it. Performance in both Gift Delay tasks is very similar to Snack Delay task with regard to the age changes witnessed (Kochanska et al., 1996).

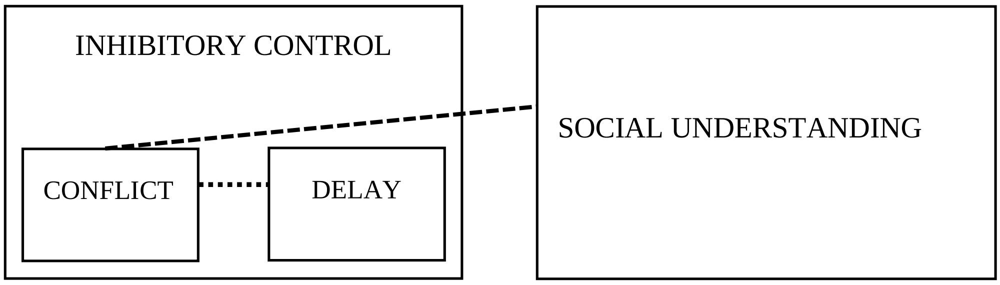
Instead of observing coping throughout a delay period or measuring the length of waiting, the 'choice' tasks are another way of assessing the Delay performance. The Choice/Delay Task takes the child's preference between an immediate smaller reward and a delayed larger reward into account. The number of times that the child chooses the delayed reward over the trials is used as the dependent variable. Lemmon and Moore (2001; 2007) demonstrated that from 3 to 5 years, children tend to choose delayed rewards more frequently as they grow older. At the age of 4, children were more likely to choose delayed rewards and they reflected an understanding of the size differences between immediate and delayed choices (Lemmon & Moore, 2007). An alternative, nine- trial Choice/Delay was adapted from Thompson, Barresi, and Moore (1997) by Prencipe and Zelazo (2005) with three different sizes and type of rewards. Three type of reward are stickers, pennies, and sweets. Three different sizes of delayed rewards were 2 later, 4 later, and 6 later, all compared to 1 now. In a study comparing the performances of 3, 4, and 5-year-olds, Hongwanishkul, Happaney, Lee, and Zelazo (2005) reported that the youngest group was less likely to choose a delayed reward compared to the older children who were more likely to prefer a larger-delayed reward. The performance of 3-year-olds was found to be significantly different to the older children (Prencipe & Zelazo, 2005; Hongwaniskul et al., 2005) but the performance did not differ between the 4-and 5-year-olds.

Both waiting and choice tasks were differed in their application but both demonstrated similar findings on the age differences. As mentioned earlier, Study1 aims to demonstrate the disassociation within the IC, through their (Conflict and Delay) relation to SU. The 9 trial Choice/Delay task appeared to be more practical compared to ‘waiting’ Delay tasks as it took a shorter time to administer. In Study 1, only a Choice/Delay task is employed to represent the delay demand of IC.

STUDY 1

This study mainly aimed to replicate the previous finding of Carlson and Moses (2001) that IC is diverse in its demands and is associated closely with SU. As mentioned above the evidence from cross-cultural studies demonstrates that Turkish children differ from their Western peers in terms of their performance in false belief tasks. Prior to addressing the cultural differences on the relationship of cognitive-and emotional- regulatory mechanisms, the purposes of Study 1 are, firstly, to demonstrate the predictive relationship between Conflict and False Belief performance. Figure 2.1 summarizes the connections that are explored in Study 1. It measures both Conflict and Delay-inhibition but the prediction is that only the former will show a relationship. Both Inhibitory Control measures were used in order to do some preparatory work towards the later studies (see Chapter 3). Secondly, by including tasks of WM and Shifting in addition to IC, the role of conflict inhibition can be compared with that of other closely related executive skills.

Figure 2.1: Constructs of Study 1



Method

Participants

Thirty-nine Turkish (24 male) children participated in the study. To capture the mental transition (e.g. Russell, 1996), 3- and 4-year-old children were randomly sampled from a nursery school in Bursa that serves mostly to the middle- and upper-middle class families. Their age ranged from 2 to 5 (*M* = 49.8 months, *SD*= 8.2, range: 28-60 months). Through sampling, slightly younger or older children than the age groups intended were recruited (two 2-year-old (34 months) and one 5-year-olds with (60 months)).Parental consent was obtained through the school administration. Children were also asked for their consent/ willingness to start or continue before every task. One further child was removed from the analysis having failed to complete the experiment.

Procedure

Children were tested individually in a quiet room of their nursery. Tasks were administered in a fixed order. The false belief tasks (5) were administered in the first place. They were followed by Inhibitory Control (IC), Shifting, and Working Memory measures.

The IC measure comprised of both Conflict and Delay dimensions. All tasks within a category were counterbalanced among their own category to avoid carry-over effects.

Conflict Measures

In the *Day/ Night Task* (Gerstadt, Hong, & Diamond, 1994), participants have to inhibit their quick tendency of responding to what they see. The children were presented with 16 cards that had a picture of the sun on 8 of them and the picture of the moon on 8 of them. The children were given the instruction that they have to say ‘night’ when they see the picture of the sun, and they should say ‘day’ when they see the moon in the picture. Each child had two practice trials and 16 test trials. Each correct response was scored with 1 point. The practice trials were counted as well; a minimum score was zero and the maximum was 16.

In *Snow /Grass* task (Carlson & Moses, 2001), children were presented with two square sheets of paper one was plain green and one was plain white. Then children were asked what colour grass and snow is. If they were wrong about pairing the colours with objects, they were given training about the colours and the object matter. They were then instructed about the game which was to point to the colour that was not named. The experimenter E said: “In this game, I want you to point to the green sheet when I say snow and I want you to point to the white sheet when I say grass. “When the child had understood the instruction, the task started with two test trials, which were followed, by 16 test trials in a pseudo-random order.

Delay Measure

The *Delay of Gratification-Choice* task was an adaptation of Hongwanishkul et al., (2005) which was originally developed by Thompson et al. (1997). Three types of rewards (stickers, pennies, and candies) were presented with three types of choice. Children were presented with each item with the following choices: “[1] Would you prefer to have one (e.g. sticker) now or two (e.g. stickers) later?, [2] Would you prefer to have one (e.g. penny) now or four (e.g. pennies) later?, [3] Would you prefer to have one (e.g. candy) now or six (e.g. candies) later?” There were two practice trials with non-test choices. Those were “one now or one later” and “one now or eight later”. In these practice trials, the demonstrator, E, demonstrated the preferences. In the first practice trial, a neutral choice of “one now or one later” was demonstrated and E made a random choice. In the second practice trial, E showed preference towards the more rewarding delayed choice by choosing “eight later” in the “one now or eight later” choice. In the test trials, E presented the objects and explained the choices. Then she asked the child, ‘Which one do you prefer?’ If the child preferred an immediate reward, she or he was allowed to eat the candy, stick the sticker or put a penny in a penny box. If the child chose a delayed reward, the rewards were collected in special envelope for later by E. There were nine trials. The preference toward delayed rewards was scored as 1 point. The preference toward immediate rewards was scored as 0.

Social Understanding (False Belief) Measures

There were 5 false belief tasks: two unexpected content, two unexpected transfer and one appearance-reality false belief task. These were very similar versions to Wimmer and Perner’s procedure (1983; Perner, Leekam, & Wimmer, 1987), with one major change. By changing the way the key test question[s] were asked, an alternative version of each false belief task was developed. One group of children was exposed to the questions with a direct evidentiality marker –DI and the other group was exposed to the indirect/general knowledge deduction marker –DIR. In one set of each unexpected transfer and content false belief tasks, the test question included a mental verb (THINK) while in the other it was asked with an action verb (LOOK FOR and SAY). Test questions were presented with different evidentiality markers. Turkish and English versions of test and control questions are provided in Appendix 2.1.

In *Unexpected Content Task (1)*, children were presented with a ‘Band-Aid box’, which contains a wooden butterfly instead of band-aids. E showed the box to participants and asked the question, ‘what is in the box?’ She then opened the lid and took out a wooden butterfly. The participant was then asked two test questions. The first question referred to the false belief of a third party: ‘If (friend’s name) came over here now and I showed him the box, what he would say was inside, before I open it?’ The correct response was ‘band-aid’. If the child identified a false belief she scored 1 point. The second question referred to the respondent’s previous false belief: ‘What did you first think was inside the box?’ The correct response was again ‘band-aid’, if that child acknowledged his or her previous state of mind. An incorrect answer such as ‘a butterfly’ or ‘toy’ scored zero. The order of the questions was counter balanced via Latin Square.

In the second *unexpected content task (2)*, children were presented with a ‘colouring pencil box’, which contained a teaspoon instead of colouring pencils. E showed the colouring pencil box to participants and asked the question, “what is in the box?”. She then opened the lid and pulled out a teaspoon. The participant was then asked two test questions. The first question referred to the false belief of a third party: “If (friend’s name) came over here now and I showed him the box, what he would say was inside, before I open it?”. The second question referred to the respondent’s previous false belief: “What did you first think was inside the box?’’ The correct response was ‘pencil’, showing that the child acknowledged his or her previous state of mind. An incorrect response was ‘a teaspoon’ as it was not acknowledging the prior false belief about the content of the box.

In the *Unexpected Transfer Task (1)*, the researcher used two puppets to present a scenario (named Puppy and Cow). Each puppet owned a container with a distinctive shape, which were their toy boxes. E enacted a short scenario for the children using the boxes and dolls. Puppy (one of the puppets) was seen to place a toy car in her container, and then ‘goes out’ to play. Cow (the second puppet) moves the toy car from Puppy’s container to its own container (e.g. a box or a purse) while Puppy is away. The participants were then asked a test question: ‘Where will Bunny look for the ball?’ and two control questions: a memory question ‘Where did Bunny put its ball in the beginning?’ and a reality control question ‘Where is the ball really?’ The correct response for the test questions was Puppy’s container. If the children pointed to the changed location, they were not acknowledging the Puppy’s false belief about the situation and their response was considered incorrect.

In the second *unexpected transfer task (2)*, the researcher used two puppets (Bunny and Duck) to present a new scenario. Each puppet owned a container but in different shapes, which are their toy boxes. The researcher enacted a short scenario for the children using the boxes and dolls. Bunny (one of the puppets) was seen to place a toy clock in her container, and then she ‘goes out’ to play. Duck (the second puppet) moves the toy clock from Bunny’s container to its own container (e.g. a box or a purse) while Bunny is away. The participants were then asked a test question: ‘Where will Bunny look for the ball?’ and two control questions: a memory question ‘Where did Bunny put its ball in the beginning?’ and a reality control question, ‘Where is the ball really?’

Additional Executive Function Measures

The *Dimensional Change Card- Sort* task was used to measure children’s flexibility in between two different sets of rules. The task was adapted from the original paradigm of Frye, Zelazo and Palfai (1995). In this task, a set of 16 test cards was presented which consist of 8 red flowers and 8 blue umbrellas. Two target cards (blue flower and red umbrella) were demonstrated, each matching the test cards in only one dimension, colour or shape. Children were firstly invited to play the ‘colour’ game as the pre-switch rule phase. In the colour game, participants were asked to sort the test cards according to colour: red flowers (test card) put in the tray under the red umbrella (target card) and blue umbrellas (test card) put in the blue tray under a test card showing a blue flower. After two practices and 14 test trials, the game was changed (to the shape game): participants were asked to sort test cards according to shape in this post-switch rule phase: red flowers were put in the (blue) flowers tray, blue cars put in the (red) cars tray. There were two practice trials to test participants’ knowledge of colour and shape, followed by 14 test trials during which their performances were recorded. Every correct placement of the test cards was scored with one point and the accumulated score out of 16 trials (the first two practice trials were counted as well) was taken into analysis.

The *Eight- Boxes Task* was used to measure children’s ability of working memory and was adapted from Diamond, Prevor, Callender, and Druin (1997). Eight identically shaped but differently designed boxes were placed on the table. One sticker was placed in each box, in front of the child. In preparation, the boxes were displayed on the table. The experimenter asked the child to open the lids of all the boxes. She let the child put one of the stickers into a box. She also asked for the child’s help to close all the lids of the boxes. Every time the child picked out the sticker from the box, an empty box was mixed up with the other boxes. The array of boxes was scrambled for approximately 7-8 seconds by the experimenter before every trial. The challenge was to remember which boxes they had already opened, and then to choose a box that still had a sticker in it. Each child was given 16 trials to find all the stickers. The number of trials a child needed in order to find all the stickers was recorded. A smaller number of trials that a child needed indicated a better performance. For children who could not find all of the stickers in 16 trials, 1 point was added to their score.

Table 2.2

Descriptive Statistics for all variables by age

Measures	Min	Max	Overall		3-year-olds		4-year-olds	
			Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Day/Night Task	1	16	13.97	3.01	13.07	3.71	14.54	2.40
Snow/Grass Task	8	16	14.72	2.18	14.07	2.71	15.13	1.70
Delay –Choice Score	0	9	4.28	3.0	5.07	2.63	3.79	3.16
False Belief	0	8	5.05	2.54	3.13	2.75	6.25	1.48
DCSS (Switch)	0	16	12.03	6.04	10.06	6.28	13.25	5.67
Eight Box (trials)	8	17	12.00	3.70	14.60	2.95	10.38	3.19

Results

The design of Study 1 was set up to investigate False Belief and its relation to the separate demands of Inhibitory Control within a sample of Turkish preschoolers. Each task in Study 1 was first analysed for the effect of age. In Table 2.2, the mean scores for both age groups are presented and they will be explained further below.

Comparisons by Age and Gender

Conflict Measures

The Day/ Night Task. At the end of 16 trials, a total score was calculated. A correct response in each trial would result in a maximum score of 16. The minimum score would be 0. As presented in Table 2.2, the mean scores of both age groups were near to the ceiling. To diminish the effects of this negative skew, the performance was transformed by Square Root. The analysis of variance by Age X Gender was conducted using this new (transformed) measure and revealed no effect of age, gender, or their interaction in the Day/Night performance, F (1, 39) = 2.01, p=.17, η_p^2= .05; F (1, 39) = 2.56, p=.12, η_p^2= .07; F (1, 39) = .33, p=.57, η_p^2= .01.

The Snow/Grass Task. Following 16 pseudo-random trials, the maximum score obtained was 16. Similar to the Day/Night task, the performance of both age groups was near ceiling in the Snow/Grass. The scores were transformed by Square Root. The analysis of variance with Age X Gender revealed no significant effect of none of the dependent variables, F (1, 39) = 2.27, p=.14, η_p^2= .06; F (1, 39) = .002, p=.96, η_p^2= .00 F (1, 39) =.004, p=.95, η_p^2= .00.

Delay Measure

The Delay of Gratification- Choice Task. The child's choice of the larger, delayed reward was scored as 1 point. The choice of smaller, immediate reward was scored as zero-point. Through nine trials, the maximum score which can be obtained was 9 and a minimum score was zero. Unexpectedly, the mean performance of 3-year-olds was higher than their older peers (please see Table 2.2). An analysis of variance by Age and Gender was conducted. The same procedure from Hongwanishkul et al. (2005) was used but their finding of the main effect of age on performance was not found, F (1, 39) = 1.75, p=.19, η_p^2= .05. Similar to their findings, neither the effect of gender F (1, 39) = .06, p=.81, η_p^2= .00, nor the interaction between age and gender were significant F (2, 39) =.49, p=.49, η_p^2= .01.

False Belief (Social Understanding) Measures

In all tasks, children's correct response of acknowledging the puppet's false belief was scored as 1 point. The incorrect responses were scored as zero-point. The self and others' false belief answers were tested separately for age, type of verb used and evidentiality. The questions were put into two groups of evidentiality markers: –DI and –DIR; in any of the false belief questions. There was no effect of evidentiality markers on false belief performance as the t-test analysis suggested, so the analysis is not reported here.

The Unexpected Content Tasks. There were two unexpected content tasks and they contained both self- and others'- false belief questions. The questions were asked with a mental verb (e.g. THINK) in one of the tasks, and in the other one, questions were asked with an action verb (e.g. SAY). In Task 1 (Mental verb), a chi-square test for association showed a significant association between age and self-false belief performance, $\chi^2(1) = 9.78$, $p < .01$, Cramer's V = .50. The same analysis with others' false belief also showed significant association $\chi^2(1) = 6.50$, $p < .01$, . V= .41. As Table 2.3 illustrates 4-year-old preschoolers were significantly above chance on self-false belief measure with a 'mental verb': P <.001. In Task 2 (Action Verb), a chi-square test for association showed significant association between age and self-false belief performance, $\chi^2(1) = 17.81$, $p < .01$, V= .68. The same analysis with the other's false belief also showed significant association $\chi^2(1) = 6.62$, $p < .01$, V,=.41. As Table 2.3.1 illustrates, in the task with 'action verb', 4-year-olds in both self- and others' false belief measures were significantly above chance: P<.001

Table 2.3

Number of children who responded to Unexpected Content FB 1 (THINK)

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	6	40	0.61
		Wrong	9	60	
	4	Right	21	88	0.00
		Wrong	3	13	
Others	3	Right	2	13	0.01
		Wrong	13	87	
	4	Right	13	54	0.84
		Wrong	11	46	

Table 2.3.1

Number of children who responded to Unexpected Content FB 2 (SAY)

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	5	33	0.30
		Wrong	10	67	
	4	Right	23	96	0.00
		Wrong	1	04	
Others	3	Right	5	33	0.30
		Wrong	10	67	
	4	Right	18	75	0.02
		Wrong	6	25	

The Unexpected Transfer Tasks. There were two unexpected transfer tasks and both only included the others' false belief question. In Task 1 (Mental verb), a chi-square test for association was not significant between age and the other's false belief performance, $\chi^2(1) = 1.24$, *ns*. Tables 2.4 illustrates that children's performance in this task with the mental verb was at chance for both age groups. In Task 2 (Action verb), a chi-square test for association showed significant association between age and others'-false belief performance, $\chi^2(1) =$

10.23, $p < .01.$, $V = .51$. The 4-year-old preschoolers' were significantly above chance on this measure when the question was asked with an action verb: P <.001, as Table 2.4.1 displays.

Table 2.4

Number of children who responded to Unexpected Transfer FB 3 (THINK)

	Age		Obs N	Obs Prop (%)	P
Others	3	Right	6	40	0.61
		Wrong	9	60	
	4	Right	14	58	0.54
		Wrong	10	42	

Table 2.4.1

Number of children who responded to Unexpected Transfer FB 4 (LOOK)

	Age		Obs N	Obs Prop (%)	P
Others	3	Right	8	53	1.00
		Wrong	7	47	
	4	Right	23	96	0.00
		Wrong	1	04	

The Appearance –Reality Task. There was only one task and it had both self- and other's false belief questions asked with a mental verb (THINK). A chi-square test for association showed significant association between age and self-false belief performance, $\chi^2(1) = 9.78$, $p < .01$, $V = .50$. The same analysis with others' false belief also showed significant association $\chi^2(1) = .49$, *ns*.

Table 2.5

Number of children who responded to Appearance-Reality FB 5 (THINK)

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	6	40	0.61
		Wrong	9	60	
	4	Right	21	88	0.00
		Wrong	3	13	
Others	3	Right	9	60	0.61
		Wrong	6	40	
	4	Right	17	71	0.64
		Wrong	7	29	

Total False Belief Score. Children's answers in each of the questions above aggregated to generate a total false belief score. In Table 2.2, children's score out of 8 was presented and it shows that the younger children's mean score was half of the mean score of the 4 year-olds. The analysis of variance of Total False Belief Score was conducted by Age and Gender and the results are displayed in Table 2.6. Age had a significant main effect on the children's overall false belief performance. Neither gender, nor the interaction between age and gender had an effect on the false belief performance.

Additionally, children's performance in 'action' and 'mental' verb version of tasks was aggregated to create a sub-total score. A repeated measure ANOVA was conducted with those verbs to examine a possible difference because previous analysis showed that 4-year-olds tend to perform better with 'action' verbs. There was a statistically significant effect of verb type (i.e. action or mental) on children's false belief performances, F (1, 35) = 8.13, $p \leq .01$, $\eta_p^2 = .19$. Due to the advantage that 'action verbs' may give to children in false belief tasks, in the future studies, 'mental verbs' will be used.

Table 2.6

Univariate Analysis of Variance of Total False Belief Performance by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	86.53	1	19.87	.36	.00
Gender	.30	1	.07	.00	.80
Age * Gender	3.78	1	.87	.02	.36

Note: R Squared = .38 (Adjusted R Squared = .33)

Additional Executive Function Measures

As mentioned earlier, although IC was defined as a core cognitive aspect of self-regulation in this thesis, two other components of executive function, as suggested in the literature, were included in Study 1. The aim was to identify key constructs to be used in the further studies. Those executive skills were ‘shifting’ and ‘working memory’.

For ‘shifting’, a summary of children’s performance in the *Dimensional Change Card- Sort (DCCS)* task was presented in Table 2.2. The mean score of 3-year-olds in this task was lower than the 4-year-olds’ performance. The analysis of variance showed no significant effect of children’s age on the DCCS performance, F (1, 39) = 2.68, *ns*, η_p^2= .07.

To assess ‘working memory’, children’s performance in the *Eight- Boxes Task* was determined by the number of trials they needed to find the stickers. Each trial was scored as 1 point. Children were allowed 16 trials to locate 8 stickers. The maximum possible score was 17, and the minimum score was 8. Finding the stickers in fewer trials was the desired performance. Therefore, higher scores indicated a worse performance. Table 2.2 displays the mean scores for trials and shows that 4-year-olds required fewer trails than their younger peers. The analysis of variance also showed that children's age had a significant effect on their working memory performance, F (1, 39) = 17.16, p<.01, η_p^2= .32.

Although, the performance in these executive skills was not central to the questions addressed in Study 1 they were included in the correlation analysis that is reported below. In Table 2.5, a correlation matrix showing the DCCS and the Eight-Box tasks and all the other measures is shown. The literature would propose unity in at least moderate correlations among the executive functions of inhibition, shifting and working memory (Miyake et al., 2000). However, such relationships were not found in this small sample. Along with the Day/Night task (Conflict), working memory and shifting were correlated with false belief performance, which was consistent with previous studies. This suggested shared developmental pathways between executive functions and false belief understanding. Study 1 focuses on the contribution of social understanding measured by false belief to self-regulation; therefore the correlations shared with working memory and shifting were used predicting the false belief performance.

Correlation Analysis

Table 2.7 allows us to address the key question of Study 1, whether conflict or delay inhibition shares more underlying developmental pathways with social understanding. It shows the link with false belief was limited to one task-Day/Night. Although the Snow/Grass task was very similar in demand and used successfully in previous studies (e.g. Sabbagh et al., 2006; Carlson & Moses, 2001), it failed to show any associations with the other complex response inhibition /conflict task and false belief. A near ceiling performance in Snow/Grass is worth noting but the lack of associations may also be a result of the small sample used.

Another point was that the lack of association between Conflict and Delay performance. Although the relationship between Conflict and SU was significant, Carlson and Moses (2001) reported a correlational relationship between Delay and SU. The correlational findings from Study 1 replicate their effect for Conflict and SU relationship but not for the Delay. A regression analysis was conducted to provide the insight predicting the false belief and conflict inhibition performance prior to the inclusion of the emotional aspect in the next studies.

Table 2.7

Pearson Correlations among the measures of Study 1

	False Belief	Day/Night	Snow/Grass	Delay Score	DCSS (Switch)
False Belief	-				
Day/Night Task	.41**	-			
Snow/Grass Task	.27	.03	-		
Delay Score	-.00	.23	-.17	-	
DCCS (Switch)	.32*	.27	.09	.13	-
Eight Box (Trial)	-.43**	-.23	-.01	-.06	-.30

Note: **p* < .05; ***p* < .01.

Regression Analysis

The relationships between the Conflict Inhibition in the Day/Night task and the SU were examined in hierarchical multiple regression models. The analysis with the delay inhibition was not presented here due to the lack of its association with the other constructs[3].

[3] None of the hierarchical multiple regression models to predict delay performance was significant.

Predicting Conflict Inhibition. A three step hierarchical multiple regression analysis was conducted to predict conflict inhibition performance (the Day/Night task). First false belief was loaded, then two sets of background variables, namely age and the three other EF variables: WM, set shifting and delay. Table 2.8 presents three models which were generated in this analysis and each was statistically significant. In Step 1, false belief performance was the only predictor and was also significant. In Step 2, age was aggregated to Model 2 but none of the explanatory variables contributed unique variance in predicting conflict performance. Model 3 was significant but none of the individual predictors were significant. As the regressions suggest, the false belief directly predicts the conflict performance but the effect disappears when children's age was added to the equation.

Table 2.8

Hierarchical Multiple Regression of Variables Predicting Conflict

	Conflict Score (Day/Night Task)								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
False Belief	.49	.18	.41**	.21	.25	.17	.11	.25	.10
Age (months)				.12	.08	.34	.15	.08	.42
Delay Score							.29	.15	.28
DCCS							.05	.08	.10
Eight-Box							.02	.13	.03
R^2		.17			.23			.32	
F		7.57**			5.24**			3.07*	
ΔR^2					.06			.09	
ΔF					2.58			1.49	

Note: $*p < .05$; $**p < .01$.

Predicting Social Understanding (False Belief Performance). A similar strategy of aggregating variables into the regression models in previous sections was also used to predict false belief performance. Table 2.9 displays the full details of hierarchical multiple regression models. In Step 1, only Day/Night performance was entered as a predictor. Model 1 was significant and the conflict inhibition was significant in predicting the false belief performance. In Step 2, the addition of age generated a significant model but the statistical effect of conflict disappeared at this stage. Model 2 had a higher R^2 value, and ΔR^2 suggested that the new model was significantly better than the previous one. Ideally, the effect of conflict inhibition should have remained significant, but age overpowered its significance. In Step 3, delay, shifting and working memory measures were added to the equation and generated a significant model. However, Model 3 was not statically better than the previous model and age remained the only significant predictor.

Table 2.9

Hierarchical Multiple Regression of Variables Predicting Social Understanding

	False Belief Performance								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Day/Night	.35	.13	.41**	.09	.11	.11	.05	.12	.06
Age (months)				.20	.04	.66**	.19	.05	.61**
Delay Score							.04	.11	.05
DCCS							.04	.05	.10
Eight-Box							-.09	.09	-.13
R^2		.17			.52			.55	
F		7.57**			19.20**			7.96**	
ΔR^2					.35			.03	
ΔF					25.76**			.74**	

Note: *$p < .05$; **$p < .01$.

Discussion

The aim of Study 1 was to explore the association of IC and SU prior to examining the relationship between cognitive- and emotional-regulation. Employing these tasks did not produce exact replications of the findings from the literature, including the age differences that have been widely reported in Day/Night and Snow/Grass Tasks (e.g. Carlson, 2005). The reason why the age effect failed to be replicated was most likely the small sample size in this study. Yet, the correlation and the predictive relationship between Day/Night and False Belief was a replication of well-documented evidence (see Blankson et al., 2013; Carlson et al., 2004; Carlson & Moses, 2001; Hughes & Ensor, 2007). Study 1 also replicated the predictive relationship between social understanding and Conflict performance, but this finding only related to the Day/Night task and was no longer significant when controlling for age. Thus, the future studies in this thesis will search for more robust evidence to replicate the predictive relationship between Conflict and SU. In spite of the findings from the Snow/Grass task in past investigations (e.g. Simpson & Riggs, 2009; Carlson, 2005), in this study, this well-known Conflict task failed to show any association with the other Conflict task or false belief performance. The performance in the task was near ceiling for both age groups. This task required children to give a response in conflict with their pre-existing knowledge of an object's colour and its demand is very similar to the Day/Night task. Yet, the response was verbal in the Day/Night and motor (i.e. pointing) in Snow/Grass. In a recent study, using Snow/Grass, Carroll, Riggs, Apperly, Graham, and Geoghegan (2012) reported that children's performance was not affected by pointing even though the salient nature of this response has long been discussed as undermining children's IC performance. Another issue that emerges from the findings of Carroll et al. (2012) is that they found an age difference in children's performance in this task and it was related to performance in the unexpected transfer false belief task. When the raw scores for the same tasks were compared, Turkish 3-year-olds' mean score was 4 points higher than the mean scores of younger children in Carroll et al. (2012)'s data. Thus, a new task might need to be developed to challenge Turkish children with a bodily motor response. This will be developed in the next study.

The assessment of Delay performance was assessed only by the DoG/Choice task in Study 1. Despite previous findings, such as Hongwanishkul et al. (2005), Study 1 did not demonstrate any specific performance difference between 3- and 4- year-olds. This might be again due to the small sample size, but Study 1 revealed an intriguing finding of higher scores in 3- than 4-year-olds. This odd finding might be due to a fortuitous sampling of some early achieving 3-year-olds in this study, but the children came from the same preschool. However, in other measures the mean scores of 4-year-olds were higher than the 3-year-olds. The unexpected performance of younger children in Delay also might have caused a disassociation between the Delay and SU.

The administration of a Choice/Delay task is shorter, so keeping children interested might be easier. This quality was one of the reasons for using it in the study. However, the better performance of the younger children in this study needs to be re-examined in the further studies, before conclusions about developmental changes in children's coping with frustration during waiting can be made. Additionally, the disassociation of Delay demand from Conflict and SU raises the question that the type of self-regulation required to Delay obtaining a reward may be more a part of an affective system, as claimed in the hot-cool systems framework (Metcalfe & Mischel, 1999; Zelazo & Muller, 2002). The motivational separation of Conflict and Delay is discussed in Chapter 3 in terms of how emotional-regulation contributes to self-regulation.

The contribution of other executive components within the cognitive-regulatory system was explored in Study 1. It was found that 'Shifting' and 'Working memory' were correlated with SU. However, both failed to predict the children's performance in false belief tasks. These executive components, unexpectedly, were not associated with any of the Conflict IC or Delay tasks. Considering the small sample size in the analysis above, Study 2 will utilize these components but if there is a repetition of a lack of association between them and other aspects of self-regulation, in the further studies these components will be dropped (e.g. Grass/Snow task).

Study 1 was a small scale analysis that aimed to test the separation of Conflict and Delay demands of IC in relation to children's developing understanding of other people. There was a finding that alternating evidentiality markers had no effect on children's performance in the tasks in any way. However, asking false belief questions with 'action' or 'mental' verbs had an effect on SU performance even in such a small sample. Nonetheless, the variance was kept through a general total score, the advantage that 'action' verbs may cause was considered for the design of future studies. Hence, mental verbs were thought to be more valuable for assessing children's true performance. Based on the clarification of the way false belief tasks are going to be assessed, Study 2 in the next chapter will focus on the emotional aspect of self-regulation.

Chapter 3 - What predicts the regulation of Negative Emotions?

This chapter follows from the possible disassociation that Study1 reported between the two types of measures of IC (delay vs. conflict). It focuses on the core theme of this thesis: that is to explore the links with the emotional aspect of self-regulation. The topics of cognitive and emotional development tend to be kept separate in research and few studies have explored the relationship between these domains with regard to their regulatory properties. The assessment of cognitive-regulation (CR) in terms of inhibitory control was addressed in the previous chapter. Here I will focus more on the conceptualization of emotional-regulation (ER). The definitions of ER that were referred to in Chapter 1 contradicted one another. As a result it is necessary to re-examine this construct in detail in the following paragraphs and simplify it into different elements. In Study 2, only the observation of negative emotionality- ER (Negative) - is examined. The investigation was conducted with a cross-cultural sample of 83 Turkish and British three to four-year olds concerning the relationships between ER (Negative), IC, and SU.

3.1 Assessment of Emotion-Regulation

The definition and measurement of ER is difficult and controversial (Cole, Martin, & Dennis, 2004). Thompson (1994) stated one of the most adopted working definitions. He emphasizes that to achieve a goal, the internal and external processes are ‘monitoring, evaluating and modifying the emotional reactions’ (p.27). The external processes that Thompson refers to are sources outside of the child, which guide and help him / her to regulate feelings. The external processes referred to are usually agents in the social network. In the early years of life, parents are an external factor for the regulation of emotions such as rocking and soothing a crying baby (Fox & Calkins, 2003). As the child’s agency develops, the internal processes that are intertwined within the cognitive and socio-emotional skills become more important. Despite the separation of intrinsic and extrinsic processes of ER, the extrinsic processes continue to be defined as the part of the socio-cultural norms and expectations in the child’s life.

In Emotional Competence Theory, Saarni (1999) acknowledges the importance of the child’s awareness and internalization of social expectations in order to adjust his or her emotional expressions. Saarni (1984) claims that younger children are not successful in hiding their true feelings, because they might not comprehend their emotional expressions influence other people. When children get older, they get better at masking their true feelings by grasping the idea of how they may affect other people’s feelings. Throughout the internalization of external norms and societal regulation, the internal process of ER and the growth of children’s cognitive abilities appear to be parallel. In adult studies, the performance in cognitively demanding tasks was also found to benefit from ER (Philipps, Bull, Adams, & Fraser, 2002).

The mutual effect of ER and CR on particular outcomes such as academic success (e.g. Blair, 2002) and problematic or risky behaviours (Hughes, Dunn, & White, 1998) has been studied, rather than how two mechanisms interact with each other. Some authors singularly link ER to academic success, usually by assessing it via parental reports (e.g. Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; Graziano, Reavis, Keane, & Calkins, 2007), whereas some others claim that CR is responsible for the same outcome (e.g. Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009). However, the literature on self-regulation lacks studies that attempt to identify a particular relationship between its emotional and cognitive aspects.

A developmental cognitive neuroscience perspective suggests an association and co-functioning of emotion and cognition as part of an intrinsic information-processing system to execute actions (Bell & Wolfe, 2004; Cacioppo & Berntson, 1999). Zelazo and Cunningham (2007) proposed a bidirectional influence within an interactive model where emotions help to organize thinking, learning and actions (emotion as regulating), and cognitive processes are necessary to regulate emotions (emotions as regulated). According to their model, ER is a corresponding motivational aspect of cognition in conscious, goal-directed problem-solving (i.e., executive functions). Either ER or CR may gain priority over the other depending on the task at hand. The task in hand might require not showing real emotions, so the problem requires one to remember the rules (the activation of working memory) to apply when not demonstrating actual feelings. Similarly, the task in hand may induce emotions but to solve the task in hand, suppressing those emotions may help the outcome. For example, suppressing frustration when making a mistake during the Simon Says (or in alike) game may reduce the likelihood of making other errors in the repeated trials.

According to Zelazo and Cunningham's (2007) model (CR *involves* ER) the reciprocal relation between CR and ER depends on the motivational significance of the problem. The motivation of problem hinders the demand of the task that needs the child to suppress emotionally or cognitively charged responses. The motivational divergence mentioned in the model of Zelazo and Cunningham (2007) was reflected as 'cool' and 'hot' pathways within the assessment of IC in the previous chapter. The 'cool' pathway is related to the abilities that are associated with dorsolateral regions of prefrontal cortex (DL-PFC) and the 'hot' pathway is associated with ventral and medial regions (VM- PFC). IC is responsible for goal-directed behaviour, but its sub-functions are difficult to relate to particular domains of brain. The 'hot versus cool' explanation is an attempt to include the importance of the emotional systems that may be interfering with the Conflict demand of IC. According to this explanation, cool measures involve the simultaneous manipulation and maintenance of representation (e.g. Baddeley, 1986) such as working memory and flexible rule use.

Procedures that are more emotion-neutral and mostly rule-based include the Conflict task which, it is claimed, measures the ‘cool’ aspect of executive functions. The ‘hot’ aspect is said to embrace the affective systems that interfere with the control of emotionality and ability to cope with frustrating situations, as in Delay tasks.

The previous studies which reported a relationship between CR and ER, defined the CR under the label of effortful control or inhibitory control. Inhibitory control was sometimes depicted as a combination of both Delay and Conflict demands, and sometimes either one of them was used. However, the specific roles of each of these demands were not mentioned, especially in relation to emotional-regulation and that is the gap that Study 2 aims to address in this chapter.

As Chapter 1 highlighted, most of the findings regarding children’s emotionality come from temperamental perspectives, which provides evidence for the cognitive skills that rely on effortful control. As highlighted earlier, Kochanska and her colleagues defined ‘delaying’, ‘slowing-down’, ‘suppressing -initiating activity to signal’, ‘effortful attention’ and ‘lowering the voice’ as the subcomponents of effortful control. Many researchers have used Kochanska’s battery and thus followed her lead. A possible overuse of this definition has been the consequence.

It is worth noting again that, ‘suppressing -initiating activity to signal’ and ‘effortful attention’ tasks are very similar in their demand and were categorized under Conflict in the previous chapter. Beck, Carlson, and Rothbart (2007) tested 420 preschool children’s performances on a comprehensive cognitive battery and a full-scale temperament assessment. They reported that a combination of *both* effortful control performance and one aspect of temperament, extraversion/surgency, predicted relatively advanced executive function. Their study is not different to others in respect to the finding of individual differences in performance, particularly effortful control which correlated moderately with parent report of child temperament (e.g., Carlson & Moses, 2001; Gerardi-Caulton, 2000; Hongwanishkul, Happaney, Lee, & Zelazo, 2005; Jones, Rothbart, & Posner, 2003; Kochanska et al., 2000; Rothbart, Ellis, & Posner, 2004). They administered only the temperament scales relevant to effortful control and mainly relied on parental reports. Although the usefulness of parent and teacher-reports is recognized, inter-rater reliability across contexts has been found to be weak (e.g., Liew et al., 2004). Additionally, explaining individual differences in terms of temperament based on parental testimony might undermine the effect of the child's performance of control as an independent variable. Parental report measures are always one step removed from the child skills that are examined here. Saarni's Disappointing Gift Paradigm to measure children's changing ability to internalize the external regulator of emotionality is a very popular task (Cole, Martin, & Dennis, 2004; Raver, 2004). Nonetheless, parental reports tend to be used for assessing ER since they appear to reveal more significant connections (Eisenberg & Sulik, 2012).

For example, a recent study conducted on Turkish children's ER that was assessed through parent and teacher reports. This suggested a relationship between CR and ER (Orta, Corapci, Yagmurlu, & Aksan, 2013). Although Orta and colleagues measured CR with an extensive effortful control battery that included tasks on 'slowing-down', 'delay', and 'conflict', they reported a CR performance that was the composite of those performances. The composite CR performance was only related to parents' reports on 'emotional-dysregulation' of children. The term 'emotional-regulation' was used to label the parent's responses on questionnaire items that refer to children's inappropriate expressions of positive and negative emotions according to the social context. The subtotal of the items that measure the (parent's assessment of) appropriate emotional reactions was not related to CR.

Another very recent study by Blankson, O'Brien, Leerkes, Marcovitch, Calkins, and Miner Weaver (2013) explored the CR -ER relationship within a longitudinal study of 3-and

4-year-olds. Their analysis reflected the challenges of ER assessment. According to their findings from 262 children, the mothers' report of ER at age 3 predicted CR and SU performance a year later. However, online assessments of the child's ER were related to neither CR nor SU. They claimed that that CR or SU were not crucial to the emotional processes. However, the battery of CR only consists of one Conflict (Day/Night) and one working memory task. Their situational assessment of ER was a frustration paradigm 'Locked Box' (Calkins, 1997) in which children were unable to reach an attractive toy from a transparent box. As mentioned above, according to proponents of the 'hot' pathway view, the lack of a Delay measure might be undermining the CR and ER relationship. The relationship between CR and ER may rely on the different demands that inhibitory control presents.

As one of the few studies which addressed the issue of the potential relationship of CR and ER, Carlson and Wang (2007) summarized three possible ways to explain how these two aspects might interact. One explanation was that the development of the cognitive - regulation is the underlying mechanism for the emergence emotional-regulation. The second explanation was that the developing emotional-regulation is responsible for the execution of 'cognitive-regulation'. The third explanation, on the other hand, was the suggestion that both emotional- and cognitive- regulatory abilities are indistinguishable, so the mechanisms responsible for each might be one integrated with those of the other. To examine these pathways, they tested 4-and 5-year-old children with tasks that require them to suppress the dominant, and activate selectively the subdominant, responses in both cognitive and emotion domains. For CR, their battery consisted of the Simon Says, Forbidden Toy, and Gift Delay tasks. These tasks (apart from Forbidden Toy[4]) were mentioned in the previous chapter. Thus, CR was assessed through an IC battery that included tasks measuring Conflict, Delay,

[4] Forbidden Toy is a task in which children are not allowed to touch an attractive toy while the experimenter is absent from the room. Then children are asked about whether they touched or did not touch the toy. In my attempt to separate the task according their Conflicts and Delay demands, this particular task weighed highly in both demands. Therefore, it was left out in the previous chapter.

and Deception. Their ER battery consisted of the tasks that require suppression of negative (Saarni's disappointment paradigm, 1984), positive (Secret Keeping Task) emotional expressions, emotional understanding, and also parental reports. The extensive investigation of Carlson and Wang (2007) revealed that the composite measures of IC and ER were positively related even when controlling for age and verbal ability. The strength of this relationship varied according to age and gender since the relationship was stronger in girls and was only significant in 4-years-olds, not younger children. They also found a quadratic relationship between IC and ER in which an optimal level of IC appeared to be strongly associated with ER. Children with low and high levels of IC performed similarly in their relation to ER. Their findings were compatible with the temperamental classification of Eisenberg and Fabes (1992) which proposes three types of characteristics: under-controlled, optimally controlled, and highly inhibited children. Since the aim here is to clarify the connection between the processes, rather than the quadratic relationships that they suggested, the measurements that Carlson and Wang (2007) used became the focus of my investigation. As mentioned before, parental reports of ER tend to predict children's CR performances, whereas direct testing might not. They employed extensive ER and CR batteries but also collapsed individual tests into composite scores. So, how the underlying processes relate to each other is still unclear. According to the correlations they reported, children's performance in a task where they were required to regulate their positive emotionality did not show associations with the Disappointing Gift paradigm and its correlates, in other Delay and Conflict measures.

As mentioned when reporting Orta et al.'s study above, it was noted that CR performance was found to be related to the parents' reports of negative emotionality. An interplay between positive and negative emotionality in terms of regulatory performance from infancy to adulthood has been suggested (e.g. Larsen, Hemenover, Norris, & Cacioppo,

2003) based on the idea of different neuropsychological mechanisms responsible for the dichotomy of positive and negative emotions (e.g. Lane, Reiman, Bradley, et al., 1997). The intention here is not to discuss this dimensional emotion model, but to introduce the idea that young children's ability to regulate negative emotions may differ from how they regulate positive emotions. Although the control of both is crucial and necessary, the connection they share with CR may be different. In predicting the later behavioural inhibitory skills of toddlers, Fox, Henderson, Rubin, Calkins, and Schmidt, (2001) suggested that considering positivity and negativity as separate constructs was beneficial.

For example, Kieras, Tobin, Graziano, and Rothbart (2005) reported that children's display of positive emotionality when presented with an unwanted present was predicted by their performance in tasks that required them to 'slow-down' an action. Children who performed better in these 'delay' tasks were those who showed positive reactions to gifts regardless of whether they were desirable or undesirable. However, children who performed poorly in those tasks were only able to show positive reactions to a desirable gift. The children's negative displays were not found to be a significant variable in Kieras et al.'s study with 62 children whose ages ranged from 3 to 5. The positive reactions they referred to were elicited in a situation in which the child had to handle his or her negative emotionality during a disappointing event. Nevertheless, the positive reactions that children showed when a desirable gift was given were elicited when the child's positive emotionality was matched with his or her reactions. There are certain situations when the child needs to regulate positive emotionality to adapt to the social context, but this is discussed further in the next chapter.

Another study that used both parental and situational assessment for ER was conducted to examine CR and ER and reported conflicting results between the two (Liebermann, Giesbrecht, & Muller, 2007). They tested 60 children whose ages ranged between 3 and 5 using ER, CR and SU measures. Their batteries of ER and CR used both situational and parental reports (the Behaviour Rating Inventory of Executive Function for Preschoolers; Gioia, Espy, & Isquith, 2003). The ER battery consisted of the Disappointing Gift paradigm. The CR battery included Delay, working memory and shifting measures. Thus, their IC battery lacked a Conflict task. The composite IC measure failed to predict the performance in ER (negative) whereas parents' reports suggested a significant relationship between CR and ER. Their findings also suggested no relationship between ER and SU.

