Exploring the influence of ownership history on object valuation in typical development and autism.

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Abstract

Items with special histories (e.g. celebrity owners) or qualities (e.g. limited editions) are more valuable than similar "inauthentic" items. Typically developing (TD) children privilege authenticity and are particularly influenced by who objects belong to. Here, we explore why children and adults over-value items with special ownership histories and examine how autism spectrum disorder (ASD) affects object valuation. In Studies 1 and 2, TD children perceived items belonging to famous owners (with "good" or "bad" reputations) to be more valuable than similar items belonging to non-famous owners. However, they ascribed significantly higher values to items belonging to famous heroes than infamous villains when compared. Children with ASD did not over-value objects with special ownership histories, but their valuations were moderated by qualities unrelated to ownership (e.g. rarity). In Study 3, adults with ASD assigned high values to authentic items with special ownership histories but were more likely to keep inauthentic objects than neurotypical adults. Our findings show that association with a famous owner is sufficient to increase an item's value for TD children and adults (with and without ASD). The degree of added value may be determined by the famous owner's character for TD children, but not adults. By contrast, children with ASD value objects via a different strategy that prioritizes material qualities over ownership history. However, the awareness of authenticity displayed by adults with ASD suggests that the emergence of ownership history as an important influence on object evaluation may be developmentally delayed in ASD, rather than completely absent.

Keywords:

Autism spectrum disorder; Ownership history; Authenticity; Valuation; Typical development.

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1. Introduction

In Western cultures, ownership has a powerful influence on personal identity; we evaluate ourselves and others based on the nature and value of property (Belk, 1985, 1991, 2000; Cunningham, Vergunst, Macrae, & Turk, 2013; James, 1890; Kahneman et al., 1991). Conversely, the emotional and economic value of property is influenced by its ownership history (Hood & Bloom, 2008). It is commonplace for typically developing (TD) children and adults to experience strong emotional attachments to certain objects that belonged to cherished relatives. Moreover, collectors of celebrity memorabilia are willing to pay irrationally high fees for mundane items that were previously owned by famous actors, musicians, or sport stars (e.g. a lock of pop singer Justin Bieber's hair sold for $40,668 on EBay in 2011; British Broadcasting Corporation (BBC), 2011). The value of these "authentic" items is not principally determined by their visual, functional, or material qualities. Rather, their unique ownership history separates them from "inauthentic" exemplars (Newman, Diesendruck, & Bloom, 2011). However, recent evidence suggests that ownership may not influence how children with autism spectrum disorder (ASD) value objects that belong to them (Hartley & Fisher, 2018). The purpose of the present study is to explore how individuals with typical development and ASD value authentic objects with unique histories associated with famous owners.

Awareness and understanding of ownership emerges early in childhood. TD children use possessive pronouns (e.g. "mine", "yours") to disambiguate objects in their environment from 12 months (Saylor, Ganea, & Vasquez, 2011) and are capable of inferring ownership from a range of heuristics (e.g. verbal testimony, first possession, stereotypes, and historical reasoning) by 3-4 years (Nancekivell, Van de Vondervoort, & Friedman, 2013). As their concept of ownership develops, so too does their appreciation of authenticity when evaluating objects (Frazier & Gelman, 2009; Gelman & Davidson, 2016; Gelman, Frazier, Noles, Manczak, & Stilwell, 2015; Gelman, Manczak, & Noles, 2012; Gelman, Manczak, Was, & Noles, 2016; Hood & Bloom, 2008). Pre-schoolers consistently believe that items owned by celebrities and original creations (e.g. the very first teddy bear) should be displayed in museums (Frazier & Gelman, 2009), and judge that people would pay more money for objects owned by celebrities than non-celebrities (Gelman et al., 2015). Similarly, Hood and Bloom

(2008) found that children aged 6.5 years perceived a personal possession of Queen Elizabeth to be significantly more valuable than an identical copy, but assigned similar values to a precious object with no special history and its replica. Thus, for TD children, intangible historical connections to people confer additional value to items over-and-above their perceptible qualities.