In contrast to the findings of Liebermann et al. (2007), Jahromi and Stifter (2008) reported marginally significant results on the children's greater performance in a delay task and demonstrated fewer negative or aggressive reactions in ER tasks. In a longitudinal study, at the age of 4.5 year-olds, 92 children were tested with the Disappointing Gift and an Attractive Toy (children were not allowed to touch or play with when the experimenter was absent in the room/ similar to Forbidden Toy in Carlson and Wang's (2007) study) tasks in addition to three Conflict (Three-pegs, Day/Night, Tapping task) and two Delay tasks (Dinky Toy and Delay of Gratification). Eighty-six children were tested again at the age of 5.5 years on their SU abilities. Those who showed fewer negative reactions in the disappointment paradigm also showed higher performance in a delay task. The performance in the Conflict tasks at the age of 4.5-year-old predicted SU performance at the age of 5.5 years. However, there was no relationship between emotional-regulation and false belief performance. In addition to the insight from Carlson and Wang (2007), who found that IC was related to ER, keeping with 'hot' system assumption, Jahromi and Stifter reported an association between ER and Delay. Since ER and CR can be very wide in their descriptions and their situational assessment or parental reports may suggest different relationships, Study 2 was designed to tap two gaps that were overlooked in the analysis of the studies summarized above. Carlson and Wang (2007) has an extensive design, but the composite scores of IC and ER measures were clouding the specific relationships that may clarify our understanding of the mechanisms within CR and ER. The controversial findings regarding the relationship between CR and ER might be underlined by the separation within IC. Since Blankson et al. (2013) only used Conflict tasks to represent CR and failed to show any relationship between CR and ER whereas Jahromi and Stifter (2008) reported a relationship between behavioural measures and ER. Thus, CR and ER will be stripped into particular assessments in Study 2 to attempt to explain the mechanisms within SR. I will test the dichotomy of positive and negative emotionality later (see Chapter 4). The reason behind singling out ER (negative) in Study 2 was to avoid the effects of fatigue or boredom. Orta et al. (2013) reported that Turkish children's ER (negative) performance was related to CR and stated that such a result was compatible with the evidence from Western studies. In this section, I have tried to illustrate that studies that report the relationship of CR and ER, or lack of it, do so not independently of how these constructs are assessed. The evidence from Turkish children is limited because ER has been assessed through parental reports only. Moreover, there is no study that has compared the performance of Turkish children with their Western counterparts in CR, ER and SU measures.

STUDY 2

In Figure 3.1, the constructs that Study 2 deals with are illustrated. As justified above, the suppression of negative emotionality is explored via the Disappointment Paradigm (DG) of Saarni (1984). Rather than relying on a composite CR measure, both Conflict and Delay measures are used in this study. As an understudied culture, the performance of Turkish children in both IC measures, ER (negative), and SU were compared to British children. In Study 1, younger Turkish children outperformed 4-year-olds in the Delay task. Thus, Study 2 employed two Delay tasks that covered both 'choice' and 'waiting'. In line with the 'hot' neural pathway assumption of Zelazo and Carlson (2012), Delay performance is expected to predict performance in ER (negative) and this expected link is presented with a dotted line in

Figure 3.1. Furthermore, the predictive relationship between Conflict and SU is expected to be replicated. Despite the methodological limitation of Orta et al.'s evidence on Turkish children, they reported that performance in both ER and CR was similar to that of Western children. Therefore, no cultural differences are expected on any of the constructs. The research questions can be summed up as follows; (1) for both 3- and 4-year-old children; Conflict inhibition is significantly related to social understanding in both English-speaking and Turkish-speaking groups when controlling for verbal and non-verbal ability; (2) for both 3- and 4- year-old children, the Delay dimension of self-regulation is significantly related to emotional-regulation in both English-speaking and Turkish-speaking groups when controlling for verbal and non-verbal ability.

Figure 3.1*: Constructs of Study 2*

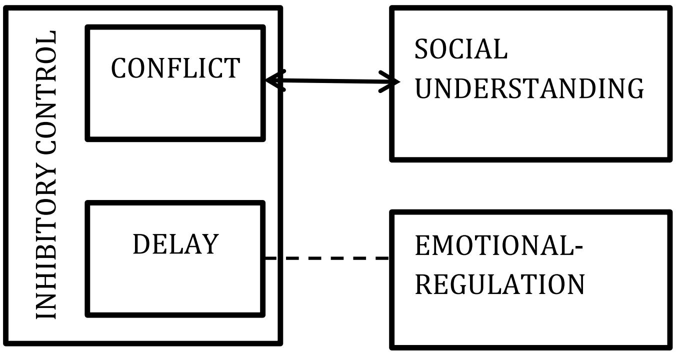


Table 3
All measures used in Study 2

Skill Domain	Variable	Tests
Inhibitory Control	IC	
Conflict		Day/ Night Task
		Giraffe/ Mouse Game
Delay		Snack Delay
		Sticker Choice
Emotional -Regulation	ER	Disappointing Gift (Negative Emotionality Suppression)
Social Understanding (False Belief)	SU	Unexpected Transfer False Belief
		Unexpected Content False Belief
Language (Receptive Vocabulary)	VOC	PPVT-III & BPVS-II
Non-verbal Cognitive Skills	NVC	Raven's Matrices
(Additional EF constructs)		
Working Memory	WM	8-Boxes Task
Shifting	DCCS	Dimensional Card Change Sorting

Method

Participants

Thirty-nine Turkish (24 male) and 45 British preschool (21 male) children participated in the study. The Turkish children's ages ranged from 2 to 5 (M = 51.51 months, SD= 8.59, range: 37-66 months). They were recruited from a nursery school in Bursa that serves mostly middle and upper-middle class families. By randomly selecting children from their classrooms, one 2-year-old and eight 5 years-olds were recruited and their data included in the sample. The British children's ages ranged from 3 to 4 (M = 45.18 months, SD= 4.15, range: 36-56 months). They were recruited from four nurseries in Lancaster that serve a range of working and middle class families. Parental consent was obtained before each child was tested. Children were also asked for their consent/ willingness to start or continue before every task. Four further children were removed from the analysis due to: failing to complete the experiment (2) and technical problems due to the video recording (2).

Procedure

Each child was tested individually in a quiet room that was provided by the preschool centre. The list of all measures is presented in Figure 3.2. Testing was conducted in two sessions to avoid any drop outs due to fatigue or boredom. The tasks were presented in a fixed order following a logic defined as follows. The tasks that were simpler to administer such as Day/Night, DCCS, 8-Box, False belief tasks were presented in the first session. The second sessions started with Verbal ability and non-verbal cognitive skills tasks. The Delay and ER tasks were given in the second session. In the second session, the Delay and ER tasks were recorded by a camera. The second session tasks were presented last as they were less tiring, shorter and ended with a reward.

Conflict Measures

The *Day- Night Test*, as administered in Study 2, was identical to Study 1. The *Giraffe and Mouse* task was a modified form of a well-known nursery game in Turkey. This game resembles the procedure used by Kochanska, Murray and Coy (1997) attempting to measure the preschool children's control of their gross-motor abilities and inhibition of a dominant response. Children were invited to play a game and asked to get up from their chair. Then they were asked about the size of a giraffe and a mouse. All of the children from Both Turkish and British samples were correct identifying the relative sizes of these animals. The experimenter then gave the following instruction to the children; "When I call you 'mouse', I want you to stand up from your chair and try to look as tall/big as you can. When I call you 'giraffe', I want you to squat down and look as short/small as you can" (the experimenter demonstrates both actions). There were 24 trials with equal numbers of each instruction, presented in a pseudorandom order. Children were scored with one point for each correct performance and their accumulated scores out of 24 trials were analysed.

Delay Measures

The *Snack Delay* task was a situational assessment for the behavioural control of gratification (adapted from Kochanska, Murray, Jacques, Koenig, & Vendergeest, 1996; McCabe & Brooks-Gunn, 2007). Children were first told that they will be eating 5 small sweets in a very funny and playful way while a camera is recording them. The verbal consent of the child before this task was obtained due to the task's nature (to prevent them eating something that they do not want to). Only children who were willing to eat sweets and comfortable to be recorded were tested and none of them refused to participate. Children were given a piece of A4 paper as their service mat or plate for this game. The following instruction was given, '*Now, you'll get five Smarties (Bonibons is the name of the Turkish brand) from me. I will give them one by one to you. I'll put each one of the Smarties at the* *centre of your service mat. But there is a funny rule here, you cannot touch or pick up and eat the sweets until I give you the signal to eat. Do you want to know what the signal is? [The experimenter claps her hands for once] I'll clap my hands when the waiting time is over. After you hear my clap, you can go for your sweet and eat it. When you finish eating let me know, so you can have the next round. Remember you have to wait until I clap my hands to give you your signal to take the Smarties. Do you want to start now?'*(instruction was adapted from McCabe, Rebello-Britto, Hernandez, & Brooks-Gunn, 2004). The experiment started with a 'practice' trial that only lasts for 5 seconds of delay. After that, four test trials were conducted. In these, the delay period lasted for 10, 20, 30 and 60 seconds. The delay periods in trials were counterbalanced through Latin square. At the half way point of each trial, the experimenter faked a signal almost completing a clapping gesture thus breaking the delay period into two. The responses of children in those waiting periods were scored using the codes designed by McCabe and Brooks-Gunn (2007). Performance was scaled from 0 to 10 according to the responses of the child such as; eating the candy, touching the candy, moving their hand or body towards the candy at the first half of the delay or the second half of the delay (for the full list of scoring, please see Appendix 3.1). In addition to the delay scores, the coping strategy of the children while waiting was analysed in terms of 13 different types of distraction (touches Smartie, plays with his or her clothing, locks arms or hugs himself/herself, puts hands in pocket, hides his/ her arms behind, rocks him/herself, talks to the self, imitates clapping, looks away/up/behind, asks irrelevant questions or tries for a small chat with the experimenter, touches the table, fixates gaze on the treat, giggles and sits perfectly still). The number of distractions that children engaged in was recorded (for the full list of distraction behaviours, please see Appendix 3.2).

Emotion-Regulation Measures

The *Disappointing Gift* was used to assess the regulation of negative emotionality. It was adapted from Saarni's (1984) disappointment paradigm where the child was expected to hide his or her actual feelings on receiving a present he or she did not pick as a favourite reward. In comparison to the original paradigm of Saarni, in which the children were presented with a set of toys and asked to rank them and received the least favourite one in the end; a very obvious 'bad' present (e.g. a piece of carton or a tissue) was presented to reduce the testing time.

The child was shown a toy and a tissue and then asked which one would be nice to play with and which one would be a nice gift to give someone. After the children pointed to their choice (all chose the toy), they were invited to play another game (Giraffe and Mouse task) with the experimenter. They were told that they will receive a surprise gift after the game. After completing the game, the children were told that their 'amazing gift' was coming along. They then were given the tissue to create the situational disappointment. The responses to the disappointing gift were recorded with a video camera for 30 seconds. Children were expected to hide their true feelings about receiving a 'bad' gift. After this period, the experimenter, looking at her papers, said that there had been a mistake with the gifts, and gave the toy to the child. The facial expressions of the children were classified according to Saarni's scale (1984) and children's negative verbal comments were added to the classification (Cole, 1986). There were 7 positive, 10 negative, 13 neutral (or 'transitional' as mentioned in Saarni's paradigm) facial expressions to categorize the children's reaction to the disappointing situation. For the emotional reactions in each category, please see Appendix 3.3. The response in each category was scored as 1 and categorical scores were generated.

Social Understanding (False Belief) Measures

In the *Unexpected Content Task*, children were presented with a ‘Smarties’ tube, which contained a pencil instead of chocolates. The researcher showed the Smarties tube to participants and asked them the reality control question: ‘what is in the tube?’ The researcher then opened the lid and pulled out a pencil. The participant was then asked two test questions, which were recorded on the data sheet. One question referred to the false belief of a third party: “If (friend’s name) came over here now and I showed him the box, what he would say was inside before I take the top off?” the second question referred to the respondent’s previous false belief: “What did you first think was inside the box?’’ The order of the questions was counter balanced via Latin Square.

In the *Unexpected Transfer Task,* the researcher used two puppets to present a scenario (named Bunny and Cow). Each puppet owned a differently shaped container as a toy box. The researcher enacted a short scenario for the children using the boxes and dolls. Bunny (one of the puppets) was seen to place a ball in her container, and then she ‘goes out’ to play. Cow (the second puppet) moves the ball from Bunny’s container to its own container (e.g. a box or a purse) while Bunny is away. The participants were then asked a test question: ‘Where will Bunny look for the ball?’ and two control questions: a memory question ‘Where did Bunny put its ball in the beginning?’ and a reality control question ‘Where is the ball really? The scoring of each of these false belief tasks was identical with Study1.

Additional Executive Function Measures

The *Dimensional Change Card- Sort* task was administered in the same way as in Study1. T*he 8 Boxes Task* was used to measure children’s ability of working memory and administered in the same way in Study1.

Language Measures

The Peabody Picture Vocabulary Test (PPVT-III-R) (Dunn & Dunn, 1981) in Turkey has been used to measure children's verbal skills. This test was used with Turkish children because the standardization of the test had been done in Turkey. 100 sets of 4 pictures were presented to children. They were asked to point to the picture that corresponds to a word as in e.g., "Show me the 'cat'." Three pre-test trials were employed to ensure that the child understood what is expected of him or her. The list of words was uttered by the experimenter and the child's correct pairing of the word and picture was recorded. The experimenter stopped following a child's 9 continuous errors. The number of correct items that a child identified comprised the child's overall raw score.

For the British children, British Picture Vocabulary Scale was used. In this version of the one-word comprehension task, there were 12 words in a set. The one appropriate to child's age would be selected to begin the test. The experimenter continued to verbalize the words in the sets in the same manner as in PPVT-III, but she stopped when a child erred more than 8 times in one set. The number of words that a child was been asked to define would be subtracted by the errors they made to produce an overall raw score. Children's raw scores in these tasks were used in the analysis.

Non-verbal Cognitive Ability Measure

The *Raven's Coloured Progressive Matrices* (sets A, A_B, B) was used (Raven, Court, & Raven, 1983). Three sets of 12 pictures were presented to the children. Every set has the same principle behind it: a picture with a missing part and 6 different pattern choices to complete the picture (or #matrix').

Results

With regard to the research questions mentioned earlier, two associations, one between conflict and social understanding, another between delay and emotional-regulation, are proposed (see Introduction to the study). Each task measures a particular skill in relation to self-regulation. Moreover, each is scored in its own way. For example, the performance in Day/Night task is represented by the total of 'correct' responses across the 16 trials. On the other hand, performance on emotional-regulation is based on the number of negative, positive and neutral reactions. Thus, I will briefly report how each measure was scored and prepared for the analyses.

As mentioned in the introduction of this chapter, Study 2 also included three additional goals. First, it explored developmental change in all aspects of self-regulation, because of the well-known age differences on IC. Secondly, the previous studies have produced contradictory findings on gender differences, particularly in delay performance. Returning to the key question of this research, whether there is a relation between Delay and ER, the effect of gender was examined in relation to both constructs. Thirdly, nationality was explored since Turkey is an understudied culture, and the recent findings regarding Turkish children's ER have been limited to parental reports (Orta et al., 2013). The exploration of each measure is guided by those demographics mentioned above. The correlational relationships between IC, ER and SU are presented next. The predictive analysis of Delay, Conflict, ER (negative) and SU are presented last.

Comparisons by Age, Gender, and Nationality

Each task employed in the study is presented by Age and Nationality groups in Table 3.1. It shows the ranges, means and the standard deviations (*SD*) for each measure Age and Nationality group. To examine the possible effects of Age, Nationality, and Gender; 2 X 2 X

2 factorial analyses of variance were conducted. The evaluation of the descriptive and variance analyses is reported below.

Table 3.1

Descriptive Statistics for all variables by Age and Nationality

Measures	Min	Max	Overall			3-year-olds		4-year-olds	
			Mean	*SD*		*Mean*	*SD*	*Mean*	*SD*
Day/Night Task	0	16	11.91	6.1	Turkish	12.28	3.4	13.68	2.4
					British	9.57	4.9	12.93	3.3
Giraffe/ Mouse	2	25	19.51	6.0	Turkish	18.78	7.1	21.80	6.3
					British	17.96	5.9	19.26	3.3
Snack Delay	9	40	34.51	6.2	Turkish	36.35	4.1	34	4.9
					British	34.64	6.4	33.50	8.7
Sticker Choice	0	1	.61	.48	Turkish	.71	.46	.60	.50
					British	.53	.48	.68	.47
Disappointing Gift	-7	3	-2.21	2.24	Turkish	-2.00	2.0	-1.60	1.9
					British	-2.42	2.4	-3.00	2.3
False Belief Score	0	3	1.89	1.09	Turkish	1.43	1.2	2.40	.42
					British	1.50	1.2	2.18	.80

Conflict Measures

The Day/Night Task. The Scoring was identical with the procedure reported in the Study 1. The Day/Night task performance was normally distributed. As Table 3.1 displays, the mean performance of Turkish 3-year-olds was closer to both Turkish and British 4-year-olds than their British peers. The number of trials where children managed to suppress the prepotent response and follow the rule of the game is the measure of success. A difference between age groups is expected in this task given the previous literature, but the slightly unusual performance of Turkish 3-year-olds may undermine the significance of this age difference. In Table 3.2, univariate analysis of variance with Day/Night by Age, Gender, and Nationality (a 2 X 2 X 2 factorial design) is displayed. As the analysis shows, age is the only significant effect on Day/Night performance. This finding is very consistent with the previous studies (see Diamond et al., 2002). The Day/Night task is a very widely used and commonly points to the mental transition between the ages of 3 to 4. The findings were consistent with the literature.

Table 3.2

Univariate Analysis of Variance of Day/Night Task by Age, Gender and Nationality

Variables	Sum of Squares	d*f*	F	η_p^2	*p*
Age	93.67	1	6.53	.08	.01
Gender	.47	1	.03	.00	.86
Nationality	46.81	1	3.26	.04	.08
Age * Nationality	19.19	1	1.33	.02	.25
Age * Gender	6.54	1	.45	.01	.50
Nationality * Gender	.21	1	.01	.00	.90
Age * Nationality * Gender	21.04	1	1.46	.02	.23

Note: R Squared = .21 (Adjusted R Squared = .14)

The Giraffe/Mouse Task. In 25 trials, children were asked to do the reverse of what the cue suggests. . This task is very similar to Day/Night in principal but instead of verbal responses, children were supposed to use their bodies. As Table 3.1 shows, 4 year-olds of both nationality groups had higher mean scores than younger children. Turkish children's mean scores were slightly higher than British children's. As the inhibitory demands of the task were similar to Day/Night; age could have had an effect on performance. Analysis of variance by Age, Gender, and Nationality was conducted for the Giraffe/ Mouse task. As presented in Table 3.3, the variance analysis showed that none of the demographic variables had an effect on children's performance of controlling their motor responses in this inhibition task.

Table 3.3

Univariate Analysis of Variance of Giraffe/Mouse by Age, Gender, Nationality

Variables	Sum of Squares	d*f*	F	η_p^2	*p*
Age	75.45	1	2.10	.03	.15
Gender	2.97	1	.08	.00	.77
Nationality	30.40	1	.85	.01	.36
Age * Nationality	11.96	1	.33	.00	.57
Age* Gender	13.23	1	.37	.00	.54
Nationality * Gender	28.37	1	.79	.01	.38
Age * Nationality * Gender	51.16	1	1.43	.02	.24

Note: R Squared = .10 (Adjusted R Squared = .02)

Delay Measures

The Snack Delay Task. Its score was the accumulation of the responses over 4 trials. Each trial was rated on a 10-point scale. Scoring was based on whether the child waited quietly for E's signal before having the treat or gives in to temptation and eats the treat before the signal. The highest score is 10, and the lowest is 0 in each trial. 36.1% of children received 10 points for all trials. This version of the Snack Delay was used for the first time among the studies in this thesis. Interrater agreement was assessed on 33.7 % of the cross-cultural sample (28 children) which was randomly selected. Since the performance was transformed into a continuous score, intra-class correlation coefficient (ICC) was used a measure of reliability (Bartko, 1966). Two-way mixed ICC with 2 raters across 28 subjects in the Snack Delay task revealed that 83 % of the variance in the mean of these raters is real, ICC (2, 1) =.83. Children who were at ceiling were the ones who managed to wait without touching or eating the treat and did not prompt E to give the signal. They also did not move their hand or body towards the treat. In Table 3.1, the means of total scores are shown. Both Turkish and British 3-year-olds had slightly higher mean scores than their 4-year-olds peers. Analysis of variance was conducted to test these apparent trends in mean scores. As Table 3.4 displays, Age, Gender and Nationality variance analysis did not have any significant main effector interaction. Children's ability to resist temptation was not influenced by their age, gender or nationality.

Table 3.4

Univariate Analysis of Variance of Snack Delay Task by Age, Gender, Nationality

Variables	Sum of Squares	d*f*	F	η_p^2	*p*
Age	23.81	1	.65	.01	.43
Gender	74.38	1	2.01	.03	.16
Nationality	32.14	1	.87	.01	.35
Age * Nationality	.32	1	.01	.00	.93
Age * Gender	107.76	1	2.92	.04	.09
Nationality * Gender	88.14	1	2.39	.03	.13
Age * Nationality * Gender	34.53	1	.94	.01	.34

Note: R Squared = .12 (Adjusted R Squared = .04)

The Sticker Choice Delay Task. It was a simplified choice task for children. They were asked to choose between 'one sticker now' and 'two stickers later.' If they chose the immediate reward, they received 0 as a score and if they chose the delayed reward they received 1 as a score. The performance in this measure demonstrated a normal distribution. Table 3.1 presents mean scores for each age and nationality groups. Mean performance of younger Turkish children was higher than their British peers and both nationalities' older children. Table 3.5 shows whether children's choice of immediate or delayed rewards were dependent on age and nationality by testing against chance using the binomial test. Performance was at chance for both age and nationality groups.

Table 3.5

Number of children who chose Now vs. Later in Sticker Choice Task

Nationality	Age		Obs N	Obs Prop (%)	P
Turkish	3	Now	4	29	0.18
		Later	10	71	
	4	Now	10	40	0.42
		Later	15	60	
British	3	Now	13	46	0.85
		Later	15	54	
	4	Now	5	31	0.21
		Later	11	69	

Emotional Aspect of Self-regulation Measure

The Disappointing Gift Task. As described above, the situation was created where the child was expecting a nice/ surprise present but received something irrelevant. This task was adapted from Saarni's (1984) original paradigm of expressive emotions. The paradigm has three categories of expressions classified as: 'positive, negative or transitional.' In these categories, there were 7 positive, 10 negative, and 13 transitional/ neutral emotional expressions. Although Table 3.1 only displays the number of negative responses of children in this unpleasant situation, here I will go into details of why negative reactions were chosen over positive or neutral ones. The original paradigm was used to test children who were 6-to 11- years old. Saarni (1984) administered this task in two sessions. In the first session children received the disappointing present, then in session 2, a pleasant gift was given to elicit positive reactions. Performance was analysed based on comparisons of the number of negative reactions in Session 1 and the positive reactions in Session 2. As these young children were not flexible enough to switch emotions immediately, only the disappointing session was recorded and coded in this study. In regard to the children's display of additional emotional expressions during the testing sessions, a few additions to the original categories were made. Children's positive verbalization was added to the positive category. Nine participants in this study showed this particular response. Children's demonstration of 'bulging eyes as in a negative surprise' was also added to the negative expression category. Twelve children displayed this behaviour. The application of this task with preschool children was drawn from Cole (1986) and Carlson and Wang (2007). They found and reported that younger children tend to display very few positive reactions. The number of negative reactions children showed was higher than other categories in those studies. Therefore, the score in a negative category was used. Each expression was scored as 1 point to produce a 'category score'. The Disappointing Gift task was used for the first time. Interrater agreement was assessed on 33.7 % of the cross-cultural sample (28 children) which was randomly selected. Since both Snack delay and Disappointing Gift performances were transformed into continuous scores, intraclass correlation coefficient (ICC) was used a measure of reliability (Bartko, 1966). Two-way mixed ICC with 2 raters across 28 subjects in Disappointing Gift task revealed that 81.4% of the variance in the mean of these raters is real.

In addition to Table 3.1, Table 3.6 here presents means and standard deviations of children's reactions in each category. As it shows, for both age and nationality categories, the mean of 'transitional' responses was higher than both negative and positive reactions.

Previous studies did not employ this category in the analysis, since the transitional reactions did not show how much the child was affected or how much she or he managed to control the discontent of the situation. The transitional (or neutral) responses identified, in part, children's engagement in the task. Considering positive reactions as the end product of well-developed emotional-regulation, 53% of the children did not show any positive response. The maximum number of positive reactions ever shown was 4, and only three children showed this high performance. Only 31% of children managed to not to produce any negative reactions that might be considered as regulate emotionality. A young child who failed to adjust social norms and did not consider the stranger's feelings who gave him or her nonsense gift was classified as producing negative reactions. 68.7% of the children showed at least one and up to five negative reactions. Table 3.6 displays the mean scores in each category where Turkish children of both age groups showed more negative responses than British children. Moreover, British children showed more positive responses compared to their Turkish peers. British children also showed more transitional responses. Table 3.1 presents this Disappointing Gift score. The minimum score is -7 and maximum is 3. It is important to remind ourselves here that, since positive and transitional was subtracted from negative category, a higher score means more negative and fewer positive/transitional responses. Thus, here, -7 is a 'better' (i.e. more mature) performance whereas 3 suggests poor ER. To calculate this score, the assumption was made that the children produce a range of emotions. So their responses in each category needed to be regarded as meaningful. Children's positive and transitional responses represented their ability to control their disappointment and engage with their surroundings. Thus, positive and transitional responses were summed and then subtracted from the negative responses. All the children's efforts in each category would count in this way. According to mean scores in Table 3.1, British children from both age groups performed better than Turkish children. In the British group, older children's performance was better than that of younger children. On the contrary, an age difference seems apparent in Turkish children. Younger Turkish children seemed to demonstrate better emotional-regulation than the older children in the same culture.

Table 3.6

Responses in Disappointing Gift Task (Means and Standard deviations)

Age/Nationality		Positive		Negative		Transitional	
		Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
3-year-olds							
	Turkish	1.07	1.07	1.64	.93	2.57	1.09
	British	.46	1.04	1.21	1.31	3.17	1.49
4-year-olds							
	Turkish	.96	1.06	1.52	1.08	2.16	.80
	British	1.19	1.33	.94	1.06	2.75	1.53

To see if any of the above relations were statistically significant, univariate analysis of variance was conducted with Age, Gender, and Nationality as factors. Age had no effect on children's ability to mask their disappointment as demonstrated in Table 3.7. Gender had no effect on emotional-regulation, either. The age groups only consisted of 3- and 4 year olds; such young ages may not show any meaningful differences in emotional-regulation development. The gender difference that Saarni (1984) suggested was apparent around age 11 and girls showed more positive reactions. Young children, for example, 3-and 4-year-olds may not, therefore, differ by gender. On the threshold, nationality showed a near significant effect on emotional-regulation [F (1, 83) = 3.86, p = .053, partial η^2 = .05]. Despite the lack of age effect on emotional-regulation, an odd discrepancy suggested that younger Turkish children demonstrated more mature reactions than the 4-year-olds. Due to the rarity of this observation (of three year olds out performing four year olds), perhaps we can ignore this borderline nationality effect? To sum up, the variance analysis suggests that 3-and-4-year-olds constitute an unstable age group from which to make inferences.

Table 3.7

Univariate Analysis of Variance of Disappointing Gift Task by Age, Gender, Nationality

Variables	Sum of Squares	d*f*	F	η_p^2	*p*
Age	.01	1	.00	.00	.97
Gender	.01	1	.00	.00	.97
Nationality	18.98	1	3.86	.05	.05
Age * Gender	18.01	1	3.66	.05	.06
Age * Nationality	6.58	1	1.34	.02	.25
Gender * Nationality	.77	1	.16	.00	.69
Age * Gender * Nationality	.65	1	.13	.00	.71

Note: R Squared = .11 (Adjusted R Squared = .03)

False Belief (Social Understanding) Measures

The Unexpected Content Task. There were self and other false belief questions in this task. A correct answer was scored as 1 point. If a child answered both of the questions correctly by saying 'Smarties' (as what she or he thought, and her/his friend would think was the content of the box), she or he received the maximum score of 2. If s/he answered both of the questions incorrectly by saying 'a pencil or paper clips,' she or he would receive the minimum score of 0. Firstly, and performance against chance in the other protagonist's false belief was tested in each age and nationality group. Table 3.8 presents children's answers to others' false belief questions. Children from both age nationality groups performed at chance. Table 3.9 shows the 'self-false belief' responses. Only the 4-year-old Turkish pre-schoolers' were significantly above chance on this measure: P $\leq$.001.

Table 3.8

Number of children who responded to Others' FB in Unexpected Content

Nationality	Age		Obs N	Obs Prop (%)	P
Turkish	3	Right	6	43	0.79
		Wrong	8	57	
	4	Right	15	60	0.42
		Wrong	10	40	
British	3	Right	14	50	1.00
		Wrong	14	50	
	4	Right	10	63	0.45
		Wrong	6	38	

Table 3.9

Number of children who responded to Self FB in Unexpected Content

Nationality	Age		Obs N	Obs Prop (%)	P
Turkish	3	Right	8	57	0.79
		Wrong	6	43	
	4	Right	22	88	<0.01
		Wrong	3	12	
British	3	Right	14	50	1.00
		Wrong	14	50	
	4	Right	12	75	0.07
		Wrong	4	25	

The Unexpected Transfer Task. There was one question of another's false belief in this task. Two additional control questions were not included in the analysis. The test question was scored as 1 if the child pointed to the correct box. The correct box was the one in which the first puppet initially hid his ball. The child received zero as a score if she or he pointed to the incorrect box that the ball was hidden in by the second puppet. From both nationality groups, the performance of 3-year-olds was at the chance level, since half of the British and 57% of their Turkish children gave the incorrect answer. Four-year-olds from both cultures answered the question correctly above chance of significance level: Turkish; P $\leq$.001, British; P$\leq$.02.

Table 3.10

Number of children who responded to Others' FB in Unexpected Transfer

Nationality	Age		Obs N	Obs Prop(%)	P
Turkish	3	Right	6	43	0.79
		Wrong	8	57	
	4	Right	23	92	0.00
		Wrong	2	08	
British	3	Right	14	50	1.00
		Wrong	14	50	
	4	Right	13	81	0.02
		Wrong	3	19	

Total False Belief Score. To increase the variation in the data, children's performance in each of these three questions is summed, and a total false-belief performance score is produced. The mean scores are displayed in Table 3.1, had a maximum score of 3 and minimum of 0. The performance in SU appeared to be normally distributed. As the descriptive statistics displays in Table 3.1; mean scores of FB was higher for both nationality groups' 4-year-olds than the 3-year-olds. A univariate analysis of variance was conducted with Age, Gender, and Nationality effects. Table 3.11 displays that only Age had a significant effect on total false belief performance [F (1, 81) = 14.25, p < 0.01]. Gender had no effect on false belief performance. Nationality also did not show any significant effect on children's false belief performance.

Table 3.11

Univariate Analysis of Variance of Total FB Score by Age, Gender, Nationality

Variables	Sum of Squares	d*f*	F	η_p^2	*p*
Age	13.21	1	12.47	.14	.00
Gender	.00	1	.00	.00	.95
Nationality	.03	1	.03	.00	.86
Age * Gender	.59	1	.56	.01	.46
Age * Nationality	.58	1	.55	.01	.46
Gender * Nationality	2.63	1	2.48	.03	.12
Age * Gender * Nationality	.55	1	.52	.01	.48

Note: R Squared = .19 (Adjusted R Squared = .11)

Additional Measures

Verbal Ability Measures. Two different language tests were used for two cultures. The Turkish Peabody Picture Vocabulary Test was administered to measure one-word comprehension because it was standardized in Turkey. The British Picture Vocabulary Scale was administered to British children. The correct pairing of a picture and a word was scored with 1 point. Their overall correct answers accumulated a total raw score for each scale. The raw scores from both tests were standardized (z-scores) to match one another. As the analysis of variance with Age, Gender, and Nationality suggests, there was a significant effect of Age on verbal ability: [F (1, 82) = 10.29, p = .002, partial η^2 = .121]. There was no effect of Gender or Nationality and no significant interactions.

Non-Verbal Cognitive Ability Measure

Raven's Matrices Test was administered to measure the non-verbal cognitive abilities. Children's correct pairing of a missing piece from a bigger illustration was scored as 1 point. 3 scales (A, B, AB) were administered and each scale had 12 items. An overall score accumulated from the correct answers in all three scales. The maximum score was 36. The analysis of variance with Age X Gender X Nationality revealed that Age [F (1, 83) =

5.36, p = .023, partial η^2 = .07] and Nationality [F (1, 83) = 8.95, p = .004, partial η^2 = .11] were significant factors on this non-verbal cognitive ability task.

Correlation Analysis

The correlations between CR, ER and SU are reported at the task level in Table 3.12. The correlations revealed the interrelations among the measure of the same construct and how different constructs related to each other. First, Conflict measures, both the Day/Night and Giraffe/ Mouse tasks strongly correlated with one another (r (82) = .40, p < .01). As compatible with the hypothesis suggests that Conflict performance would be correlated with SU (False Belief performance), both conflict tasks were correlated with the FB performance (Day/Night: r (82) = .40, p < .01; Giraffe/Mouse: r (82) = .29, p < .01). As Table 3.12 displays, despite being considered as a subtype of inhibitory control, the Delay and Conflict tasks failed to demonstrate any significant correlations with each other. The conflict tasks did not relate to emotional-regulation performance. Based on the correlations, the two Conflict tasks were collapsed together to produce a composite score. Additionally, both Conflict tasks correlate with verbal ability performance. The Day/Night task alone was also correlated with Raven's matrices task.

In contrast to the inter-correlations among Conflict tasks, the Delay tasks were not related to each other. In the hypothesis, emotional-regulation was expected to relate to Delay performance. Only one Delay task - Snack Delay- fulfilled this expectation: (r (82) = -.23, p < .05). Children's reactions in the Disappointing Gift task negatively correlated with Snack Delay performance. Although the correlation is low, this relationship supports the dissociation hypothesis.

The correlations were an informative step prior to a more predictive analysis. This study aimed to observe the possibility of divorcing two principal components of inhibitory control. The ability to regulate the self is a puzzle in terms of how it is constructed by inhibitory control, emotionality, and social understanding. To address each of these constructs, the discrepancies and relationships between them must be presented in a causal manner. At this juncture, the dissociation between Conflict and Delay was examined, based on the separate associations of each with social understanding and emotional-regulation respectively. Next, a hierarchical multiple regression analysis is conducted to add direction on the associations found.

Table 3.12

Pearson Correlations among all variables in Study 2

	Day/Night	Giraffe/ Mouse	Snack Delay	Sticker Choice	Disappointing Gift	False Belief	Verbal Ability
Day/Night	-						
Giraffe/Mouse	.40**	-					
Snack Delay	-.11	-.01	-				
Sticker Choice	.01	-.03	.17	-			
Disappointing Gift	-.03	-.03	-.23*	-.01	-		
False Belief	.37**	.26*	-.04	-.17	.13	-	
Verbal Ability	.34**	.36**	-.17	-.07	-.03	.20	-
Raven's Matrices	.28*	.21	-.00	-.04	.04	.12	.28**

Note: * *p* < .05; ** *p* <.01.

Regression Analysis

To turn the associations between Conflict and social understanding, and Delay with emotional-regulation were explored using multiple regression. First, the strategy of simultaneously entering all variables was considered to control for the effect of all predictors on each other. However, given the sample size, using the number of variables as predictors was thought to be inefficient for such a model fitting. Instead of aggregating all variables into the model, a different approach was followed based on the previous studies conducted multiple regression analysis with similar measures (Scullin & Bonner, 2006; Carlson, Moses, & Claxton, 2004). Simply, the loading of predictors into the models was done in three steps. In the first step, the psychological construct that was suggested in the hypothesis was loaded. In the second step, the demographic variables such as age (based on the variance analysis) and verbal ability (based on the correlations) were added to the model. In the third step, the model was completed with the 'disassociated' constructs to make sure that the variables in the first step contributed unique variance to the Model. This approach is explained thoroughly for the specific prediction criteria below. Before I continue with the regression analyses data reduction should be mentioned, since some of the measures are not included into the equations.

Data Reduction. As mentioned with reference to the correlations; the Conflict measures were collapsed to produce a Composite Conflict measure. The Composite Conflict measure was correlated with social understanding (r (82) = .37, p < .01); verbal ability (r (82) = .42, p < .01); and Raven's matrices (r (82) = .30, p < .01). However, the same did not apply to Delay measures because as mentioned above, the Sticker Choice task was not correlated with Snack Delay. Therefore, no composite score was created for the Delay dimension; the performance of Snack Delay is used in the regression analysis. Sticker

Choice, a dichotomous variable which did not relate to any measure, was dropped from the regression analyses.

Based on the analysis of variance, gender had no effect on any of the measures in this study. Thus, gender is dropped from the regression analysis. A similar conclusion was made concerning Nationality l. Apart from emotional-regulation performance, analysis of variance showed no difference between the two nationality groups. Age was included into regression analysis because it was significantly related to the Conflict and verbal ability. As the aim was to follow the practice of other studies and to conduct a developmental exploration, Age and Verbal ability were used as demographic variables.

The first multiple regression was conducted to predict the Conflict dimension. The second one was conducted to predict the Delay dimension and the third to predict Emotional-Regulation.

Predicting the Conflict Dimension. A hierarchical multiple regression was run to determine if the addition of demographic variables, followed by the variables assessing 'hot' aspects of control, improved the prediction of the Conflict performance over and above False Belief alone. Table 3.13 presents the full details of each regression model. In Model 1, false belief alone significantly predicted how children were able to suppress a prepotent response in rule based conflict tasks. Model 1 was statistically significant, $R^2 = .14$, $F\ (1, 81) = 12.84$, $p < .005$; adjusted $R^2 = .13$.

The addition of Age and Verbal ability to predict Conflict performance (Model 2) led to statistically significant increase in R^2 of .31, $F\ (2,78)=11.91$, $p<.001$; adjusted $R^2 = .29$. Both demographic variables were significant predictors of Conflict performance along with false belief performance. In Step 3, the Snack Delay and emotional-regulation measures were added to the model. Although Model 3 was a significant model, ($R^2=.33$, $F\ (2, 76) = 7.34$, $p < .001$; adjusted $R^2 = .28$), the subsequently added variables did not add unique variance to the prediction of Conflict performance. False belief and the demographic variables remained as significant predictors in Model 3, but the new measures did not lead to a statistically significant change from Model 2 to 3. The fittest model of all three was, therefore, Model 2. Children's ability to solve conflict in a stoop-like task was predicted by their understanding of others' mind states, verbal abilities, and their age. This analysis provided a replication of the previous findings that provide evidence that the conflict dimension of inhibition control shares variance with false belief understanding (Carlson, Moses, & Breton, 2002). Although Carlson and colleagues (2002) suggested that false belief/social understanding have a shared developmental pathway with the Conflict aspect of inhibitory control, the potential ties with the Delay aspect had been slightly overlooked. Inhibitory control was found to be strongly correlated with emotional-regulation in 4-year-olds (but not 5-year-olds) and quite strongly in girls (compared to boys) by Carlson and Wang (2007). However, their IC construct, as mentioned earlier, was a combination of Delay and Conflict measures. The results of this study showed that Conflict performance was not related to ER. To succeed in tasks with high demand of Conflict resolution, the ability to delay or the ability to successfully hide emotions was not necessary. For better ER performance and for the ability to resist and wait, a different underlying mechanism was in place.

Table 3.13

Hierarchical Multiple Regression of Variables Predicting Conflict Composite

	Conflict Composite Score								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
False Belief	.57	.16	.37**	.32	.16	.21*	.34	.16	.22*
Age (months)				.06	.03	.27*	.07	.03	.29*
Verbal Ability				.43	.17	.26*	.40	.17	.24*
Snack Delay							-.00	.03	-.01
Disappointing Gift							-.08	.07	-.11
R^2			.14			.31			.33
F			12.84**			11.91**			7.34**
ΔR^2			.14			.18			.01
ΔF			12.84**			9.99**			.64

Note: *$p < .05$. ; **$p < .01$.

Predicting the Delay Dimension. A multiple hierarchical linear regression to predict Delay performance was conducted following similar three steps in the previous analyses. See Table 3.14 for full details of each regression model. For Model 1, emotional-regulation performance was added as the only predictor of Delay performance. Although the R^2 value of

.055 was mediocre, Model 1 was a significant model, F (1, 80) = 4.65, $p < .05$, adjusted R^2 = .04. In Step 2, Age and Verbal ability aggregated to the equation (Model 2), but this model was not significant F (3, 81) = 2.43, p = .072. In Step 3, Composite Conflict and False Belief were added to the equation and this model also failed to reach significance F (5, 81) = 1.44, p = .22.

Children's ability to wait for a desired snack was predicted by their way of coping with disappointment. This finding fits the model that suggests that affective processes are intertwined with the 'hot aspect' of executive control abilities (Cunningham, Zelazo, Packer, & Van Bavel, 2007). Coping with delay is neither rule-based, nor structured. Nevertheless, waiting derives from social norms and requires conformity to these. In that sense, masking real emotions to spare someone else's feeling and delaying a desired reward share an understanding of those social norms. In the version of Snack Delay that was used in this study, children were presented with a delay period that was under the control of the experimenter. The way in which a child copes with the uncertainty was linked to their performance. Even prompting the experimenter to give them permission to eat Smarties caused the child's delay score to be marked down. Thus, a child who gets easily excited about the reward in front of him/her may engage in actions such as 'moving hands or body'; 'prompting the experimenter'; 'touching the reward.' All these actions cause a lower score. The tendency of the same child to respond towards an undesirable present would be in the same direction. She or he may easily get agitated and find it difficult to resource positive expressions.

Table 3.14

Hierarchical Multiple Regression of Variables Predicting Delay

	Delay Score								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Disappointing Gift	-.65	.30	-.23*	-.65	.31	-.24*	-.67	.16	-.24*
Age (months)				.01	.10	-.01	-.02	.12	-.02
Verbal Ability				-1.06	.75	-.17	-1.06	.79	-.17
Conflict Composite							-.03	.50	-.01
False Belief							.23	.70	.04
R^2			.055			.085			.087
F			4.653*			2.423			1.441
ΔR^2			.055			.030			.001
ΔF			4.653*			1.291			.056

Note *p < .05. **p < .01.

Predicting Emotional-Regulation. Delay performance was exclusively predicted by emotional-regulation performance in disappointing situations. Although correlation analysis points to singular relationships between Delay and emotional-regulation, hierarchical multiple regression analysis was conducted to predict children's performance in the Disappointing Gift task. It requires coping with negative feelings. However frustrated the child may be feeling about the situation, she or he is expected to reveal few, if any, negative responses. Table 3.15 displays three regression models in detail. Model 1 included only Delay performance as a predictor and was significant, F (1, 80) = 4.65, p < .05, adjusted R^2 = .04. In Step 2, the demographic variables were added, and Model 2 remained statistically significant, F (2, 78) = 2.82, p <.05 adjusted R^2 = .06. However, subsequently adding False Belief and the Composite Conflict performance (Model 3) did not add significant variance, F (2, 76) = 2.05, p = .08. Model 2 was not statically different from Model 1, so the leanest model was taken to be the fittest one. We can conclude here that children's coping with negative emotionality in a socially demanding situation was predicted by their delay performance and vice versa. The models suggesting a causal relationship between emotional-regulation and the ability to delay were not exceptionally strong. Therefore, a replication of the same trend between delay and emotionality ought to be addressed with a larger sample.

Table 3.15

Hierarchical Multiple Regression of Variables Predicting the Emotional-Regulation

	Emotional-Regulation								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Snack Delay	-.09	.04	-.23*	-.09	.04	-.23*	-.08	.04	-.23*
Age (months)				.07	.04	.22	.07	.04	.22
Verbal Ability				-.35	.27	-.16	-.27	.28	-.12
Conflict Dimension							-.20	.18	-.15
False Belief							.25	.25	-.11
R^2			.06			.10			.12
F			4.65*			2.82*			2.05
ΔR^2						.04			.021
ΔF					1.86			.91	

Note: *$p < .05$. **$p < .01$.

Discussion

Study 2 focused on the situational assessment of children's regulation of negative emotionality in relation to the diverse demands of tests under the banner of IC. The regression analysis revealed that Delay performance (in Snack Delay task only) was predicted by ER (negative) performance and vice versa. Contrary to previous studies, the assessment of responses to the Disappointing Gift paradigm was not based only on positive or negative reactions. Instead, children's reactions in all three categories (i.e. positive, negative, and transitional) as defined by Saarni, were incorporated into overall performance. In line with previous findings, Conflict performance was predicted by SU (e.g. Carlson et al., 2002).

Having discussed the CR construct in Chapter 2, and the ER construct in this chapter, the results reported in this study have their own drawbacks. As mentioned earlier, studies that report a relationship between IC and ER rely on an extensive analysis of emotionality and composite IC measures. Nevertheless, Study 2 revealed that performance in the Conflict tasks did not relate to ER (negative) as Blankson et al. (2013) suggested. However, Blankson et al. overlooked the potential of how Delay inhibition might be supporting IC separately. This might also indicate that findings from studies such as Carlson and Wang (2007) or Orta et al. (2013) (which assume a relationship between IC and ER) might in fact be highlighting a link with responses to Delay tasks, rather than Conflict. When age and verbal ability were controlled, the regressions of Study 2 demonstrated that ER (negative) still significantly predicted Delay, as well as SU predicting Conflict. The Conflict that was predicted by SU was still significant when age and verbal ability were controlled in the model.

In terms of the relationship between ER and SU, in line with previous findings (e.g. Liebermann et al., 2007), Study 2 also showed no association between these two constructs. However, before jumping to conclusions, we should note that ER was only assessed in this study in relation to the control of negative emotions. Others who have found a relationship between SU and measures of emotional- understanding, such as Blankson et al. (2013), suggest that we should cast the net further. This will be done centrally in Studies 4 and 5 (see Chapters 5 and 6). However, the next study (and chapter) will start this process, examining the child's emotionality in terms of a construct involving a broad analysis of the construct 'Emotional Understanding' and the regulation of positive emotionality as conducted by Carlson and Wang (2007).

Regarding performance in each of the Delay and Conflict tasks, a composite score from the Conflict tasks was created based on their inter-correlation. However, the Delay tasks were not correlated with each other. Snack Delay was the only measure that was correlated significantly with ER performance. Similar to Study 1, younger Turkish children's performance in Choice/Delay (Sticker Choice) was better than in their older counterparts. As this finding could not be explained, Sticker Choice was dropped from further analysis. This odd result was also observed in the Disappointing Gift task. The positive reactions to an unwanted gift were higher in the younger group of Turkish children compared to the older Turkish and same age British children. However, nationality was the only significant effect in ER paradigm. Considering the marginal significance in age and nationality interaction, the difference in Turkish and British children's performance in the ER paradigm is hard to explain. The performance of the older British children was compatible with the expectations of this task, showing more positive and fewer negative reactions towards an unwanted present. On the other hand, four-year-old Turkish children performed worse than those who were younger than them in both cultures, as well as British peers who were the same age. Although, the effect of culture appears to relate to performance, an additional regression analysis (not reported above) showed no significant predictions. Thus, nationality was dropped from the analyses reported in the results section. Additionally, due to lack of associations, Choice/Delay tasks were not included in the future designs.

In comparison to Study1, the relationship between Conflict and SU was more robust in Study 2 when the sample size was increased, and both Conflict tasks were associated with SU. There was significant relationship between Delay and ER. However, ER was limited to the observation of suppression of negative emotionality only, so the lack of relationship between SU and ER might be due to this limitation. An ER battery that combines the regulation of positive emotionality and emotion-comprehension might carry the ER -IC relationship a step further in Study 3. The Delay tasks are altered in the next study but the justification for the change will be discussed further in Chapter 7.

Chapter 4 - How Does the Regulation of Positive Emotionality and Emotion-Understanding Contribute to Self-Regulation?

In the previous chapter, Study 2 supported an association between *Delay* inhibition and the emotion- regulation (ER). However, ER was defined through the number of children's negative expressions during a disappointing event, and the construct was thus labelled as ER (negative). Although ER (negative) predicted waiting performance, the strength of this relationship was limited to the regulation of negative emotionality. As mentioned in previous chapters (1 and 3) the definition of ER remains unclear based on the multiple demands inherent in this construct – from highly positive to intensely negative. In addition to managing one's feelings and overcoming emotional challenges, understanding emotions has also been claimed to be a vital tool (e.g. Kopp, 1989). In addition to emotion-understanding, the suppression of positive emotionality has also been overlooked by most authors.

In this chapter, Study 3 examines whether the regulation of positive emotionality shares a similar relationship with *Delay* as does ER (negative). The investigation stretches our grasp of the underlying construct to examine the relationship between ER (positive), ER (negative) and a measure of emotion-understanding (EU). The aim is to conduct an extensive exploration of ER. By stretching the scope of ER, whether examining EU revealed any specific associations between the 'understanding' of both cognition and emotion; and the relationship of EU and SU can be investigated. Since there was no robust effect of culture, Study 3 was conducted with only Turkish children to provide an insight into this understudied culture. 117 children from three age groups (3-, 4-, and 5-year olds) were tested for their performance in IC, SU, ER (negative), ER (positive) and EU tasks. I will first describe the studies that have introduced the constructs of ER (positive) and EU, and explored their relation to other aspects of self-regulation. Study 3 aims to clarify whether the control of both positive and negative emotionality plays a role in terms of the association of cognitive and emotional aspects of self-regulation. Additionally, it explores the role of children's growing ability to label emotions in terms of both CR and SU.

4.1 Regulation of Positive Emotionality

The research has not shown a consensus on how to define emotion or how to distinguish it from emotion-regulation (Gross, 1998), let alone differentiating out the regulation of different emotions (i.e. positive or negative). A recent study by Kim and Hamann (2007) addressed the issue of ER in terms of the regulation of positive and negative emotions. The authors have shown that brain activation was different for ER (negative) and ER (positive). In line with the notion that emotional stimuli are critical for the activity in the amygdala (Ochsner et al., 2004), Kim and Hamann (2007) reported that decreasing negative emotionality was different from decreasing positive emotionality. Compared to the studies of the former, the control of positive emotionality is not very common in the developmental psychology literature.

There are popular tasks to measure the regulation of negative emotionality, such as Saarni's Disappointment Paradigm (1984) and the Frustration Paradigm (Calkins, 1997). However, there are not many tasks to measure the regulation of positive emotionality. The Disappointment paradigm is often alternated with a desirable gift to reveal children's positive emotionality (e.g. Liebermann et al., 2007). However, such an alternation is not a meaningful measure of 'regulation'. Children demonstrate clear emotions towards a pleasing event. The demand in that task does not require a child to control his or her positive or negative emotionality.

As mentioned earlier, academic success requires young children to regulate their positive emotionality in certain circumstances, particularly in class. For example, getting too excited with the task in hand or not being able to hold back when knowing the answer to a teacher's question may interfere with the child's social engagement as much as an inability to hide negative emotions. As the neuropsychological findings indicate a difference between positive and negative emotionality, young children's coping with positive emotions deserves experimental attention.

Most of the interest in the separation of positive and negative emotionality has been during infancy in which children's high negative emotionality towards a novel object has been shown to predict better IC at 14 months and even at the age of 3, whereas babies who showed high positive emotionality towards a novel object were the ones who lacked IC at 14 months (Kagan & Snidman, 1991; Park, Belsky, Putnam, & Crnic, 1997). This evidence from infant studies points to temperamental explanations of a child's reactions toward novelty, yet the paradigm they use simply shows whether such novelty is interpreted positively or negatively. Despite the finding that young children's negative reactivity to novelty is often related to their better inhibition in toddlerhood (Spinrad, Eisenberg, & Gaertner, 2007), Bridgett et al. (2013) reported that, for young adults, IC was inversely related to their tendency to display negative emotionality, as reported in a questionnaire.

Bearing in mind that the methodologies for studying infants and adults may be very different, negative emotionality may involve different links to the regulation of actions and feelings. For example, adults' appraisals of an unpleasant memory that elicits negative emotions can be used (Levine, 1996). In the assessment of young children's ER capability, situational analyses of negative emotions may well be necessary.

In Study 2 (Chapter 3), children's coping with an event that elicited a negative emotion predicted how they cope with a delay. This raises the question of whether suppressing positive emotionality shares a similar pattern as ER (negative). Alternatively the demands of ER (positive) could be different to those of ER (negative). The novelty and attractiveness of a toy or a game can be used to simulate positive emotionality such as excitement or surprise. During ER (negative), children are expected to reverse their negative emotional expressions to positive ones, whereas in ER (positive) process a child is expected to neutralize the desire to display true feelings. Now, I will address two tasks that have been used as ER (positive) tasks.

One of the early procedures is the Forbidden Toy task which has been mentioned but not discussed in the previous chapter. Although this method has been mostly used for its demand on the ability to delay, it was created as a task that intertwines both with emotional and cognitive requirements by Lewis, Stanger, and Sullivan (1989). This task was used by Carlson and Wang (2007) to assess children's coping with a delay and whether they told E about their misdemeanour. They found that children's ability to withhold from touching a toy, as instructed, was correlated with their performance in another delay task. Moreover, whether this happened while the experimenter was absent from the room was inversely related to the number of negative expressions children shown in the Disappointment Paradigm. I considered this link as support for the relationship of Delay and ER (negative) and Study 2 demonstrated similar evidence. However, the deception part of the task was overlooked. When Lewis et al. (1989) developed this task; they reported that just over half of the children in their sample, whose ages ranged from 3 to 5-years, touched the toy that was forbidden. The majority of the children also lied about this misdemeanour. Performance in false belief tasks was related to whether children denied about their misdemeanour while the experimenter was not in the room. Similarly, ER (negative) performance was also correlated with children's denial of touching the toy in Carlson and Wang's (2007) sample. Aside from its delay demand, the Forbidden Toy task does not exactly elicit positive emotionality but does encourage children to touch the toy and therefore inform the experimenter about what they did.

A very good example of a task that elicits positive emotionality and also shares the Forbidden Toy's demand of deception was also created by Carlson and Wang (2007). These authors created a very exciting procedure in which a goldfish started to communicate with children and asked them to keep the fact that he can speak as a secret. The Secret Keeping Task excited children with the novelty/impossibility of a talking fish and demanded of them not to share the news with the experimenter. Their responses were correlated with EU performance and the feigned answers stating whether they liked their undesirable gift or not in the Disappointment Paradigm. Thus, ER (Positive) performance in the Secret Keeping Task was not related to children's ability to hide their emotional expressions in ER (Negative) but their deceptive answers were. Carlson and Wang (2007) aggregated all emotionality measures into a scale of combined ER performance and found that it was related to an IC score which contained both Conflict and Delay.

As Study 2 showed in the previous chapter, it was not Conflict but the Delay demands of IC that was predicted by ER (negative). In Study 3, first the relationship between ER (negative) and ER (positive) will be investigated. Carlson and Wang (2007) reported that it was not emotional displays in the Disappointment Paradigm but children's answers regarding whether they liked the gift or not that related to IC. Since this finding depended on an aggregated ER score, while task level in ER (positive) was not correlated to IC measures, ER (positive) is not expected to relate any Conflict or Delay measures in Study 3. However, the performance in ER (positive) is expected to relate to other aspects of emotionality.

4.2 Emotion-Understanding (EU)

Emotion-understanding (EU) embodies three components; [1] to identify emotional expressions, [2] to foresee others' emotional reactions, [3] to understand the difference between visible and private emotional experiences (Denham, 1986; Pons, Harris, & de Rosnay, 2004). Children show competence in understanding certain emotions based on their simplicity and complexity at certain ages (Harris, 1989). Many studies have focused on the age that the child acquires the ability to comprehend different components of the construct such as simple (e.g. happy, sad) or moral (e.g. guilt, shame) emotions (Harris, 1989; Saarni, Mumme & Campos, 1998).

According to Denham (1986), children as young as three can identify basic emotions, and demonstrate an understanding of particular situations that cause particular feelings (e.g. receiving a present makes people happy). Ten month-old children can comprehend their mothers' emotional expression and adjust their actions accordingly (Campos & Stenberg, 1981). If their mother is frowning, children become less likely to approach an interesting toy. This example illustrates the connection between comprehending an emotion and the ability to regulate one's own behaviour. Since the child's behaviour was affected by the mother's emotional expression, the assumption is that the child has started to comprehend another's emotional expressions.

Here, I intend to report the findings from the assessment of EU through a task that requires children to label the emotions via verbal or pictorial cues. Although EU has been claimed to be part of a broader construct 'ER', not many studies have compared the regulatory and understanding demands of emotions in early childhood. Garner and Power (1996) linked emotion-understanding with performance in the Disappointment Paradigm. They reported that the positive emotional expressions of children to a disappointing gift were positively associated with the EU performance. However, children's negative expressions did not share a similar pattern. Garner and Power used an EU scale with 10 items that were audio vignettes. Children listened to and chose an emotional expression for the character that was described in the story. The range of emotions was 'happy, sad, angry, afraid, and, surprise'. Using a very similar scale to Gardner and Power to assess EU, including natural observations of children's emotional expressivity among peers, and assessing the ER through both parental reports and natural observations, Denham et al. (2003) generated a model in which EU directly predicted children's social competence at the age 3-and 4-year-old. The ER performance of 3-and 4-year-olds, on the other hand, predicted their social competence in the kindergarten years.

Blankson et al. (2013) reported that in their longitudinal sample, when tested at the ages of both 3-and 4-year-olds, children's EU performance was strongly related to ER (negative). Moreover, ER (negative) performance at the age of 3 was correlated with the EU performance at the age of 4. Blankson et al. (2013) also demonstrated that children's ER was predicted by EU at the age of 4-years. More importantly, their finding also sheds light on the relationship between CR and EU that has been much less studied that the association of CR and SU. They reported that EU performance at the age of 3 predicted Conflict and SU performance at the age of 4. In Carlson and Wang's (2007) study, EU performance was related to both Conflict and Delay performance and was stronger between Conflict and EU.

As mentioned earlier, the growing ability to understand more complex emotions may go hand in hand with SU. The development of EU and SU was tied to the emergence of other social-emotional abilities such as prosocial behaviours and moral decision making (Eggum, Eisenberg, Kao, Spinrad, Bolnick, Hofer, Kupfer, & Fabricius, 2011; Lane, Wellman, Olson, LaBounty, & Kerr, 2010). Eggum et al. (2011) assessed EU and SU to investigate their relation to prosocial orientation by testing children first at 3.5-years, and then at 4.5 and 6. A prosocial orientation includes behaviours that intend to help others, such as putting someone else's well-being or benefit before yours. Regulating one's own desire or expectations is necessary for such altruistic behaviour to occur. Eggum et al. (2011) reported that EU performance of 3.5 year-olds was related to the ability to share another's emotional states (sympathy) at the age of 6. Early EU and SU performance were related to the later abilities of sharing and being compassionate about others' feelings. Similar to prosocial development, children's reasoning, based on an appreciation trusted adults' knowledge and desire to adapt to social expectation at the age of 5.5, was predicted jointly by EU and SU performance (Lane et al., 2010). Children's understanding of *hidden emotions* was highlighted by Harris, Donnelly, Guz, and Pitt-Watson (1986), and was thought to be based on maturing social cognition, particularly the mutual development of SU and EU.

Despite the mutual effect of EU and SU on later development reported in the above studies, Cutting and Dunn (1999) suggested that SU and EU are not joint processes. They found a lack of correlation between false belief and emotion-comprehension. However, Harris et al. (1986)'s claim of understanding hidden emotions raises the issue of whether children's ability to hide their own emotions is influenced by such understanding. The level of the association between SU and EU is investigated in Study 3. This might help to explain the variance between EU and ER. The assessment of EU has mostly been done through children's labelling of emotions in stories. Those EU tasks were limited to the child's recognition of another's emotions.

The child's grasp of how more than one emotion can be felt, how an emotion lingers to be remembered later, and how moral reasons may interfere with emotionality were not part of most traditional EU tasks. Pons, Harris and de Rosnay (2004) created the Test of Emotion Comprehension (TEC) involving nine components as a more comprehensive scale of understanding of emotions. In these, children were expected to show competence in: recognizing emotions, causality of emotions, desire and belief reasoning behind emotions, remembering emotion, and the possibility of holding more than one emotion simultaneously. In addition, there were also items to assess children's understanding of how an emotion can be regulated and hiding one's feelings for moral reasons. Their scale has been used widely in research and the performance in TEC has been found to be strongly related to false belief performance in the preschool years (see Weimer, Sallquist, & Bolnick, 2012). Pons, et al. (2004) reported that with age performance increases on each component and moves from recognizing simpler emotions to appreciating mixed states, where for example feelings may be mixed. Weimer et al. (2012) explored whether each component might differ in their relation to SU. They reported that more complex components, particularly understanding causality, desire and belief reasoning behind emotionality and remembering a previous emotional state, were relating better to SU rather than simpler components such as recognizing emotions.

TEC has never been used with a Turkish sample before, let alone in relation to explore the role of EU in the development of regulatory skills. The developmental pattern that occurs from age 4 to 11 that the components of this scale draw upon was validated with an Italian sample (Albanese, Grazzani, Molina, Antoniotti, Arati, Farina, & Pons, 2006). The TEC assesses a wide range of emotion-comprehension skills that children develop till the age of 11 but from the age of 4 the performance across all components improves (Pons et al., 2003; 2004). Thus EU performance in Study 3 will be assessed via using the TEC.

According to the previous studies, there is an association between EU and SU, so Study 3 aims to replicate this finding within a sample of Turkish 3-, 4-, and 5-year-olds. Moreover, in Study 2, only ER (negative) was examined to represent children's emotion-regulation. A lack of association between ER and SU was observed in Study 2. Adding another component of ER will expand the investigation. In Study 3, ER (positive) is examined. The process of controlling or hiding positive emotions resembles one of the explanations for the child's failure to pass a false belief task which is the child's over eagerness to give a correct answer (Zelazo, Frye & Rapus, 1996). Although, this eagerness is mostly mentioned under the lack of inhibition in terms of executive functions, anyone who spends a few minutes to play with children would guess how emotionally charged they are when expected to give an answer. Children's performance in an ER task that assesses the ability to suppress the excitement of new information is expected to relate to their SU performance. In case SU remains disassociated with ER (negative) but forms an association with ER (positive), the nature of the relationship between ER (positive) and ER (negative) would be explored at a further level. This might indicate that the understanding of others' mental states helps to suppress positive emotions but SU does not interfere with the regulation of negative emotions. The second half this assumption was supported in Study 2 but Study 3 also seeks evidence to be able to support that finding. Both of the types of negative or positive emotion-regulation is an adaptation to the social expectations, so instead of SU, either ER mechanism would be explained through the understanding of emotional processes.

STUDY 3

First this study stretched the sphere of emotion-regulation by including tasks of emotion-understanding and suppression of positive emotionality. Hence, the relationship between CR and ER could be explained through separate mechanisms that may play a role in the development of self-regulation. Secondly, an understanding of another's mind (SU) and emotions (EU) might influence the regulation of both aspects of self-regulation. Based on the previous studies that were reported in this thesis, Study 3 aims to replicate the disassociation of IC in regard to the relationship that the Conflict shares with SU; and the Delay shares with ER (negative). Thus, ER (positive) in Study 3 is also expected to be related to the child's reaction to a Delay. EU, on the other hand, is expected to be related to children's SU performance, consistent with the literature suggesting such a connection. Since EU is associated to SU, Conflict is also expected to be related to EU as well. Figure 4.1 illustrates the constructs in question in Study 3. As shown with a double arrow, the association of Conflict and SU is expected to be replicated here similar to previous studies reported here in this thesis. Since the effect of EU is in question here, the potential links that are expected to be observed are illustrated in dotted lines.

Figure 4.1: Constructs of Study 3

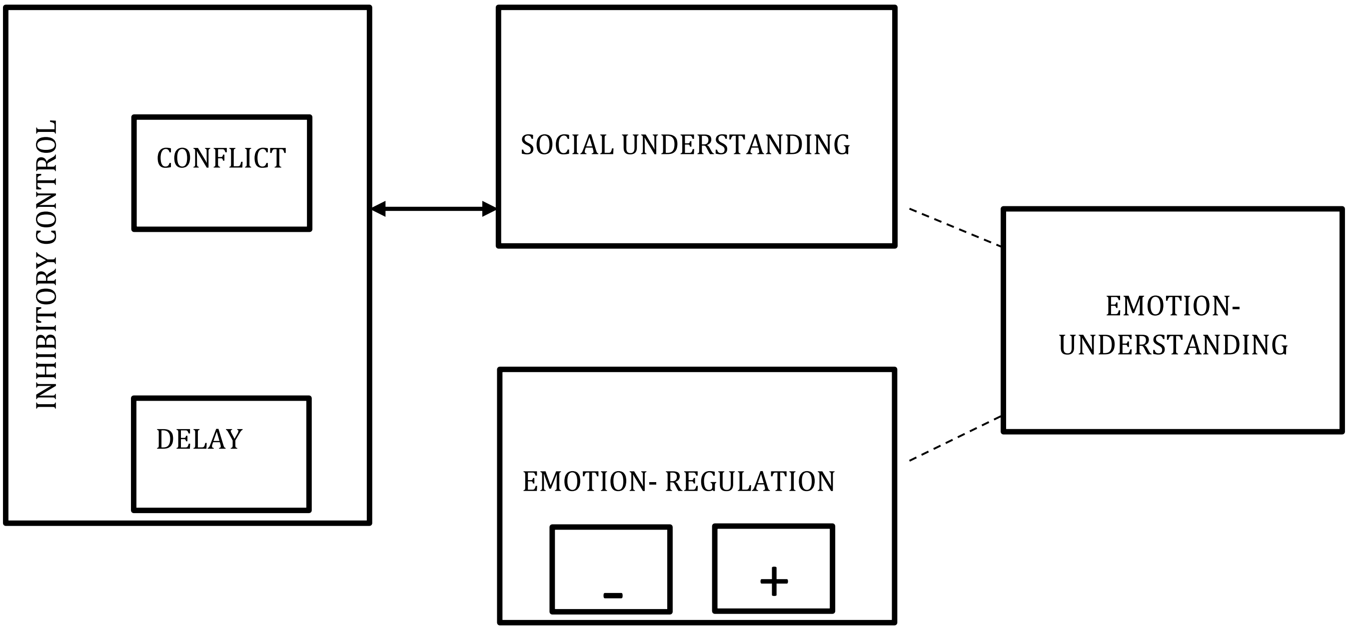


Table 4

All measures used in Study 3

Skill Domain	Variable	Tests
Cognitive -Regulation	CR	
Conflict		Day/ Night Task
		Hand Game
		Whisper Game
		Less is More
Delay		Snack Delay
		Gift Delay
Emotion-Regulation	ER	Disappointing Gift
		Secret Keeping
Social Understanding (False Belief)	SU	Unexpected Transfer False Belief
		Unexpected Content False Belief
		Appearance-Reality False Belief
Emotion-Understanding	EU	Test of Emotion Comprehension

Methods

Participants

One hundred and seventeen (63 female) Turkish children participated in this study. Their ages ranged from 3 to 5 (*M*=52.51 months, *SD*=9.21 range: 35-70 months.) They were recruited from three nurseries in Bursa (Marmara region) in Turkey. Those nurseries serve mostly middle to upper-middle class families. Parental consent was obtained through the school administrations, following ethical clearance from the Departmental and University Research Ethics Committees. The consent and the willingness of the child to participate were treated seriously before and during the testing. Three further children were tested but removed from the analysis due to: failing to complete all tasks (2) and technical problems (the speaker battery died in the middle of the session) (1).

Procedure

Each child was tested individually in a separate room which was provided by the nursery (unoccupied administration office or, an activity room). Due to the availability of the separate testing facilities in the nurseries, 29.1 % of the children were tested in two separate sessions, 70.9 % of them completed the study in one session. There was no difference between the performance of children who completed the tests in a single or two sessions. The tasks were presented in a fixed order in two parts. The first part comprised of the following: three *False Belief* tasks, *Day / Night Task*, *Hand Game*, *Whisper Game*, *Less is More*, and the T*est of Emotion Comprehension* (TEC). Behaviour was not recorded by a camera but coded simultaneously. The second part comprised the following: *Snack Delay*, *Secret Keeping*, *Gift Delay*, *Disappointing Gift*, and the performances were recorded by a camera and analysed later. Table 4 illustrates the list of tasks that were used in Study 3 and the abbreviations in use.

Conflict measures

The *Day/ Night Task* was administered in the same way as in Studies 1 and 2.

The *Hand Game* was adapted from Hughes et al. (1998) (based on Luria et al., 1964) to assess children's motion control, in the face of a conflicting rule. The experimenter instructed the child to make the same hand motion with her; a fist or a pointed index finger. After the child managed 6 consecutive correct imitations of the experimenter's hand motions, the instruction was changed to 'anti-imitation'. The child was asked to do the opposite motion to the one the experimenter makes (e.g., children should point a finger when he makes a fist). Sixteen of these anti-imitation test trials were conducted. Each correct anti-imitation response was scored as 1, and the total score was the number of correct trials out of 16.

The *Whisper Game* was adapted from Kochanska et al. (1996) and contained 14 cards depicting; 10 familiar and 4 unfamiliar cartoon characters. Children were told that they will name cartoon characters in a whisper. Since some children may not have known the meaning of the term 'whispering' [a few 3- year-olds struggled], they were first trained in what the skill involves, by being asked to say their own and the E's name in a loud and soft tone. Then they were asked to say the names of the cartoon characters in a low tone. Children were instructed about the game as follows: *"Now, you will be looking at some cartoon characters. You will tell me their names in a whisper…. (E whispers) 'a very low tone'. (In normal intonation): If you do not know their name, that's fine. There might be some of them that you do not recognize. Please don't worry, not many children of your age know all their names. Just say 'I don't know this one'. But remember, if you do know their name, you need to whisper the names to me*." E presented the cards in a pseudo-random order. When the children said the name of the cartoon character in a whisper or lower voice, their response was scored with 1 point; if they called the name in a loud or normal tone, their response was scored with a 0. Responses of ‘I do not know’ were not counted in the analysis. The maximum score in the game was 10, and the minimum score was 0. Scores including ‘don’t know’ were prorated to 10 – indeed most children identified most characters.

The *Less is More Task* was adapted from Carlson, Davis, and Leach (2005). First, the children were introduced to a soft toy called *‘Naughty Cow’* who is a character that wants to win all the treats in this game. Both the child and the puppet were given their ‘collecting cups’ to put their gains from this game. Then E placed two small boxes on the desk placing the treats inside, by introducing them to the child saying *“One of these boxes will have a small treat in it like 1 candy (or 1 goldfish cracker), and the other one will have more treats in it like 3 candies (or 3 goldfish crackers).”* Then the child was told that, in this game to win the bigger price, she or he has pick and point the box with a smaller amount of treat with the following instruction: *“You will pick one of them first for Naughty Cow, and then the content of the box you did not pick will be yours. Remember, the box you pick first will go into Naughty Cow’s cup, the one you did not point/ pick will go into your cup. Be careful, you do not want the Naughty Cow to win all the treats, do you? ”* When the child picks the cup with 1 treat in it, her/his performance was scored as 1 point. When the child picks the cup with 3 treats in it, her/his performance was scored as 0 in that trial. This task continued for 16 trials and the amount of treats in each cup (the one on the right/left) were presented in a pseudo-random order. The maximum score was 16 and the minimum score was 0 in this task.

Delay Measures

The *Snack Delay Task* was conducted based on Wiebe et al.’s (2011) adaptation from (Kochanska et al., 1996; Korkman, Kirk, & Kemp, 1998) for measuring children’s ability to wait in the face of an exciting treat. Children were first told that they would be having some small treats in a very funny and playful way while a camera was recording them. The verbal consent of the child was obtained before the task (to prevent them from eating something that they do not want to). In this task, a handful of Smarties (candies) or goldfish crackers (salty snacks) were placed in a transparent, plastic cup directly in front of the child. Children who were willing to eat treats and were comfortable being recorded on camera were tested. Children were given two pieces of A3 paper as a hand resting placemat for this game. The following instruction had been given, "*This cup of treats is yours but in this game, you have to wait for them quietly. This is the trick of this game. You will place your hands on the circles drawn on the placemat and you will not move your hands out of these circles. So, there is a funny rule here, you can't move your hands, touch or eat the treats and you should not talk either until I give you the signal to pick up your treats. Do you want to know what the signal is? [The experimenter claps her hands once] I'll clap my hands when the waiting time is over. After you hear my clap, you can pick up your sweet and eat it. Remember you have to wait until I clap my hands to give you your signal to take your treats. Do you want to start now?"* E helps the child to put her/his hands on the placemats and makes sure that she or he sits comfortably on the chair. Then E places the cup and starts the time for the waiting period which lasts for 240 seconds. In the first 120 seconds, the experimenter stays in the room with the child and applies two distractors (e.g. dropping her pen and coughing). In the next 90 second period, E tells the child that she needs to leave the room for a quick break, but she will be back very soon. The child was asked to wait in exactly the same way as E had instructed her or him before. E returned to the room again for the last 30 second period. Children's performance was scaled based on their reaction toward the stimuli during each waiting period [experimenter present in the room (120 sec), experimenter absent (90sec), experimenter present second time (30sec)] such as; eating the candy, touching the candy, moving their hand or body towards the candy. The child's latency to move their hands from the placemats, duration of the time that the child's hands were not on the placemat and the return of the moving hands from the placemat were also recorded for the each waiting period.

The selected dependent measure was the latency to move hands to the mat for first time in each waiting period. Children's specific behaviours were coded similar to the coding scheme used in Study 2. The coding system asked [1] did the child move hands from the placemat?; [2] did the child eat the treat during the waiting period?; The experimenter recorded [3] when was the first time that the child moved his or her hands?; [4] how long were the child's hands not on the placemat ? [5] how many times has this behaviour occurred (moving hands, and keeping them away from they were supposed to be); [6] did the child move body its towards the treats? Additionally, when the child first moved her hands from the placemat (the latency to break the rule of the game), and the duration of their distraction from the rule were also coded. There were three stages of the task. In two of them the experimenter was present in the room and in one of them she was absent. Whether the children's performance might be different in these situations was of interest, particularly the difference between the performance while E was present or absent in each age group.

The *Gift Delay Task* was adapted from Kochanska et al. (2000). Children were expected to wait for 60-seconds without looking in the direction of the experimenter who was intriguingly wrapping a present for the child. In case of peeking, children received a score of 0 point (fully turned around and looked), or a score of 1 point (look over the shoulder) for their performance. Children who did not peak received 2 points. Latency to the first pick and the total number of peeks were used with the performance score to create a standardized composite score for the task.

Emotion-Regulation Measures

The *Disappointing Gift Task* was administered in the same way as in Study 2. There was only one small change in this study. Children were not presented with the toy and 'the bad present' option prior to conducting the disappointment task. Carlson and Wang (2007) administered the Gift Delay task prior to this task. Their lead was followed in this study.

The children were presented with the wrapped 'gift' from the previous task and were told that "This is your surprise present! I hope you like it. Thank you for playing with me today." After this, E did not start any conversation with the child, unless the participant promptly asked any questions. Neutral answers were given to those questions, mainly by repeating questions or yes/no answers (e.g. Q: Is that what you are giving to me? A: Yes; or Q: What am I going to do with this? A: So, you want to know what you are going to do with this).

The *Secret Keeping Task* was developed by Carlson and Wang (2007) to assess the ability to suppress positive emotionality in the face of an exciting event. Participants were made to believe that there is a talking goldfish in the room. The experimenter presented a goldfish in a bowl placed in a square blue box with a hidden speaker inside the top. On each side of the box, there were two identical blue containers for fish food. One container had a picture of pizza, and the other had a picture of spinach on it. E introduced the goldfish as 'Ziya' to the child and told her or him that this goldfish belongs to the experimenter's brother and she needs to take care of him for the day (that was a cover-up for bringing a goldfish to the nursery- since more than a few children questioned the purpose of carrying the goldfish around). E had familiarized the child with her own name and also stressed here the goldfish's name. When it was clear that the child was comfortable E said that she needed to leave the room briefly to ask a question of the child's teacher and that she would be back very soon. Then she asked, in her absence, would the child mind looking after Ziya (All children were quite excited about being alone with Ziya. Some even engaged in interaction [like calling its name] before it started talking). When the child was alone in the room, E switched the bluetooth speaker on, and played the following recording for Ziya's first speech.

> "Ziya eh?! She gave me this silly name, Ziya meh! Hi kid! What's your name? [Silence for the child to answer, most of them said their name in this break] Your name is nice. Do you like my name, Ziya? [Another silence] Hmmm! Alright then. Oh, by the way, I can talk, yes. Please, do not tell this to [Cansu]! She would go and

> tell everyone about it, and then I would have to talk to too many people. This would tire me. Ooph! Let's keep this as a secret between us, alright? [Short silent break], Wait, I think she is coming."

After the first speech was completed, E returned to the room briefly saying that she forgot her pen and paper, and she is there to collect them. Then she asked the child 'Was everything alright when I was gone?'. After this question, if the child shared Ziya's secret, and said something about the goldfish talking, the game ended. E said that it was a joke intended to surprise the child and showed the speaker behind the box containing the fishbowl. Together they played the recording of the 'fish-talk' once more. She also asked the child whether she or he enjoyed her joke, or not. The child who did not tell the secret in the first phase received 1 point for passing the first prompt. If the child did not say anything about Ziya's secret, E left the room again and the second part of Ziya's speech started.

> "Phew! That was close. Thank you for not telling my secret to E. Oh!, all this craziness made me hungry. I wish I had a slice of pizza. Pof! I wish somebody fed me some pizza. Oh, I'm starving! E always gives me spinach, yuk! I hate spinach. Oh, she is coming again. Please, do keep my secret, do not tell anyone."

After the completion of Ziya's speech, E returned to the room and asked the child the same question: 'Was everything alright when I was gone?'. If the child did not tell Ziya's secret, she continued with the following questions as prompts for the child to spill the beans. Those prompts were as follows "Do you think the fish likes its name? Do you think the fish is hungry? What should we feed Ziya with? Which one does Ziya like the most do you think - spinach or pizza? / How do you know that Ziya likes pizza? / Did Ziya talk to you (as a final question)?". If the child did not say anything about the fish's secret all through these 5 prompts, then the child received the maximum score of 6. At any point, if the child told the secret, then the game was over and the child was debriefed. The minimum score in this task was 0, when the child told the secret, at the first time E returned the room. The children's performance was scored ranging from 0 (told the secret immediately) to 6 (not revealed the secret).

Emotion-Understanding (EU) Measure

EU was tested with the *Test of Emotion Comprehension* (TEC), which was adapted from Pons et al. (2003). Their assessment was based on 9 components of emotion-understanding. The first component was '*recognition*' of the following emotions: 'sad'', ''happy'', ''angry'', ''just alright,'' and ''scared'' in 5 pictures. These consisted of 4 faces depicting 4 of those emotions and children were asked to point to the emotion that the experimenter uttered. If the child succeeded in recognizing four items out of five, she or he received 1 point as a score for this component. The second component was '*external cause*' and it also included 5 items. Children were told a simple story in which, for example, the protagonist's pet turtle died and they were asked about how she or he felt. This would lead to a certain emotion such as 'sadness'. After the story was told with the help of small drawings, children were asked 'how would [name of the protagonist] feel?', and the outcome emotions ''sad'' (the protagonist's turtle just died), ''happy'' (the protagonist is getting a birthday present), ''angry'' (the protagonist is being annoyed by his little brother), ''just alright'' (the protagonist is standing at the bus stop), and ''scared'' (the protagonist is chased by a monster). In this component, similar to the first one, children were given 1 point when they answered at least 4 items out of 5 correctly. The third component was '*desire*', in which two characters (Tom and Jack) were in conflict over their desire for a food item in a closed box. Then the content of the box was revealed. Children were asked 'how does the character (e.g., Tom) who hates this food feel?' (sad) and 'how does the other character (Jack) who loves this food feel?' (happy). Children received 1 point when they answered both of the questions correctly. The fourth component was *'belief'* where a story about a pet bunny of the protagonist was presented. The bunny was enjoying some carrots without knowing the fox, who wants to eat the bunny, was peeking through the bushes. The child pulled open the bushes to allow the participant to see the fox for him herself/herself. After the story, the child was asked the two following questions. The first one was whether the bunny knows that the fox was behind the bushes and the second one concerned how the bunny feels. If the child picked the correct outcome “happy”, since the bunny was oblivious of the fox and enjoying the carrots, she or he received the score of 1 point for this component. The fifth component was ‘*reminder*’ where the story of the protagonist’s (Tom’s) pet bunny’s tragic end at the hands of the fox has been told and then the follow up stories looking at photograph albums have been told as well. Children were asked about Tom’s feeling towards his pet’s demise. The correct answer was “sad” and was scored with 1 point. The sixth component was for ‘*regulation*’ in which children were asked about the best solution for the protagonist to stop feeling upset after his pet’s demise. The options for the protagonist were to ‘close his eyes’, ‘go out and do something else’, ‘think about something else’, or that ‘there is nothing Tom can do’. Children were expected to pick the choice of ‘‘Tom can think about something else to stop himself being sad’’ to regulate their emotions. The seventh component was ‘*hiding*’ the emotions. Children were introduced to another character who was a friend (Daniel) of the protagonist (Tom) but who also teases Tom for having more marbles than him. Tom smiles back at Daniel. It was asked, ‘What would Tom be feeling after Daniel teased him although he is smiling? A correct response from the child was “angry”. The eighth component was for ‘*mixed*’ emotions in which the protagonist was in a situation where he has received a bicycle as a birthday present but was also concerned about falling off since he did not know how to ride a bike. Children were asked what would be the protagonist's feelings in a situation like that, and the expected outcome was ‘‘happy and scared’’ [Tom has just received his first bicycle (happy but fears that he might hurt himself (afraid)]. The final component was ‘*morality*’ where the protagonist took a cookie without asking in somebody else’s house and he did not confess to his mother. When the child was asked: "how does Tom feel about not confessing to his mother about the cookie that he took without any permission in somebody else’s house?" The expected outcome as an answer was ‘‘sad’’ (Tom is upset at not having confessed to his mother). A total score was calculated through accumulation of each component. Each component was scored 1 point for correct answers or was scored 0 points in case of failing to recognize the emotion correctly. The maximum score was 9 points, and the minimum score was 0.

Social Understanding (False Belief) Measures

The *Unexpected Content and* The *Unexpected Transfer Tasks* were administered in the same way as in Studies 1 and 2.

The *Appearance-Reality Task* was presented as a money-box that looks like a small birthday cake. The child was shown the plastic cake and asked “What do you think this is?” Then the child was invited to touch the cake and look closely to see the money hole and shake it to hear the sound of the pennies in it. When the child realized that this object (looking like a cake) is actually a money-box, the experimenter asked false belief questions as follows: “What did you think this object was when you first looked at it?’’; “What is this object really?”.

Results

Study 2 demonstrated the discrepancy between two dimensions of inhibitory control. Children’s ability to cope with rule-based conflicts was strongly predicted by their ability to understand another’s beliefs. Children’s ability to cope with delay in the face of temptation was related to how they masked their real emotions in a negative situation. The strength of the relationship between the Delay and ER was insufficient due to the limitations of measures. Thus, Study 3 aimed to replicate the findings of the previous study by employing different and complementary tasks. For example, Snack Delay task was too structured and short in the previous study. A prolonged waiting game was administered with an additional absent condition where E left the child alone in the room for 90 seconds. ER was observed through negative emotion suppression in the previous study; the Secret Keeping task was used here to add performance in terms of positive emotion suppression. Most importantly, despite the strong relationship of social understanding with Conflict performance; children's understanding of others' minds brought out the question of children's understanding of others' emotions. Although the previous study did not find any relationship between false belief and ER (negative) performance, enhanced emotionality measures in this study attempted to seek a link between SU and ER. Mainly, EU was added to build a bridge between social understanding and the situational control of emotions.

The findings presented below explain whether each construct was related to children's age. Gender was not examined since Study 3 failed to show any gender differences on any of the constructs. Developmental change on conflict, delay, emotion-regulation, and social and emotion-understanding were examined through the analysis of variance with one-way ANOVA. Following the descriptions of the measures, to show how each task relates to the construct, the correlations among them are reported. Data reduction to create composite scores is described in detail. Lastly, the hierarchical multiple regression analyses concluded the predictions.

Children's mean performances and standard deviations in each task of Study 3 are presented by Age group in Table 4.1. Below, the preparation of each measure for the further analysis has been explained.

Table 4.1

Descriptive Statistics for all variables by Age

Measures	Min	Max	Overall		3-year-olds		4-year-olds		5-year-olds	
			Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Day/Night Task	0	16	13.08	2.7	11.71	2.8	12.97	2.7	14.96	1.0
Hand Game	2	16	13.38	2.6	11.44	3.2	14.25	1.7	14.66	1.4
Whisper Game	0	10	5.57	2.8	3.75	2.6	6.34	2.9	6.81	1.9
Less is More	0	16	12.45	3.7	10.65	4.4	13.13	3.1	13.78	2.7
Snack Delay	0	12	10.06	2.0	9.30	2.1	10.04	2.1	10.93	1.4
Latency(sec)	21	240	175.72	63.2	158.12	66.7	164.27	66.5	212.51	34.48
Gift Delay	0	2	1.60	0.6	1.44	0.7	1.58	0.5	1.84	0.4
Latency(sec)	0	60	51.1	14.9	48.9	15.8	50.4	15.4	54.8	12.7
Disappointing Gift	-9	3	-2.00	2.40	-1.92	2.5	-1.86	2.3	-2.27	2.5
Secret Keeping	0	6	2.24	2.6	2.46	2.5	1.51	2.3	2.93	2.8
False Belief (SU)	0	3	1.89	1.1	1.43	1.2	2.40	0.4	2.75	0.4
Emotion-Understanding (EU)	0	9	3.96	1.8	2.95	1.5	3.76	1.6	5.48	1.6

Comparisons by Age

Conflict Measures

The Day/Night Task. The scoring was identical with the procedure reported in the Studies 1, and 2. As Table 4.1 illustrates, the mean performance of 3-year olds was lower than the 4-year-olds. The highest mean score belongs to the group of 5-year-olds. The analysis of variance showed a significant effect of Age on children's performance in this task,

F (2,117) =16.53, p<.001, η_p^2= .23 (see Table 4.2). A Tukey test (with the Tukey-Kramer correction here and below) revealed that the performance of 4-year-olds was significantly different to that of the 3- year-olds (p=.05, 1.25, 95% CI [.00, 2.52]) and 5-years-olds (p<.001, -1.99, 95% CI [-3.33, -.66]). The performance of 5 year-olds was also significantly different from the 3-year-olds (p<.001, 3.25, 95% CI [.00, 2.52]). This finding indicates a performance difference from age 3 to 4.

Table 4.2

Univariate Analysis of Variance of Day/Night by Age

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	194.29	2	16.53	.23	<.001

Note: R Squared = .23 (Adjusted R Squared = .21)

The Hand Game. Children were required to do the opposite gesture to E's cue gesture (an index finger versus a fist). In each of the 16 trials, children's correct responses were scores as 1, and incorrect responses were scored as 0. A sum of the correct responses was claimed as a total score in this task. The maximum score was 16, and minimum score was 2. Three-year-olds' mean score was below the overall mean performance and lower than both of the older age groups. Four- and 5-year-old children's performance was not different from each other. As Table 4.3 shows in the analysis of variance, Age has a significant effect on children's performance in Hand Game, F (2,117) =23.19, p<.001, η_p^2= .29. Tukey tests revealed that the performance of 3-year-olds was significantly different to that of both 4-and 5- year olds (p<.001, 2.81, 95% CI [1.63, 3.99]); p<.001, 3.22, 95% CI [1.96, 4.49]). The performance of 4-and 5- year olds was not statistically different from one another *(p*=.71, .413, 95% CI [-.84, -1.67]).

Table 4.3

Univariate Analysis of Variance of Hand Game by Age

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	241.12	2	23.19	.29	<.001

Note: R Squared = .29 (Adjusted R Squared = .28)

The Whisper Game. Children were shown 14 cards. Two of them were unfamiliar cartoon characters, 2 of them were difficult to identify cartoon characters and the rest were easily recognizable by the children. Children were asked to say the names of the characters in a very low-volume voice (whisper). The correct response of whispering the names of the cartoon characters in each trial was scored as 1. When children recognized the character and called its name in a high volume or the normal voice, their response was scored as 0. The maximum score was 10, and minimum score was 0. Table 3.1 illustrates mean scores, in the Whisper game. The mean performance of 3-year-olds was very much below that of their elder peers. The performance of 4-and 5 year-olds was not much different from each other. The analysis of variance in full detail presented in Table 4.4 shows that Age has a significant effect on Whisper Game performance, F (2,117) =16.16, p<.001, η_p^2= .22. The performance difference between age groups was revealed by Tukey tests as 3-year-olds performed significantly different to both 4-and 5-year olds (p<.001, -2.59, 95% CI [-3.92, -1.27]; p<.001, -3.05, 95% CI [-4.48, -1.63]). Similar to mean scores point, the performance of 4-year-olds was not statistically different from the 5-year-olds, p=.72, -.46, 95% CI [-1.87, .94].

Table 4.4

Univariate Analysis of Variance of Whisper Game by Age

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	211.90	2	16.16	.22	<.001

Note: R Squared = .22 (Adjusted R Squared = .21)

The Less is More Task. In this task, children's choice of the smaller reward to gain a bigger one was scored as 1 and, their choice of a bigger reward in the first place was scored as 0. In 16 trials, children accumulated a maximum score of 16, or a minimum score of 0. Again, based on children's mean scores in Table 4.1, 3-year-old children performed poorly compared to 4-and 5-year olds whose performance was not much different from each other. The analysis of variance in full detail presented in Table 4.5 showed that Age has a significant effect on children's performance in the Less is More task, F (2,117) =8.59, p<.001, η_p^2= .13. Similar to what the mean scores show, Tukey tests showed that 3-year-olds performed significantly less well than the 4-and 5-year-olds, (p<.005, -2.48, 95% CI [-4.30,-.67]; p<.001, -3.12, 95% CI [-5.07, -1.18]. However, the performance was not statistically different between 4-and 5-year olds, p=.71, -.64, 95% CI [-2.57, -1.28].

Table 4.5

Univariate Analysis of Variance of Less is More by Age

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	211.28	2	8.60	.13	<.001

Note: R Squared = .13 (Adjusted R Squared = .12)

Relations among Conflict Measures

In regard to the variance analysis reported above, performance in all four of the Conflict measures was improved as children reach the age of 5-year-olds. In further analysis, to examine the conflict measures as a whole, data reduction was attempted. Table 4.6 illustrates all the positive inter-correlations among four of the Conflict tasks. The strongest correlation existed between Day/Night and Hand Game tasks. The rest of the correlations had medium strength. Based on the inter-correlations, the Conflict tasks were aggregated into a Conflict Composite score by using standardized (z-scores) scores. Each task was strongly correlated with the Composite score. The Conflict measures were correlated with false belief performance at the task level. The analysis of variance of Conflict Composite Score by Age reported that a significant effect on this composite score as well, F (2,117) =38.50, p<.001, η_p^2= .40. The relation between the Conflict Composite score to other measures will be presented after reporting other measures by comparison to age.