Why are authentic items considered to be more valuable than non-authentic exemplars and even exact replicas? Establishing ownership causes an item to be processed in relation to the self, triggering the extension of self-related cognitive biases that make it psychologically salient (Beggan, 1992; Kim & Johnson, 2012, 2014). As we tend to view ourselves favourably, positive self-perceptions are transferred to the items we own, making them more memorable and enhancing their value in comparison to equivalent non-owned items (Cunningham et al., 2013; Gelman, et al., 2015; Gelman et al., 2012; Hood, Weltzien, Marsh, & Kanngiesser, 2016; Kahneman, Knetsch, & Thaler, 1991). Similar effects may also explain why we over-value items that are connected to certain other individuals. An item belonging to a celebrity (e.g. a guitar belonging to a famous rock star) may increase in value because it is associated with their personal qualities (e.g. musical talent). On the other hand, items belonging to infamous individuals may be avoided or treated with repulsion because they are associated with their owners' negative traits (Nemeroff & Rozin, 1994; Rozin et al., 1989). As TD children treat objects as extensions of the self by 5 years (Hood et al., 2016; Diesendruck & Perez, 2015), it follows that they might consider a t-shirt belonging to Peter Pan (a famous hero) to be more valuable than a hat belonging to Captain Hook (an infamous villain).

An alternative hypothesis is that authentic items belonging to famous celebrities are significantly more valuable than items belonging to non-famous individuals because of their distinctive histories. An historical ownership relation to a well-known celebrity distinguishes a specific item from other exemplars and this "uniqueness" may increase the item's desirability and economic value (Brock, 1968). In this case, association with a famous owner should be sufficient to enhance an item's value, irrespective of why that owner is famous. Therefore, children may perceive Peter Pan's t-shirt to be of equivalent value to Captain Hook's hat because their owners are similarly famous. A novel goal of the present research is to directly test these competing hypotheses by

exploring how qualities of famous owners (e.g. regarded as "good" or "bad") affect children and adults' valuations of authentic items in comparison to inauthentic items and other authentic items.

Putting aside why authentic items are valuable, it is relatively uncontroversial that ownership of such items is highly desirable. According to the 'extended-self hypothesis', an individual's self-concept integrates one's material belongings, which in turn serve as physical markers of their identity (Belk, 1988; Dittmar, 1992; James, 1890). Given their "special" status, ownership of authentic items can be psychologically rewarding and an exclusive signal of social standing. However, increased valuation of items with authentic ownership histories is contingent on perceiving intangible relationships between people (the self or revered others) and their property as important. If one was relatively unconcerned by abstract ownership-induced relationships between people and objects, then we may expect to observe a diminished influence of ownership history, as valuation would likely be driven by what an object *is* rather than *whom* it is associated with.

Recent evidence suggests that children with ASD may display this unusual, yet economically-rational, strategy when evaluating objects. In Experiment 1 of Hartley and Fisher (2018), TD children and children with ASD were randomly assigned one of three toys to keep, before being offered the chance to trade for an alternative. While TD children showed a clear preference for their randomly endowed toy and traded infrequently (replicating the reliable "ownership effect"; Gelman et al., 2012; Harbaugh, Krause, & Vesterlund, 2001; Hood et al., 2016), children with ASD often traded for a different object that they preferred. Experiment 2 reported that both TD children and children with ASD assigned higher valuations to their toys if they are self-selected and different from toys belonging to other parties. However, in contrast to TD controls, children with ASD did not over-value their toys in comparison to non-owned identical copies. This finding was replicated in Experiment 3, which also revealed that mere ownership elicited over-valuation of randomly assigned toys (in comparison to different other-owned toys) in TD children, but not children with ASD. Importantly, these findings suggest that ownership-induced connections to the self do not irrationally bias how children with ASD evaluate objects. The fact that children with ASD assigned similar valuations to copies of their favoured and randomly-endowed property indicates that ownership history in connection with the self does not enhance the value of authentic exemplars.