Table 4.6
Correlations among Conflict Measures

	Day/ Night	Hand Game	Whisper G.	Less is More
Day/Night	-			
Hand Game	$.61^{**}$	-		
Whisper G.	$.25^{**}$	$.26^{**}$	-	
Less is More	$.29^{**}$	$.26^{**}$	$.35^{**}$	-

*Note: ** p< .01.*

Delay Measures

The Snack Delay Task. For the 240 seconds of the waiting period, children waited in two conditions: an adult present in the room and absent. In the first 120 seconds E was present in the room. Next for 90 seconds E was absent; in the last 30 seconds E returned to the room. Children's latency to move their hands for the first time was recorded, along with the following behaviours. 'Move Hands', 'Move Body', 'Eat treats', 'Touch treats'. If a child did not engage in any of the 4 responses, she or he received 1 point for each of them. Apart from 'Move Hands', the other outcomes were not too common in many children. Out of 117 children, only 6 of them ate the treats before the cue was given. Two (one 3-year-old; one 4-year-old) who ate the treats before the time were in the first 'E is present' stage, 2 (one 3-year-old; one 5-year-old) of them were in 'E is absent' stage, and 2 (both 4-year-olds) of them were in the second 'E is present' stage. When a child moves its hands, the rule of the game was broken but the child was still required to wait before eating the treats. Since not many of the children ate the treats, as a threshold for their patience, whether they moved their hands or not, touched the treats, moved their body towards the treat or ate any of the treats were all considered. For each time interval period (present-absent-present conditions), children received scores out of 4. The maximum score was 4; a minimum score was 0 for each interval. Then the scores in each interval were added up to a total Snack Delay score in which the maximum score was 12, and the minimum score was 0. The latency to move hand for the first time was recorded. For total latency, the seconds for a child to move his or her hand was aggregated. Minimum latency for a child to move hands was 21, and the maximum latency was 240 which meant that the child never moved hands during the task. Two-way mixed, intra-class correlation coefficient (ICC) was used a measure of reliability with 2 raters across 23 subjects (20% of the sample) in the Snack Delay *Latency* revealed that 87.2% of the variance in the mean of these raters is real. For Snack Delay *Score*, ICC (2, 1) = .78.

Table 4.7

Univariate Analysis of Variance of Snack Delay (Total Score) by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	46.79	2	6.23	.10	.00
Gender	6.49	1	1.73	.02	.19
Age * Gender	2.92	2	.39	.01	.68

Note: R Squared = .12 (Adjusted R Squared = .08)

In Table 4.1, the means of the total score and total latency are displayed. The mean performance of 3-year-olds was slightly lower than the older children of both other age groups. The mean performance of both 4-and 5-year olds was very close to each other. In the total latency, 3-and 4-year olds were below the overall mean. The mean of total latency was around 212.51 seconds for 5-year-olds. It was quite high considering the length of the task was 240 seconds. The analysis of variance was conducted with both Score and Latency by Age and Gender. The child's gender was added to the variance analysis in order not to overlook the gender effect on delay performance as suggested in the work of McCabe and Brooks-Gunn (2007). See Tables 4.7 and 4.8 for details of the variance analysis. Age had a significant effect on Score in Snack Delay. Tukey tests showed that the performance of 5-year-olds was significantly different to that of 3-year-olds but not 4-year olds (p<.005, 1.54, 95% CI [.47, 2.63]; p=.12, .89, 95% CI [-.17, 1.96]). The performance of 4 year-olds was not significantly different from the 3-year-olds, p=.27, -.66, 95% CI [-.35, 1.66].

As displayed in Table 4.8, Age is a significant effect also in the Latency in Snack Delay task. The performance of 5-year-olds was significantly different from both 3-and 4-year-olds (p<.001, 54.39, 95% CI [21.74, 87.05]; p<.005, 48.23, 95% CI [15.92, 80.55]). The difference between performances was not statistically significant for 3-and 4-year old children. Gender or any interaction did not significantly affect the children's scores or the latency to move their hands.

Table 4.8

Univariate Analysis of Variance of Snack Delay (Total Latency) by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	64089.99	2	9.27	.14	.00
Gender	12190.53	1	3.53	.03	.06
Age * Gender	4078.23	2	.59	.01	.56

Note: R Squared = .18 (Adjusted R Squared = .14)

The ‘move hands’ occurred more often than the other types of response. The number of children who ‘moved hands’ is displayed in Table 4.9 by age group and in present-absent conditions. It shows, in all age groups, that more children tend to move their hands in the absent condition compared to when E was present. In the 3-year-old group, 78% of the children moved their hands in the absent condition. Similarly for 4-year-olds, children who moved their hands (65.1 %) outnumber the ones who did not. For the 5-year-olds, only 36.4% of the children moved their hands in the absent condition. In the youngest group, it was quite clear that children tend to be tempted away from waiting when the adult left the room. The way 4-year-olds behave while the absent conditions was similar to younger children. However, the 5-year-olds did not seem to be much affected by E’s departure. The analysis of variance on children’s latency to move their hands in the absent condition showed that Age significantly influenced the latency to move, F (2, 117) =6.29, p<.05, η_p^2= .102. Tukey tests revealed that 5-year olds’ performance was significantly different than 3-and 4-year-olds (p<.05, 26.66, 95% CI [7.95, 45.38]; p<.05, 20.94, 95% CI [2.42, 39.46]). On the other hand, 4-year-olds did not perform differently from their younger peers.

Table 4.9

Number of children who moved hands from the placemat in each delay period

Age		T1(Present)	T2 (Absent)	T3 (Present)
	moved	18 (43.9%)	32 (78%)	15 (36.6%)
3	did not move	23 (56.1%)	9 (22%)	26 (63.4%)
	moved	17 (39.5%)	28 (65.1%)	7 (16.3%)
4	did not move	26 (60.5%)	15 (34.9%)	36 (83.7%)
	moved	5(15.2%)	12 (36.4 %)	2 (6.1%)
5	did not move	28(84.8%)	21 (63.6%)	31(93.9%)
	moved	40	72	25
Total	did not move	77	45	93

The Gift Delay Task. This task took place prior to the Disappointing Gift. Children were told that they were going to receive a surprise present from E, but whilst she wrapped their present, they were asked to turn their back and wait for 60 seconds without turning around or peeking. Children who did not peek for the whole waiting period received the maximum score of 2. Children who peeked at any time in the waiting period received the score of 1. Children who fully turned around and looked at the experimenter at any time of waiting period received the minimum score of 0. The latency of the child's first peek and the repetition of the peeking were recorded. For the Gift Delay *Score*, the interrater reliability for two raters with 20 % of the sample (23 children) was found to be Kappa =.50 (p <.05), 95% CI (.007, .010) which indicated a moderate agreement.

Table 4.10 below displays number of children who responded according to the scoring mentioned above. It shows that in all age groups, children tended to be more patient and did not look at E wrapping the present[5]. For children who peeked during the delay period, the repetition of peeking decreased as the child got older. Table 4.1 above shows the children's mean score and the mean latency to peek for the first time. As shown, children's mean score increases as age increases. The latency to first peek (in seconds) was gradually higher for older children compared to the younger ones. Then three-year-old group had the shortest latency. The analysis of variance was conducted to Score, Latency and Repetition by Age and Gender. For both Latency and Repetition, neither Age nor Gender has an effect on the performance. Table 4.11 shows the analysis of variance which reports the significant impact of Age on children's Gift Delay (Score) performance. Gender or any interaction does not have any significant effect on the performance. Tukey tests showed that the performance of 5-year-olds was significantly different to that of the 3-year-olds, $p \leq .01$, .41, 95% CI [1.0, .73], while the difference was not statistically significant from 4-year-olds, $p = .11$, .27, 95% CI [-.043. .58]. The performance was not significantly different between 3-and 4-year-olds, $p = .48$, 3.14, 95% CI [-.15, .44]

[5] In Table 4.10, it is shown that the children scored highly in Gift Delay tasks which indicates a negatively skewed distribution. Thus, the scores were square rooted. The analysis variance was conducted with this new Square Rooted Gift Delay Score by Age and Gender.

Table 4.10

Children's responses and the descriptive statistics of repetition in the Gift Delay Task by Age

	Gift Delay				
	Responses			Repetition	
	fully turned/ looked (0)	look over the shoulder (1)	did not peek (2)	*Mean*	*SD*
3-year-olds	5	13	23	1.00	1.67
4-year-olds	1	16	26	.72	1.16
5-year-olds	0	5	28	.51	1.62
Total	6	34	77	.76	1.48

Table 4.11

Univariate Analysis of Variance of Gift Delay (Square Root Score) by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	1.23	2	5.71	.09	.00
Gender	.12	1	1.08	.01	.30
Age * Gender	.31	2	1.46	.03	.24

Note: *R Squared = .11 (Adjusted R Squared = .07)*

Relations among Delay measures

Each Delay task involved Score, Latency and Repetition measures. Table 4.13 displays the correlations among each of these measures. The score children received in Snack Delay was strongly correlated with the latency to move hands in the first place in this task. The same pattern existed for Gift Delay task. The children's score based on whether they peeked or not was strongly correlated with the latency to peek. The repetition measure in each task was negatively correlated with Score and Latency. Children who tended to have lower scores and shorter latency to move their hands or peek at the present wrapping were also more likely to repeat this distractive behaviour. The score and the latency in both Delay tasks were correlated among themselves. The correlations for Score and Latency were stronger compared to Repetition. Thus, the composites from each task for Score and Latency were created.

When the analysis of variance was repeated for the composites, the Delay Composite Score was not predicted by age or gender. However, Delay Composite Latency was significantly predicted by both Age and Gender but the interaction of these two was not significant. Table 4.14 below displays the further details of this analysis. Tukey tests revealed that the performance of 5 year-olds was significantly different to that of the 3- and 4-year-olds ($p<.001$, .62, 95% CI [.25, .99]; $p\leq.01$, .47, 95% CI [.11, .84]). However, the performance of 4 year-olds was not statistically different from the 3-year-old group, $p=.60$, .14, 95% CI [-.20, .49].

Table 4.12

Correlations among Delay Measures

	Snack D Score	Snack D Latency	Snack D Repetition	Gift D Score	Gift D Latency
Snack Delay Score	-				
Snack Delay Latency	.80**	-			
Snack Delay Rep	-.65**	-.71**	-		
Gift Delay Score	.50**	.45**	-.43**	-	
Gift Delay Latency	.42**	.41**	-.44**	.78**	-
Gift Delay Rep	-.37**	-.34**	.38**	-.70**	-.84**

*Note: ** $p< .01$*

Table 4.13

Univariate Analysis of Variance of Delay Latency Composite by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	7.97	2	8.99	.14	.00
Gender	2.68	1	6.05	.05	.02
Age * Gender	1.08	2	1.22	.02	.30

Note: R Squared = .19 (Adjusted R Squared = .15)

Emotion-Regulation Measures

The Disappointing Gift Task. The procedure and the scoring were the same as in Study 2. In this study, 60.7% of the children did not show any positive reaction to the disappointing gift. Only 39.3% of them showed at least 1 or more (up to 5) positive reactions. The percentage of children who did not show any negative reactions was 10.3%, but 89.7% of them showed at least 1 or more (up to 5) negative reactions. The percentage of the children who did not show any transitional reaction was very low (1.7%). When children were asked if they liked the present or not; 15.4% of them said that they did not like it. 26.5 % answered the question positively (like it) but only showed a bodily gesture (closing eyes as in a ‘yes’ or shaking their heads). 58.1 % verbally answered the question saying that they liked the mock present. Children’s verbal answers were given a score of 2; gesture answers were given the score of 1, and children’s negative answers were given the score of 0. When children were given their actual present, after the task was over, they were asked which present they would prefer; almost all of them picked the second present –a real toy. Only 2 children said they did not mind. Children’s responses to the question: ‘Did you like your present?’ were similar in all age groups, clustering on ‘yes’. The analysis of variance did not show any age effect on children’s answers. The same variance analysis was also conducted with the children's reactions in each category. Mean scores for positive, negative, and transitional response categories is displayed in Table 4.14. The mean responses in Positive and Transitional categories were similar to each other for all age groups. The analysis of variance showed that Age does not have a significant effect on each emotional category.

Table 4.14

Responses in Disappointing Gift Task (Mean and Standard deviations)

Age	Positive		Negative		Transitional	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
3-year-olds	.78	1.33	2.00	1.22	3.14	1.35
4-year-olds	.74	1.02	2.25	1.19	3.37	1.23
5-year-olds	.81	1.26	1.96	1.33	3.42	1.29

Table 4.15

Univariate Analysis of Variance of Disappointing Gift (Score) by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	2.78	2	.24	.00	.79
Gender	8.56	1	1.46	.01	.23
Age * Gender	5.10	2	.43	.01	.65

Note: R Squared = .03 (Adjusted R Squared = -.02)

Instead of using negative reactions only in the further analysis, a score was created using the same strategy in Study 2. The total positive and transitional reactions were subtracted from the total negative reactions. Table 4.15 displays the mean scores for this new measure. Children's scores ranged from -9 to 3. Similar to Study 2, positive scores meant lower performance indicating a higher number of negative reactions and a lower number of positive and/or transitional reactions. The analysis of variance by Age and Gender on the

Disappointing Gift performance, neither age nor gender had any impact on children's emotion-regulation performance. The full details of the variance analysis are reported in Table 4.15. Although, Saarni (1984) reported that older children tend to show more positive reactions, whereas younger children express more negative reactions, in this sample, the preschool children were not as young as the children in this study.

The Secret Keeping Task. The task was administered in the nurseries, instead of under laboratory conditions as in Carlson and Wang's (2007) version. Each prompt to make the child tell the 'talking fish's secret' received 1 point. A child, who did not reveal the secret all through 6 prompts, received the maximum score of 6. The child received the minimum score of 0 when she or he revealed the secret in the middle of the task (at the 1st prompt). This task was used for the first time in this study, so interrater reliability with 20 % of the sample (23 children) showed a high agreement between two raters as the Kappa = .80 (p <.001), 95% CI (0.86, 0.97) (Landis &Koch, 1977).

4-year-olds' tendency (60.5%) to reveal the secret in the first prompt was higher than the older and younger children. Only 39% of the 3-year-olds and 39.4% of the 5-year-olds revealed the secret in the first prompt. A similarity between 3-and 5-year olds raised a curious point. Most of the 4-year-olds told the secret at the first prompt. This may implicate that they were very eager to share new information with E or they did not believe that the fish was talking. If 4-year olds are unable to keep a secret, the 3-year-olds should be more likely to inhibit their eagerness to tell the secret, however only 39% were in this position. The same percentage of children in the 5-year-old group also managed to keep the secret. In Table 4.1 above, children's mean score out of 6 was shown for each age group. The mean score of 4-year olds was lower than that of both younger and older children. On the 6-point scale, children's responses were mostly clustered on 'told the secret' and 'did not tell the secret'. The scoring varied depending on which prompt the children told the secret. Thus, the scores were reduced to a 3-points scale. Table 4.16 below, displays the number of children according to a 3-point scale. In this way, children who told the secret throughout the prompts were clustered together. The analysis of variance showed that children's ability to keep a secret was affected by Age significantly and Table 4.17 displays the full details of this analysis. However, Tukey tests revealed that the performance of 5-year-olds was significantly different from the 4-year olds (p<.05, .47, 95% CI [.04, .91]), but no such difference was found with the 3-year-olds (p=.50, .62, 95% CI [-.23, .64]). The performance also was not statistically different between 3- and 4-year-olds (p=.27, .27, 95% CI [-.14, .67]). This indicates that 4-year-olds were more likely to give the secret away compared to 5-year-olds.

Table 4.16

Number of children who kept the secret or not in the Secret Keeping by Age

	Secret Keeping		
Age	Told Secret without prompt (0)	Told Secret during prompts (1)	Did not tell Secret (2)
3-year-olds	18	16	7
4-year-olds	28	10	5
5-year-olds	15	5	13
Total	61	31	25

Table 4.17

Univariate Analysis of Variance of Secret Keeping by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	4.42	2	3.49	.06	.03
Gender	.36	1	.57	.01	.45
Age * Gender	.04	2	.03	.00	.97

Note: R Squared = .06 (Adjusted R Squared = .02)

Emotion-Understanding (EU) Measure

Test of Emotion Comprehension (TEC). There were nine components in the emotion-comprehension test. Based on the scoring of Pons et al. (2003), the correct answer to each component was scored as 1 point. All components were aggregated to create a total score. Out of nine components the maximum score was 9 and the minimum score was 0. As Table 4.1 displays, the mean scores for TEC for each age group, 5-year-olds have the highest mean score of 5.48 when compared to younger children. 4-year-olds also have a higher mean score than the 3-year-olds. The analysis of variance showed in Table 4.18 revealed that Age has a significant effect on children's understanding of emotions. Tukey tests showed that 5 year-olds performed significantly differently to the 3-and 4-year-olds, *(p*<.001, 2.53, 95% CI [1.64. 3.43]; *p*<.001, .1.72, 95% CI [.84, .2.60]). However, 4 year-olds' performance was not significantly different to that of the 3-year-olds *(p*=.06, .82, 95% CI [-.02, 1.65]).

Table 4.18

Univariate Analysis of Variance of TEC by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	123.65	2	23.29	.30	.00
Gender	2.06	1	.80	.01	.38
Age*Gender	3.16	2	.61	.01	.55

Note: R Squared = .29 (Adjusted R Squared = .28)

Table 4.19

Correlations among Emotion-Regulation/Understanding Measures

	Disappointing Gift	Negative R.	Secret Keeping
Disappointing Gift	-		
Negative Reactions	.73**	-	
Secret Keeping Task	- .17	-.31**	-
TEC	-.09	.04	.21*

*Note: **p<.01; *p<.05.*

Relations among Emotion -Regulation and Understanding Measures

Similar to the other constructs, based on the inter-correlations among emotionality measures, creating a composite score was attempted. Nevertheless, the Disappointing Gift and Secret Keeping performance failed to show any association. Table 4.19 displays the details of this correlation analysis. The negative reactions in the Disappointing Gift task were inversely associated with the performance in keeping a secret which indicates a better performance. Children who showed fewer negative reactions to a disappointing situation also tended to keep the fish's secret longer. This correlation was in line with the hypothesis that suggested that positive and negative emotion suppression should be interlinked. However, this interconnection was not apparent when the positive and transitional reactions were taken into consideration. Secret Keeping was correlated only with emotion understanding. Hence, no composite score was created from ER task and the potential of each task to explain other aspects of self-regulation was preserved.

False Belief (Social Understanding) Measures

The *unexpected content* and *unexpected transfer* tasks were identical with those in Study 2. The additional false belief task was *Appearance-Reality*.

The Unexpected Content Task. Children were asked only a self-false belief question. A chi-square test with age groups showed that there is a statistically significant association between age and self-false belief performance, χ^2 (2) = 9.07, p < .05,Cramer's V=.28. As Table 4.20.1 illustrates, both 4- and 5-year-old preschoolers were significantly above chance on self-false belief measure with a mental verb: P <.001.

Table 4.20

Number of children who responded to Unexpected Content

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	24	59	0.35
		Wrong	17	41	
	4	Right	35	81	0.00
		Wrong	8	19	
	5	Right	33	1.00	0.00
		Wrong	0		

The Unexpected Transfer Task. The administration and the scoring were identical to Study 2. A chi-square test with age groups showed that there is a statistically significant association between age groups and others' false belief performance, $\chi^2(2) = 19.02$, $p < .001$, V=.40. As Table 4.21 illustrates that both 4- and 5-year-old preschoolers were significantly above chance on others' false belief measure with a 'mental verb': P <.001.

Table 4.21

Number of children who responded to Unexpected Transfer

	Age		Obs N	Obs Prop (%)	P
Other	3	Right	21	51	1.00
		Wrong	20	49	
	4	Right	32	74	0.02
		Wrong	11	26	
	5	Right	27	82	0.00
		Wrong	6	18	

The Appearance-Reality Task. The correct answer of 'cake' by referring to a previous state of mind to the self-belief question in this was scored as 1 point. The answer of 'money-box' was incorrect and scored as 0 because it was referring to the current state of mind about the object. A chi-square test for association was conducted between age groups and self-appearance-reality false belief performance. There was a statistically significant association between age and others' false belief performance, $\chi^2(2) = 25.70$, $p < .001$, V=.47. Table 4.22 illustrates that both 4-and 5-year-old pre-schoolers were significantly above chance on self-false belief measure with a 'mental verb': P <.001.

Table 4.22

Number of children who responded to Appearance –Reality Task

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	23	56	0.53
		Wrong	18	44	
	4	Right	35	81	0.00
		Wrong	8	19	
	5	Right	31	94	0.00
		Wrong	2	06	

Total False Belief Score. Children's performance in each of these tasks was summed. A total false belief performance score was created, with a maximum score of 3 and a minimum of 0. This aggregated measure is displayed in Table 4.1. Children's performance in this total score was normally disturbed. The analysis of variance on the total score showed that Age had a statically significant effect on the false belief performance, F (2,114) = 16.16, p <.001, η_p^2=.22. Tukey tests showed that the 3-year-olds' performance was significantly different from 4-and 5-year-olds, p<.001, -.84, 95% CI [-1.33, -.34], p<.001, -1.22, 95% CI [-1.75, -.69]. The performance of 4-and-5-year-olds was not statistically different from each other (p=.19, -.39, 95% CI [-.91, .14]). In further analysis, the total score of false belief is used and labelled as SU.

Correlation Analysis

The inter-correlations among the measures of same construct were used for data reduction to create composite scores, as already reported above. Before predictive analysis, the relationships among the cognitive and emotional constructs of self-regulation were explored. Table 4.23 presents the correlations between each self-regulation construct.

As the hypothesis and the previous findings suggest, the Conflict Composite was strong positively correlated with False Belief Performance (r (116) = .61, p<.001). The next strong correlation for Conflict Composite was with emotion- understanding measure (TEC), (r (116) = .54, p<.001). TEC demonstrated an unforeseen link with Conflict which ought to be explained in detail. The emotion-understanding task was included in the study to support the emotion-regulation tasks. Due to the emotional demands of the task, it was expected to be closely related to both ER tasks. Instead of being related, EU performance in TEC was correlated with Conflict. EU was also related with SU which indicates an underlying ‘understanding’ skill both cognitive and emotional domains. Children’s grasp of emotions may be closer to how they solve conflicts and understand others’ minds than their control their own emotions. This was a cue to me to explore the importance of ‘understanding’ further.

In comparison to Studies 1 and 2, Conflict and Delay shared a relationship in this study. Conflict and the Delay (Latency) were positively correlated. This relationship is not surprising because both of them are sourced from an IC construct. The correlation indicates that children who tend to cope better with conflicting demands are also more likely to wait longer before they become disturbed during the waiting period.

The weak negative correlation between Conflict and the Disappointing Gift indicates a relationship between better coping with conflict responses and the lack of ability to hide true emotions about a disappointing present. Neither ER (negative) nor ER (positive) was expected to relate to Conflict. However, the Conflict shared a small negative correlation with ER (negative) in this study.

In contrast to the expected relationship between the Delay and ER; none of the ER measures were related to any of the Delay measures. The findings in task level repeated the results in Study 2. Snack Delay was in a weak negative correlation with Disappointing Gift task (Score, r (116) = -.22, p< .05; Latency, r (116) = -.18, p< .05). The composite Delay measures failed to show a similar relationship with emotionality measures. However, The Delay (Latency) was related to EU to a moderate degree. The Delay (Latency) was also related to the Conflict and SU. This was an unexpected finding based on the disassociations reported in Studies 1 and 2, because SU was not related to Delay performance in those investigations. The children's response to Delay was expected to relate both ER measures and EU but not to SU. Notwithstanding the separation between Conflict and Delay in the previous studies, these two still share an underlying link to inhibitory control.

Although both the Delay Score and Latency were strongly correlated with each other, only Latency shared an association with the Conflict, SU and EU. Recall that in all measures, the Latency is the time until the child broke the rule of waiting.

Lastly, one of the key links was between false belief and emotion-understanding. Initially, both of these skills tap the 'understanding' of a mental construct. One is focused on understanding others' state of mind or beliefs and can be summarized as social understanding or false belief. The second is focused on the comprehension of emotions in which children are required to spot the correct emotion that suits the situation for a protagonist. Matching the appropriate emotion to a given situation firstly requires understanding of the situation itself. Different situations may elicit different feelings and the child must understand the nature of the situation first to be able to produce any emotions. For example, a child who received a birthday present would feel happy. To match the emotions, children are supposed to identify the situation and project such feelings to the protagonist. This exerts very similar cognitive demand to those that SU entails. The relationship between SU and ER hinders the importance of awareness and understanding regarding the other's mental states and the environment prior to adjusting a reaction.

Table 4.23

Pearson Correlations among CR, ER, SU, and EU constructs

	Conflict	Delay *Score*	Delay *Latency*	ER (positive)	ER (negative)	SU
Conflict Composite	-					
Delay *Score* Composite	.09	-				
Delay *Latency* Composite	.26**	.77**	-			
Secret Keeping (ER+)	.03	.03	.12	-		
Disappointing Gift (ER-)	-.20*	-.08	-.13	-.17	-	
SU	.61**	.17	.27**	.01	-.17	-
EU	.54**	.09	.24*	.21*	-.09	.57**

Note: * *p* <.05; ** *p* <.01.

Regression Analysis

With a hierarchical multiple regression analysis, it was expected to replicate the disassociation between the two dimensions of IC with a larger sample and a wider age range in Study 3. With regard to the correlations among the constructs that entail self-regulation, the story was slightly changed here. Yet, the same strategy as in Study 2 was followed on conducting the following regression analyses. For predicting the constructs in focus, firstly the predicted variable was entered into the model. Then, the demographic variable Age was added. In the third step, the distant measure to the construct was predicted in the model

The Conflict, Delay and ER measures were predicted by the same strategy. Since children's understanding of emotions within SR would throw some light on the investigation of the association between 'regulation' and 'understanding', a hierarchical regression analysis was conducted with EU as well.

Predicting Conflict. Children solve problems that have two conflicting solutions in this measure. One of the solutions to the problem is an initially impulsive reaction (e.g. imitation in the Hand Game or pointing the desired outcome in Less is More) whereas the other solution is a required/task-appropriate response. Conflict ability kicks in when the child starts to initiate in the task-appropriate responses.

A three step hierarchical regression analysis is displayed in full detail in Table 4.24, producing three models to predict Conflict. Model 1 with only False Belief (Social Cognition) was significant, $R^2 = .38$, $F\ (1, 115) = 69.40$, $p < .001$; adjusted $R^2 =.37$. In this model, false belief was significantly predicted Conflict performance. In the next step, Age was added to the Model 2 and it was also significant, $R^2 = .57$, $F\ (1, 114) = 74.23$, $p < .001$; adjusted $R^2 =.56$. Both False Belief and Age significantly predicted unique variance in Conflict performance. In Step 3, delay and emotionality measures were added to produce Model 3. Although Model 3 was significant, $R^2 = .58$, $F\ (4, 110) = 25.21$, $p < .001$; adjusted $R^2 =.56$; it was not statistically different from Model 2, given the change in R^2 value was parsimonious. In Model 3, previous significant predictors remained significant. As Model 2 is the fittest model, it showed the clear link between understanding the others' mind and coping with the conflicting demands. Considering this finding is not novel since it has been reported in the literature, the lack of attachment between conflict and emotionality was posed.

Table 4.24

Hierarchical Multiple Regression of Variables Predicting Conflict Composite

	Conflict Composite Score								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
SU	.40	.05	.61**	.25	.05	.38**	.22	.05	.33**
Age (months)				.04	.01	.49**	.04	.01	.47**
Delay Composite (Latency)							-.01	.07	-.01
Disappointing Gift							-.03	.02	-.09
Secret Keeping							-.06	.06	-.07
EU							.03	.03	.09
R^2		.38			.57			.58	
F		69.40**			74.23**			25.21**	
ΔR^2					.19			.01	
ΔF					49.68**			.87	

Note: $*p < .05$; $**p < .01$.

Predicting Delay. Based on the 'hot' explanation, an association between Delay and ER was expected to be found in the multiple regression model. Despite the lack of correlation between delay and emotion-regulation or understanding measures, the same strategy in Study 2 to produce regression models was employed in this study. The hierarchical multiple regressions failed to produce any significant models. When the performance in Delay in terms of Latency was employed in the analysis, three significant models were produced and it is displayed in detail in Table 4.25. Model 1 had all three emotionality measures: positive and negative emotion-regulation, and emotion- understanding. Model 1 was significant, R^2 = .07, F (3, 113) = 2.88, p < .05; adjusted R^2 =.05. Only TEC (that measures emotion-understanding) significantly predicted children's ability to delay in the face of a provoking desire. In Step 2, age was added to the equations and emotion-understanding lost its significance as a predictor. Model 2 was statistically different from the first model with better R^2 value of .13 and was a significant model, F (1, 112) = 4.12, p < .001; adjusted R^2 =.09. Age was the only variable predicting Latency significantly. Model 3 included the false belief and conflict measures and was significant, R^2 = .14, F (2, 110) = 3.00, p< .001; adjusted R^2 =.09. Despite the fact that Age remained as significant predictor in Model 3, the model itself was not statistically different to that in Model 2. None of the emotion-regulation measures demonstrated any significant effect on delay performance, thus not supporting the research question. Admitting the shortfall of the effect of emotion-regulation, the ability to understand emotions succinctly predicted the Delay performance in the first model.

Table 4.25

Hierarchical Multiple Regression of Variables Predicting Delay

	Delay Composite Latency								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	β	*B*	*SE B*	β	*B*	*SE B*	β
Secret Keeping	.05	.09	.06	.06	.08	.06	.07	.08	.08
Disappointing Gift	-.03	.03	-.10	-.03	.03	-.09	-.02	.03	-.07
EU	.08	.04	.22*	.02	.04	.05	-.01	.05	-.02
Age (months)				.02	.01	.29**	-.03	.01	.27*
Conflict Composite							-.02	.14	-.02
SU							.10	.08	.15
R^2		.07			.13			.14	
F		2.88*			4.12**			3.00**	
ΔR^2					.06			.01	
ΔF					7.35**			.78	

Note: $^*p < .05$. $^{**}p < .01$.

Predicting Emotion – Regulation. Given the lack of a correlation between the positive and negative emotion-regulation tasks, a composite emotion-regulation construct was not compiled. Instead, each task was analysed by the hierarchical multiple regression individually. None of the regression models generated to predict Disappointing Gift reached an appropriate level of significance, so they are not reported in here.

The regression analysis with Secret Keeping was conducted in four steps. The additional step was used to separate emotionality and delay measures. ER (positive) was predicted by ER (negative) and EU in Model 1 which was significant, $R^2 = .07$, $F\ (2, 114) = 4.12$, $p < .05$; adjusted $R^2 =.05$. Only EU was a significant predictor [b=.09, t(114)=2.21, p<.05] of whether children tell or do not keep the talking fish's secret. In the next step, Delay was added to Model 2 but it was not significant. In the third step, Age was added to the equation but Model 3 was also not significant. Model 4 included Conflict and False belief performance but that was also not a significant model. Since the performance in situational assessment of emotionality control failed to show a link with the delay aspect of inhibitory control, the potential influence of EU was highlighted. Therefore, a multiple regression analysis was conducted with both emotional- and social understanding as predictors.

Predicting Emotion- Understanding. The four step hierarchical regressions are presented in Table 4.26 in full detail. The first step included two situational emotion-regulation measures. Model 1 was marginally significant (p=.06) with the positive emotion-regulation as a significant predictor. In the second step, the Delay measure was also added to the model and it was a significant predictor along with Secret Keeping. Model 2 was a significant model within the margins, $F\ (2, 113) = 3.83$, $p < .05$; but had a very low R^2 value .09 (adjusted R^2 =.07). The addition of Age in Model 3 made Age the only significant predictor of performance in EU, $R^2 = .35$, $F\ (1, 112) = 15.16$, $p < .001$; adjusted R^2 =.33. The effect of age was not surprising since it was shown in the variance analysis as well. In step 4, both conflict and false belief were added to the equation and Model 4 was the fittest model based on the highest R^2 value of .48 (adjusted R^2 =.45) and a significant model, F (2, 110) = 16.87, p < .001. It was also significantly different to Model 3. Model 4 shows that EU was significantly predicted by the ability to keep a secret (ER-positive), age and the understanding of their own or others' state of minds. This model suggests a cluster of relationships among, social- and emotion- understanding along with the control of positive emotionality.

Table 4.26

Hierarchical Multiple Regression of Variables Predicting Emotion-Understanding

	Emotion-Understanding											
	Model 1			Model 2			Model 3			Model 4		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Secret Keeping	.48	.22	.21*	.43	.22	.18*	.34	.18	.15	.43	.17	.18*
Disappointing Gift	-.05	.07	-.06	-.03	.07	-.03	-.01	.06	-.01	.04	.06	.05
Delay Composite (Latency)				.55	.24	.21*	.09	.21	.03	-.03	.19	-.01
Age (months)							.11	.02	.54**	.06	.02	.21**
Conflict Composite										.28	.28	.11
SU										.65	.16	.37**
R^2		.05			.09			.35			.48	
F		2.95			3.83*			15.16**			16.87**	
ΔR^2					.04			.26			.13	
ΔF					5.37*			44.69**			13.52**	

Predicting Social-Understanding (False Belief). Since children's social understanding significantly predicted Conflict and EU in separate models, a hierarchical multiple regressions analysis with false belief performance was conducted to explain how children's understanding of their own and others' state of mind and belief would interact with the other self-regulatory constructs. In three steps that are displayed in Table 4.27, three significant models were generated. Model 1 only had the Conflict as a predictor, R^2 = .38, F (1, 115) = 69.40, p < .001; adjusted R^2 =.37. Age was added to the equation in the second step. Conflict remained significant in the model. Although the model was significant, it was not statistically different to the previous model and the added predictor (Age) failed to reach significance. In the final step, delay and emotional measures were added to generate Model 3. It was significantly different from the previous model as ΔF value suggests. Along with the Conflict, EU also significantly predicted SU in the final model.

Table 4.27

Hierarchical Multiple Regression of Variables Predicting Social Understanding

	Social Understanding								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Conflict Composite	.94	.11	.61**	.82	.15	.54**	.62	.15	.41**
Age (months)				.01	.01	.11	-.00	.01	-.04
Secret Keeping							-.01	.10	-.01
Disappointing Gift							-.03	.03	-.06
EU							.21	.05	.37**
Delay Composite (Latency)							.13	.11	.09
R^2		.38			.38			.48	
F		69.40**			35.41**			16.77**	
ΔR^2					.007			.095	
ΔF					1.26			4.98**	

Discussion

The main purpose of Study 3 was to explore the dynamic relationship of the regulation of positive and negative emotionality. In expanding ER assessment, *understanding of emotion* was also included. The focus on EU and its relation to ER aimed to examine a parallel to the relationship between SU and Conflict. This new construct showed that understanding 'emotions' was connected to both cognitive and emotion-regulation skills in a way that was not expected. Moreover, in Study 3, the tasks that were responsible for the measurement of some SR constructs were modified. For example, a new set of Conflict tasks related to SU as coherently as in Study 2. The Delay construct was also strengthened by adding another measure, but increasing the number of tasks did not show support for the predicted ER (negative) – delay association. Indeed the association found in Study 2 disappeared in Study 3. ER (positive) was also not related to Delay. I will start by discussing the deviation of findings from Study 2 focusing on why two 'hot' measures (i.e. Delay and ER) were no longer related. Then I will discuss the rising importance of EU in terms of both cognitive and emotional aspects of SR. There was also a commonality in both emotional and cognitive 'understanding' which requires further attention.

As mentioned in Chapter 1, a distinction between 'hot' and 'cool' aspects of self-regulation was proposed by Zelazo and Muller (2002) to highlight how high-order-mental-activities may differ in their demand. The 'hot' aspect was defined by its emotionally charged nature. Accordingly, it is necessary to exercise inhibitory control to delay gratification. The 'hot' measures were studied mostly in the course of executive function tests and the distinction between IC to Delay (hot) and Conflict (cool) demands has been used to support the separation of the constructs (Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Smith-

Donald, Raver, Hayes, & Richardson, 2007; Carlson, Moses, & Breton, 2002). However, the affective feature of this 'hot' aspect of control remained unstudied. Studies 2 and 3 examined the affect-control link and ties with its functional component – Delay.

One possible reason why there may be differences in the link between delay and emotion-regulation in Studies 2 and 3 lies in the methods used. Different Delay tasks were used in these studies. A very structured and succinct version of Kochanska's Snack Delay Task was used in Study 2. The constant supervision of E may have prompted children's better performance. Wiebe et al.'s (2011) longer alternative of the task was used in Study 3, incorporating, over 4 minutes, the 'absent' and 'present' conditions of Kochanska's task. The absent condition in Wiebe's version may have challenged the children more. The reason for the switch from one task to another concerns the nature of the tasks. The longest of the trials in Kochanska's design was 60 seconds. It is therefore possible that a shorter period of delay might shift the demand from 'coping with the temptation' to 'ability to abide by a rule'. It was my contention that such a short delay may well have turned Kochanska's procedure into a rule-based Conflict task. Children are told a 2-step rule: 'do not eat or touch the treat until the cue', 'when you hear the cue, you can eat the treat'. Similarly, the Snack Delay task in Study 2 might be also high on Conflict demands. Despite the expectation of an association between Delay and ER based on 'hot' neural pathway explanation and the finding from Study 2, the alternative demands in Delay tasks raised awareness that the relationship among these constructs might be task-specific. Jahromi and Stifter (2008) demonstrated that the Tapping Task (a Conflict task with motor responses) was negatively correlated with children's negative and aggressive responses in the Disappointment Paradigm. Children who were better at moving flexibly between two rules (about how to tap their fingers) were also less likely to display negative emotional expressions. Given that similar concerns about Kochanska's task are hinted at in more recent work (Wiebe et al., 2011), the decision to move to a measure that measures delay in a more ecologically valid way seems to have been justified.

Despite the lack of its relationship with the ER tasks, the Delay measures administered in Study 3 were positively correlated with each other and were discriminated by age in a similar manner to previous studies (e.g. Jahromi & Stifter, 2008). In the absent condition of the Snack Delay task, especially, the likelihood of ending the delay period prematurely was significantly lower in the 5-year-old group. The better performance in the absent condition in this study may reflect the child's developing internalization of the value of social conformity. Indeed, only Age was significant as a predictor of children's latency in the Delay tasks. We return to the issue of delay tasks in Study 5, when a further measure will be added to explore the cognitive underpinnings of the child's 'hot' EF.

The inclusion of ER (positive) and EU was attempted to broaden the ER construct as it has been defined. The correlations among the three emotionality measures (ER (positive), ER (negative) and EU) were limited to the link between EU and ER (positive). For ER (negative), only children's negative reactions in the Disappointing Gift tasks was correlated with Secret Keeping performance. For the Disappointing Gift task children's reactions to change in each dimension (i.e., transitional behaviours) formed the central measure, and a distinction was made between positive and negative emotional expressions. This score was used in both Studies 2 and 3. Contrary to the positive link between ER (negative) and Delay in Study 2, a small negative correlation was observed in Study 3 between ER (negative) and Conflict. This association disappeared in regression analysis, as children who were better at hiding their true emotions in the face of a disappointment performed better in Conflict tasks. This finding also support the arguments that some Delay tasks might be high on Conflict demand (such as in Study 2).

Why did we not observe the expected Conflict-ER relationship as in the previous study? In Study 2, one verbal (Day/Night) and one motor (Giraffe/Mouse) procedure were used to assess Conflict. Yet, Study 3 increased the number of Conflict tasks. The Hand Game is a simple motor task. The Whisper Game is a task for controlling the voice. The Conflict tasks of Study 3 were more diverse and may have captured the children's performance better. Although positive and negative ER performances were correlated with each other, ER (positive) did not share any association with Conflict. This result may lead to the conclusion that the regulation of positive and negative emotionality has involved separate operations. However, the relationships between the emotionality measures require closer inspection.

Firstly, the link between ER (positive) and EU in this study may be consistent with Blankson et al.'s (2013) finding of a link between ER (negative) and EU, thus suggesting a general link between the regulation of 'emotion' and its cognitive underpinnings. In both studies inhibitory control was used. However, without further experimentation (Studies 4 and 5) this link remains speculative as they used a frustration paradigm while Study 3 used a disappointment task. EU, though, was positively correlated with both Delay and Conflict. Study 4 starts this process by attempting to understand more about the nature of EU.

It is important here to consider the findings of Study 3 in relation to the nature of EU itself. Children's budding awareness of emotionality (as measured by EU) and social understanding were both related to inhibitory control. The data seem to suggest that a child's early grasp of emotions links with his/her behaviour -how long she or he waits for a treat and performance on tasks with conflicting rules. Given the strong link between SU and EU reported in Study 3, we need to examine if there is an overall 'understanding' skill that is general and not specific to, emotionality or social cognition. This has been suggested in other studies (e.g. Blankson et al., 2013; Eggum et al., 2011; Cutting & Dunn, 1999; Hughes & Dunn, 1998). Indeed such emotional-understanding has been found to predict children's prosocial behaviours and moral reasoning (e.g. Eggum et al., 2011; Eisenberg et al., 2006). However, there are also conflicting findings that suggest dissociation between these two constructs. In a much cited paper, Dunn et al. (1991) reported no correlation, but they tested considerably younger children compared to studies that reported an association.

The strong EU-SU relationship that was reported in this study contributes to a body of investigations that dwell on the specifics of the link. EU is sometimes measured as an index of affective competence (for a review see, Izard et al., 2011) but Hughes (1998) treats it as a test of social cognition among others (e.g. Harwood & Farrar, 2004; Dunn, 2002. What we need is to explore the nature of EU further. Study 4 looks closely at it and suggests that the Pons et al. scale assesses only a limited aspect of understanding when it comes to regulation. It develops a new measure to fill this gap.

Furthermore, it was found that both EU and Conflict explained a significant amount of SU variance whilst EU was associated with SU as well as the ER (positive). This thesis aimed to reveal the nature of interaction between two lines of regulatory mechanisms for emotions and cognitions, and the links between them and other skills.

It was established that neither ER (negative) nor ER (positive) was significantly related to any aspects of the IC. However, through the 'understanding' performances, there was a chain of interactions. Hence there is a robust influence of understanding in binding cognitive and emotional aspects of self-regulation. A meta-understanding of emotion-regulation was thought to contribute to explaining the mechanism of self-regulation. Based on the correlations both EU and ER (negative) shared with Conflict, it was thought that the missing link between Conflict and ER might be the children's understanding of emotion-regulation process itself. The EU measure that was used in Study 3 also had a ‘regulation’ component for children’s understanding of ER which was thought to emerge in children’s emotional behaviour repertoire around the age of 7 according to Pons et al. (2004). The features and qualities that components possessed will be examined in detail in the next chapter, a new scale will also be developed to explore the middle ground between both understanding and regulation of cognitions and emotions.

Chapter 5 - Assessing the Understanding of Emotional-Regulation: *A Scale for an Understanding of the Regulation of Emotions (SURE)*

Chapter 4 identified a connection among EU, SU, and Conflict Inhibition. Many studies have reported a close link between SU and EU (O'Brien et al., 2011; Hughes & Dunn, 1998; Harwood & Farrar, 2006; Wellman, 1990), but a further look at the nature of this connection is necessary. EU can be approached as a part of social cognition, in regard to its hypothesised shared 'metacognitive' structure with SU. The idea of 'metacognition' proposed by Flavell in the 1970s focused on key developmental changes in children's cognitive abilities. How children come to understand the mind and the complexity of emotions has been thought to be strongly tied to the emergence of cognitive activities in which two contrasting perspectives can be compared and reconciled (e.g. Flavell, 1999; also see Pillow, 2008). Young children's ability to understand mental activities has also been claimed to be limited to constructing inferences between past emotional experiences and present thought and feelings (Lagattuta & Wellman, 2001). As reported in the previous chapter (Study 3), the performance of preschoolers in an extensive emotional-comprehension scale (TEC) was found to be strongly related to their performance in false belief tasks (SU). Moreover, both understanding of emotions and others' mental states were closely related to inhibitory control.

Despite the intensely investigated relationship between the meta-understanding of mind and self-control, the relationship between understanding of emotions and control of emotions has not been explored in depth. EU has been considered as a prerequisite for ER, or as a complementary part of ER performance, but the investigation of meta-understanding of ER is limited in three ways. First, generic emotion-comprehension is considered as an understanding skill that underlies ER. Second, the understanding of ER is identified mostly as the ability to generate coping strategies. Third, children's understanding of ER is observed in retrospective situations such as emotions that are already elicited and regulated. This chapter will introduce and discuss these limitations as a justification for, and introduction to, a new scale of ER-understanding that will be devised in an attempt to overcome these limitations.

In terms of metacognitive abilities, researchers have speculated that EU is a specific metacognitive skill underpinning ER and their assumption has received some support. First, the ability to keep the secret of a confidante in ER (positive) predicted the performance of extensive emotional-comprehension scale (EU) in Study 3. In unpacking such a finding, EU can be claimed to be a prerequisite for ER, which emerges in the child's daily behaviour (Gross, 1998). In support of this prediction, results from the Turkish sample in that study showed that ER-EU relationship was specific to ER (positive). These studies report that ER measures are mostly gathered from parental reports (e.g. Blankson et al., 2013). In online assessments (i.e. the child being tested him- or herself), ER lacks an association with SU or either aspect of IC (delay and conflict inhibition). As the assessments of ER skills were mentioned in the previous chapter, this chapter focuses particularly on children's understanding of the regulation of action.

The suggestion that EU facilitates ER was also supported by Rieffe (2012), who reported that the ability to differentiate negative feelings was limited in a sample of deaf children, who have been shown to be slow in developing SU (Russell, Hosie, Gray, et al., 1998; Schick B, de Villers, de Villers, & Hoffmeister, 2007; but see Woolfe, Want, & Siegal, 2002). They found that deaf children tend to exhibit less efficient ER strategies, and were less likely to avoid a situation that would cause negative feelings, when compared to their hearing peers.

In terms of children's understanding of ER, most studies have focused on coping strategies. As Davis et al. (2010) suggested metacognitive emotional-regulation strategies include children's ability to alter their mental states in order to change their negative feelings.

Besides exploring how an understanding of the ‘regulation’ of ER develops, researchers have closely observed children’s solutions to problems where they need to cope with changing emotional states.

The Test of Emotion Comprehension (TEC) used by Pons et al. (2004) covered each developmental threshold in the acquisition of EU including a section about the ‘regulation’ of emotions. Similar to the studies mentioned in the previous paragraph, the ER-understanding component was based on coping strategies required to cope with negative feelings that have been caused by a previous event. In these studies, children were given a scenario for example, the following: ‘a young boy’s pet rabbit is dead, and he is feeling sad about it.’ They were asked whether they would choose a physical or mental strategy to change this emotional state. Pons et al. (2004) illustrated four strategies for the protagonist. The physical strategies were ‘closing eyes’ and ‘going out and doing something else’. The mental strategy was ‘thinking about something else’. The last [neutral] strategy option was ‘there is nothing this boy could do’. The mental strategy was identified as the correct response in their scoring. The finding from Pons et al. (2004) suggested that the majority of children were able to opt for the mental strategy after the age of 7. Children, who were younger than 7-years, were able to pinpoint the external causes of the emotion, understand that two people in the same situation may experience different emotional states due to different desires, and grasp that the emotions can be recalled. However, they still tended to prefer physical strategies to cope with their negative feelings.

The same component of ‘regulation’ was presented to Turkish preschoolers in Study 3. Nearly half of the youngest group (53.7%) (3-year-olds) chose the physical strategy of ‘closing eyes’ to stop feeling sad. Only 7.3% of these 3-year-olds were able to choose the correct strategy. Among 4-year-olds, only 16.3% were able to choose a mental strategy over a physical one. 36.4 percent of 5-year-olds children successfully chose the mental strategy. This was higher than the 20 percent reported by Pons et al. (2004) for the same age group. Pons et al. (2004) suggested that children grasp the mentalist nature of emotions at around age 7, and mostly opt for physical coping strategies in the preschool years. In contrast, the Turkish data suggests that 5 year-olds were more likely to choose mental strategies rather than one of the other strategies.

However, generating a coping strategy for negative emotionality may not be the only way to assess how children start to understand ER. When the locus of a meta-understanding of ER is coping, then children's understanding of past emotions is assessed. Thus, a retrospective comprehension of emotions is observed in Pons et al.'s measure. Instead of expecting the child to generate a solution to the given emotional state that was caused by a past event, asking them to make predictions about the emotional display expected of a protagonist might expand our understanding of children's EU performance. What if we were to ask children to make suggestions for the possible emotional display that the protagonist should be presenting?

Some findings regarding children's ability to make assumptions about future emotions suggests that they are able to prepare themselves for a future based on past experience. Atance and Meltzoff (2006) found a shift in children's ability to anticipate future *internal* states between 3 and 4 years of age. They gave participants (3- to 5-year-olds) pretzels which made them thirsty, and then asked these children what they would like on their visit the following day: pretzels or water. The older children were able to inhibit their current desire for water and predicted that they would like some more pretzels, thus anticipating their future state. However, 3-year-olds were unable to inhibit their current desires and chose the less desirable alternative (i.e., water) as their next day choice of snack. Although this finding may be accounted for by the limited self-regulation ability of preschoolers, it also shows that older children were able to predict what they might desire the next day regardless of what they desired at the moment. In addition to physical desire and needs, Suddendorf and Busby (2005) showed that children were able to attribute future mental states to avoid boredom. In their *Two Rooms* task, children in the experimental condition were told that they were going to have the chance to play with an empty puzzle board, whereas the control group simply waited in an empty room. Next, all of the children were taken to a room where they were instructed to pick from various toys, which they could then take back with them to the first room. The results showed that 4- and 5-year-old children who were instructed to play with an empty puzzle board were more likely to choose the puzzle pieces for that board in the new room than the children who had been in an empty room. The toy preferences of the 3-year-olds were not affected by the previous condition. In addition to the fact that preschoolers were able to make assumptions about their present based on their past experiences (Lagattuta, Wellman, & Flavell, 1997), children were also shown to be able to make predictions for the future based on their current conditions. Preschoolers' ability to predict future desires becomes stronger as they get older (see Lagattuta, 2014).

The ability of children to assemble past experiences flexibly in order to create novel scenarios has been investigated in order to explore the potential link between episodic future thinking and relational memory during the preschool years. Richmond and Pan (2013) found that children were capable of describing both past and *possible* future events and both abilities were expected to develop between 3 and 5 years of age. However, when making up scenarios for future events, children were less likely to generate detail than when they recalled a past event. In their episodic future thinking task, participants were asked to talk about a past event and to speculate about a likely future experience using three cue cards (i.e., a person, an object, and a place). The cue cards were developed by asking children and their parents about their experience in the past 3 months. When the relevant cue cards were constructed for their life events (e.g., grandma, a hat, and the beach), children were asked to generate a possible future event after a random card was chosen (as a cue). The researchers reported that children were able to reconstruct relational knowledge in a flexible manner for future events. Children's ability flexibly to assemble past and future knowledge in particular situations allows them to make inferences based on possible outcomes in the future, by drawing on their knowledge of past events.

The research findings summarized above indicate that preschoolers have some ability to anticipate their own future internal states. However, as argued by Pons et al. (2004), children's presumptions about their own and others' emotional states raises a key question about their understanding of emotions that need to be controlled. As anticipation over one's own or another's emotional state develops, the preschoolers' ability to be in control of their own emotional reactions improves. At the age of 4, children are able to anticipate future events and to grasp the causality between the emotions, such as another's happiness or sadness, and the sources of those feelings (e.g. Cutting & Dunn, 1999; Denham, Zoller, & Couchod, 1994). Although children can make inferences about another's happiness or sadness, and the sources of those feelings, they still struggle to distinguish how anger might relate to sadness until the age of 6-and 7-years (Levine, 1995). It can be inferred, then, that the ability to distinguish negative and positive emotions occurs earlier whereas the understanding of the differences between two negative emotions may still pose a challenge for young preschoolers.

Thus, rather than adapting an ER-understanding task that observes children's mental strategies for handling emotional states that have already been experienced (as in Pons et al., 2003; 2004), a new approach is introduced. In their review of ER theories, Gross and Barrett (2011) concluded that focusing on the process of ER would help us to understand how emotions are generated. In terms of investigating ER, online assessments have been used in an attempt to elicit an emotional experience and then observe how a child behaves in that emotionally charged situation. The interpretation of their behaviour cannot be done independently of the social expectations, such as the need to be polite to stranger. Thus social expectations ought also to be incorporated into the emotionality for a complete assessment of both EU and ER.

Capturing a child's ER performance over time through a lens of social expectation was made possible through Saarni's (1984) Disappointment Paradigm. The paradigm proposed in this chapter aims to develop a task that imitates the Saarni's Disappointment Paradigm, but creates characters who find themselves in difficult circumstances such as masking sad feelings because of an unwanted present. Instead of being disappointed by a stranger, these characters would find themselves in need of adjusting their emotional expressions towards people from their social group such as friends or relatives. Since basic emotions are easier to provoke within online assessments like the ones used in Study 3, the assumption is that such a procedure elicits a single emotion for example sadness or happiness. However, a closer look at emotional states would probably identify more complex processes which hinder mental evaluation of the situation, and which therefore need to be controlled. Although online- assessment of ER of both positive and negative emotions relies on the assumption of creating the reactive states of disappointment or excitement, they are also limited because individual children seem to react in different ways (or levels of awareness). I will return to this issue in Chapter 7.

Hitherto, children's understanding of the causality between emotional states and their external elicitors emerges in the early preschool years (Harris et al., 1989) when they come to understand the appraisal of feelings. In a shift to false belief understanding, within a process of grasping desires, then beliefs then emotions, as Wellman et al. (1995) suggest, children start to base their judgment by comparing two conflicting mental states. At the age of around 4-and - 5-years, children recognize how thoughts and beliefs may influence one's actions, but the understanding that thoughts and beliefs have an influence on emotions has been thought to develop later (Wellman & Liu, 2004; Wellman, Cross, & Watson, 2001).The items that have been assembled to assess emotional understanding were ranked as highly difficult in Wellman and Liu's (2004) false belief scale. One of their items was 'Belief-Emotion' in which a character's feeling was based on his or her false-belief about a snack that he or she likes. The other emotionality item on Wellman and Liu's scale is 'Real-Apparent Emotion' and it is more complex. In that item, a character is teased by his friends by a mean joke. Despite being teased already, the character tries to hide their emotions to avoid more embarrassment. The emotion that needs to be hidden (i.e. feeling sad) and the emotion that is used to mask (i.e. expressing happiness) the actual feeling was presented to children. Both of these items was derived from Harris et al.'s (1989; 1986) earlier work. According to the evaluations from Wellman and Liu (2004), a child's comprehension of a hidden emotion emerges later in development, similar to the hidden and moral emotional items in Pons et al.'s (2004) scale. The item distinguishing real from apparent emotion was based on the child's need to suppress negative feelings but the motivation for hiding true feelings is to avoid the public embarrassment which is the source of the feeling as well. The regulation of emotion is needed to eliminate the persistence and development of the negative feelings. However, it is suggested here that the regulation of both negative and positive emotions is also necessary to keep a social relationship intact, protecting the feelings of others by hiding one's own emotions.

I aimed, in a new measure, to create an emotion-eliciting setting equivalent to an online ER task, by suggesting that a condition can be created in order to elicit a *disappointment*, even if the source of the feeling may not fulfil the previous (true) desire, or if recent events have changed the situation to lead the current emotional state. As will be discussed in Chapter 7, it is predicted that this ability slightly contrasts with the expected shift at the age of 6 made by Wellman and Liu (2004). I based my analysis on the idea that the structure of this task is equivalent in complexity to false belief and conflict inhibition, which both require the resolution of two contrasting positions. I would like to demonstrate my logic with the help of an example.

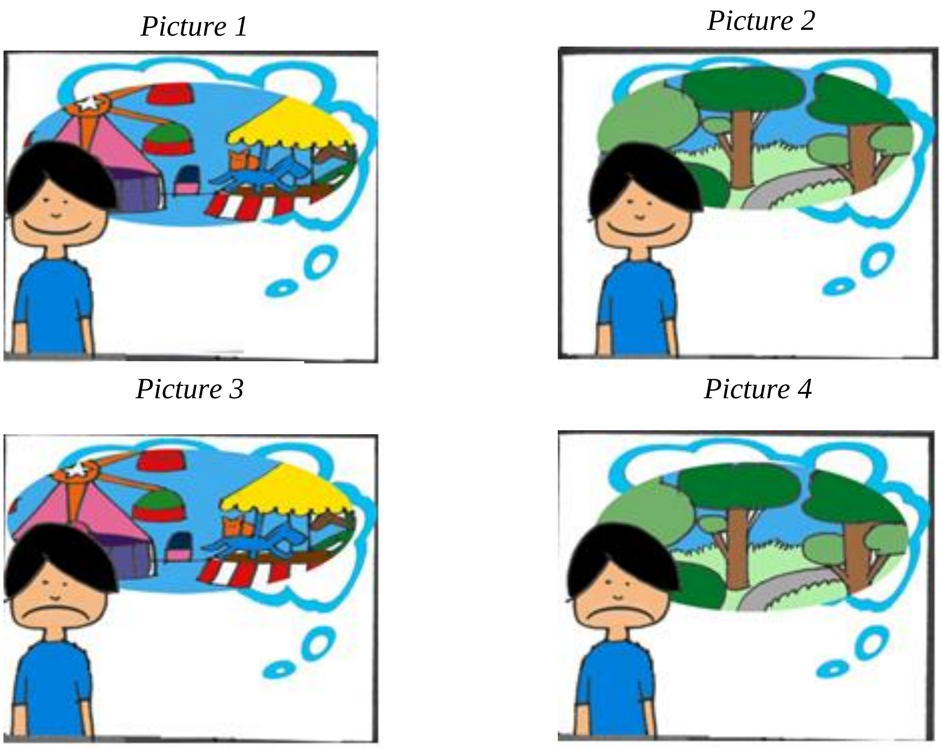
> *Billy loves funfairs. His grandparents promised to take him to the funfair. On the way, his grandmother noticed the beautiful woods nearby. She asked Billy to go for a walk in the woods instead of going to the funfair.*

What is straightforward about the story above is that Billy is a boy who has been disappointed by his grandmother. The nature of their social exchange is complicated and may require Billy to act differently: they were going out to spend time together at the funfair. This new suggestion for a last minute change of plans from his grandmother, to go to the woodland instead, is most likely to alter Billy's emotional state (it is hard to imagine a preschooler who would rather walk in the woods than experience a funfair). His internal state is expected to change from 'happy/ excited' (because he was going to do something he wanted), to 'sad/disappointed/angry' (because he was not going get what he wanted). As mentioned above, the evidence suggests that preschool children may not grasp the nuance between two negative feelings but they can understand the causal relationship between the feeling and the emotional display. If '*How is Billy feeling*?' was asked, this question would be very straightforward even for 4-year-olds, as observed earlier in the external causes component of TEC (Pons et al., 2004). Moreover, around the age of 4 to 6 years, children start to grasp the fact that it is possible for a person to express an emotion [outwardly] but feel another emotion [internally] (e.g. Harris, Donnelly, Guz, & Pitt-Watson, 1986). So, we would expect them to understand that Billy is feeling upset internally. To tap the relationship between the child's inner feelings and his commitment to pleasing his grandmother, we could ask '*How would Billy express his feelings to his Grandmother?*' For a developmental researcher who presents a young child with a broken toy and expects them to show a minimum number of negative emotional expressions to a stranger as a measure of ER ability, I would also expect the response that Billy would be nice to his grandmother.

The options for emotional display need to be simple in order to summarize the boy's reaction as being 'positive' or 'negative'. However, this raises a source problem. Why was Billy feeling a certain way? To answer this, children need to be reminded of the origins of the emotion. While remembering or thinking about the emotion underlying the cause of the recent event is within preschoolers' range of capabilities, simultaneously holding conflicting states of feeling and inhibiting the expression of this feeling may be still difficult for young children.

In Figure 5.1, four pictures are presented to depict Billy's true desire (what he is thinking about) and the emotional display that he makes to his grandmother. Both the top two pictures depict Billy smiling when reacting to his grandmother's idea, but in one he is keen to go to the wood while in the other he hankers after the funfair. This latter display, in Picture 1, indicates his ability to hide his true feelings. In Picture 2, Billy thinks about the walk in the woods, which indicates that he might have changed his mind and therefore is smiling to his grandmother about their joint new venture. It is predicted that only older children would be able to acknowledge the possibility of being able to conceal a true emotion whilst holding onto their true desire. It is also possible that as a demonstration of ER, another strategy would be to adjust the mental state in order to change the emotional state (as depicted in Picture 2). Pictures 3 and 4 can be defined in two ways: as the display of true emotions or a failure to regulate emotions. Here, though, the changed events are a true cause of the negative emotionality. Billy is looking upset and thinking about the woods which were the reason he could not reach his true desire in Picture 4. This combination is a match between the true emotion and its cause. The literature would suggest that at around 3 and 4- years of age, preschoolers can make this deduction. However, they will be expected to avoid their initial deduction regarding Billy's feelings and make a prediction about how he should display his emotions.

Figure 5.1.: Emotional Display Choices for Story 1



STUDY 4

Stitching up: A Scale of Understanding the Regulation of Emotions (SURE)

In the introduction, the objectives for a scale to cover the middle ground between EU and SU have been explained. Eight more vignettes were created that were similar to Billy's story above. In all of those vignettes, the emotional outcome options were created in the same way. To explore whether it is possible to construct a coherent scale of EU relating to controlling one's displays of emotion and to be able to use this scale later in comparison to Conflict, SU, and EU (in Study 5, next chapter), the main aim of this chapter is to test the reliability of this new scale. The scoring scheme is based on two dynamics. Positive displays are regarded as showing understanding towards the necessity of ER (and execution of it), so scored higher than the two negative emotional reactions. The ability to conceal one's true thoughts (thinking about the funfair in this case) was also considered as a more mature form of thinking. Based on the previous findings on children's EU as speculated above, I expect to see older age group to tend to show a better understanding of ER and choose positive emotional displays.

Method

Participants

Sixty-two Turkish (32 male) preschool children participated in this study. The age range was from 3 to 5 (M = 54.22 months, SD= 11.10, range: 35-75 months). Children were recruited from a nursery school in Bursa that serves mostly middle-class families. The consent of the parents and the child's willingness to participate in testing were obtained, following permission from the Departmental Ethics Committee.

Procedure and Materials

Children were tested individually in a quiet room in their nursery. Each story was presented in a picture book. E told the stories with the help of pictures and pointed to the relevant picture while telling the story in detail. Continuing the example provided above, the instructions for that story were as follows: *"Let's look at these pictures together. I am going to tell you a story about this boy/girl [points to the first picture]. This boy's name is Billy. He loves funfairs very much. His grandparents promised to take him to the funfair this weekend. Here, his grandparents came to pick him up [points to the second picture]. On their way to the funfair, they pass by this nice woodland [points to the third picture]. His grandmother says, 'what a beautiful wood, why don't we go for a walk in the wood instead of going to the funfair? We'll go to the funfair another time.'"* E stopped the story there and turned to the next page. There were four pictures that each depicts an emotional display for the protagonist on the next page.

As mentioned in the introduction of this chapter, those emotional expressions were represented in the positive-negative dichotomy. The emotional displays were backed up with thoughts that Billy might be having at that moment. The mental representations were presented in a *thought balloon* next to Billy's head. In those thought balloons, the protagonist's true desire or the recent change of events were depicted and the child was instructed that this was the case (see below). Thus, there were two pictures that showed Billy's smiling and two pictures frowning. In one of the positive display versions, Billy was thinking about the funfair that represents his true desire. The recent change of events was depicted as Billy was thinking about the walk in the woods. Both true desire and the recent events were also combined in the negative emotional expressions (please see Figure 5.1 for the examples of each of these emotional outcome options). Then E asked the child to point which outcome would be appropriate for the character in the story; *"Now, how should Billy react to his grandma?"* [6]*She continued with describing each picture. "Should he smile to his grandmother* <u>*but*</u> *still think about the funfair?* [points *Picture 1* in Figure 5.1]*; Should he smile to his grandmother* <u>*and*</u> *be thinking about the walk in the woods?* [points *Picture 2*]*; Should he frown at his grandmother and be thinking about the funfair?* [points *Picture 3*]*; Should he frown at his grandmother and be thinking about the walk in the woods?* [points *Picture 4*]."

After the child had pointed to the picture to reveal his/her choice, two follow-up questions were asked. Each answer was recorded for possible qualitative analysis later, particularly in terms of the justifications for the choice of emotional display. Those questions were dependent on whether the child chose a positive or negative emotionality display, "[1] *Why did you think [E* <u>*points*</u>*] this child would be smiling/ frowning*?; [2] *How would you act if you were this child?"* Here Story 1 was used as an example to describe how items were presented to children. The illustrations and vignettes of the rest of the stories of SURE are presented in Appendix 5.1.

Scoring. The rationale for generating each emotional display combination and why they were scored accordingly was mentioned in the introduction of this chapter. Here, I will only summarize how each item of the scale was scored. The protagonist of the story faces a socially demanding situation where his or her desire is not met for the greater good of others. Thus, the protagonist is expected to adjust the display of his or her emotions. Only a dichotomy between a positive and negative display of emotions was presented. The

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[6] This question asked in Turkish was, "Sence [e.g. Billy- character's name] babaannesine nasil davran-mali?" [Do you think –Billy-to grandmother-how- react-should]. So, the exact translation of the question from Turkish would be 'how should [character's name] react [to X person], do you think?'. Using 'do you think' or 'in your opinion' as a conditional clause is necessary at the beginning of the sentence because it continues with *should*. The translation that fits the meaning better in English was provided in the example, even though the literal one is more complex.

protagonist was depicted as smiling or frowning. The thoughts to accompany emotional displays were also dichotomous. They varied from the true desire of the protagonist to the recent change of the events. The match of the thought of the recent change of events – as the source of disappointment- and the negative emotional display was scored as 1 point [i.e. see *Picture 4* above]. The match of the true desire that was not fulfilled and the negative emotional display was scored as 2 points [i.e. see *Picture 3*]. The match of the thought of the recent change of events and the positive emotional display was scored as 3 points [i.e. see *Picture 2*]. The match of the true desire and the positive emotional display was scored as 4 points [i.e. see *Picture 1*].

Results

There are two very straightforward segments of the analysis in Study 4. The reliability of the scale was in the first main question. Secondly, the nature of the scoring of each item was examined in terms of the possible differences between age groups. The assumption was that the older (i.e. 5 year old) children would tend to have a grip of social necessity of putting on a positive emotional display, whereas the choices of younger children would be expected to be at chance or would show more expressions of ‘negative’ emotions due to the true feelings caused by the situation. Thus, attributing a positive display in spite of holding a conflicting desire (or feeling) is difficult but it would indicate a child’s ability to understand hiding emotion and replacing them with a socially appropriate (i.e. positive) emotion display.

Reliability Analysis

Cronbach’s alpha value calculated for 9-item version of SURE was 0.792. Excluding Story 6 from the scale led to an increase in alpha value to .81. In the next step, exclusion of Story 4 was also suggesting an increase of alpha value. Thus, two items (Story 4 and Story 6) were dropped from the scale. The 7-item version of SURE had Cronbach’s alpha value of .83

which indicates a uniform scale with large inter-correlations among items. Since the reliability analysis showed that Stories 4 and 6 provided a less robust fit into the scale, they are dropped from the further analysis[7].

Age Comparisons

For each story, the number of children's choices is presented in a table. The effects of age group and gender on each story was examined by a series (2 X 2) ANOVAs.

Story 1. Billy is the protagonist of the story who desired (was promised in the first place) to go to a funfair but he was taken for a walk in the woods instead by his grandmother. The number of participants who chose each emotional display is illustrated in Table 5.1. Children from all age groups tended to attribute a positive emotional display for Billy rather than a negative one. The univariate analysis of variance showed that neither age nor gender groups had a significant effect on children's choices in Story 1: age, F (2, 62) =.36, p=.70, η_p^2= .01; gender, F (1, 62) =.96, p=.33, η_p^2= .02. The interaction of these variables was also insignificant; F (2, 62) =1.81, p=.17, η_p^2= .06.

[7] The analysis with Stories 4 and 6 showed no significant main effects of age, gender or their interaction.

Table 5.1

Numbers of Children based on Their Choice of Emotional Display in Story 1 by Age

	Emotional Outcomes/Scores			
Age Group	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3-year-olds	0	8	8	3
4-year-olds	3	3	8	7
5-year-olds	2	4	9	7

Ten children from the whole sample did not state any explanation for their choice. 8 of the children who chose the positive display of emotions made an explanation regarding the grandma's feelings. A boy (5-year and 4 months-old) picked the highest scored outcome (positive display and true desire) as his choice and this is his explanation for his choice: 'he should not go to funfair and not upset his grandma *(ID: 12)*". A girl (5-years 9 months- old) also chose the same outcome and gave the following explanation: "he should know that he could go to the funfair later, and not to upset his grandma now *(ID: 20)".* On the other hand, a younger girl (3 year and 2 months old) who chose a negative display and the recent event explained her choice as 'he didn't go the funfair but my mum would take me to the park in any minute now *(ID:43)".*

Story 2. Jasmine is the protagonist of this story who finds out that her beloved pet turtle died in the morning of a close friend's birthday party. The true feeling towards the tragic event of losing a pet is 'upset' or 'sad'. However, she would have been expected to display positive emotional cues to conform to the behaviour expected at a party while she may still think about her pet turtle. As Table 5.2 shows, most of the 3-year-olds tended to choose the negative emotional display for Jasmine. Four-and 5-year-olds, on the other hand, tend to choose positive emotional displays more than the negative ones. As the univariate analyses of variance (please see Table 5.2.1) shows, age significantly affected the emotional display choices in Story 2, but gender and the interaction were not significant. Tukey tests (with the Tukey-Kramer adjustment) revealed that the 3-year-olds' choice in this story was statistically different from the older children. Such a difference was not apparent between the 4-and 5-year-olds' choices.

Table 5.2

Numbers of Children based on their Choice of Emotional Display in Story 2 by Age

	Emotional Outcomes/Scores			
Age Group	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3-year-olds	8	5	4	2
4-year-olds	3	3	8	7
5-year-olds	1	7	8	6

When children's explanations were solicited, a girl (5 year and 8 months old) who chose a positive emotional display gave the following explanation: "she would not miss out a friend's birthday. I would have been thinking about my turtle, but I would still go to my friend's party *(ID: 27)*". Another boy (4 year and 1 month old) chose a negative display (with the recent event) and justified his choice by describing the characters' situation: "she is upset that her turtle is dead and she is at a party *(ID: 5)*".

Table 5.2.1

Univariate Analysis of Variance of Story 2 by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	10.83	2	5.74	.17	.01
Gender	.32	1	.34	.01	.56
Age * Gender	5.18	2	2.75	.09	.07

Note: R Squared = .23 (Adjusted R Squared = .16)

Story 3. Eileen is the protagonist of the story who wants to go ice-skating with her parents. Her parents say that they will go to her brother's football match before ice-skating. However, her brother gets slightly injured and is very tired after the match. Thus, her parents decide to go back home instead of ice-skating. Clearly, Eileen would be upset and/or disappointed due to her unfulfilled desire but she would also be expected to feel compassionate towards her brother's condition. Table 5.3 presents the raw number of children according to their choices. Eighteen children chose positive emotional display and a true desire out of the whole sample. Seven of them justified their choice by giving explanations like "could go ice skating later", "brother is hurt, better go back home". Fifteen children picked the negative emotional display and recent event mostly explaining their choice as "she really wanted to go ice-skating" or "because she had to go back home".

Table 5.3

Number of Children based on their choice of emotional display in Story 3 by Age

Age Group	Emotional Outcomes/Scores			
	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3-year-olds	9	4	5	1
4-year-olds	4	5	6	6
5-year-olds	2	1	8	11

Three-year-olds mostly picked a negative emotional display. The choice of the 4-and-5-year-olds was inclined towards positive emotionality displays. The univariate analysis of variance backed up that finding and demonstrated that both age and gender has a significant effect on children's choices in Story 3 as displayed in Table 5.3.1. Tukey tests revealed that the choices of 3-year-olds was different from the 4-year-olds ($p \leq .05$, -.77, 95% CI [-1.53, -.01] and 5-year-olds ($p < .001$, -1.38, 95% CI [-2.13, -.62]. The age difference was not apparent between 4- and 5-year-olds ($p = .13$, -.61, 95% CI [-.13, -1.34].

Table 5.3.1

Univariate Analysis of Variance of Story 3 by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	18.90	2	9.42	.25	<.001
Gender	4.51	1	4.50	.07	.04
Age * Gender	.25	2	.13	.00	.88

Note: R Squared = .30 (Adjusted R Squared = .24)

Story5. Mabel is the protagonist of this story who buys flowers for her mum's birthday with her sister. While their tired mum is resting, she is supposed to wait until her sister finishes her homework before they present the flowers. Mabel would cope with this obligatory delay request from her sister with a positive or negative display of emotions, and by delaying the gift presentation, or not. In Table 5.4, the raw number of children's choices is illustrated again. In all age groups, children tended to pick the recent change of events (e.g. Mabel thinking about her sister doing homework as opposed to the two girls presenting the flowers together) with either positive or negative emotional displays. The analysis of variance presented in Table 5.4.1 though showed a marginal effect of age group on children's choices in Story 5. Tukey tests also showed that there was no difference between the performances of 3-, 4- and 5- year-olds.

Table 5.4

Number of Children based on their Choice of Emotional Display in Story 5 by Age

	Emotional Outcomes/Scores			
Age Group	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3-year-olds	9	3	4	3
4-year-olds	3	4	7	7
5-year-olds	4	2	12	4

Table 5.4.1

Univariate Analysis of Variance of Story 5 by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	7.31	2	3.10	.10	.05
Gender	1.60	1	1.36	.02	.25
Age * Gender	.21	2	.09	.00	.91

Note: R Squared = .12 (Adjusted R Squared = .04)

Story 7. Denise, the protagonist in Story 7, was told by her mother to postpone her play date that she was very much looking forward to because she was feeling poorly. In this story, the illness of the main character was the reason behind the delay of this pleasurable activity but she was prevented from doing this by her mother to spare her friend from catching her cold. Again, how she handles the situation could go either way. She might focus on not being able to get what she want (e.g. playing her friend) and display negative emotions or see the possibility of having what she wants later and display positive emotions.

The univariate analysis of variance showed a significant effect of age on children choices as an outcome for the protagonist (see Table 5.5.1). Tukey tests suggest that the 3-year-olds' responses were statically different from the 4- (p<.001, -1.17, 95% CI [-1.93, -.42] and 5-year-olds (p<.001, -1.45, 95% CI [-2.20, -.70]. However, there was no such difference between the older children (p=.63, -.28, 95% CI [-1.01, .45].

Table 5.5

Numbers of Children based on their Choice of Emotional Display in Story 7 by Age

	Emotional Outcomes/Scores			
Age Group	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3-year-olds	11	4	3	1
4-year-olds	2	6	6	7
5-year-olds	2	4	5	11

Table 5.5.1

Univariate Analysis of Variance of Story 7 by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	23.86	2	12.12	.30	.00
Gender	2.02	1	2.05	.04	.16
Age * Gender	2.01	2	1.02	.04	.37

Note: R Squared = .34 (Adjusted R Squared = .28)

Story 8. Bob is the protagonist of this story who faces social pressure when sharing his favourite toy with a new friend in his nursery. His friends know he likes to play with that special toy, but the new boy in the nursery wants to play with it too. Bob may display negative emotion if he does not want to share his toy with a new friend. His smiling response would be his acceptance of sharing, irrespective of whether he was thinking about playing with the toy alone or with the new friend. Most of the children acknowledged that Bob should be sharing his toy with his friend in their answers to follow-up questions. Although his true desire is identified as playing alone, based on the protagonist's habits, the recent turn of events required imagining playing together. Playing together with a friend seemed more appealing to 30 children, so their explanations were: “he should be happy to share his car with a friend”, “not sharing his car with a friend would be rude”, and “playing together is fun”. Thirty-two children, who chose a positive emotional display, also used the prosocial words such as the underlined ones: ‘sharing (is important/ nice)’, ‘playing together nicely’.

Regardless of their emotional display choices, 21 children chose the version where the protagonist thinks about playing alone and not liking the idea of sharing his toy with a friend. Only 5 of those children chose a positive emotional display imagining playing alone. The rest chose the negative emotional display for the protagonist. When asked what they would do if a new kid in their class asks them to play together with their favourite toy; 34 children said that they would share and be happy about it. Nine children did not give any relevant explanation for their choices, and all of them chose a negative display of emotion for the protagonist. As Table 5.6 presents, younger children tended to go for a negative display for the story character. The univariate analysis of variance was demonstrated in detail in Table 5.6.1. It revealed that age was a significant predictor in Story 8. Tukey tests showed that the responses of 3-year-olds were statistically different from the 4- ($p<.05$, -.85, 95% CI [-1.64, -.07] and 5-year-olds ($p<.001$, -1.36, 95% CI [-2.13, -.57]. However, there was no difference between the older children, $p=.25$, -.50, 95% CI [-1.26, .25].

Table 5.6

Numbers of Children based on their Choice of Emotional Display in Story 8 by Age

	Emotional Outcomes/Scores			
Age Group	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3-year-olds	7	7	3	2
4-year-olds	1	6	6	8
5-year-olds	3	1	16	2

Table 5.6.1

Univariate Analysis of Variance of Story 8 by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	19.23	2	9.04	.24	.00
Gender	.47	1	.44	.01	.51
Age * Gender	1.96	2	.92	.03	.40

Note: R Squared = .27 (Adjusted R Squared = .20)

Story 9. John is the protagonist of this story in a dilemma based on being kind and polite to his sister for the hard work that she put into making cookies for him and revealing his true feelings about their unappetizing nature. As a reflection of his politeness, he could smile and display positive emotionality. Displaying negative emotions would be considered as showing his true feelings toward the cookies but that would upset his sister. Such actions would take place when imagining either how bad the cookies were or how much effort his sister put into making them. A positive display of emotions would conform to the norms of being kind to someone who has attempted to be kind themselves. In Table 5.7 the raw numbers of emotional display choices are shown. Three-year-olds tended to choose a negative display when they were disappointed with the outcome whereas older children appreciated the need to smile regardless of how bad the cookies were. In their explanations, older children pointed out how John's sister got tired after baking the cookies for him, so he should be smiling at her no matter what the cookies taste like. Younger children, on the other hand, stated that John would be frowning because he is not going to like the tasteless cookies. The univariate analysis of variance that was displayed in Table 5.7.1 showed that age significantly influenced children's choices in Story 9. Tukey tests showed that the 3-year-old-group responded significantly differently from the 4- (p<.05, -.87, 95% CI [-1.73, -.02] and 5-year-olds (p≤.001, -1.19, 95% CI [-2.13, -.45]. Again, there was no difference between the older children (p=.44, -.42, 95% CI [-1.24, .40].

Table 5.7

Numbers of Children based on their Choice of Emotional Display in Story 8 by Age

	Emotional Outcomes/Scores			
Age Group	Negative Display-Recent Event (1)	Negative Display-True Desire (2)	Positive Display-Recent Event (3)	Positive Display-true Desire (4)
3	11	3	2	3
4	3	6	6	6
5	2	6	1	13

Table 5.7.1

Univariate Analysis of Variance of Story 9 by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	17.67	2	7.06	.20	.00
Gender	1.35	1	1.08	.02	.30
Age * Gender	1.85	2	.74	.03	.48

Note: R Squared = .23 (Adjusted R Squared = .16)

Total SURE Score. Seven-items from the scales evaluated above were aggregated to create an overall score for this scale. The overall mean was 18.71 (*SD* =5.50, ranging from minimum 8 to maximum 28). The mean score increased by each age group (3-year-olds: *M*=14.26, *SD*=; 4-year-olds: *M*=19.81; *SD*=4.73; 5-year-olds: *M*=21.50; *SD*=4.73). When the univariate analysis of variance was employed to this new total score of SURE; Age had a significant effect on overall performance, and the detail of the analysis is in Table 5.8. Gender, on the other hand, did not significantly affect performance on the SURE. The interaction between two variables was also non-significant. Tukey tests showed that the performance of 3- year-olds was significantly different from both 4- and 5- year-olds. There was no difference between the performances of 4-and 5-year-olds.

Table 5.8

The analysis of variance on 7-item Scale (SURE) with Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	578.15	2	14.34	.34	.00
Gender	65.88	1	3.27	.06	.08
Age * Gender	71.12	2	1.76	.06	.18

Note: R Squared = .39 (Adjusted R Squared = .33)

Discussion

The objective of this chapter was to develop a scale that taps a specific skill of understanding emotion-regulation. Since Study 3 revealed that Conflict Inhibition and ER (positive) were explained mostly by SU and EU performance, the Scale of an Understanding of Regulation of Emotions (SURE) was developed.

As summarized in the introduction of this chapter, previous studies approached EU as the reflection of understanding of ER. Even those studies that investigated the notion of understanding of emotional-regulation process approached emotions post-hoc and explored the coping strategies with these past feelings. In SURE, children were presented with a story in which a character faces a need to suppress true feeling and display socially appropriate emotion. By creating items with such contrasts, a child’s anticipation for an emotional outcome that will be produced has been taken into account.

Nine-items were generated in the first place. As this pilot study suggested in the reliability analysis, two items were dropped from the scale so that the measure of internal consistency was strong. In most items (excluding Story 1), children’s age was a significant factor in their choice of emotional display for the story characters. Hence, through a reliability analysis it was ensured that the items in the scale were in harmony.

In addition to the reliability analysis, children’s choices of each story protagonist’s actions and thoughts were also informative. Choosing the positive emotional display was suggested as a reflection of ER, young children’s tendency to select positive emotions without considering the moral implications was suggested in a previous study by Nunner-Winkler and Sodian (1988). In spite of involving a moral transgression such as lying or stealing, as long as the protagonist gets what he or she wants, 4-and 5-year-olds claimed that the protagonist would be happy. Denham et al. (2014) recently suggested that when asked to make a judgement regarding an emotion younger children tend to go for positive emotions while older children were able to adjust their answers according to the context. Our findings here show that young children are able to attribute negative feelings to someone displaying positive emotion. According to their findings, younger children would have chosen a positive emotional display more often. However, the explanatory age analysis showed that.3-year-olds in this study tend to choose negative emotional outcomes for the protagonists. The consistent significant age differences in this study strongly suggest a developmental change between the choices of 3-year-olds and 4- year-olds (apart from Stories 1 and 5). When the scores of each item were aggregated, the overall SURE score also showed the same significant effect of age, with a 3-4 transition.

The performance in SURE should be compared to other SR constructs for two reasons. Firstly, SURE is also a comprehension task similar to SU and EU. Children's understanding and awareness of a situation that elicits certain emotions such as excitement or disappointment may relate to their false belief performance and the understanding of emotions in general.

The way children predict the desired emotional outcomes for the protagonist may determine ER performance. Therefore, a test of emotional-regulation would make better predictions for the ability to regulate both positive and negative emotionality in online assessments. Instead of using ER as a tool to keep the child's own psychological state stable, the SURE was specifically designed to test the types of competing demands that are presented in ER tasks. Thus, we expect the performance in SURE as a reflector of child's better grasp of control of emotionality in which the ER abilities are assessed without being too demanding.

Chapter 6 - How does the "Understanding" (Emotional and Social) relate to other Mechanisms of Self-Regulation?

Study 5 syntheses the constructs that have been examined in the previous studies of this thesis. It aims to explain the relationship between 'regulatory' (i.e., behavioural measures: CR and ER) and 'understanding' mechanisms (SU, EU and SURE). Figure 6.1 presents a schematic analysis of the relationships between these constructs in the previous chapters (i.e., in Studies 1, 2, and 3). The associations that were reported were not always consistent, as the reference to each study in Figure 6.1 suggests (the flag S2, for example, refers to Study 2 in each of the boxes with a lighter border). In terms of distinguishing the Conflict and Delay aspects of inhibitory control and their relation to emotion-regulation performance, Study 2 and 3 revealed a discrepancy. There seemed to be a strong relationship between SU and EU and each correlated with Conflict in Study 3. We need, first, to replicate this link with the new measure of ER-understanding in order more fully to explore the hypothesis that there is a crucial role of 'understanding' of mind and emotion in children's self-regulation.

There are two key aims of this thesis. One is to look more closely at the differences between conflict and delay tasks in their relations to emotionality. The other one is to clarify the assessment of emotionality in terms of regulatory performance. As illustrated in Figure 6.1, the ER measures demonstrated an inconsistent pattern regarding to their association to other SR constructs. In Study 3 (Chapter 4), the scope of ER was broadened with positive and negative emotionality and EU. A different developmental pathway was suggested for negative and positive ER processes due to their lack of association. The ability to hide a secret for an unusual confidant was considered as the regulation of positive emotions, and it was only related to emotion-comprehension performance in Study 3. The regulation of negative emotions was assessed via creating a 'disappointing' situation. The child's ability to control his or her emotionality was observed according to assumption that certain emotions (i.e. negative or positive) were always provoked in the assessment setting. The inconsistency that ER (negative) and ER (positive) presented in their associations to IC measures led to the development, in Study 4, of a new measure of the child's understanding of ER. In this chapter, this novel task of ER will be examined thoroughly in its relation to both cognitive and emotional aspects of SR.

Thus, this study adds a new dimension; the part of emotion understanding tested by the SURE was to assess prospective control of one's behaviour. The SURE investigates children's potential to appraise a situation where, instead of displaying true feelings, socially appropriate versions should be displayed. Chapter 5 identified that the SURE is a reliable way to measure such understanding in preschoolers. The beginning of the children's grasp of the pragmatics of the regulation of both emotions and thoughts is suggested to be an important point to start investigating both CR (traditionally assessed in delay or conflict inhibition) and ER (in both its positive and negative forms). Thus, this chapter aims to extend our grasp of the importance of children's growing 'awareness' of regulation.

In the previous studies, our analysis was guided by the psychological proximity among various measures of SR. For example, EU was considered as part of the ER measures, disregarding the task's demand of 'understanding' which resembles the demand of SU. At the same time, the regression analysis tested the expected proximity between behavioural or cognitive measures. As stated above, these analyses revealed that the link between emotional aspect of SR and Delay IC appears to be inconsistent. Thus, we aim to shift our focus to constructs to seek greater consistency in the associations between the constructs that have been examined throughout. With the inclusion of EU in Study 3, our focus shifted to exploring the importance of meta-cognition in terms of social and emotional abilities. Children's performance in Conflict IC was consistently related to SU and even EU, but the significance of EU's impact on Conflict disappeared when controlled by age. I believe that children's understanding of social cognition, emotion, and emotion-regulation may be the key underlying mechanism of SR.

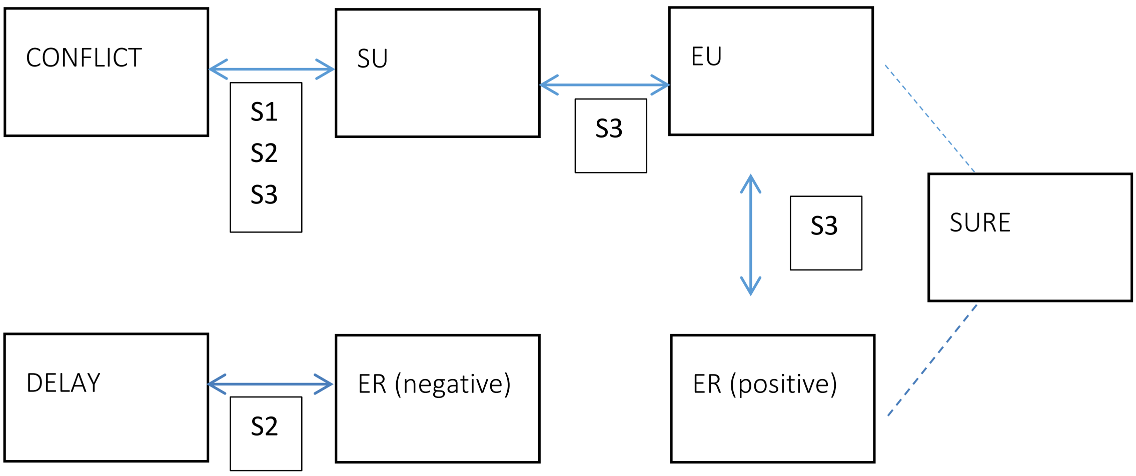
STUDY 5

To probe the trajectory of SURE, a straightforward question was asked in the current study, which was whether the ability of prospective emotion attribution according to ER requirements related to the performance of online control of emotionality. Regarding this question, it should be recalled that the items of SURE imitate real-life ER processes such as those tested in the Disappointment Paradigm. The demand of both ER assessments (i.e. negative and positive) may be different from the new method developed in the previous study, because of the engagement of the child with the given tasks. The child's contribution in SURE is easier to control by the experimenter, compared to ER tasks. By emotionality, I specifically refer to the child's reactivity in a task. The level (or valence) of experiencing emotions may be different for each child (Russell, 2009). The child's level of experiencing disappointment or excitement might be influenced by the prior events that cannot be controlled in a natural setting. It was felt that SURE might be a simpler way of elaborating children's understanding of the control of emotions. Similar to ER tasks, Delay performance is also prone to be influenced by situational factors (Kidd, Palmeri, & Aslin, 2013). The impact of such factors on the SURE should be considered as an equivalent to the effect of the behavioural measures used in previous studies.

Although the conditions for the protagonist in SURE were set up to match on the social interactions they experience in ER, the constructs tapped might online ER processes for the reasons mentioned above. The factors that may play a role in the ability to attribute ER in others might stem from the recognition of others' state of mind and/or inhibitory control. Thus, it is expected that SURE performance will be in a closer relationship with SU rather than performance-based ER measures. Moreover, based on the strong bond between SU and Conflict, it is predicted that the emotional attribution of control will also predict children's performance in Conflict tasks.

If SURE was related to SU and Conflict but not ER and Delay, some might argue that then the task I developed might be lacking the emotional qualities that I aimed to assess in the first place. I would like to remind the reader that the studies showing any effect of ER on the other cognitive abilities mostly relied on parental reports that make overarching statements about the child's behaviour in an emotionally challenging situation. I intend to put the child in a position where she or he can make predictions regarding an emotion-control in a familiar scenario. Hence, it is predicted that the performance in SURE would be a better reflector of children's developing ER mechanisms.