Hartley and Fisher (2018) propose that an absence of the mere ownership effect in children with ASD could be attributed to atypical development of the psychological self. Children with ASD experience myriad differences associated with self-concept development, including unusual use of first-person pronouns (e.g. "I" and "me"; Jordan, 1996; Lee, Hobson, & Chiat, 1994; Lind & Bowler, 2009) and reduced awareness of emotions and mental states (e.g. Ben Shalom et al., 2006; Hill, Berthoz, & Frith, 2004; Silani et al., 2008; Williams & Happé, 2010). Children with ASD may also have difficulty encoding and recollecting personally experienced events and facts (e.g. Bruck, London, Landa, & Goodman, 2007; Goddard, Howlin, Dritschel, & Patel, 2007). These differences suggest that the self does not provide a robust organising structure within the memory of children with ASD, affecting their ability to tag information as self-relevant (Lind, 2010). Due to these differences, associating objects with the self may not confer cognitive biases that cause TD individuals to perceive their property to be more desirable, memorable, and valuable than similar property belonging to others (Cunningham et al., 2013; Gelman et al., 2012; Kahneman et al., 1991).

If ownership does not reliably induce children with ASD to over-value their own property, then it follows that their appraisal of objects may not be influenced by ownership associations to others. The concept of ownership is a cultural convention acquired through interactions with others (Kanngiesser, Rosano, & Tomasello, 2015), and differences in self/other understanding coupled with differences in social interaction (APA, 2013) may reduce the likelihood that children with ASD infer ownership history to be a meaningful determinant of value. As such, children with ASD may display a distinctive approach to valuing authentic items that are associated with famous owners. Whereas TD children privilege such items over those without famous owners, children with ASD may adopt a more pragmatic approach by considering material and functional properties irrespective of ownership.

If this is the case, then we would expect children with ASD to be as sensitive as TD children to qualities that relate to the nature of objects rather than their owners. Firstly, an item's value may be determined by its age. General consumer culture is characterised by a desire for newness, with brand new items considered to be more valuable than second-hand items of the same type (Campbell, 1992). Excluding differences in ownership history, new items may be more valuable for functional reasons (i.e. they are less worn or damaged, making them better long-term investments), or because they are

perceived as signals of superior social status. However, some "old" objects are regarded as valuable antiques and command higher values than contemporary counterparts. While TD children appreciate that such objects belong in a museum, they nonetheless prefer to own a brand new item of the same type (Frazier & Gelman, 2009). Secondly, an object's value is determined by what it is constructed from. A single type of item (e.g. a ring) can be made from many different materials (e.g. plastic, titanium, gold, platinum) that vary wildly in their economic worth. Thirdly, value can be influenced by an item's rarity. Brands often release "limited edition" products that consumers consider to be more special and valuable than non-limited alternatives (Aggarwal, Jun, & Huh, 2011; Jang, Ko, Morris, & Chang, 2015). According to commodity theory, this phenomenon occurs because value is closely related to scarcity; items that are highly infrequent and difficult to attain are instinctively more desirable and of higher worth (Brock, 1968). Interestingly, Echelbarger and Gelman (2017) recently showed that TD children aged 4-12 years rarely preferred scarce items over abundant alternatives in most situations. Fourthly, an object's value can be influenced by its place of origin. TD adults from both individualist and collectivist cultures regard authentic items from distant locations (e.g. a rock from the moon) as more valuable than similar items from nearby locations (e.g. a rock from your backyard; Frazier, Gelman, Wilson, & Hood, 2009), or identical replicas created by a physicist's duplicating machine (Gjersoe, Newman, Chituc, & Hood, 2014).

The present research is the first to systematically investigate the influence of authentic ownership history on children and adults, with and without ASD. In Study 1 we explore how children's object valuations are mediated by owner characteristics and authentic qualities that are unrelated to ownership history. In one task, children valued pairs of items that belonged to owners that differed on particular traits. Specifically, we compared famously "good" owners against non-famous owners, famously "bad" owners against non-famous owners, famously good owners against famously bad owners, and modern celebrity owners against historical celebrity owners. This design enables us to test whether TD children over-value celebrity possessions because their owners have valuable personal qualities, or because they are merely famous. The former theory would predict that items belonging to famously good owners would receive higher values than items that belong to non-famous owners or famously bad owners. Items belonging to famously bad people may receive lower

values than similar items belonging to non-famous people due to the negative bias associated with their owners. However, the latter theory would predict that authentic items belonging to famously good and famously bad owners should both be over-valued in comparison to inauthentic items belonging to non-famous people. The contrast between modern and historical celebrity owners was included to test whether young children's preference for new objects over old objects (Frazier & Gelman, 2009) extend to valuations associated with ownership history. Based on recent evidence (e.g. Hartley & Fisher, 2018), we predicted that children with ASD would value items independent of their ownership history, leading to minimal systematic differences between owner types.