Figure 6.1: *Constructs explored in all studies*



[8] The dotted lines are put to represent the potential relationships that SURE might share with other SR constructs. SURE may demonstrate a link with performance based ER measures and/or cognitively driven Conflict Inhibition and 'Understanding' measures.

Table 6.1

The tasks used for each construct in Study 5

Skill Domain	Variable	Tests
Cognitive -Regulation	CR	
Conflict Dimension		Day & Night Task Hand Game Whisper Game Less is More
Delay Dimension		Marker Delay Snack Delay Gift Delay
Emotional -Regulation	ER	Disappointing Gift Secret Keeping
Social Understanding	SU	Unexpected Transfer False Belief Unexpected Content False Belief Appearance-Reality False Belief
Emotion Understanding	EU	Test of Emotion Comprehension
Understanding of Regulation of Emotion	SURE	A Scale for an Understanding of Regulation of Emotion
Verbal Ability	Language	TEDL-III (Turkish Adaptation)

Method

Participants

One hundred and twenty (60 female) Turkish children participated in this study. Their age ranged from 3 to 5 (*M*=53.77 months, *SD*=9.95 range: 34- 72 months). They were recruited from four nurseries in Bursa (Marmara region) in Turkey. The socio-economic statues of the families in those nurseries ranged from lower- middle to middle class. Following clearance from the Departmental and University Research Ethics Committees, parental consent was obtained through the school administrations. The consent and the willingness of the child to participate were taken very seriously before and during the testing. Five further children were tested but removed from the analysis due to: failing to complete all tasks (3), technical problems (speaker made odd noises that jeopardized the Secret Keeping task's credibility) (1), and refusing to continue to the study (1).

Procedure

Children were tested individually in a quiet room at their nurseries. The testing session lasted approximately one and a half hours to two hours depending on the child. The tasks were presented in a fixed order in two sittings (see Table 6.1 for the full list of tasks). At the end of the first sitting, E allowed the child to have a short break (5-10 min). In the first half of the test, False Belief tasks, Conflict tasks, SURE, the language measure, and TEC were administered. In the second half, Marker Delay, Secret Keeping, Toy Sort, Snack Delay, Gift Delay and the Disappointing Gift tasks were administered. 48 of children needed to finish the tasks in two sittings in addition to the usual break time, due to the interruptions caused by nursery's daily activities (i.e. lunch break, nap time).

Conflict Measures

The same Conflict measures (*Day/Night, Hand Game, Whisper Game,* and *Less is More* tasks, as in Study 3) were administered in Study 5.

Delay Measures

The same Delay measures as *Snack Delay* and *Gift Delay* tasks in Study 3 were administered in Study 5. In addition to these, the *Marker Delay* task was added. The Snack Delay task was based on the motivation of eating some treats. During testing in nurseries, meal times may interfere with some of the children's motivation in this task. So, in addition to using an edible reward following the wait, a task with a neutral reward was added.

The *Marker Delay Task* (Calkins, 1997) is adapted from the Telephone task (Vaughn, Kopp, & Krakow, 1984). It assesses the ability to suppress a desire to engage in an enjoyable activity. It measures children's response to delay colouring when left alone with the supplies to do so. Each child was presented with a box of markers/ crayons and paper. Then the participant was asked if she or he would like to colour. The box of markers was opened. They were readily accessible and visible, and both the markers and paper were pushed toward the child. Then E said that she needed to leave and she will be back in the room very soon. The child was instructed not to colour or touch the paper, markers, or marker box until E's return. The delay period was 2 minutes. Performance was scored based on ability to follow instructions. Scores ranged from 1 to 6 (see Appendix 6.1 for the scoring)

Emotionality Measures

For emotional-regulation, the *Disappointing Gift* and *Secret Keeping* tasks used in Study 3 were administered in Study 5. For emotional understanding, the Test of Emotion Comprehension (TEC) in Study 3 was administered in Study 5 as well. For understanding of emotional-regulation, The Scale of Understanding of Emotional-Regulation (SURE) that was developed in Study 4 was administered with a 7-item-version in Study 5.

Social Understanding (False Belief) Measures

The same three tasks were used in Studies 1, 2, and 3, Unexpected Transfer, Unexpected Content, and Appearance Reality tasks were administered in Study 5.

Language Measure

Test of Early Language Development-Third Edition: Turkish (TELD-3) was used as a language battery (Topbas & Guven, 2007). TELD-3 is a recently adapted Turkish assessment that is normed in Turkey. The test has both Receptive and Expressive language batteries. Considering the length of testing procedure, the Receptive language battery (Form A) was used. Children given the oral instructions: *"We are going to play a fun game now. I will show you some pictures. When I ask you to 'show me the small one' on the picture; you will point the relevant picture".* Testing started with an entry item based on the child's age. Then a basal point was specified according to the child's consecutive three correct answers. If the child did not succeed three items in a row, E continued with items that were prior to her/his entry point. The testing continued until the child made three mistakes in a row. When the child reached this ceiling, the raw score was calculated by adding correct items. Each was scored as 1 point.

Results

Study 5 comprised all the aspects of self-regulation that were addressed in the previous studies in this thesis. The purpose of the analysis here is to replicate the previous findings and to synthesise the components of self-regulation. In this study, verbal ability was also assessed, so this gives us the opportunity to control the effect of verbal ability in the regression analysis along with age. Then a conclusion can be made about whether verbal ability and age influence the relationship that the SR constructs share with each other. However, as mentioned in the introduction, rather than repeating the same predictions that were reported in the previous chapters, Conflict and SURE will be explored closely in terms their contribution to the aspects of SR (i.e. cognitive and emotional).

Comparisons by Age and Gender

Children's mean performance and standard deviations in each task of Study 5 are presented by age group in Table 6.1. As below, the preparation of each measure for the further analysis has been explained. The first analyses explore whether there are (within the constraints of a cross-sectional design) developmental changes in the constructs under investigation and the particular age transitions that are evidence from 3 to 5. Gender, on the other hand, is only tested for delay and emotion measures because the findings regarding the effect of gender on those constructs remain complicated in the literature such as better performance of the girls in Delay tasks (e.g. Jahromi & Stifter, 2008; McCabe & Brooks-Gunn, 2007). There is also the new measure –SURE - that is supposed to control for individual differences which may have any potential impact on the performance, by making the procedure as equivalent as possible for all children and making it third person.

Table 6.2

Descriptive Statistics for Conflict Measures by Age

Measures	Min	Max	Overall		3-year-olds		4-year-olds		5-year-olds	
			Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Day/Night Task	0	16	12.71	3.47	11.36	4.16	12.41	3.62	14.25	1.61
Hand Game	0	16	11.80	4.63	7.83	5.28	12.75	3.74	14.32	1.69
Whisper Game	0	1	.63	.36	.38	.40	.70	.31	.77	.26
Less is More	3	16	11.93	3.43	9.53	3.92	12.66	2.70	13.30	2.50

Conflict Measures

The Day/Night Task. The scoring was identical with the procedure reported in the Studies 1, 2, and 3. As illustrated in Table 6.2, the mean performance of the task was quite high. The mean scores for each age group increase with age. The 5-year-olds were almost at the ceiling. To avoid the effect of the negative skew, the Day/Night scores were transformed using the square root procedure. The analysis of variance was conducted with age on the transformed Day/Night scores. In Table 2, the detail of the analysis shows that Age significantly affected Day/Night performance, F (2,120) = 6.72, p<.01, η_p^2= .1. Tukey tests revealed that the performance of 5-year-olds was significantly different to that of the 3-years-olds (p<.001, .49, 95% CI [.17, .82]) but was not statistically different than the 4-year-olds (p=.06, .30, 95% CI [-.01, .61]). The performance was not statically different between 3- and 4-year-olds (p=.31, -.20, 95% CI [-.51, .12]).

The Hand Game. The scoring was identical with the procedure reported in Study 3. As illustrated in Table 6.2, 3-year-olds had the lowest mean score that was smaller than the overall mean. With increasing age, the mean score for the Hand Game increased. Similar to the Day/Night task, 5-year-olds' performance was almost at ceiling. The scores were square root transformed before the analysis of variance by age. Age had a significant effect on Hand Game performance, F (2,120) = 23.34, p<.01, η_p^2= .29. Tukey tests showed that the performance of 3-year-olds was statistically different from the 4-and -5-year olds, (p<.001, -.93, 95% CI [-1.35, -.49]; (p<.001, -1.22, 95% CI [-1.66, -.78])). The performance was not significantly different between the 4-and-5-year-olds, (p=.22, -.29, 95% CI [-.71, .12]).

The Whisper Game. The administration of the task was identical the procedure reported in Study 3. The scoring was slightly changed in this study. Children were instructed to whisper when they see the cartoon characters. However, some children did not know every cartoon character. Children's performance was supposed to be based on their ability to hold their impulse to call the character's name, not based on their cartoon character knowledge. Therefore, the following formula was used for calculating children's performance in this task:

Whispered Responses / (Whispered Responses+ Loud Responses)

Table 6.2 displays children's mean scores based on this formula. The three-year-old group has a lower mean score than the older children. The analysis of variance showed that the Age had a significant effect on the Whisper Game performance, F (2,120) = 15.53, p<.001, η_p^2= .21. Tukey tests revealed that the performance of 3-year-olds was significantly different to that of the 4-and 5-year-olds, (p<.001, -.32, 95% CI [-.49, -.14]; (p<.001, -.40, 95% CI [-.57, -.22]). The performance was not statistically different between 4-and 5-year-olds, (p=.50, -.08, 95% CI [-.25, .09]).

Less is More Task. The administration and the scoring were the same as in Study 3. Table 6.2 displays the mean scores for each age group. Three-year-olds had the lowest mean score in this task. Five-year-olds, with a mean score of 13.30, are very close the maximum score of 16 which indicate a possible ceiling effect. Children's scores were transformed by using the Square Root procedure. The transformed scores were used in the analysis of variance that showed that age significantly affects how children can inhibit their impulsive urge to point the box with more treats (e.g. stickers) and be able to point to the box with less treats to win more, F (2,120) = 17.54, p<.001, η_p^2= .23. Tukey tests show that the performance of 3-year-olds was significantly different from both 4-and 5-year olds, (p<.001, -.51, 95% CI [-.77, -.26]; p<.001, -.60, 95% CI [-.86, -.35]). However, the performance was not statically different between 4-and 5-year-olds, p=.65, -.09, 95% CI [-.34, .16].

Relations among Conflict Measures

The analysis of variance suggested that in the Day/Night task, the performance of 3- and 4 year olds was similar to each other in comparison to 5-year-olds who performed better than their younger peers. The aim of the analyses in this subsection (and subsequent ones with similar titles) is to examine how similar measures relate to each other and whether these should be combined to form a composite construct. For the other three Conflict measures, 4- and-5 year-olds showed a similar level of performance compared to 3-year-olds' poorer performance. Before creating a composite score out of the conflict measures, the inter-correlations among them were analysed. Table 6.3 displays that the strongest correlation appears to be between the Day/Night task and Hand Game. Hand Game was correlated with the Whisper Game and in the Less is More as well. The weakest correlation was between the Day/Night and the Less is More. The performance in each task was standardised (*z*-score) and those transformed scores were used to generate a Conflict Composite Score. The analysis of variance conducted with this new Composite score showed that Age significantly predicted it, F (2,120) = 35.14, p<.001, η_p^2= .38. The Conflict Composite Score is used in the further analyses.

Table 6.3
Pearson Correlations among Conflict Measures

	Day/Night	Hand Game	Whisper
Day/Night Task	-		
Hand Game	.45**	-	
Whisper	.30**	.42**	-
Less is More	.20*	.39**	.38**

*Note: * p <.05; ** p <.01*

Table 6.4

Descriptive Statistics for Delay Measures by Age

Measures	Min	Max	Overall		3-year-olds		4-year-olds		5-year-olds	
			Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Snack Delay	0	12	9.22	2.35	8.64	3.03	9.47	1.84	9.45	2.11
Latency	8	240	177.63	68.53	156.39	81.03	182.45	58.83	191.43	63.09
Gift Delay *Score*	0	2	1.41	.71	1.17	.85	1.48	.63	1.55	.64
Latency	2	60	45.85	78.97	43.08	20.33	46.30	19.26	47.85	17.50
Marker Delay *Score*	0	6	5.02	1.32	4.72	1.56	5.13	1.19	5.15	1.21
Latency	1	120	85.45	45.01	82.67	44.38	87.61	44.76	85.58	46.83

Delay Measures

One additional Delay measure was added to the design of Study 5; Marker Delay.

Snack Delay. The administration and the scoring of the task were identical with Study 3. Children's score out of 4 for each time-interval was aggregated to a total score. The latency to first hand movement was recorded. Table 6.4 displays children's scores out of 12 and clearly suggests an exceptional performance based on the mean scores. The score of 3-year-olds was slightly lower than older age groups whose performance was not different from one another. The analysis of variance by Age and Gender is presented in Table 6.5, and showed that the main effect of each demographic variable was not significant. However, the interaction between them had a significant effect on children's scores in Snack Delay task. To unpack the interaction, one-way ANOVA was conducted separately for gender groups. For girls (M= 9.43, SD=2.47), there was a statistically significant effect of Age, F (2, 57) = 4.57, $p \leq .01$. Tukey tests revealed that the performance of 5-year-olds was statically different than 3-year-olds ($p \leq .01$, 2.28, 95% CI .46, 4.11]. For boys (M= 9.00 SD=2.22), age had no significant effect on their Delay performance, F (2, 57)= 1.01, p=.37. The increasing ability with age and the better performance of girls was in line with McCabe and Brooks-Gunn's (2007) findings. The univariate analysis on the performance by children's latency to move hand did not show any statistical effect of age, F (2,120) = 2.74, p=.07, η_p^2=. 05; gender, F (1,120) = 1.92, p=.17, η_p^2= .02; or the interaction of these two, F (2,120) = .83, p=.44, η_p^2= .01.

Table 6.5

Univariate Analysis of Variance of Snack Delay Task Total Score by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	17.18	2	1.65	.03	.20
Gender	4.70	1	.90	.01	.34
Age * Gender	42.60	2	4.10	.07	.02

Note: R Squared = .10 (Adjusted R Squared = .06)

Gift Delay. The administration and scoring of the task were same as in Study 3. In Table 6.4, the mean score of children in the task (ranging from 0 to 2) was presented. Although 3-year-olds had the lowest mean score, all three age groups were above 1. Therefore, in Table 6.6, the children's responses in raw numbers were presented. It is clear that more children tend to wait without peeking whilst the E was wrapping their present. Furthermore, mean latency to peek for all age groups (overall mean was 45.85) was also high considering the 60 second delay period. Due to the negative skew on this performance, scores were transformed by Square Root procedure. As the analysis of variance with Age and Gender presented in Table 6.7 shows, both of them had a significant main effect on children's performance, as in scores in the Gift Delay task, but their interaction did not. The main effect of Gender was unpacked by conducting one-way ANOVA with Age for each gender group separately. It showed that statically significant age effect was only observed in girls (*M*=1.60, *SD*=.64), $F(2,57)=5.53$, $p \leq .01$; the same trend was not observed in boys (*M*=1.21, *SD*=.74), $F(2,57)=.26$, $p = .77$. The performance of 3-year-olds was significantly different from both 4- and 5-year-olds, ($p<.05$, -.25, 95% CI [-.49, -.01]; $p<.05$, -.28, 95% CI [-.52, -.03]). The performance was not statistically different between 4-and 5-year olds ($p=.96$, -.03, 95% CI [-.26, .20]). When the univariate analysis was conducted with children's performance as in latency to first peek in the Gift Delay task (see Table 6.8), only gender had a significant effect on performance (*for girls*: *M*=51.88,*SD*=14.30, *for boys*: *M*=39.82,*SD*=21.14) . Neither age nor the interaction between age and gender statistically predicted the latency to peek during the delay period.

Table 6.6

Children's responses in the Gift Delay Task by Age

	Gift Delay		
	Responses		
	fully turned/ looked (0)	look over the shoulder (1)	did not peek (2)
3-year-olds	10	10	16
4-year-olds	3	17	24
5-year-olds	3	12	25
Total	16	39	65

Table 6.7

Univariate Analysis of Variance of Gift Delay Task Scores (Transformed) by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	1.77	2	4.471	.07	.01
Gender	1.32	1	6.68	.06	.01
Age * Gender	.42	2	1.05	.02	.35

Note: R Squared = .14 (Adjusted R Squared = .10)

Table 6.8

Univariate Analysis of Variance of Gift Delay Task <u>*Latency*</u> *by Age and Gender*

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	444.29	2	.67	.01	.52
Gender	4407.22	1	13.26	.10	.00
Age * Gender	101.90	2	.15	.00	.86

Note: R Squared = .12 (Adjusted R Squared = .08)

Marker Delay. This task was added to the Delay measures as the stimulus was neutral, based on its lack of connection to any natural need for food. Children were instructed to not start colouring/drawing before E was back with some ‘special crayons’, so then the child can start colouring. The delay period that the E was absent was 2 minutes. The performance of children during that time was scored based on how they engaged in with the colouring activity. The minimum score of 1 point was given if the child started to colour with the makers. The maximum score of 6 was given if the child did not touch the marker or the paper during the delay period. The score of children was marked down based on whether they engaged with paper or the markers. When a child touched the paper, his or her score was marked down to 5 points and touching the box or the markers was scored as 4 points. The act of lifting the box of markers decreased the score to 3 points. The child received 2 point when she or he took the markers out of the box. The list of scoring also presented in Appendix 6.1. This task was used for the first time in this study, so inter-rater reliability with 20 % of the sample (24 children) was conducted. This showed a high agreement between two raters as the Kappa = .93 (p <.001), 95% CI (0.86, 0.97) (Landis &Koch, 1977).

Considering that the maximum score was 6, as Table 6.4 displays children's mean performance in the task, all age groups were very good at waiting during E's absence. 3-year-olds had the lowest mean score compared to older children but the score of 5-year-olds was almost at ceiling. Therefore, the scores were transformed by square root. The analysis of variance on the performance for Marker Delay task showed that neither the age nor the gender had a significant effect on Score: Age, F (2,120) = 1.55, p=.22, η_p^2= .03; Gender, F (1,120) = .44, p=.51, η_p^2= .00, and Latency: Age, F (2,120) = .12, p=.89, η_p^2= .00; Gender, F (1,120) = 1.12, p=.29, η_p^2= .01. The interaction between Age and Gender was also not significant for the Score: F (2,120) = .54, p=.59, η_p^2= .01, or the Latency F (2,120) = .75, p=.48, η_p^2= .01.

Relations among Delay measures

Before exploring the relationships that the Delay measures may have with other variables, the inter-correlations among three tasks were presented in Table 6.9. For obvious reasons the score and the latency in each task had the strongest correlation with each other. The score of Snack Delay was positively correlated both the scores Gift and Marker Delay task. The score for Gift Delay was also positively correlated with the Marker Delay Score. A similar pattern also occurred between the latency in all three Delay tasks. Based on these inter-correlations, the scores and the latency in the three tasks were standardized (z-scores) and aggregated to generate a Composite Delay Score and a Composite Delay Latency performance. These two Composite Delay measures were strongly correlated to each other r (119) =.85, p<.01. The univariate analysis with Age and Gender on the Composite Delay Score showed that only children's age significantly predicted performance F (2,120) = 3.27, p=.04, η_p^2= .05. The univariate analysis with Composite Delay Latency showed no significant effect of age or gender on children's performance.

Table 6.9

Pearson Correlations among Delay measures

	SD Score	SD Latency	GD Score	GD Latency	MD Score
Snack Delay *Score*	-				
Snack Delay *Latency*	.79**	-			
Gift Delay *Score*	.46**	.34**	-		
Gift Delay *Latency*	.34**	.34**	.61**	-	
Marker Delay *Score*	.47**	.43**	.25**	.34**	-
Marker Delay *Latency*	.40**	.34**	.17	.22*	.72**

Note: * p <.05; ** p <.01.

Emotional -Regulation Measures

Table 6.10

Descriptive Statistics for Emotion Measures by Age

Measures	Min	Max	Overall		3-year-olds		4-year-olds		5-year-olds	
			Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Disappointing Gift	-6	4	-1.25	2.19	-1.53	2.51	-1.18	1.98	-1.08	2.13
Secret Keeping	0	2	.60	.77	.47	.77	.50	.66	.82	.85
EU	0	7	3.67	1.85	2.28	1.52	4.00	1.77	4.55	1.48
SURE	8	27	18.83	5.35	16.08	5.56	18.16	5.08	22.03	3.63

Disappointing Gift. The administration and the scoring were same as in Studies 2 and 3. In the previous studies, the numbers of positive and transitional reactions were summed and then subtracted from the number of negative reactions. As displayed in Table 6.10, children's scores ranged from -6 to 4. A smaller score means that children had fewer negative and more positive/transitional reactions. For all age groups, children's scores were not particularly different. For a thorough picture of children's performance in the Disappointing Gift task, in Table 6.11, mean reactions in each emotional category are presented. For all age groups, children showed a smaller number of positive reactions. The mean number of the transitional reactions was marginally the highest. The univariate analysis with Age and Gender on the Disappointing Gift score revealed that neither of them has a statistical effect on children's performance of masking their disappointment (Age, F (2,120) = .44, p=.65, η_p^2= .01. Gender, F (1,120) = 1.97, p=.16, η_p^2= .02, Age X Gender, F (2,120) = .79, p=.46, η_p^2= .01).

Table 6.11

Responses in Disappointing Gift Task (Mean and Standard deviations)

Age	Positive		Negative		Transitional	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
3-year-olds	.83	1.18	2.27	1.21	2.97	1.21
4-year-olds	.70	.95	2.31	.95	2.79	1.13
5-year-olds	.65	.98	2.55	1.11	2.98	1.22

The Secret Keeping Task. The administration and the scoring were same as in Study 3. As Table 6.10 displays, children who did not reveal the secret following all 6 prompts, received the maximum score of 6. However, similar to Study 3, children's responses clustered around revealing the secret in the first half of the task, or not revealing the secret at all. Therefore, as presented in Table 6.12, children's performance was assessed using a 3-point-scale. For all age groups, children mostly tended to reveal the secret on E's first return to the room. Children who told the secret in the first half of the task received the score of 0. Only 21 children out of 120 managed to keep the fish's secret and their performance was scored with 2 points. Children who revealed the secret when E prompted them with questions received the score of 1.There were a few in this group as the children who kept the secret. The performance in this task suggested a positive skew but it was within acceptable limits. The univariate analysis on the Secret Keeping score (see Table 6.13) showed no main effect of Age or Gender. However, the interaction of two had a significant effect on children's performance. Table 6.12 shows the raw numbers of responses and the mean scores for each gender group by age. To unpack the interaction, one-way ANOVA was conducted for each gender group and showed that Age was statically a significant effect on girls' performance (*M*= .72, *SD*=.78), *F* (2, 57)= 5.71, *p*<.01; but not for boys (*M*= .47 *SD*=.75), *F* (2, 57)= .18, *p*=.83. The performance of 5-year-old girls was statically different from 3-year-olds (*p*<.01, .76, 95% CI [.19, 1.33]) and 4-year-olds (*p*<.05, .56, 95% CI [.02, 1.09]).There was no statistical difference between 3-and 4-year-olds, *p*=.66, -.20, 95% CI [-.76, .35].

Table 6.12

Number of children who kept the secret or not in the Secret Keeping by Age

Age		Secret Keeping: Told Secret (0)	Told Secret during Prompt (1)	Kept Secret (2)	*Mean*	*SD*
3-year-olds	Female	13	3	2	.39	.70
	Male	12	2	4	.56	.86
4-year-olds	Female	11	9	2	.59	.67
	Male	15	5	2	.41	.67
5-year-olds	Female	15	7	8	1.15	.81
	Male	13	3	3	.47	.77
Total		69	29	21		

Table 6.13

Univariate Analysis of Variance of the Secret Keeping Task Score by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	2.77	2	2.50	.04	.09
Gender	1.57	1	2.83	.02	.10
Age * Gender	3.38	2	3.05	.05	.05

Note: R Squared = .11 (Adjusted R Squared = .07)

Emotional Understanding (EU) Measure

Test of Emotion Comprehension (TEC). The administration and scoring of this task were the same as in Study 3. In Table 6.10, the mean scores for each age group show that the youngest group had the lowest mean score compared to the older children. In the analysis of variance presented in Table 6.14, both age and gender had a significant effect on children's emotional-understanding. The interaction was not significant. Tukey tests revealed that the performance of 3-year-olds was significantly different than both 4-and 5 year-old children, (p<.001, -1.72, 95% CI [-2.56, -.88; p<.001, -2.27, 95% CI [-3.13, -1.41]). There was no statistical different between the performances of 4-and 5-year-olds (p=.25, -.55, 95% CI [-1.36, .26]). The performance of the girls was better than the boys (*for girls*, M= 4.00, SD=1.79; *for boys*, M= 3.33 SD=1.86).

Table 6.14

Univariate Analysis of Variance of the TEC by Age and Gender

Source	Sum of Squares	df	F	η_p^2	p
Age	105.54	2	21.45	.27	.00
Gender	12.31	1	5.01	.04	.03
Age * Gender	7.36	2	1.50	.03	.23

Note: R Squared = .31 (Adjusted R Squared = .28)

The Scale of Understanding a Regulation of Emotions (SURE). The administration and the scoring of this scale were identical with the procedure reported in Study 4. As the reliability analysis suggested in Study 4, the 7-item version of the scale was administered. The SURE was found to be highly reliable as the Cronbach's alpha was .81. Children's performance was scored based their choice of a positive or negative emotional display for the protagonist of the stories. Each item was scored from 1 to 4. Thus for all 7 items, the maximum score was 28 and the minimum score was 7. As Table 6.10 displays, the mean score of 5-year-olds was quite high. The mean scores of the two younger age groups were less than the 5-year-olds. The analysis of variance showed that children's age has a significant effect on their overall performance in the SURE (see Table 6.15). Neither gender, nor the interaction was significant. A Tukey test showed that the performance of 5-year-olds was statistically different from both 3-and 4-year-olds (*p*<.001, 5.94, 95% CI [3.33, 8.55; *p*<.001, 3.87, 95% CI [1.38, 6.35]). However, the performance of 3-year-olds was not statistically different from the 4-year-olds, *p*=.14, -2.08, 95% CI [-4. 63, .48].

Table 6.15

Univariate Analysis of Variance of the SURE by Age and Gender

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	699.71	2	15.27	.21	.00
Gender	56.50	1	2.47	.02	.12
Age * Gender	40.25	2	.88	.02	.42

Note: R Squared = .23 (Adjusted R Squared = .20)

Relations among Emotionality Measures

To generate a composite emotional-regulation score, inter-correlations among the emotionality measures are presented in Table 6.16. As it displays, the positive and negative emotional-regulation neither relate to each other nor relate to the emotion understanding (TEC) and emotion-regulation understanding (SURE) scales. On the other hand, understanding of emotion and emotional-regulation scales were positively correlated with each other, *r* (119) =.40, *p*<.001. The lack of inter-correlations among the emotionality measures led to the decision to examine each aspect of emotional-regulation separately in the further analyses.

Table 6.16

Pearson Correlations among Emotionality Measures

	Disappointing Gift	Secret Keeping	TEC
Disappointing Gift	-		
Secret Keeping	.13	-	
TEC	-.02	.15	-
SURE	.02	.11	.40**

*Note: * p <.05; ** p <.01*

False Belief (Social Understanding) Measures

The Unexpected Content Task. The scoring was identical to Studies 1, 2, and 3. A chi-square test for association was conducted between age and self- and other-false belief performance. There was a statistically significant association between children's age and self-false belief performance, $\chi^2(2) = 31.65$, $p < .001$, Cramer's $V= .51$. A chi-square test for association was also significant for the other's false belief performance $\chi^2(2) = 33.12$, $p < .001$, $V= .53$. Table 6.17 presents children's performance and binomial tests against chance in each age group. The 4-and-5-year-olds were both above chance on their performance.

Table 6.17

Number of children who responded to Unexpected Content Task

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	14	39	0.24
		Wrong	22	61	
	4	Right	35	80	0.00
		Wrong	9	20	
	5	Right	38	95	0.00
		Wrong	2	5	
Other	3	Right	12	33	0.07
		Wrong	24	67	
	4	Right	31	70	0.01
		Wrong	13	30	
	5	Right	38	95	0.00
		Wrong	2	5	

The Unexpected Transfer Task. The scoring was identical to Studies 1, 2, and 3. A chi-square test for association was conducted between age group and children's performance of the false belief of others. There was a statistically significant association between age and other's false belief performance, $\chi^2(2) = 18.42$, $p < .001$, $V = .39$.

Table 6.18

Number of children who responded to Unexpected Transfer Task

	Age		Obs N	Obs Prop (%)	P
Other	3	Right	15	42	0.41
		Wrong	21	58	
	4	Right	31	70	0.01
		Wrong	13	3	
	5	Right	35	88	0.00
		Wrong	5	13	

The Appearance-Reality Task. The scoring was identical to Studies 1, 2, and 3. A chi-square test for association was conducted between age and self- and other's-false belief performance. There was a statistically significant association between children's age and self-false belief performance, $\chi^2(2) = 29.18$, $p < .001$, $V = .49$. A chi-square test for association was also significant for others' false belief performance $\chi^2(2) = 36.63$, $p < .001$, $V = .55$. Table 6.19 illustrates that both 4-and-5-year-olds were above chance.

Table 6.19

Number of children who responded to Appearance –Reality Task

	Age		Obs N	Obs Prop (%)	P
Self	3	Right	12	33	0.35
		Wrong	24	67	
	4	Right	29	66	0.00
		Wrong	15	34	
	5	Right	37	93	0.05
		Wrong	3	07	
Other	3	Right	9	25	1.00
		Wrong	27	75	
	4	Right	28	64	0.00
		Wrong	16	36	
	5	Right	37	93	0.00
		Wrong	3	07	

Total False Belief Score. Similar to the previous studies, children's performance in each false question was aggregated to generate a Total False Belief Score. Out of 5 false belief questions, in this aggregated measure, children's maximum score was 5 and the minimum score was 0. Three-year-olds had the lowest mean score (*M*=1.72, *SD*=.14) whilst the 5-year-olds were nearly at ceiling (*M*=4.63, *SD*=.87). Four year olds had mean score of 3.50 (*SD*=1.41). The analysis of variance by age conducted on the total false belief score is presented in Table 6.20. This shows that children's age had significant effect on the false belief performance. Tukey tests showed that the 3-year-olds' performance was significantly different from the 4-and 5-year-olds (p<.001, -1.78, 95% CI [-2.44, -1.11]; p<.001, -2.90, 95% CI [-3.58, -2.22]). The 4-and 5-year-olds were also statistically different form each other, *p*<.001, -1.13, 95% CI [-1.77, -.48].

Table 6.20

Univariate Analysis of Variance of the Total False Belief Score by Age

Source	Sum of Squares	d*f*	F	η_p^2	*p*
Age	161.39	2	51.99	.47	<.001

Note: R Squared = .47 (Adjusted R Squared = .46)

Correlation Analysis

Prior to the predictive analysis among different aspects of self-regulation, associative analysis was conducted via Pearson correlations and presented in Table 6.21 below. Conflict Inhibition had a small correlation with the Delay aspect of the same construct. Consistent with the previous findings, Conflict was strongly associated with SU, as in false belief performance. Conflict was also correlated with EU and the understanding of emotional-regulation (SURE). Against the previous findings in this thesis, Conflict performance shared a (weak) correlation with children's performance of regulating positive emotionality (e.g. excitement) in the Secret Keeping task(ER-positive) in this study. Although it was a small correlation, this finding provokes the concerns about a shared inhibitory demand between ER (positive) and SU. Delay Inhibition did not relate to the children's performance in the regulation of both positive and negative emotions but it had a small correlation with EU. ER-(negative) performance in the Disappointing Gift task did not correlate with any of the other measures. ER (positive) performance in the Secret Keeping task was correlated with SU and Conflict. Children's understanding of emotional-regulation in SURE by attributing altered displays of emotions to the protagonists had no association with ER performance. Two understanding scales were correlated with each other as mentioned earlier.

Table 6.21 shows that EU and SURE were highly associated with the children's social understanding which may indicate an alignment of among these measures because all were assessing conceptual competence. The performance in Conflict tasks was also related with EU and SURE which may indicate that inhibitory control performance may reach to solving conflicting emotional representations. In following section, the regression analysis is conducted with each of the aspects of inhibitory control, emotionality measures and social understanding.

Table 6.21

Pearson Correlations among all variables of Study 5

	Conflict C.	Delay Score C.	Disappointing Gift	Secret Keeping	TEC	SURE	False Belief	Language
Conflict Composite	-							
Delay Composite	.26**	-						
Disappointing Gift	.13	-.11	-					
Secret Keeping	.22*	.04	.13	-				
EU	.60**	.20*	-.02	.15	-			
SURE	.53**	.06	.02	.11	.40**	-		
SU	.65**	.16	-.00	.28**	.60**	.46**	-	
Language	.36**	.07	-.15	.07	.47**	.16	.32**	
Months	.67**	.21*	.11	.19*	.56**	.46**	.69**	.07

Note: * p <.05; ** p <.01

Regression Analysis

In a hierarchical regression analysis, the tasks were grouped and loaded in the analysis based on their cognitive or affective demand affiliations. The measures were grouped together in an attempt to resolve the conflicting findings between Studies 2 and 3 regarding the relationship between ER and IC. As mentioned in the introduction, the behavioural measures such as ER and Delay were unpredictable in their contribution. Study 5 aimed to clarify this discrepancy by generating models to explain the factors that relate to SURE as a new an outcome measure that embodies both affective and cognitive demands. Conflict performance has been suggested as a core predictor of SU and its potential relations to emotionality is further investigated in this section. To be able make clear conclusions, it is necessary to develop parsimonious models for both Conflict and SURE to identify the relationship between the cognitive and emotional aspects of SR. Another tweaking in the regression analysis was done in the order of the loading of demographic variables. As a new addition language was also known for its impact in the growth of SU and EU in the literature (e.g. Astington & Jenkins, 1999; Ruffman, Slade, Rowlandson, Rumsey, & Garnham, 2003). Age and Language performance were added into regression analysis as a final step, thus the effect of age or verbal ability were overpowering the effect of the psychological constructs was controlled.

Predicting Conflict. Table 6.22 displays all the details of the hierarchical regression analysis which generated three models to predict Conflict performance. As mentioned above (and in the introduction), the behavioural measures were loaded as Model 1. This was significant and ER (negative) and Delay contributed significant variance. This model had a very low R^2 value. In Step 2, SU and EU as understanding measures were added along with SURE (its demand varied between understanding and attribution of ER) and all three new variables were significant predictors along with ER (negative) and Delay. Model 2 was significant and has a statistically higher R^2 value. However, there was a change of the significance occurred in the variance that ER (negative) contributed in Model 2. Despite its lack of contribution to the previous model, the contribution of 'understanding' measures related it in such a way as to produce unique shared variance with Conflict. In Step 3, age and language performance were added and generated also a significant model; but the significant predictors were different to Step 3. The contribution of age and language were significant but their inclusion caused the loss of significance for SU and EU in Model 3. Despite their correlation with Conflict, EU and SU were no longer contributing the variance. The effect of SURE on the other hand remained significant.

Language might play a role in the disappearance of the effect of SU and EU because verbal performance is known to be closely related to both of the understanding performance. Thus, I attempted to separate the effect of age and language by adding them into the analysis in separate steps, in models excluding the influence of the behavioural measures. Table 6.22.1 presents these models. In Step 1, SU, EU and SURE were loaded and each contributed unique variance to the Conflict in a model that had a fairly good R^2 value. In Step 2, inclusion of the age generated a statically better model in which each variable was significantly predicting the outcome. In Step 3, language performance was added and the model was also significant but SU and EU were no longer contributing statistical variance. As expected, when verbal ability was taken into account, the standardized performance in TEDL-III seemed to overpower the contribution of SU and EU. In Model 2, significant contributions of SU, EU, SURE, and Age show that the representation of emotionality and its attribution purposefully plays an important role on children's inhibitory responses in complex tasks that require handling two conflicting mental representations.

Table 6.22

Hierarchical Multiple Regression of Variables Predicting Conflict

	Conflict Composite Score								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
ER (positive)	.18	.08	.18*	.03	.06	.03	.03	.06	.03
ER (negative)	.04	.03	.12	.05	.02	.15*	.05	.02	.14*
Delay *Score* Composite	.25	.08	.27**	.14	.06	.15*	.11	.06	.12*
SU				.15	.04	.35**	.07	.04	.16
EU				.10	.03	.25**	.04	.03	.09
SURE				.03	.01	.25**	.03	.01	.21**
Month							.03	.01	.36**
Language							.01	.00	.22**
R^2		.13			.57			.64	
F		5.48**			25.14**			24.34**	
ΔR^2					.45			.07	
ΔF					39.23**			9.93**	

Note: *p < .05; **p < .01

Table 6.22.1

Hierarchical Multiple Regression of Variables Predicting Conflict (Alternative-without behavioural measures)

	Conflict Composite Score								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
SU	.16	.04	.37**	.09	.04	.21*	.07	.04	.16
EU	.11	.03	.27**	.08	.03	.21**	.04	.03	.10
SURE	.03	.01	.25**	.03	.01	.20**	.03	.01	.20**
Month				.02	.01	.31**	.03	.01	.40**
Language							.01	.00	.20**
R^2		.54			.57			.59	
F		44.63**			40.12**			35.57**	
ΔR^2					.05			.03	
ΔF					12.92**			7.80**	

Note: $*p < .05$; $**p < .01$

Predicting SURE. SURE was developed to explore whether there is interference between the online assessment of emotional behaviour and the understanding of ER. This new scale was analysed through hierarchical regression models with a novel approach. Understanding measures – SU and EU were grouped together instead of loading EU together with ER measures in the first step as in the previous study (Chapter 3).

In this study, behavioural and understanding measures were grouped separately. So, in the first step ER and Delay were loaded in the analyses because they represent the behavioural outcomes. Thus, EU was not loaded in this step. As Table 6.23 illustrates, Model 1 was not significant. I continued with loading the understanding measures in Step 2 and the Conflict in Step 3. Model 2 revealed that SU contributed a significant variance to model. In Step 3, the inclusion of Conflict created a statically better fit than Model 2. Conflict was the only significant predictor of SURE in Model 3. Children's ability to inhibit impulsive responses in cognitively demanding tasks appears to predict their performance of attributing regulated emotional displays for others in social interaction. Children's insight into comprehending emotions and the requirement of emotional-regulation social situation did not relate their online performance of suppression of positive or negative emotionality. Understanding emotionality, though, was affiliated with cognitive control of conflicting situations and rules.

Similar to the approach in the analysis of Conflict and based on the lack of significance of the model that contained the behavioural measures the variables that were loaded in the Step 1 were dropped in the next regression analysis. As Table 6.23.1 illustrated, in Step 1 SU and EU were loaded and only SU was contributing a unique variance to SURE. EU on the other hand did not contribute to model. One of the concerns about including EU in a model that predicts SURE was that both scales might be very similar in their assessment of emotional ability. It is considered that EU might be dropped from the analyses later. In Step 2, with the inclusion of Conflict; SU also lost its significant contribution to model. The addition of Age and Language in Step 3 generated a significant model but neither of demographic variables contributed unique variance to SURE. Model 3 was not statically different than the previous model based on the ΔR^2 value. When the EU was dropped from the regression analysis, new model was not as strong as the prior ones but both SU and

Conflict were contributing unique variance to SURE, R^2= .31, F (2,117)= 25.87, p<.001; adjusted R^2=.30.

In a nutshell, children's ability to attribute prospective emotional outcomes where the masking of the true feelings was necessary was strongly related to their performance in tasks which require them to inhibit a prepotent response in favour of the less salient one. Children's emotional attribution was also related to their ability to grasp the other's mental states. It appears that, at the core of a need for masking a true feeling lies in the ability to consider others as mental entities. The findings from the current study support this assumption despite the less likely relationship of ER and SU in the literature (Blankson et al., 2012, 2013; Liebermann et al., 2007).

Table 6.23

Hierarchical Multiple Regression of Variables Predicting SURE

	SURE								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
ER (positive)	.72	.65	.10	-.17	.60	-.03	-.23	.57	-.03
ER (negative)	.01	.23	.00	.06	.21	.03	-.09	.20	-.04
Delay Score	.40	.64	.06	-.25	.58	-.04	-.63	.56	-.09
SU				1.11	.34	.35**	-.70	.36	.17
EU				.58	.30	.20†	.55	.07	.09
Conflict							3.02	.84	.41**
R^2		.12			.49			.56	
F		.57			7.03**			8.64**	
ΔR^2					.22			.08	
ΔF					16.50**			12.97**	

Note: **p* < .05; ***p* < .01, † = *.057*.

Table 6.23.1

Hierarchical Multiple Regression of Variables Predicting SURE (Alternative-without behavioural measures)

	SURE								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
SU	1.08	.32	.35**	.55	.34	.17	.44	.38	.14
EU	.57	.29	.20┼	.22	.30	.08	.26	.33	.09
Conflict				2.76	.80	.37**	2.60	.88	.35**
Months							.04	.07	.08
Language							-.02	.03	- .06
R^2	.24			.31			.32		
F	18.33**			17.36**			10.62**		
ΔR^2				.07			.01		
ΔF				11.99**			.65		

Note: *p < .05; **p < .01, ┼=*.056*.

Discussion

Study 5 explored the association of cognitive and emotional aspect of SR at a new level. It examined the influence of the ‘understanding’ of others’ mental representations, feelings, and the conditions that require regulation of emotions. The Conflict aspect of IC was related to SU, EU, and the meta-understanding of ER (SURE). As highlighted earlier (in Study 2), Conflict was found to be not associated with emotional aspect of self-regulation. Despite the correlation reported between Conflict and ER (negative) in Study 3; and with ER (positive) in Study 5, the relationship was inconclusive because the association with regulation performances was not supported by the regression analysis. Rather than relying on the behavioural measures of ER, children’s ability to attribute prospective emotions in conditions where the true feelings were supposed to be masked was compared to inhibitory control in Study 5. The Delay aspect of IC was associated with Conflict and EU but it did not share any relationship with the other constructs in Study 5. The different pathway of Delay performance in each of these studies will be discussed in further detail in Chapter 7.

One particular problem with the Delay task in this study concerned the increased number of tasks administered. Children might have been disappointed in the Marker Delay task because E said that she will turn up with new set of crayons. Although she did, children had already been patient and were alone in the room for 2 minutes. Later they were asked to wait 4 more minutes in Snack Delay and then another minute for Gift Delay. The performance in each delay task was associated with the others but extending the tasks may have eroded their performance in the consecutive tasks. For example, the number of children who actually ate the treat in the Snack Delay task increased in the current study. Only 6 children ate the treat in Study 3 but their number increased 29 in the current study. So by increasing the number of Delay task, we may have cause a disadvantage for children.

There have been inconsistent findings regarding ER measures. For example, there was a lack of association between ER (positive) and EU in Study 3 but ER (positive) was related to SU in the current study. The association with EU may indicate that regulation and understanding of emotions might stem from a similar core which was claimed by many researchers (Izard et al., 2011; Waters et al., 2010; Cole et al., 2009). There are not many studies that have examined the performance –based ER and SU relationship. Liebermann et al. (2007) and Blankson et al. (2012; 2013) who investigated the link between SU and ER, reported that there was a lack of association between very common. However, this can be explained based on the demands of both false belief and secret keeping tasks. The ER (positive) task imposes a demand of deception that is very high because children are expected to see the talking fish as a confederate. Lewis et al (1989) claimed that false belief performance is closely related to children's deception ability. The demand of manipulating the reality to create a misconception in another person resembles (and requires) the ability to represent (imagine) another's mental representation which may entitle an alternative reality. Thus, both EU and SU were associated with ER performance, suggesting that 'understanding' plays a role in the domain of emotion-control abilities.

Moreover, despite the studies that claimed that there is a lag between understanding of emotions and the false belief (Cutting & Dunn, 1999; Harwood & Farrar, 2006), the current study showed a close relationship between SU and EU. In addition to their correlation, predictive analysis that has not been reported in this chapter (see Appendix 6.2) showed that the correlation between EU and SU was strong even when controlled by age but not by language performance. Our focus on SURE as a task that collaborate the qualities of SU, EU and ER (in social context) was due to its relation to the cognitive-control would be considered as a support for CR and ER relationship.

SURE was strongly associated with SU and EU. It lacked an association with the behavioural measures of ER. However, it was shown that SURE predicted Conflict. Although ER measures suggested an odd relationships with both Conflict (in Study 3) and Delay (in Study 2), those were not repeated to make trustworthy conclusions. SURE on the other hand (as a measure of children's ability to make prospective emotional attributions for situations requiring ER) had a strong relationship with Conflict that persisted even when the age and language skills were considered. This may lead us to consider that the SURE as a task may resemble a false belief task. According to Wellman and Liu (2004), though, children's ability to grasp the emotional meaning of mental (social) interactions would develop later in preschool years around age of 6. Nonetheless, children's performance on SURE, as a task exploring emotional demands within a social situation, showed that at around age of four they tend to understand the necessity of masking true feelings. There was clear age difference that 3-year-old were more likely to attribute the true feeling of protagonist whereas older groups (4-and 5-year-olds) tend to mask the true emotions and chose emotional displays that socially appropriate for the protagonist. These findings will form the core of the final section of Chapter 7.

Chapter 7 - General Discussion

"The greatest weapon against stress is our ability to choose one thought over another."

William James [cited by Jamieson, Nock, & Mendes, (2012)]

General Discussion: Does the ability to 'understand' lie at the core of Self-Regulation?

When I was first interested with self-regulation as a doctoral research topic, I kept returning to the philosophical background behind self-regulation as this provides an essential ingredient for our understanding of this construct. Schopenhauer raises the idea that to understand the 'will' we necessarily need to consider the intertwined nature of 'desire' and 'action' in the production of 'control' and 'understanding' (see Appendix 1).

I am not the first to address the link between control and understanding. In the past three decades, the understanding of mind (theory of mind/SU) along with its relations to the control of the mind (EF) has been one of the most investigated topics in developmental psychology. I am also not the first to mention Schopenhauer's explanation of the inseparability of mind and will in terms of young children's developing control of themselves and their social surroundings. As mentioned in Chapter 1, Russell's (1996) argument on experience of agency was referred to in its claim that self-awareness depicts children's control over their action in terms of their emerging self-awareness as beings separate from others.

The investigation of self-regulation had two angles. First, the developing ability to control in cognitive and emotional domains and their interaction were explored. Second, the 'understanding' of these domains that are imbued with both cognitive and emotion-regulation was investigated. This chapter will briefly summarize the contribution of each study and will focus on the collective empirical findings in an attempt to draw together a novel approach tp preschoolers' the self-regulation.

In Study 1, the cognitive aspect of SR was linked with inhibitory control. The distinguishable demands within IC, Conflict, and the ability to Delay were identified based on their differential association with SU. Even with a small sample, Study 1 showed that the relationship between control and understanding can only formed between Conflict and SU that was consistent with previous studies (e.g. Carlson & Moses, 2001). Study 2 introduced the focus on ER performance in negative emotion-inducing situations. This construct was only related to Delay Inhibition. Interestingly this finding was unique to that data set and was not observed in the later studies. The inconsistency of Delay, regarding its assessment and theoretical grounding, is discussed briefly in section 7.1.

Study 3 stretched the scope of ER by including the regulation of positive emotions and emotional understanding. A separate dynamic within ER was suggested in Study 3 due to the lack of association between positive and negative ER measures. Moreover, ER (negative) showed an association with Conflict, instead of Delay as reported in Study 2. Conflict Inhibition also had an association with EU which was noteworthy given the paucity of research which has been conducted to examine at the influence of CR on the growing ability of comprehension of emotions. The strong association between SU, EU and Conflict raised an issue on the role of 'understanding' as within social-cognition. So, Study 4 devised a scale –SURE - to measure children's understanding of emotions, specifically in ER situations. The assessment of ER in performance–based settings, rather than parental reports, was one of the aims of this thesis. However, the inconsistency of the findings and difficulties of testing are critiqued in section 7.2.

Study 5 consisted of SURE along with other SR constructs that were in question in the previous studies. In spite of being associated with performance-based ER; understanding of the nature of situations that require ER in SURE was related to the ability of inhibiting prepotent responses (Conflict) and understanding others' belief (SU) and emotions (EU). A long-discussed issue of the 'control' versus 'understanding' issue will be addressed based on the findings from Study 5, in section 7.3.

7.1 What is the Role of Delay Inhibition in Self-Regulation?

Delay Inhibition was addressed in Chapter 1 through the lens of self-control, following Mischel et al. (2010). I asked whether Delay can be used as a construct/measure to represent children's ability to abstain from temptation and can influence the development of emotion- regulation. Interestingly, a relationship between Delay and ER (negative) was demonstrated in Study 2. This relationship suggested that a shared skill may be responsible for both coping with a negative display of emotions and the ability to postpone a desirable action. However, their link was not replicated in the following studies. One of the two issues should be considered here is that the assessment of Delay performance. A structured Snack Delay task that was developed by Kochanska et al. (2000) was used in Study 2 and I will reflect upon this next. The other issue concerns the situational factors that recent studies suggested may influence the child's performance.

The methodology used for assessing Delay inhibition is rich and includes a variety of different tasks. However, each of these differs from the rest in terms of the demands it imposes upon children. For example, Mischel's paradigm involves a higher degree of uncertainty as the participant does not know when the experimenter will return. Under such a constraint the child waits with the tempting treat in a room by himself or herself. In contrast, the Delay tasks that were designed by Kochanska et al. (2000), and used by many other researchers, contain more structure and exert different types of influence on the child's performance. If we examine Snack Delay by way of example, children's delay periods are shorter (longest trial is 60 sec) compared to the approximately 15 minute interval of Mischel. Additionally, adult supervision is constant in Kochanska's version. Even for younger children, to give in to the temptation while E is sitting across the table might not be easy, and the much shorter time period might also help the child to resist a temptation. Thus, Kochanska's version might assess cooperation with E until she presents the child with a cue rather than how children cope with delay. This structured version of a delay task did relate to children's reactions to disappointment in Study 2, but this finding did not generalise to other studies.

It is impossible to tell whether the failure to replicate the Study 2 finding shows that this was a statistical artefact or the product of the methods I used, I altered the Delay tasks in Study 3 and 5 to test whether different procedures would replicate the effect of Kochanska's procedure as I discuss in the next paragraph.

Delay tasks may contain different executive skills to different degrees, depending on how they are designed and presented. Garon et al. (2008) distinguished the Delay as a simple inhibitory reaction, due to its lower working memory demand, from more complex inhibition which they labelled as 'conflict'. Delay is described as requiring the participant to postpone a prepotent response whereas the conflict concerns holding a rule in mind and responding according that rule by managing to inhibit the dominant reaction, this was discussed in Chapter 4. However, all the delay tasks that are in use require the child to remember a rule and adjust his or her reaction accordingly. In Snack Delay, the preschooler needs to remember not to eat or touch the treat until E gives her permission with a symbolic gesture. Over the past decade delay has been theorised as being separate from Conflict due to the demands that is supposed to work which are deemed to be similar to the way in which emotionality works. Zelazo and Carlson (2012) clearly identify delay as such a ‘hot’ aspect of executive functions.

Studies 3 and 5 increased the demand of the Delay tasks (by longer and unsupervised delay periods as in Wiebe et al.’s (2010) method). I presume as a result the link between ER and Delay disappeared under these conditions, whereas associations that Delay shared with Conflict were reported in both studies. In contrast to Zelazo and Carlson, the vast bulk of the literature approaches Conflict and Delay as complementary skills of inhibitory control. Indeed many studies tend to use one or the other as a representative of IC. For example, Blankson et al. (2013) only used Day/Night –Conflict task when reporting that CR at age 3 and found that this predicted SU, EU and ER at the age 4. ER was, however, based on maternal reports, not observational assessments.

The length of the delay period may also have an effect on the data collected at around age 4. Garon et al. (2011) suggested that children tend to keep preferred toys for themselves or for a friend rather than a less-known peer and this may become particularly salient in longer delay periods. Similarly, in their choices for delay or immediate rewards Kidd, Palmeri, and Aslin (2013) reported that children who were in reliable environments such as where their needs were met consistently, waited for longer periods of time during the traditional marshmallow task. A child’s growing representations about the world that surrounds him may thus alter her or his performance in tasks that requires the control of impulsive actions.

7.2 The holy grail of emotion-regulation

Throughout this thesis, the aim has been to consider whether emotion regulation in preschool children can be directly observed and measured sufficiently enough for the relationship between such a skill and a range of social-cognitive skills can be examined. The measurement of children's changing ability to control emotions remains as a widely debated issue (e.g., Zeman, Klimes-Dougan, Cassano, & Adrian, 2007). In an attempt to explore the links between the cognitive and emotional aspects of self-regulation, the performance-based assessments of ER in conditions that induced positive and negative emotions revealed inconsistent results. The inconsistencies in my data, in fact, echo the mixed findings from the literature as a whole and the critique that many authors rely on parental report alone (see especially Chapters 1, 4 & 5). Although the child's typical responses across a range of situations are thought to be captured in those methods, there is an inconsistency between direct observations of ER and parental reports in which statistically meaningful links are mostly based on the parental reports (e.g. Blankson et al., 2012). This leads me to conclude both that the behavioural assessment of ER is difficult and that before abandoning the quest for a valid study of ER we need to search for a different solution (see 7.4 below).

The direct observation of children's ER capabilities can be assessed through a few paradigms that were mentioned in chapters that used the ER constructs such as the Disappointment (Saarni, 1996), Frustration (Calkins, 1997), or Excitement (Carlson &Wang, 2007) Paradigms. These are important for observing a child's abilities to control emotion when facing a stranger. Most of the other studies using these methods tested children in laboratory settings. So, the control of emotions was assessed with a stranger in unfamiliar surroundings. To avoid unfamiliar environment, children were tested in their nurseries in all studies of this thesis. Environmental validity may be an important for ER measure because children's emotional responses towards an unfamiliar environment and/or a stranger may play a role prior to the tasks that set out to induce certain emotions.

Diamond, Balvin, and Diamond (1963) stated that the people attribute their own and others' behaviours as more consistent and coherent than they truly are. The control of emotions analyses produced similar to the findings regarding Delay (as mentioned in the section above) and I would contend this again suggests that measures of regulation-in-action cannot be considered separate from the situations in which they are tested. We may each assume that we are good at regulation emotions, but there would be occasions that we lack control over them. Thus, I feel that a conclusion from this thesis is that ER is not a behaviour that I can easily label as consistent, particularly for children. To cover the variety of emotionality in positively or negatively charged affects, children's performance of ER (positive) is measured by their ability not to tell a secret that excites them; and ER (negative) by their ability to hide emotional displays of disappointment were used in this thesis. ER (positive) was moderately correlated with EU in Study 3, which suggests support for a domain-specific mechanism for emotionality. However, ER (positive) was associated with SU and Conflict in Study 5. So it can also be argued, tentatively, that the inhibitory demand of three constructs accounts for this relationship. When assessing ER (negative), I found that children were prone to show more negative reactions to a disappointing event, instead of hiding them and engaging in socially appropriate positive emotion reactions in all age groups. Despite the link between ER (negative) and Delay (which was compatible with the theory that offered a hot-neural pathway explanation in Study 2), there was no association between these two measures in the following studies. Instead a weak association with Conflict suggested that the links with ER measures are elusive or only of minor importance.

Due to their volatile nature, both Delay and ER measures tend to be influenced easily by situational changes. In each study, inclusion of new Delay and ER measures might have led a carry-over effect on children's performance from one task to another. Although such effects and fatigue due to the additional tasks were considered as a potential risk, using a fixed-order in testing was used to eliminate the differences between children in terms of the effect of one task over the other. A fixed-sequence for the similar constructs has been also used commonly by Cole et al. (2009) and Carlson et al. in various studies (2007; 2001). Moreover, a fixed-order was necessary to create a meaningful setting of a play with the children. For example, the gift was needed to be given in order to set up the Disappointment Paradigm at the end of session as it is customary to make such presentations as a thank you for the other tasks that have been completed. The Delay and the ER measures were presented to children in the second of the testing sessions (recall that both 'sessions' occurred on the same morning/afternoon). Thus, the children's performance on these tasks may have reflected their fatigue, particularly in Study 5, where there were 3 Delay tasks that may collectively have undermined the child's patience in later ER tasks. From this possible point of view, the fixed-order may appear as a weakness. However, the testing took place in the child's usual surrounding. The immediate contextual variables have been known to have a crucial impact on the young children's behaviours (Bronfenbrenner, 1986). Most of the research on self-regulation has been conducted in laboratory assessments. Testing in the nurseries was necessary for the environmental validity of my research. In the hectic daily schedule of a nursery, a fixed-order was important for pragmatic reasons.

7.3 Broadening our grasp of the relationship between social understanding and inhibitory control

The relationship between mental state understanding, as I defined SU, in this thesis and Conflict has been widely reported including in various cultural settings (see e.g. the review in Chapters 1 and 2). This thesis extends this literature in two ways. First, the studies replicate the SU-Conflict link in a group of participants who are not usually the focus of studies on EF-SU links, Turkish children. Secondly, and more importantly, a less explored connection between EU (as measured in Pons et al.'s measure of children's reaction to emotional experience) and Conflict has been established in the series of studies reported here.

Children's emerging beliefs about others' mental states and emotions seems to be intricately related to their control over their behaviours, as measured in Conflict Inhibition tasks. Indeed the regression models presented in this thesis suggest that SU and the two different dimensions of EU contributed unique variance in these latter measures.

We can conclude from these links that the child's self-regulation gains a momentum when the need for control is internalized. The reason for investigating SU, EU, and SURE together is understand to gather whether the control of behaviour is linked to how much and in what ways a child figures out about the nature of thoughts, emotions, and emotion-related social displays. I am not alone in attempting to forge such links, Blankson et al. (2013), in particular, searched for a link between control and understanding in a very similar framework to the design of the studies in this thesis.

The fact that I looked at three aspects of social understanding in the later studies of the thesis allows me to draw some tentative conclusions about its nature. As mentioned in Chapters 4 and 5, Wellman and Liu's (2004) approach to 'theory of mind' has received widespread attention over the past decade, as indeed Wellman's (1990) earlier theory drove the research on pre-schoolers grasp of belief. Throughout his series of papers on this topic Wellman has proposed that the children's predictions of the potential emotional states of others does not emerged until later in 'preschool' years in the US or indeed the primary school years in the UK and Turkey. According to Wellman and Liu's scale, a young child is able to comprehend false belief in a 'not emotionally charged' context earlier than making predictions about someone's emotional state. The implication is that a child should see others as mental entities earlier than she or he sees them as beings feelings, or rather that emotions are more complex because they decay at different rates and have conflicting effects on one another.

However, others, like Pons and Harris, have argued for a more nuanced and developmentally sensitive approach to the development of emotion understanding. They created an emotion-comprehension scale which consisted of various components. They demonstrated that performance in the comprehension of false belief and identification of emotions were closely linked. The findings of Studies 3 and 5 supports this view that SU and EU are interlinked. Together they appear to play a statistically meaningful role for one another. The data collected in Turkey supports Pons and Harris's ideas in a cross-sectional setting.

Chapter 4 set up the reasons why we need to study the possible connections between the control and the comprehension of emotions when I introduced EU as a topic. This was considered as a construct that is considered as part of ER and an additional means of assessing it. However, Studies 3 and 5 suggested that the regulation of negative or positive emotions may play a different role regarding their association to EU. Very few studies, notably Liebermann et al. (2007), have addressed the link between SU and ER. They reported a lack of relationship between SU and ER (negative) which was also assessed using the Disappointment Paradigm.

The quotation from James at the beginning of this chapter highlights the importance of mental flexibility over the experience of emotionality. Even holding a certain thought creates a state of feeling. As mentioned, in Chapters 1 and 2 particularly, the children's grasp of others' mental states has been claimed to responsible for their control over their mental activities (Perner & Kloo, 2003; also see Carlson et al., 2002; and Zelazo et al., 2003). In Perner's view, the reason behind the failure in the false belief is not merely the lack of children's inhibitory skills that both tasks (IC and FB) are claimed to require. Similar to Perner, Lang, and Kloo (2002), the correlations between SU and IC were reported but it was broadened with the understanding of control of emotions. The cross-sectional studies in this thesis reported links between SU, EU, and Conflict, the final study showed that on rule-based control of behaviour, the effect of the understanding of ER was stronger. The SURE measure predicted unique variance in conflict even when we controlled for age and both other social cognition tasks (FB and TEC). The counter theories claim that the power of control over understanding was also introduced (from Russell, 1996). Only longitudinal, studies will enable us to tease apart the relative influences of SU and executive skills like inhibitory control or, in the case of Zelazo's research, attentional flexibility. Kloo and Perner's (2003) training study strongly supports the possibility that there might be a functional inter-dependence between these skills. However, the studies presented here suggest that the network of inter-connecting skills should be extended to a broader range of social understanding including deeper a grasp of EU. I turn to this issue next.

7.4 A new approach to the study children's (grasp of) ER?

Much of the second half of the thesis has developed an alternative means of studying children's emotional responsivity. The SURE test assesses preschoolers' ability to attribute regulated emotional displays to protagonists in socially demanding situations. In keeping with the 3 to 4 shift that is witnessed in inhibitory control, attentional flexibility and social understanding, a development was observed at the ages of 4-5. Three-year-olds attribute true emotional displays to a protagonist who has been let down by a familiar adult or a peer/sibling. Children's performance in response to the stories may differ according to whether the protagonist was disappointed by an adult or a peer. However, in this thesis, I have overlooked this potential difference. Later in development, children (at age 11-years-old) tend to produce more logical arguments in their discussions with peers than their mothers (Kruger & Tomasello, 1986). The reliability of the scale with mixed items (adult and peer) was sufficient to enable me to claim that this collection of stories may not have a direct effect. However, in the future applications of SURE, the setting of the narrative, particularly whether an adult or a peer was the source of distress, should be manipulated and tested. Unlike school-age children, young children may find it easier to choose a regulated emotionality strategy when an adult is the reason for them to adapt an emotional expression. In face of conflicting information, young children tend to seek out and trust the guidance of an adult rather than a peer (Harris & Corriveau, 2011). Thus, the manipulation of emotionality for the sake of protecting an adult's feelings in a disappointing situation might be more likely for young children.

The SURE demonstrates that they understand the predicament that a child faces in such circumstances. After their fourth birthdays, on the other hand, children are able to grasp that an emotional display should not necessarily match their true feelings. Given that, the results from the multivariate analyses in Study 5 show that the SURE and the TEC seem to tap different skills, they point towards a need to study these in more depth, including longitudinal links between each other and between each measure and other related emotion regulation tasks.

We can conclude from the findings of the SURE that we need to understand how preschoolers come to understand appropriate behaviour in particular contexts. Children's prospective emotional attributions indicated that they were able to appreciate the necessity of hidden or altered display of feelings in social contexts. Study 5 suggested a close association between SU, EU, and SURE which lead to consider a common underlying mechanism. The stronger relationship between Conflict and SURE may indicate a different explanation. SURE was designed to document children's anticipation of emotional expression. Each choice they make towards a positive emotion was considered as the reflection of ER. In terms of reflecting ER performance, SURE was not related to situational ER assessments in Study 5.

However, the lack of association of SURE and both negative and positive ER performance should not be considered as SURE did not appear to underlie emotional processes. The association between SURE and EU though may reveal the fact that this new scale is high on the demand of comprehension.

Thus, the role of SURE in social cognition as an understanding measure is complementary but it is not synonymous with conflict inhibition. The relationship between these constructs suggests that the awareness for control (of emotional displays) is strongly related to the control of behaviour in rule-based settings. The demands of Conflict and SURE were unpacked. Both tasks require the child to solve a dilemma. Although SURE presents situations that are high in emotion, the child may pick the natural reaction (negative emotionality) that the situation is set up to elicit a knowledge that expressing such feeling would not exercise any inhibitory control to suppress this salient response. The child might also suppress this salient response by stating falsely suppressing her or his own wishes. Thus, in ER and/or SURE, the inhibition of initial emotional reaction might both involve a first step of self-regulation. In the next step, affective processes might be more involved to seize the situation and come up with less salient but accurate emotional display.

When SURE items are seen in term of making two steps (suppressing feelings and initiating socially appropriate action). Such dual processes may occur with reference to other feelings. For example, hiding a giggle when a friend had a bad fall resulting in injury might mimic the disappointment conditions in SURE trials. A future study should consider a greater variety of emotions that may be presented in a context of suppressing socially inappropriate emotions as well the production of more acceptable emotional expressions.

Future Directions

Regardless of where testing takes place, such a laboratory or the child's usual surrounding (e.g. home or nursery), SR performance is usually assessed in individual settings. SR is mostly necessary for social conflicts and its importance has been mentioned for school-readiness and classroom behaviours (e.g. Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2014). Yet, in this study children's performance in groups was not investigated. It is known that the presence of others can be very influential on individual performance (Fitzsimons & Bargh, 2004) and for children the peer group is a context that cannot be isolated from their developing social skills and behaviours (Chen, Chang, He, & Liu, 2005). The effect of the peer group on an individual's self-regulation was addressed by McCabe and Brooks-Gunn (2007) who reported that children were less able to cope with delay in groups than in individual contexts. In addition to a potential performance change in a group context, children delay ability modulates by a rational decision making process based on the environmental input. Thus, a future study may include a condition where a child's performance in Delay and ER were observed in a group context along with other SR constructs.

The SURE was only tested with Turkish children. There are studies that reported children from Eastern culture are less likely to be confrontational and tend to mask their feelings (as suggested by Vander Wege, Gonzales, Friedlmeier, Mihalca, Goodrich, & Corapci, 2014). Even the display of emotions in media directed at children in different cultures shows key differences. For example, children's books in America are different to Turkish or Romanian books based on the presentation of more diverse powerful negative and positive emotion in the former culture. Negative emotions were less likely to be presented in Turkish storybooks (Vander Wege et al., 2014). The exposure that children receive from their cultural surrounding might play a role on the grasp of the function of ER in social interactions for Turkish children. 4-and 5-year-olds were attributing positive emotional displays for characters in distress. Culture-specific emotion norms may be needed to be taken into account. A training study where children are exposed to different levels of emotional displays in storybooks may influence their performance on SURE. Children who are exposed to stories in which the negative emotions were explicitly displayed like in American storybooks may tend to choose a masked emotion for the protagonist in the SURE. This may also explain why American preschoolers in the scale of Wellman and Liu (2004), children were claimed to be grasping others' feelings later than understanding their desire and beliefs. Turkish children are exposed already regulated displays of emotion in the media, possibly due to cultural tendencies. American children are exposed to a variety of emotional displays but not enough to hidden emotions. The performance on SURE where 4-year-olds were able to attribute regulated emotional displays prospectively may be specific to Turkish children who are exposed to others' hidden emotions more than the display of true feelings. Yet, despite the fact that their methodology of understanding ER was different to mine, Cole et al. (2009) found that American 4-year-olds were able to attribute functional ER strategies. My suspicion is that the 3 to 4 transition in performance on SURE in Turkish studies would be replicated in other cultures, including the US.

Conclusion

In the exploration of various aspects of children's changing ability of controlling emotions and behaviours, this thesis showed that the theory in developmental psychology is mostly based on the scope of the tasks that research is using. The assessment of the delay inhibition and the direct observations of ER were easily influenced by situational factors and revealed inconsistent findings in terms of their relationships with other constructs. Children's growing awareness of others' beliefs and emotions plays an important role in their control of their behaviours. However, the control of emotionality and behaviour interacts in the level where children's grasp of the requirement of alternation of the emotional displays strongly relates the behavioural control. Along with other social-cognitive abilities, children's newly explored skill of prospective regulated emotional displays attribution in SURE contributes a unique variance to the control of behaviour in Conflict Inhibition contexts.

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Appendix

Appendix 1.1

A PHILOSOPHICAL DEBATE TO UNDERSTAND WHAT ‘WILL’ IS OR DOES

Schopenhauer’s critique of Kant’s transcendental idealism is useful, because the tension between these two important philosophers’ influences on the source of knowledge for self in explaining self-regulation. The tendency in developmental psychology to explain child’s behaviour based solely on mental faculties comes from Kantian logic that can be seen in Piaget’s stage-like explanation of child’s understanding of the knowledge. Child’s epistemology of the world could be also viewed from an added window. That window could be opened through an analysis of the beginning of child’s volitional being. Schopenhauer’s analysis focuses on the volitional act of the human being. His understanding of the representational self and his notion of ‘will’ concerns not simply a property of mind but, to the contrary, is the driver of the self. His analysis should reveal the points that are needed to be taken forward in the search for a grasp of self-regulation in this thesis. This analysis will also build up an account for my decision to start with Russell’s (1996) claim that children’s cognitive control is bounded by the development of agency over experience. Russell’s claim is an integration of the views of Piaget and Schopenhauer, over and above the Kantian logic of Piaget. From Piaget, Russell draws inferences about the child’s mental abilities. These are based on the assumption that knowledge is constructed through action, which derives from Kantian transcendental idealism. For Piaget and Kant, the contents of the mind are derived from rational inferences. Schopenhauer disagrees. He proposes a uniting feature, ‘will’, that combines the knowledge of the body and the ‘mind’, through the intimate relation of how ‘mind’ cannot be conceptualised without taking into account affective ability. After the discussion of the philosophical roots of the ‘will’ as a construct, whether or not it should be used to grasp the basic principles of empirical studies in psychology will be in the focus. A brief description of how self-regulation has been shaped and investigated in recent research will be presented.

Having briefly suggested that the definition and the meaning of a term like ‘inhibition’ have constantly been affected by historical changes in the economy and technology within the previous section, a similar question will be asked towards the ‘self.' It is necessary because the hypothesised ‘self’ must employ inhibitory skills can be discussed.. This is a harder question to answer given the accumulation of knowledge and viewpoints in philosophy and psychology. To touch on the limitations, argument on the operation of the ‘will’ in the context of the abilities that the ‘self’ possesses should be noted. To achieve regulation, the ‘self’ must operate within a complex framework, involving behaviour, emotion and mental expression. To discuss these regulatory abilities, the views of Kant and Schopenhauer should be mentioned. A quotation from Kant’s “anthropology” lectures in the late eighteenth century, displayed in Smith’s (1992) work, illuminates how German philosophy interpreted the enlightenment view on inhibition and its effect on expressing the meaning of ‘self’. Moral concerns and practical psychological issues were central to these lectures of Kant. He focused on issues like the trajectory of “drunkenness, sleep, fainting, and asphyxia.” He referred to these attributes as “the inhibition, weakening, and total loss of the sense powers” [the meaning of the term ‘sense’ here is to perceive and its clarity the perception] to exemplify “an inhibition of the regular and ordinary use of our power of reflection” (as cited in Smith, 1992; p. 50). This example that Kant used to illustrate the idea, which is lack of inhibition, causes an absence in the power of reflection. Smith (1992) raises the issue of the hierarchal relation between inhibition and the ‘will’ as follows:

"Even 'inhibition' itself, as a term referring to control, has multiple meanings. It may indicate a relationship between two forces, one power, at least for a time, arresting and thereby regulating another power. In such circumstances, the inhibitory relationship is frequently a hierarchical one, in which a higher power (such as will) controls a lower one (such as instincts)" (Smith, 1992; p.8)

As Janaway (1989) suggests, Kant's doctrines of experience or empirical knowledge require having intuitions and concepts. In Kant's view, the representations of space and time are intuitions and these are a priori. In other words, their justification does not depend on any evidence or experience. For Kant, therefore, how the self represents time and space are inexplicable. He rules out a role for intuitions (Janaway, 1989). Schopenhauer's take on the matter relies on a different description of the self where the intuitions of time and space could be a source for the self in seeking or constructing knowledge.

The main reason I wanted to readdress the issues Schopenhauer raises was that, for him, the self's perception of time and space directly relate to the actions we take, their underlying value and decisions we make concerning the self. The main function of the term 'self' in Schopenhauer's theory (see e.g., Janaway, 1989) is to identify the core or essence of thehuman being, as opposed to accidental or contingent potential qualities of them (Zöller, 1999). Within the tradition that he was working in, the self was the identification of the human soul or mind instead of the human body. In simplistic terms, Schopenhauer disagrees with Kant's general designation of the self. His disagreement was on the idea that the self does not rest on top of the core of the intellect or a cognitive faculty. In his account, understanding (or reasoning) is not the only main component of the self. In addition to this rational side, he adds another essential feature to the self that he defines as the 'will.' What is different is that in earlier accounts of the philosophy of the self, the will was represented as subordinate to reasoning and considered for its practical purposes, as a restraint on human action.

The claim of Schopenhauer was that the will is the essence of a human, and it is the thing that makes it possible for us to have knowledge of the world through ourselves. This idea runs contrary to Kant's idealism where the assumption is that the self is disengaged, with limited ways to acquire knowledge of the world. Following from the doctrine above, the primary description of the self and its position in the world comes from the subject's experiences (Kant, 1929/1979; as cited in Janaway, 1989). Kant draws a distinction between the world that we understand through our perception on one hand and reasoning on the other. We cannot process or understand objects with bare reasoning since there is a gap between object perception and reasoning. Knowledge of objects is bound to the observer's experience. In contrast, a priori ideas cannot be perceived and are classified as things-in-themselves. Acquiring the knowledge of them is not possible as they are impregnable to conscious reflection or experience. 'Will' was one of those things that contained its knowledge, so the reflection of it was only possible in the trajectory of reasoning. Therefore, its essence is unknown to the human mind. Since the contents of the will are incomprehensible to the subject, Kant's definition of this metaphysical view concerns a form of knowledge that cannot be empirically studied.

To get to grips with Schopenhauer's analysis, let's consider the following statement:

"For nothing is more certain than that no one ever came out of himself in order to identify himself immediately with things different from him; but everything of which he has certain, sure, therefore immediate knowledge, lies within his consciousness. Beyond this consciousness, therefore, there can be no immediate certainty (...) There can never be an existence that is objective absolutely and in itself; such an existence, indeed, is positively inconceivable. For the objective, as such, always and essentially has its existence in the consciousness of a subject; it is therefore the subject's representation, and consequently is conditioned by the subject, and moreover by the subject's form of representation which belong to the subject and not to the object" (Schopenhauer, 1844/1966; p.5).

In his critique of Kant's transcendental idealism, Schopenhauer argues that the 'riddle' of the self should comprise affective qualities. He begins with the realization of the conscious self, onto which the essential qualities of the 'will,' which emerge, are qualities like urging, striving, wanting and desiring. According to his view, the will is the representation of all that we desire from the world and everything that we do is to serve what the 'will' wants. His ontological description would place the primacy of desire over the intellect as for him; thought is the follower of desire. Schopenhauer broke the will's attachment to reason and defined it as a blind striving (Janaway, 1989). The 'will' designated as the source of the self, including our intellectual facilities in Schopenhauer's redefinition, also include the volitional sides of the human self. His complementary conception of selfhood included both how the will forms the core of the human being and how the achievement of selfhood occurs through the accumulation of intellectual effort.

Schopenhauer attains the inner essence quality to the will. Since it has inside qualities, everything 'will' possess is unobservable yet, only the actions of the 'will' is observable. Where we accumulate the knowledge of other objects is outside us, and this is the only way to acquire knowledge according to Kant. So form same logic, Kant claims that the true nature of the self is known due to it not being observable. Schopenhauer, on the other hand, points out the intimate nature of one's bodily actions and its relation with the 'will'. Our actions are the reflection of the will; therefore, the bodily expressions and the mental entity of self are united in the presence of 'will'. As a distributor and the container of all urges and desires that one may possess, the psychological presence of 'will' can be only observed on bodily awareness and action awareness comes with it. Early childhood contains the milestones for child's awareness of his or her influence on own actions. When this awareness turns into control behaviour, child's regulated behaviour and emotion are similar to the adult-like control.

In one way, Schopenhauer's insight on 'will', and his ranking of desire over intellect, would explain the developmental trajectory of the children's interactions with their environment. It starts with the physical needs to be fulfilled at an early age. Crying is one of the most common responses children give to upsetting events and provides a useful demonstration of pleasure- and self- oriented nature of childhood in terms of 'willing,' With crying, child does not give emotional cues but demonstrates his or her needs at present and uses crying as a communicative tool. Such a communicative tool in infancy continues to be an emotional signalling in toddlerhood and the rest of the life. Crying is not necessary to show how upset the person is, but general people are expected to have some control over their emotional outburst. In Schopenhauerian sense, if crying occurs, it can be interpreted as an act of crying is willed, and that is why it happens but this interpretation would not be complete. The 'will' also represents the things that are will be maybe cannot be achieved, therefore, crying may occur. His way of redefining the construct of 'will' to explain the true nature of human behaviour and his unification of the process of desire (and the ability to desire) is so inseparable as seen in the statement in his On the Freedom of the Will;

"You can do what you will, but in any given moment of your life you can only one definite thing and nothing other than that one thing" (Schopenhauer, 1841/2005, p.24).

The illuminating point of the quotation above is how it exemplifies urges and desires that one person need to deal with every day, and the 'will' is not yet only the 'desire' itself, but also the ability to satisfy such a desire. Schopenhauer reflects on how the 'will' should be manipulated, in-famous pessimistic claim sums the cycle of desire to unsatisfactory for people since whether desires are fulfilled or not, the happiness may not be leaded by the decision of following desires or abstaining from them. Although, his pessimistic view is irrelevant, the take-home message here is to seeking equilibrium. Despite this dark outlook, the idea of equilibrium, or mental and affective unification of representations presents a clear picture of self-regulation. Nevertheless, whether the urges of will are satisfied or not, the will is there to strive continuously. The ‘will’ is the core of the people’s experiences to understand the world and more importantly themselves. Schopenhauer’s unified ‘will’ is an approach that I would like to apply to self-regulation in relation to its aspects. The urge and the control of the urge are combined in the will, so it must be in self-regulation, as well. More importantly, emotional, cognitive and motor aspects of regulation should be contributing, through the mutual relationships to the concept of self-regulation equally.

The definition of the ‘will’ or the source of it might be pre-determined by cultural or religious customs. Religious doctrines have the tendency to promote delayed rewards for whom wait and stay absent from hedonistic acts. So every society promotes the saving for the rainy days. One way or other, children are exposed to such tendencies. However, our ‘contemporary’ dilemma in developmental psychology in terms of explaining the source of ‘regulation’ should be isolated from the overall impact of society or religion[9]. The reason that Schopenhauer’s ‘will’ was analysed in this thesis, Schopenhauerian approach to self-regulation would also point out the importance of the lack of control in early childhood. As much as regulated behaviour is the need, a child’ non-regulated nature makes him or her open to experiences. The lack of control is one way to explore all the possibilities surrounds the child. When a child develops the controlling mechanism, their purpose should be making a child’s exploration deeper.

[9] Although such isolation should not counted as overlooking the early bootstrapping effect of family and language in the present and future self-regulatory development of child (Landry et al., 2000.) The effect of language particularly in early development will be discussed in a different line of literature further in this thesis.

The Kantian distinction that Schopenhauer based knowledge acquisition either from the outside world via perception or through inner reasoning can be seen as a stepping stone towards an argument about self and self-knowledge. Since Kant claimed that knowledge of things could be acquired when only they are observed, this kind of observation can only mean that we can represent the objects around us in our mind and be able to think about them. Schopenhauer agreed on the differentiation of kinds of knowledge. In the Critique of Practical Reason, Kant says:

"It may be admitted that if it were possible for us to have deep an insight into man's character as shown both in inner and outer action and all external occasions, that every, even the least, incentive to these actions an all external occasions which affect them were so known to us that his future conduct could be predicted with as great a certainty as the occurrence of a solar or lunar eclipse" (Kant cited in Schopenhauer, 1841/2005, p.82).

In this quotation from his predecessor, Schopenhauer claims the act of will and bodily movement cannot be causally connected since the will is expressed in bodily movement and this occurs before conscious reflection takes place (see Janaway, 1989). To understand his philosophy further, his assumption of one extreme unity should be acknowledged, as a single thought that might require further explanation (Janaway, 1999). In his claim, Schopenhauer defines the single thought as the 'most perfect unity, 'the context that I address the single thought is how to approach the abilities of the self in terms of the 'will'. He proposes that communicating one idea involve dividing it into its parts, but these parts need to be reconnected again. In this division and reuniting relationship creates a drive, as much as the divided parts support the whole, whole also supports its parts. This 'organic' relationship is a metaphor for the 'will' and its unification of desire and the ability to understand the desire itself. This is a unification that should be reflected on redefining self-regulation and how its trace in child development should be pursued. The 'will' that child develops is there from the beginning when the child first strives for something. Such a strive makes the world understandable for the child and to be able to continue understanding the world, child starts to control his or her striving.

In this section, the depth of the self-regulation construct has been related to the construct ‘will’ in Schopenhauer’s philosophy. The representation of the outside world as a whole can only be acquired through the will based on Schopenhauer’s logic. Therefore, the child’s representations are limited the presence of the development ‘will.’ The will combines both mental and affective representation to have an inner perspective where a person can reflect on the subjective experience. Schopenhauer’s account of the human being as an embodied, active spectator of the world of objects is the basis for an analysis of children’s varied abilities in early development. Being an active spectator of the world is the beginning of developing self-regulation, and it can be expressed through the development of agency.

Children’s ability to understand other people as ‘agents’ arises upon the self-awareness of their own agency has been argued by Russell (1996). As the ability to make explicit judgements about the physical and mental world is one of the main developmental trajectories was particularly mentioned in Piaget’s work theory, and its relevance to the agency should be mentioned further. Agency can be demonstrated as the first leg of the will where the one’s own and other’s needs, belief and desires can be represented which leads to act according to those. The actions start to be based on an understanding of agency occurs, I claim that the self-regulation takes place where the cycle of Schopenhauer’s ‘will’ closes its loop.

As one of the few who pay attention to the partially rhetorical question of ‘what does it take to have a mind,’ Russell (1996) broadens the scope of the self-world dualism through psychological understanding. The knowledge within the self cannot be thought separate from the world is represented; therefore consciousness ascends unity of knowledge of the self and the world. According to Kant, only observable matters in the world can be represented in one's mind, Russell addresses Schopenhauer's explanation of representation to explore the relationship of the conscious act and cognitive faculties. His starting point is "the ability to alter at 'will' one's perceptual inputs" (p.64) is the important component of the developing conception of the external world and the mind. To describe the perceptual understanding of the world and the self, he uses Kantian arguments. He does this by drawing upon the Piagetian process of 'agency' in which it is necessary for the child to gain gradual control over his or her actions and as the building block for the development of cognition. Russell (1996) employed Schopenhauer's approach to eliminate the nativist tendencies, which can be traced to the Kantian argument in developmental stories of mental process. Russell argued that the notions of 'willing' and 'agency' cannot be separated due to their nature in mind. Simply, agency is an individual's act of intuition towards what is required or desired, whereas the willing is the demonstration of a desire. A conception of objects as causally coherent within themselves and in relation to other objects, as existing in space and through time, is only possible for a unitary consciousness that synthesizes its experience. Russell argues that agency achieves such a unitary consciousness that is similar to Schopenhauer's proposal of the 'will.' Schopenhauer unifies the 'act of will' and the 'action of the body,' since the latter is the reflection of the former. With the help of agency, Russell defines this unity as the 'synthetic mind.' He also considers that agency (like the 'will') is the only way to unify the reflective experience of self and the experience itself. The only way to be the owner of your experiences is to keep the type of relationship that is a loop between the ability/ wanting/desire itself and its consequences. This loop in the first place is because ability to exist. So, why does Russell rely on this synthesizing effect of agency? Russell's interpretation of Schopenhauer's designation of 'will' was bound to the fact that the will's particular type of distance to the self, and its effect on the unity of mental faculty. According to Schopenhauerian philosophy, 'will' is a key to unify mental representations of theworld; therefore a developing child requires this fundamentally important skill to own a conscious experience of the world. Russell relates consciousness with the bodily awareness in which volition arises upon the act of body where the expression of will occurs but the bodily activity may not match with the will. To achieve the volitional action, in early years, 'trying' occurs.

Secondly, he draws a link between Schopenhauer's explanations of the 'immediate' experience of the self as in the representation of the will. This is the only way to understand that we are the subjects of objective experiences. Thus, differentiation between 'willing' self and 'knowing' self is part of conception of belief, where perceiving 'I' is the accumulation of these mental constructs as similar to the 'will' in Schopenhauer's claim as an unifier of mental representations of experiences. From a linguistic perspective though, 'I,' can be discussed as a reflection of unified ability like agency. Based on these three points, he defines the existence of agency as the interrelation between bodily awareness, will and reality, which comes out the thought process from self. Schopenhauer's account of will is also represents all bodily striving since, his conception of 'will' was very materialistic, and its content and purpose cannot be thought apart from the physical body (Janaway, 1999). Russell does not treat the notions of will and agency synonymously in the sense of their functional purposes or ontological definitions. However, he points out the similarity between their main characteristics of intentionality, and how this relates to both in some extend. Schopenhauer argued that the will was not a representation of knowledge or the experience but a construct for itself. In a similar way, Russell has also argued that agency is not a product of the mind's representation; instead, it is a contributor mechanism for representation. The self within the world would also have its own knowledge since it represents itself too. In a progressive explanation of the self is the subject as who has knowledge of the ‘inner essence’ of the self. That inner quality was defined as the ‘will’ by Schopenhauer (Janaway, 1999). When the conscious knowledge of the world was acquired, the will has an identical knowledge as the self. Conscious knowledge of the world is similar to having a ‘will.’ According to Schopenhauer, with ‘willing,’ the knowledge is formed without representing it since the will has representational qualities embedded. ‘Will’ is represented in the act of body, since it is an expression of the will. Immediate knowledge of the event comes from the ‘will’, as the subject’s actions and the object that is the subject’s body in an empirical sense (Janaway, 1989). Action situates the subject in the world, by providing access to underlying thing-in-itself, which is the ‘will’.

Based on Schopenhauer’s unitary logic, the underlying drives of self-regulation should be equally contributed by emotional, cognitive and motor features, but to see this contribution, asking the first question of ‘Is emotional development or cognitive advancement the driver to the overall self-regulation?’ is helpful. Firstly ,one-directional relationship, between them can be examined,andthen the bi-directionality of their relationship can be pursued.

The recent literature on self-regulation of young children has the tendency to define according to its relative components, instead of a single construct. I aim to present a view where core of the ability lies in the network of socio-emotional and socio-cognitive abilities and presents itself with the behaviour is based on needs or demands of the situation. Self-regulation can be situated in the three main mechanisms of the early child development of emotion, behaviour (psycho-motor skills) and cognition. The organic relationship between these aspects (emotion, behaviour, cognition) and the wholeness of the ability to regulate is the key to explaining the connections between these separate aspects. All of these aspects have been received attention from many researchers in the psychology literature. However, whilst explaining the whole construct, literature lacks studies, which combines these three aspects together and values them equally.

Appendix 1.2

ADDITIONAL REVIEW ON THE HISTORY OF INHIBITION: ARE CONCEPTS OF SELF-REGULATION 'NEW'?

It is commonly found that psychologists derive descriptions of their subject matter – constructs like 'attention,' 'memory' or 'self-control' and believe that they are the product of the work within their discipline. Terms like 'self-regulation', and its parts, are a case in point. Not only do psychologists differ in their definitions of this construct and its necessity in the development. They also often equate it to the development of similar constructs that are 'behaviours' and their nature is assumed to be based on 'inhibition.' Apart from the emotional or cognitive coverage on self-regulation ability, its core has always been related to inhibition. The use of term 'inhibition' has been historically tracked down and discussed as how it has been used in scientific knowledge by Roger Smith (1992). In his precise evaluation of the term that has been utilized by both physiology and psychology over the last two centuries, he points out that the meaning of the term has been shaped through the changes in society. The following quotation summarises the relation between constructs has been in the focus:

"The history of inhibition is also part of a wider history of regulation and control, concerns that are so fundamental they almost define the scope of the sciences of body, mind and behaviour. They are also central to thought about the social nature of the individual and to the very continuance of social life." (Smith, 1992, p.7)

In physiology or psychology, concepts concerning the control of automatic reflexes or organized behaviours can be studied under the term of inhibition. Given the diversity of origins of the use of the term in the nineteenth century, it is not possible to derive a particular source or the range of the diverse definitions of the term. Smith (1992) states that since the first usage of the term ‘inhibition’ in the English speaking world at the beginning of the nineteenth century, the same term was used in divergent ways in religious, political, economic and even scientific institutions. To exemplify how technological development and industrialization of society led to a shift where the physiological process were directly used to explaining mental qualities, Smith (1992) shows how the metaphor of ‘self-regulatory capacities’ as a steam engine governor was used along with notions of the regulation of production described in terms of factory machinery. He also links these types of regulatory concepts to the regulation of the market, finances and the trade cycles. The political economy and changing industry required a new definition of regulation that would be put down as “regulation of flesh by spirit and the value of individual grace, autonomy, and responsibility” (Smith, 1992, p.238). Where industry and working settings were changing, the value of the regulation of an individual became an issue to consider as we see in the case of child workers. In a faster working setting, the compliance of a child worker can be seen as central to the maintenance of industrial production. In addition to that, where the parents were working longer hours and away from home, there were the subject of children who need adult supervision or instant control of authority. These two examples links to how definition of childhood could have been revisited in the last two centuries – suddenly in the history of Western culture the problem of controlling children’s natural inclinations to seek pleasure came under scrutiny.

Based on Smith’s (1992) evaluations, we can infer that in the course of sustaining ‘inhibition’ as a term that emerged in a number of political and scientific literatures, a longstanding tradition of synthesizing the concepts of physiology, medicine and psychology to address the mind and body as synthetic concept was set in motion. In case of creating this synthetic science, terms like inhibition are interesting because they cut across different disciplines. In fact, there were scientists like Sherrington and Pavlov as Smith (1992) addresses whose theoretical syntheses were aimed at capturing the organized control and the regulation of automatic bodily functions, which was a trending topic of the late 1800s; however, the control of social interactions was also part of their synthetic theoretical understanding. The questioning of a central inhibition mechanism that was associated with the workings of the nervous system gave rise to the experimental physiological studies where each aspect of inhibition was rather isolated to understand the central mechanism question.