In another task, children valued pairs of items that differed on qualities that are unrelated to ownership: age (new vs. old), material value (expensive vs. cheap), rarity (limited vs. common), and origin location (distant vs. local). We predicted that TD children would assign higher values to new objects than old objects (Frazier & Gelman, 2009), but may not assign higher values based on rarity (Echelbarger & Gelman, 2017). To our knowledge, no previous studies have investigated TD children's sensitivity to material worth or origin location when valuing objects. However, we anticipated that their responses would align with adult intuitions, with higher valuations assigned to items from distant (rather than near) locations and items made from expensive (rather than cheap) materials. Unlike the ownership history task, we expected that children with ASD would demonstrate broadly similar patterns of responding to TD children, thus showing awareness of qualities that determine an object's worth that are unrelated to ownership.

Study 2 re-examines the influence of ownership history on how children value objects and Study 3 extends this research question to adult populations. Crucially, the results of this research will make a valuable contribution to the ownership literature by highlighting why typically developing individuals over-value celebrity possessions and revealing whether individuals with ASD have reduced concern for authentic ownership history when evaluating property.

2. Study 1: Exploring the influence of ownership history and object qualities on item valuations by TD children and children with ASD.

2.1. Method

2.1.1. Participants

Participants were 17 children with ASD (14 males; *M* age = 9.00 years, *SD* = 1.25, range = 6.5-11 years) and 18 TD controls (8 males, *M* age = 5.94, *SD* = 0.53, range = 5.08-6.75) recruited from two specialist schools and one mainstream school in the Cheshire area. Samples were closely matched on receptive vocabulary as measured by the British Picture Vocabulary Scale Version 3 (BPVS; Dunn, Dunn, Sewel & Styles, 2009; ASD: *M* age equivalent = 6.40 years, *SD* = 1.42; TD: *M* age equivalent = 6.24 years, *SD* = 0.63). The profile of our ASD sample was very similar to those of Hartley and Fisher (2018) and, disregarding their diagnosis, they were at a developmental stage characterised by sensitivity to ownership history (see Hood & Bloom, 2008). All children with ASD were diagnosed by a qualified educational or clinical psychologist using standardized instruments (e.g. Autism Diagnostic Observation Scale and Autism Diagnostic Interview – Revised; Lord, Rutter, DiLavore, & Risi, 2002; Lord, Rutter, & Le Couteur, 1994) and expert judgement. Diagnoses were confirmed via the Childhood Autism Rating Scale 2 (CARS; Schopler, Van Bourgondien, Wellman, & Love, 2010), which was completed by each participant's class teacher (ASD *M* score: 33.29; TD *M* score: 15.28). Children with ASD were significantly older than TD children, $t(33) = 9.53$, $p < .001$, $d = 3.19$, and had significantly higher CARS scores, $t(32) = 8.58$, $p < .001$, $d = 2.86$. The samples did not differ on receptive vocabulary, $t(32) = 0.42$, $p = .67$. All procedures performed in this research (Studies 1-3) involving human participants were in accordance with the ethical standards of the institutional and national research committee. Informed consent was obtained from parents/caregivers prior to children's participation (Studies 1 and 2) or directly from participants (Study 3).

2.1.2. Materials

2.1.2.1. Ownership history game. Stimuli for the warm-up included 12 colour photographs of objects organised into three sets. Each set included two pairs, depicting: (1) one desirable item and one undesirable item (e.g. helicopter, old leaf), (2) two equally desirable items (e.g. red car, blue car), and (3) two equally undesirable items (e.g. empty can, empty sweet wrapper). Stimuli for the ownership history game consisted of 32 photographs of objects organised into 16 pairs. Four pairs belonged to each of four sets. The sets differed in terms of *who* owned the depicted objects: (1) famously "good" owner vs. non-famous owner (e.g. SpongeBob's spatula vs. my brother's whisk), (2)