In summary, there are important questions that need to be discussed, even acknowledging the chance of not being able to produce a clear answer to the questions 'What is the source of self-regulation in human beings?', 'What can be defined as the ability to self-regulate in children?' and 'How does psychology deal with such a complex construct and provide meaningful insights to the mechanism underlying self-regulation?'. Controlling one's urges and desires is not only a question concerning childhood; this is a challenge that each one of us needs to face on a daily basis. In this thesis, I am not talking about an ability that is achieved in early childhood that continues exactly the same into adulthood. It is a changing ability, and it is never stable. Because, I believe, that understanding self-regulation involves getting close to understanding the core of development and developmental psychology. If self-regulation is subject to constant change, it will be difficult to capture in empirical work and even harder to define. In order to build a concrete understanding of what self-regulation could be, a trip to the philosophical roots of it needs to be taken. Philosophy asked questions of how a person becomes the owner of her/his life and the master of her/his desires and urges prior to psychology. It also defined the world we know through an empirical perspective.

The empirical approach to constructs, as a form of scepticism, is a concept that became central in the enlightenment era. The observed knowledge of the construct has been claimed as the one and only source for knowledge. The things that cannot be observed were deemed to be unknowable. To know the things that are only represented in the mind was not possible from a Kantian perspective. Although Kant's transcendental idealism introduced the separation of the beyond-reality matters (metaphysics), which are unobservable to human beings, and the knowledge comes from observable matters, Schopenhauer comes with the solution of affective understanding of the world. His new invention of a tool to understand the world is what we do understand are both showing the capability of desiring and also trying to be in control of those desires. Wanting something is the first step of the controlling the limits of your ability to acquire the desired object. So, children may not be the best to control their feelings or thoughts, they are good at wanting. Everything in our lives starts with a desire. A child tries to grasp that 'trying' is the reflection of a desire that the child possess. The limitation of our ability to acquire our desire objects expands with understanding firstly our own needs and then the others' needs and desires.

Appendix 2.1

<u>Direct evidentiality</u> marker group: -DI version of the test question

Mental Verb:

<u>Self-false belief question</u>,

What did you think was inside the box, before I showed you?

(Turkish) Bu kutunun icinde sen ne oldugu DUSUN-DU-N?

(Exact translation) This box inside you what is think-DI (direct experience-past reference)-you (2nd person assertive).

<u>Others' false belief question,</u>

I showed this box to your friend, what did he think was inside the box?

(Turkish) Sence arkadasina bu kutuyu gosterdigimde; o bu kutunun icinde ne oldugunu DUSUN-DU?

(Exact translation) you think, friend-your(second person assertive)-to this box showed; he this box inside what is think-DI(direct experience- past reference)

Action verb

Self-false belief question,

What did you **SAY** was inside the box, before I showed you?

(Turkish) Bu kutunun icinde sen ne oldugu SOYLE-DI-n?

(Exact translation) This box inside you what is **SAY**-DI (direct experience-past reference)-you (2^{nd} person assertive)

Others' false belief question,

When I showed this box to your friend, what did he SAY was inside the box?

(Turkish) Sence arkadasina bu kutuyu gosterdigimde; o bu kutunun icinde ne oldugunu SOYLE-DI?

(Exact translation) you think, friend-your(second person assertive)-to this box showed; he this box inside what is think-DI(direct experience- past reference)

Belief evidentiality marker group: -DIR version of the test question

Mental Verb:

Self-false belief question,

What did you think was inside the box, before I showed you?

(Turkish) Bu kutunun icinde sen ne oldugu DUSUN-MUS-SUN-DUR?

(Exact translation) This box inside you what is think-DUR (DIR) (indirect experience-past reference)-you (2^{nd} person assertive)

Others' false belief question,

When I showed this box to your friend, what did he THINK was inside the box?

(Turkish) Sence arkadasina bu kutuyu gosterdigimde; o bu kutunun icinde ne oldugunu DUSUN-MUS-DUR?

(Exact translation) you think, friend-your (second person assertive)-to this box showed; he this box inside what is think-DIR (indirect direct experience- past reference)

Action verb

Self-false belief question,

What did you **SAY** was inside the box, before I showed you?

(Turkish) Bu kutunun icinde sen ne oldugu SOYLE-MIS-SIN-**DIR**?

(Exact translation) This box inside you what is **SAY**-DIR (indirect experience-past reference)-you (2nd person assertive)

Others' false belief question,

When I showed this box to your friend, what did he SAY was inside the box?

(Turkish) Sence arkadasina bu kutuyu gosterdigimde; o bu kutunun icinde ne oldugunu SOYLE-MIS-**TIR**?

(Exact translation) you think, friend-your (second person assertive)-to this box showed; he this box inside what is think-TIR(indirect experience- past reference)

Mental Verb:

Direct evidentiality marker group: -DI version of the test question

Tavsan topunun nerede oldugunu dusun-**DU**?

Where did Bunny think that the ball was?

Belief evidentiality marker group: -DIR version of the test question

Tavsan topunun nerede oldugunu dusun-**MUS-TUR**?

Where would Bunny think that the ball was?

Action verb:

Direct evidentiality marker group: -DI version of the test question

{Topunu bulmak icin} Tavsan ilk nereye bak-TI?

{to find his ball} Where did Bunny **look**ed first?

Belief evidentiality marker group: -DIR version of the test question

{Topunu bulmak icin} Tavsan ilk nereye bak-MIS-TIR?

{to find his ball} Where has the Bunny looked first?

Control questions with exact translations:

Control question of reality control; 'Where is the ball really?'

Direct evidentiality marker group: -DI version of the control question:

Top aslinda nerede? [Ball really where?]

Belief evidentiality marker group: -DIR version of the control question:

Top aslinda nerede-DIR? (Ball really where?]

Control question of memory; 'Where did Bunny put the ball at the beginning?'

Direct evidentiality marker group: -DI version of the control question:

Tavsan topu ilk nereye koy-du? (Bunny ball fit where put)

Belief evidentiality marker group: -DIR version of the control question:

Tavsan topu ilk nereye koy-mus-tur? (Bunny ball fit where put)

Appendix 3.1

The Scoring Of Snack Delay Task (In Study 2)

- The child receives **0 point** when s/he **eats** the snack during the **first** half of the delay.

  The child receives **1 point** when s/he **eats** the snack during the **second** half of the delay.
- The child receives **2 points** when s/he **touches** snack/ mat/experimenter during the **first** half of the delay.

  The child receives **3 points** when s/he **touches** snack/ mat/experimenter during the **second** half of the delay.
- The child receives **4 points** when s/he **prompts** the experimenter during the **first** half of the delay

  The child receives **5 points** when s/he **prompts** the experimenter during the **second** half of the delay
- The child receives **6 points** when s/he **moves hand towards** snack/ mat/experimenter during the **first** half of the delay

  The child receives **7 points** when s/he **moves hand towards** snack/ mat/experimenter during the **second** half of the delay
- The child receives **8points** when s/he **moves body towards** snack/ mat/experimenter during the **first** half of the delay

  The child receives **9 points** when s/he **moves body towards** snack/ mat/experimenter during the **second** half of the delay
- The child receives **10 points** when s/he **waits** until the signal was given.

Appendix 3.2

The List of *Distractions* in the Snack Delay Task (in Study 2)

- Plays or touches with own clothing
- Locks arms/Hugs herself

- Puts hands in pocket
- Hides arm behind
- Rocks herself
- Talks to herself
- Imitates clapping without prompting
- Looks away or close her eyes
- Asks questions or talks to the experiment (about something else not the task or treat)
- Touches the table on corners
- Fixates gaze on the treat
- Laughs or giggle

Appendix 3.3

Behaviour Coding List of the Disappointing Gift Task (in Studies 2 , 3, 5)

Positive Dimension (7-reaction)

- Broad smile with teeth showing
- Broad, closed lip smile
- Enthusiastic thank you
- Arched brow, as in surprise
- Smiling eye contact with experimenter
- Eye wrinkle when smiling
- Positive vocalization

Negative Dimension (10-reaction)

- Nose wrinkle
- Lowered brow as in frown

- Omitted thank you
- Puckered or pursed mouth
- Tight, straight line mouth
- Avoid eye contact with experimenter
- Negative noise emitted
- Abrupt departure from room
- Shoulder shrug
- Bulged eyes, as in negative surprise

Transitional /Neutral Dimension (13-reaction)

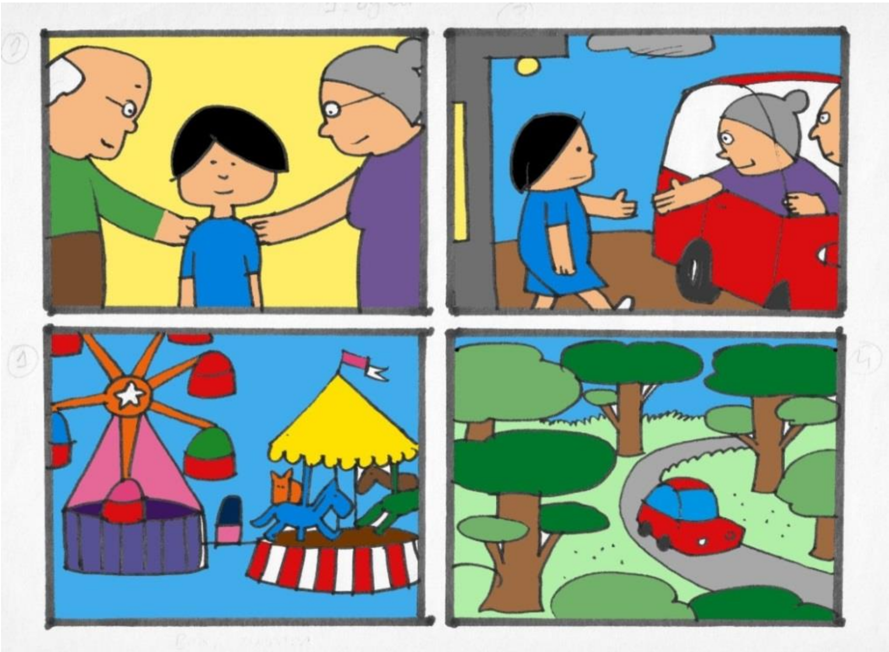
- Slight smile
- Faint thank you
- Knit brows whilst smiling slightly
- Protruding tongue
- Two or more gaze shifts
- Biting or teeth visible on lips
- Hand to face, head
- Head tilt or turn
- Question vocalization
- Laughing giggling
- Mouthing (open/shut)
- Abrupt loss of smile
- Rolled in lips

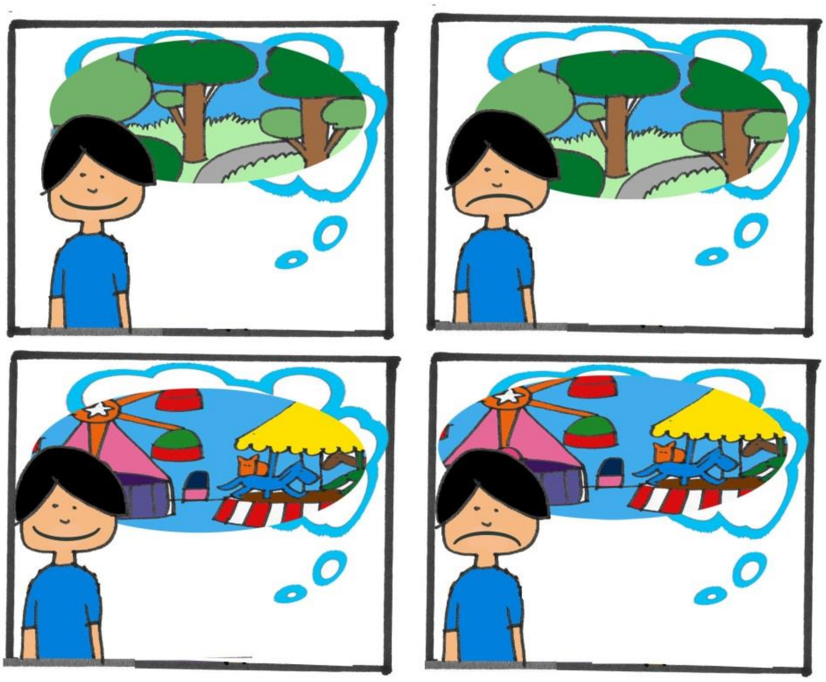
Appendix 5.1

Study 4- SURE: Vignettes and Pictures

Story1

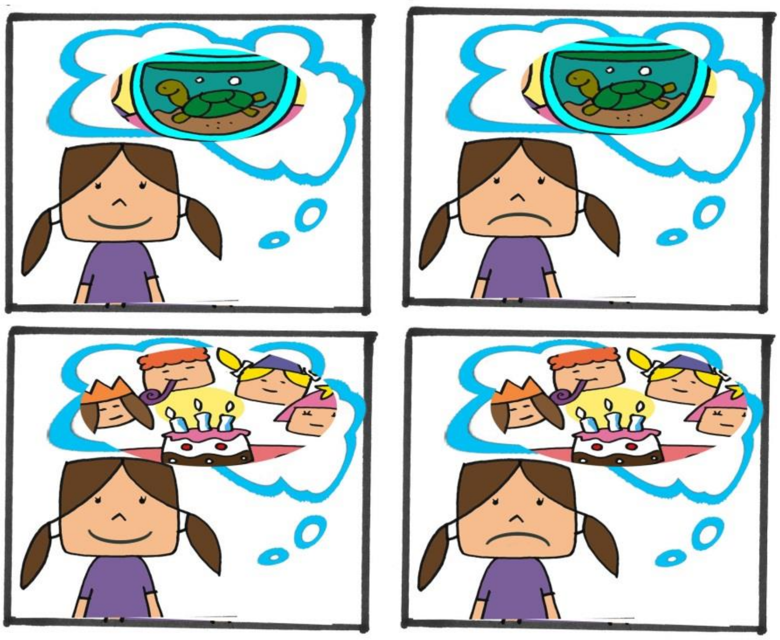
Billy/Ali loves funfairs. His grandparents promise to take him to an amusement park this weekend. When the day comes, Billy jumps into car with his grandparents. They drive through some lovely woods. Grandma says ‘These woods are so lovely. Let’s go for a walk in the woods instead! We’ll go to the funfair another time’.





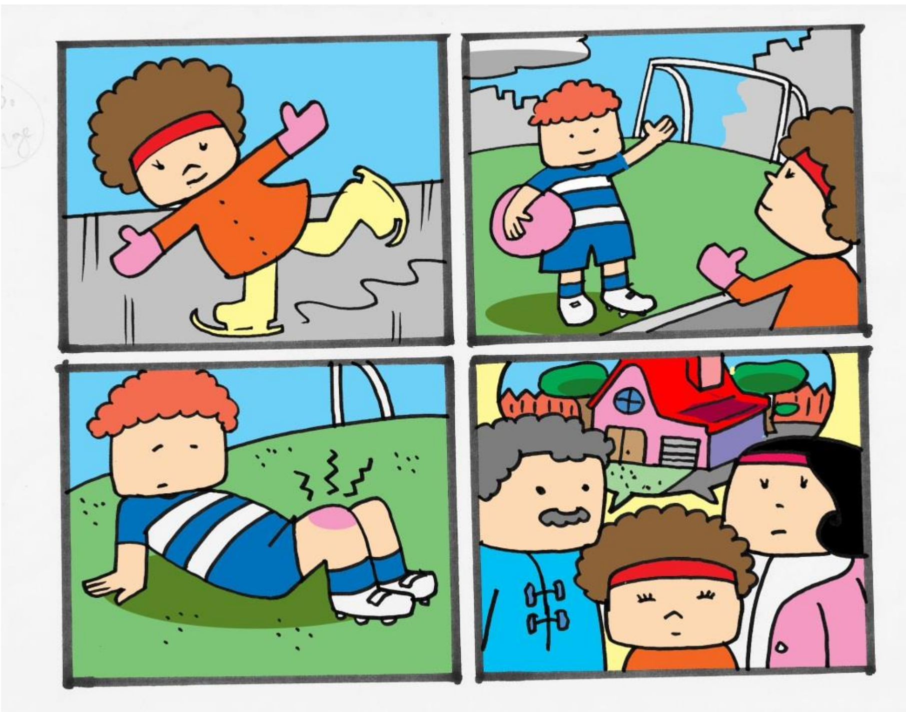
Story2

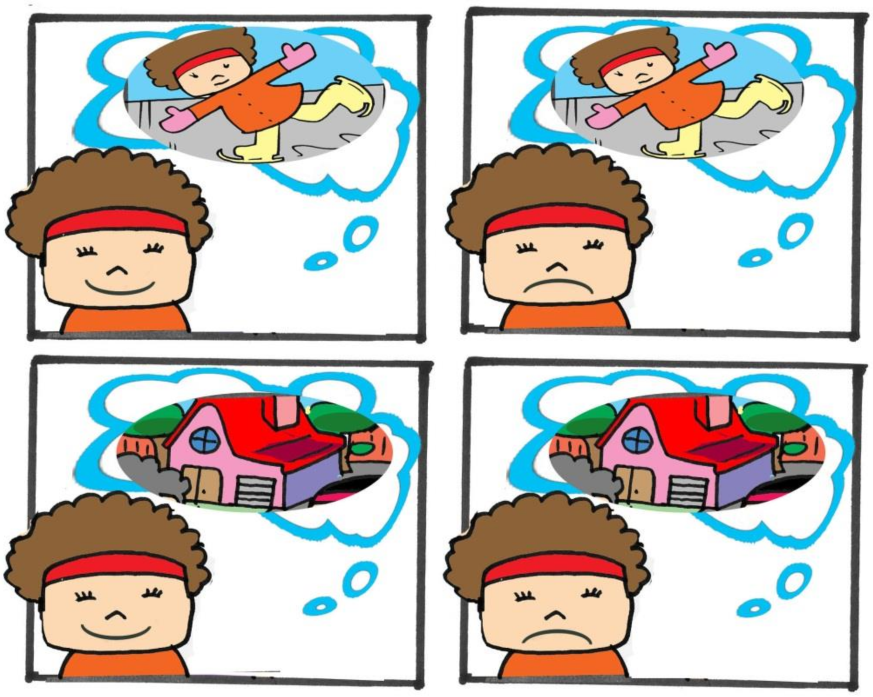
Jasmine/Yasemin loves her turtle. Her turtle dies this morning. Jasmine is going to her friend's birthday party today. Jasmine is very upset about her turtle. It is time to go to her friend's birthday party now.



Story3

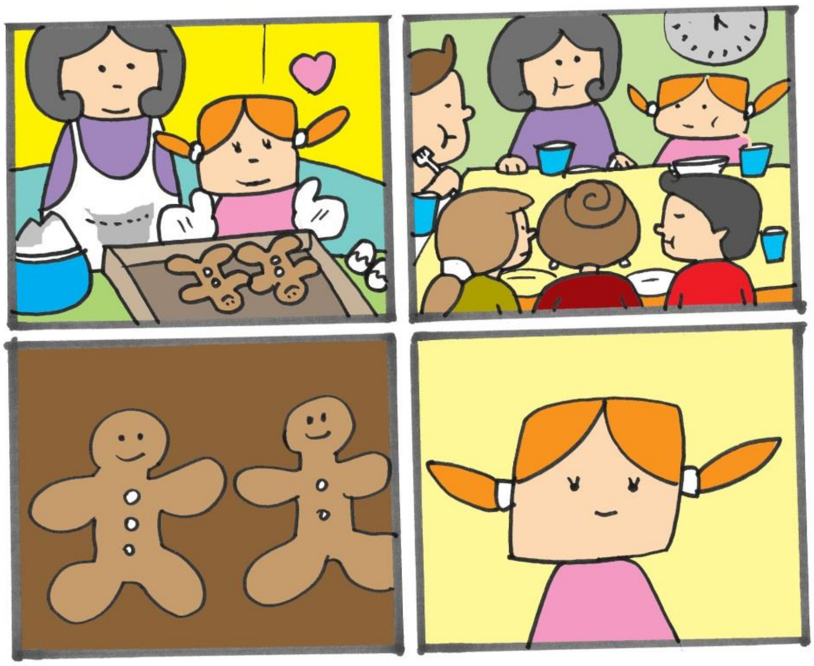
Eileen/Aylin wants go to ice-skating. Her parents say that they will go to ice-skating after her brother’s football match. Sydney watches her brother’s match. However, her brother was very tired and a little bit injured after the match. So her parents decided to go back home instead.

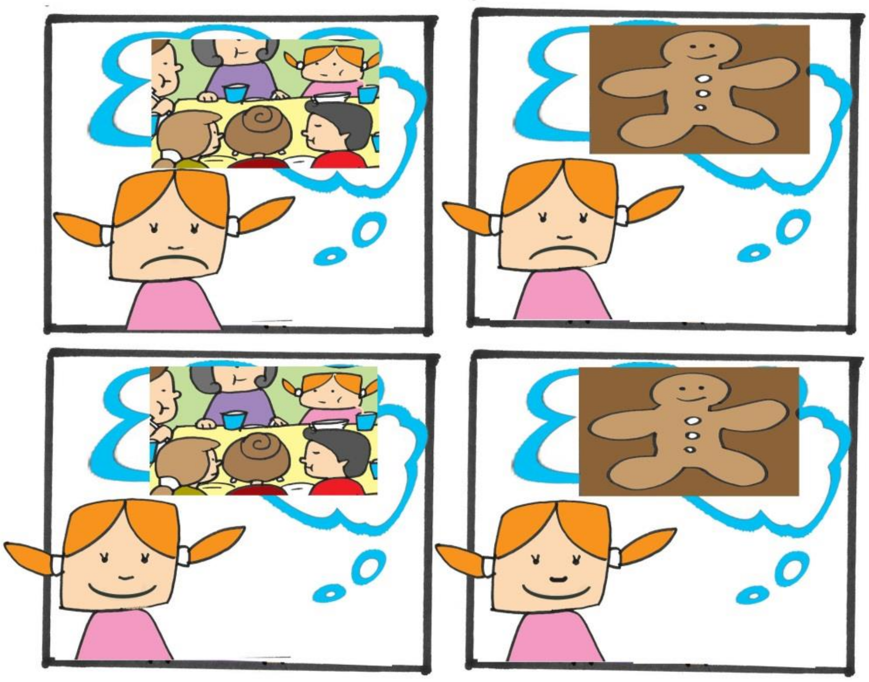




Story 4

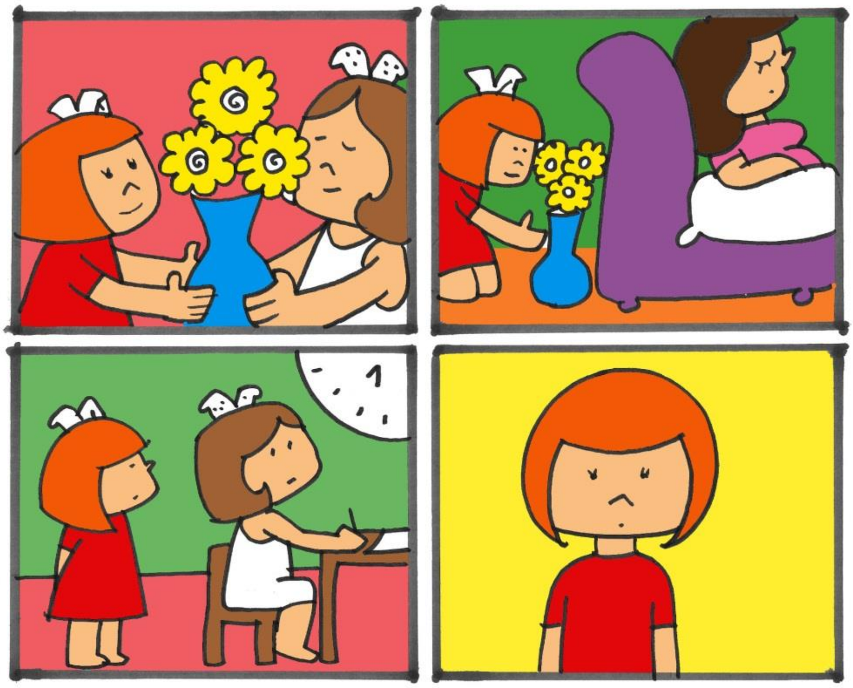
Amy/Ayse loves cookies and baking them with her mum. She needs her mother to help her bake. Her mother tells her that they can bake the cookies after everybody finishes their dinner and they have cleared the table. She finishes her dinner and wants to start baking. Her mother says, they can only start baking when everybody in the table finishes their dinner.

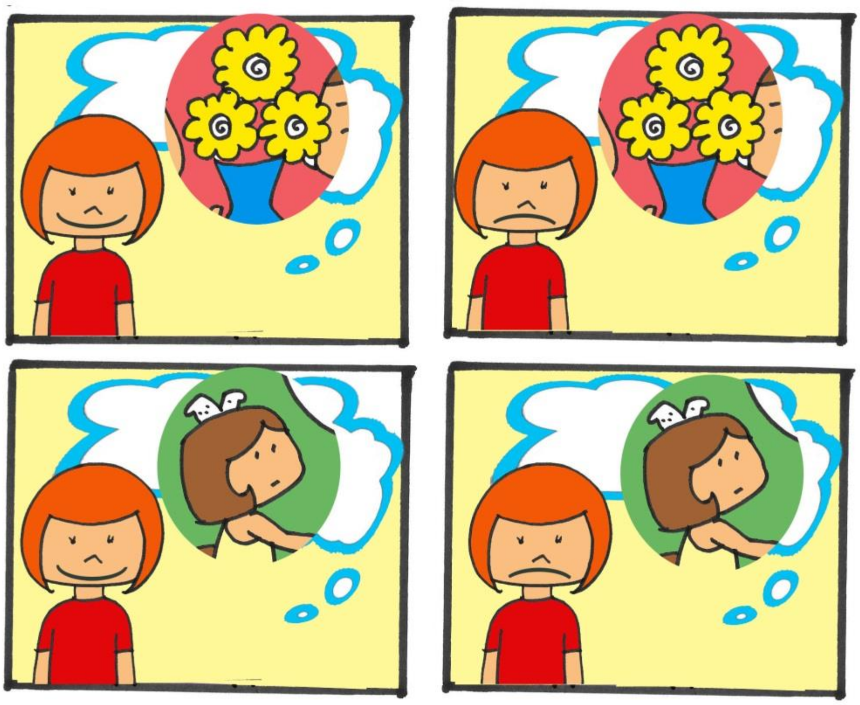




Story 5

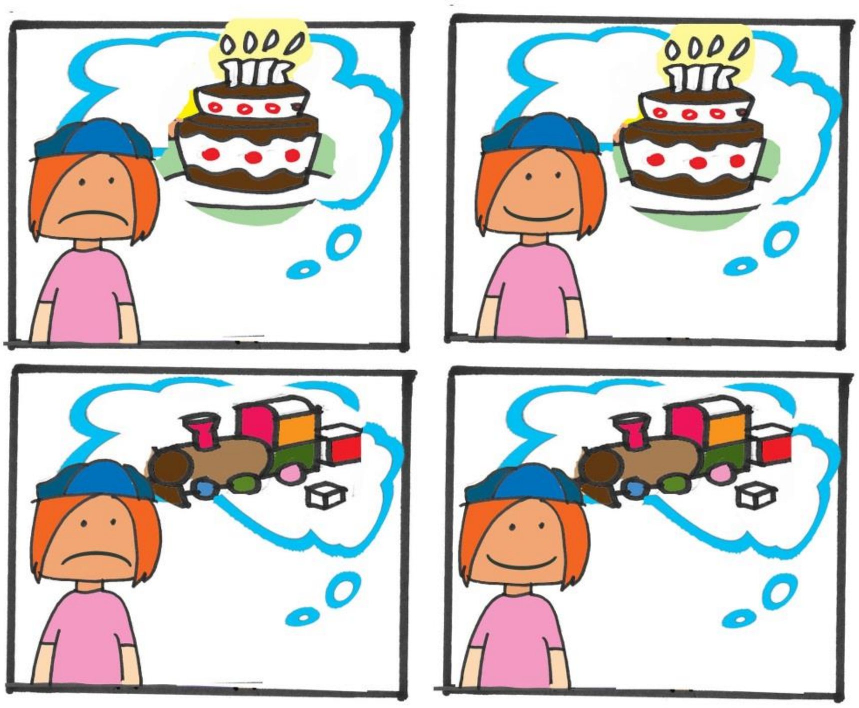
Mabel/Merve and her sister buy their mother some nice flowers for her birthday. They hide the flowers behind the sofa. Her sister says to wait until he finishes his homework. Mother is very tired and is about to fall asleep on the sofa. Now Mabel is very excited. She wants to show her mum the flowers.





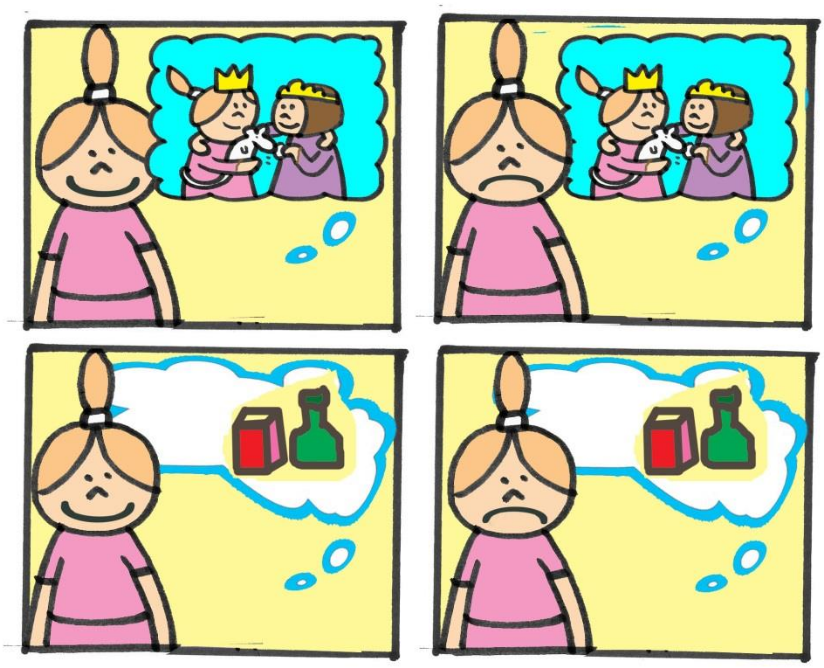
Story 6

Max/Umut’s dad promises him to go to shopping for a model train. Max’s loves model trains. And today is Max’s birthday. He is so excited. His dad takes him to the toy shop. When they get to the shop it is closed. They cannot buy a model train today. Max’s dad is very upset that he does not have present for his son’s birthday



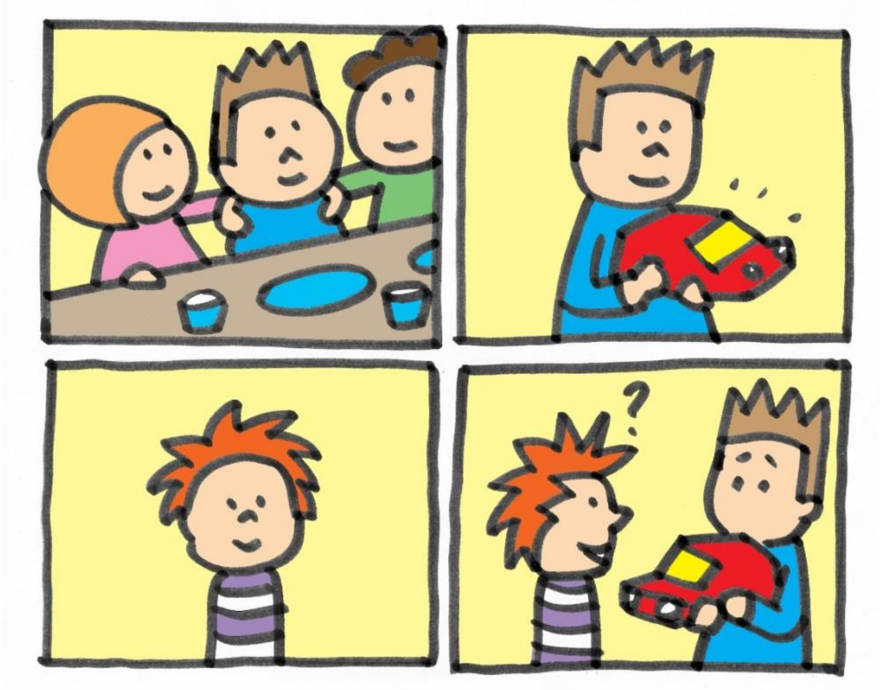
Story 7

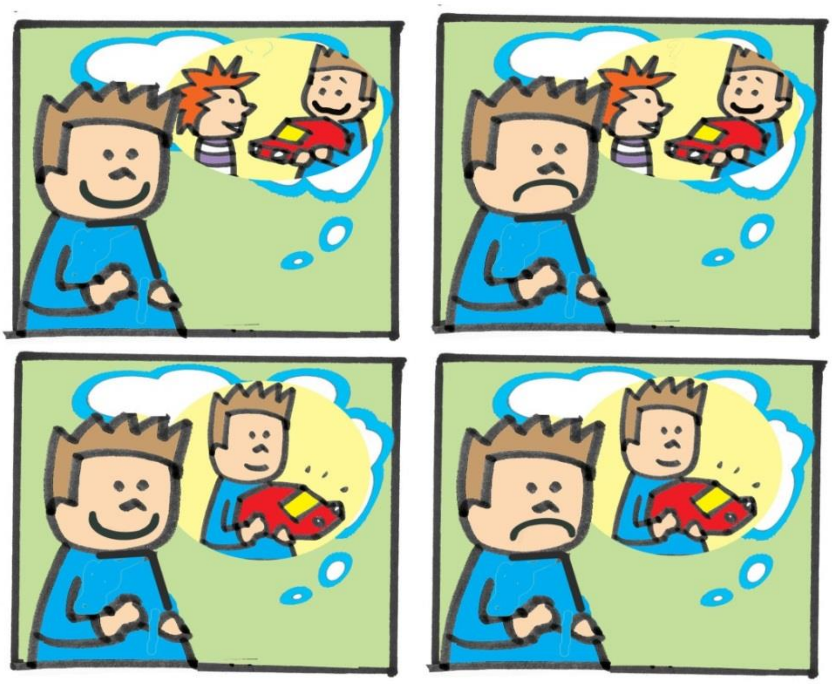
Denise/Deniz is looking forward to play with his friend. He plans to play with cars and show his hamster to his friend. However, Drew's mother rings his mother up to say that he feels very poorly so cannot come round to play.



Story 8

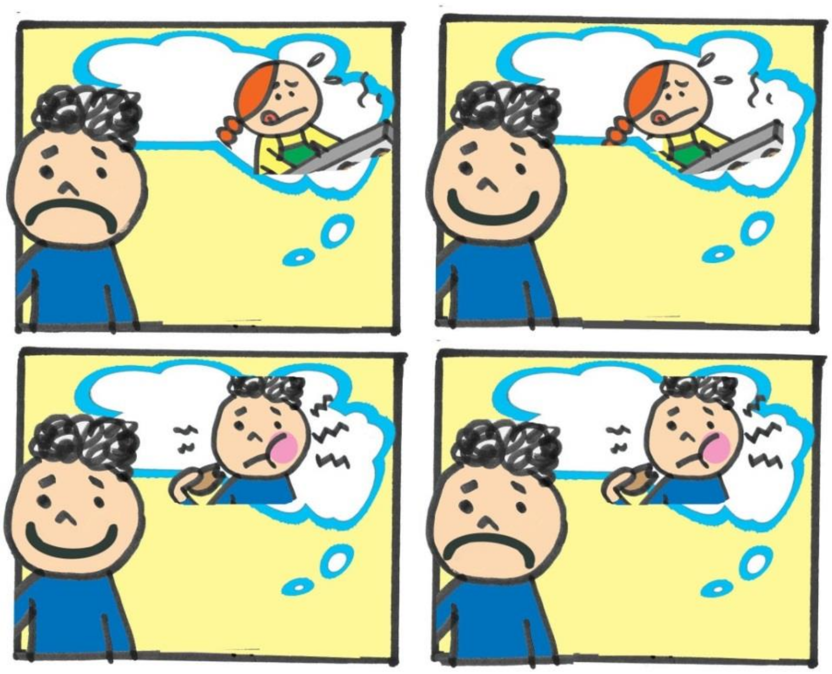
Bob/Bora loves his teacher and friends in the nursery. Every day after lunch they are allowed to play with a toy of their choice. The red car is Bora's favourite. Everybody knows that Bora plays with the red car. Ali is a new student in the nursery. He is very quiet. After lunch, Bora comes back to classroom and finds that Ali is next the red car. Ali asks Bora's to play with





Story 9

John/ Can's big sister bakes cookies for hours and she gets very tired after. Can tries a cookie. The cookie is very hard and not sweet. Can knows that her sister was working on these for hours. Can's sister ask him; 'Do you like the cookies?'



Appendix 6.1

Marker Delay Scoring (in Study 5)

- The child receives **1 point** when s/he **colours** with markers.
- The child receives **2 point** when s/he **takes** markers out of box
- The child receives **3 points** when s/he **lifts up** box.
- The child receives **4 points** when s/he **touches** box/marker
- The child receives **5 points** when s/he **touches** paper
- The child receives **6 points** when s/he **does not touch**

Appendix 6.2

Here, I present the hierarchical regression analysis for EU and SU that was not presented in Chapter 6 to not crowd the analysis. The strong bound between SU and EU was an important contribution to the literature because the their relationships has not been agreed upon among the researcher such as Cutting and Dunn (1999) who claimed that these two constructs were not related.

Predicting Emotional Understanding Performance

By TEC

Children's emotional-comprehension was also predicted in three step hierarchical regression model. In Table 6.28.1, the full details of the analysis were presented. In Step 1, to predict TEC performance, emotional-regulation measures, understanding of emotional-regulation scale performance (SURE), and delay performance were inserted. Model 1 was significant, R^2= .21, F (4,114)= 7.43, p<.001; adjusted R^2=.18. Both SURE and Delay performance were significant predictors of children's emotion comprehension performance. The relationship between TEC and SURE was apparent in the correlation analysis but Delay and TEC relationship was overseen. In Study 3, Delay performance also predicted TEC in a significant model along with the positive emotionality suppression (Secret Keeping). The latter lacked the significant role in this model. In Step 2, age was added to the model and generated model that was significant, R^2= .35, F (1,113)= 12.20, p<.001; adjusted R^2=.32. In Model 2, the significance of the SURE was remained as a predictor, but Delay was no longer significant. Instead, age was significantly predicting the emotion comprehension performance. As the delta values in Table 6.28.1 suggests, Model 2 was statistically an improved model with a higher R^2 value. In Step 3, Conflict Composite and False Belief were added to the equation. Model 3 was also a significant model with a statistically better R^2 value. However, previously significant predictors were no longer existed. The latest additions in Model 3 created that the Conflict and False Belief performances were significantly predicting the TEC performance. In Study 3, final model had False Belief, Age, and Secret Keeping as the predictors of emotion-comprehension. The close relationship between Social and Emotional understanding is undeniable which may be due to the similarity in the task demand as well as the common developmental underpinning they shared (Harris et al., 1989). Harris et al. suggests that when children predicting the weight of an emotionally charged situation, they employ mental concepts that are also used to predict belief and desires of others. Therefore, the Model 3 that suggests the false belief performance was predicting children's emotion comprehension scores was compatible with their findings. The relationship between false belief and conflict performance indicates that instead of the Delay ability that may have share an affective underpinning with emotion comprehension, the Conflict skills was also playing a crucial role in explaining children's understanding emotionally charged situations.

Since the critical effect of children's language skills on both emotion and social understanding was reported (Cutting & Dunn, 1999; Pons et al., 2003) an alternative regression analysis was conducted where language ability was added into the equation in Step 2 as a demographic variable. In Table 6.28.2, the alternative hierarchical regression analysis is displayed in detail. Model 1 was identical with the previous analysis. In Model 2, the addition of language performance leads a significant model, R^2= .35, F (2,112)= 19.49, p<.001; adjusted R^2=.49, that had Age and Language performance as significant predictors. Unlike the previous model, the significant position of SURE as a predictor was absent in Model 2. Similarly, Model 3 was still significant, R^2= .45, F (2,110)= 15.72, p<.001; adjusted R^2=.50, but the Conflict and False Belief were not significant predictors of the emotion comprehension scores. Instead, Age and Language remained as significant predictors in Model 3. Yet, it did not show that the model was statistically improved in the third step.

Table 6.28.1

Hierarchical Multiple Regression of Variables Predicting TEC (N = 120)

Emotion Comprehension

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*B*	*B*	*SE B*	*β*
Secret Keeping	.26	.20	.11	.13	.19	.05	-.04	.18	-.02
Disappointing Gift	-.04	.07	-.05	-.07	.07	-.09	-.07	.06	-.08
SURE	.13	.03	.38**	.06	.03	.18*	.02	.03	.05
Delay *Score* Composite	.43	2.0	.18*	.22	.19	.09	.12	.18	.05
Age (months)				.08	.02	.44**	.03	.02	.13
Conflict Composite							.73	.28	.30**
False Belief							.32	.12	.30**
R^2		.21			.35			.45	
F		7.43**			12.20**			13.06**	
ΔR^2					.14			.10	
ΔF					25.00**			10.25**	

Note: $*p < .05$; $**p < .01$.

Table 6.28.2

Hierarchical Multiple Regression of Variables Predicting TEC (N = 120)

	TEC								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*B*	*B*	*SE B*	*β*
Secret Keeping	.26	.20	.11	.06	.16	.02	-.03	.16	-.01
Disappointing Gift	-.04	.07	-.05	-.01	.06	-.01	-.02	.06	-.02
SURE	.13	.03	.38**	.04	.03	.12	.02	.03	.07
Delay *Score* Composite	.43	.20	.18*	.17	.16	.07	.14	.16	.06
Age (months)				.08	.01	.45**	.05	.02	.29**
Language				.05	.01	.41**	.04	.01	.34**
Conflict Composite							1.0	.27	.12
False Belief							.20	.11	.18
R^2		.21**			.51**			.53**	
F		7.43			19.49			15.72	
ΔR^2					.30**			.02	
ΔF					34.79			2.68	

Note: $*p < .05$; $**p < .01$.

Predicting Social Understanding (False Belief Performance)

Social understanding that assed via false belief tasks was analysed with three step hierarchical regression models. In Table 6.30.1, the full details of the regression model are presented. In Step 1, only Conflict score was inserted in the model. False belief performance was significantly predicted by the Conflict scores in Model 1 which was significant, R^2= .42, F (1,117)= 84.88, p<.001; adjusted R^2=.42. In Step 2, age was added to the equation. Model 2 was significant, R^2= .54, F (2,115)= 67.25, p<.001; adjusted R^2=.53, and had a higher R^2 value. Both variables were significant predictors of the false belief performance in Model 2. In Step 3, all emotionality measures and delay performance were aggregated. Model 3 was significant, R^2= .60, F (5,111)= 23.88, p<.001; adjusted R^2=.58 and a statistically better fit compared to the previous models . Both age and Conflict remained as significant predictors of the false belief performance. In addition to them, emotion comprehension and positive emotionality suppression performance were also significant predictors of the social understanding. Children's ability to understand the mental states of their own or the others was predicted by the children's ability to comprehend emotional displays. Moreover, the way children cope with the exciting news, whether they kept the exciting secret or not also predicted their performance in the false belief tasks.

Table 6.30.1

Hierarchical Multiple Regression of Variables Predicting Social Understanding (N = 120)

False Belief Performance									
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*B*	*B*	*SE B*	*β*
Conflict Composite	1.52	.17	.65**	.80	.20	.34**	.52	.22	.22*
Age (months)				.08	.02	.47**	.07	.02	.38**
TEC							.20	.07	.22**
SURE							.02	.02	.07
Disappointing Gift							-.08	.05	-.10
Secret Keeping							.30	.14	.14*
Delay *Score* Composite							-.09	.14	-.04
R^2		.42			.54			.60	
F		84.88**			67.25**			23.88**	
ΔR^2					.12			.06	
ΔF					29.18**			3.56**	

Note: *p < .05; **p < .01.

Alternatively, language performance was added to the second step of the regression along with the age. Model 2 was significant and all variables in the model were statistically predicting the false belief performance. The age, language, and conflict performance are very well documented effects on children social understanding (e.g. Carlson &Moses, 2001) and the findings of this study was supporting the previous studies(for a review, see Moses & Tahiroglu, 2010).

Table 6.30.2

Hierarchical Multiple Regression of Variables Predicting Social Understanding (N = 120)

	False Belief Performance								
	Model 1			Model 2			Model 3		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Conflict Composite	1.52	.17	.65**	.53	.21	.23**	.40	.23	.17
Age (months)				.09	.02	.53**	.07	.02	.44**
Language				.02	.01	.20**	.01	.01	.12
TEC							.14	.08	.16
SURE							.03	.02	.08
Disappointing Gift							-.06	.05	-.08
Secret Keeping							.30	.14	.14*
Delay *Score* Composite							-.07	.14	-.03
R^2		.42			.57			.61	
F		84.88**			50.79**			21.54**	
ΔR^2					.15			.04	
ΔF					19.97**			2.29*	

Note: $*p < .05$; $**p < .01$