famously “bad” owner vs. non-famous owner (e.g. Darth Vader’s helmet vs. my friend’s motorcycle helmet), (3) famously “good” owner vs. famously “bad” owner (e.g. Batman’s cape vs. Joker’s jacket), and (4) historical celebrity owner vs. modern celebrity owner (e.g. Queen Cleopatra’s headdress vs. Queen Elizabeth’s crown; see Table 1). Each pair elicited comparison between an authentic item owned by a famous character and an inauthentic item owned by someone of no significance to the participant, or two authentic items whose owners differ on important qualities that are known to impact TD children’s valuations. Items within pairs were matched on function and estimated material value disregarding ownership history. Children’s valuations were indicated via four laminated pictures: two depicting 1 star and two depicting 5 stars.

Table 1. Sets of item pairs in the ownership history valuation game in Study 1.

Set	Object pair
1. Famously good owner vs. Non-famous owner	SpongeBob's spatula vs. My brother's whisk
	Alice in Wonderland's shoes vs. My sister's trainers
	Super Mario's hat vs. My friend's sunglasses
	Winnie the Pooh's honey jar vs. My mum's cookie jar
2. Famously bad owner vs. Non-famous owner	Darth Vader's helmet vs. My friend's motorcycle helmet
	White Witch's fur coat vs. My mum's dress
	Scar's skull vs. My dog's bone
	Cruella de Vil's gloves vs. My sister's scarf
3. Famously good owner vs. Famously bad owner	Harry Potter's glasses vs. Voldermort's cloak
	Snow White's headband vs. Evil Queen's necklace
	Batman's cape vs. Joker's jacket
	Peter Pan's t-shirt vs. Captain Hook's hat
4. Historical celebrity owner vs. Modern celebrity owner	William Shakespeare's quill vs. Roald Dahl's pen
	Henry VIII's hat vs. Barack Obama's tie
	Albert Einstein's notebook vs. Stephen Hawking's calculator
	Cleopatra's headdress vs. Queen Elizabeth II's crown

2.1.2.2. Object qualities game. Stimuli for the warm-up were 12 colour photographs of relatively "desirable" and "undesirable" items organized into sets as described for the ownership history game (although different objects were depicted). Stimuli for the object qualities game consisted of 32 photographs of objects organised into sixteen pairs. Four pairs belonged to each of four sets. The sets differed in terms of the depicted objects' tangible qualities: (1) old vs. new (e.g. old book vs. new book), (2) expensive material vs. cheap material (e.g. gold watch vs. plastic watch), (3) rare vs. common (e.g. rare coin vs. common penny), and (4) distant location vs. local location (e.g. rock from the moon vs. rock from a garden; see Table 2). Children's valuations were indicated via the star cards used in the ownership history game.

Table 2. Sets of item pairs in the object qualities valuation game in Study 2.

Set	Object pair
1. Old vs. new	Old chair vs. New chair
	Old teddy bear vs. New teddy bear
	Old car vs. New car
	Old book vs. New car
2. Expensive material vs. Cheap material	Diamond ring vs. Rubber ring
	Gold watch vs. Plastic watch
	Silver spoon vs. Wooden spoon
	China plate vs. Paper plate
3. Rare vs. Common	Rare coin vs. Common penny
	Rare trading card vs. Common trading card
	Rare comic book vs. Common comic book
	Rare beanie baby vs. Common beanie baby
4. Distant location vs. Local location	Kimono from Japan vs. Dressing gown from England
	Shell from a beach in Florida vs. Shell from a beach in Blackpool
	Dust from Mars vs. Dust from under a bed
	Rock from the moon vs. Rock from a garden

2.1.3. Procedure

Children were tested individually in their own schools and were accompanied by a familiar adult. They were verbally praised for attention and good behaviour. Children completed the BPVS in session one, the ownership history game in session two, and the object qualities game in session three (sessions were administered on different days). Both sessions two and three began with a warm-up game.

2.1.3.1. Warm-up game. The warm-up game was designed to familiarise children with valuing pairs of depicted objects and teach them that objects within pairs could both be high or low value. Following previous studies (e.g. Hartley & Fisher, 2018; Hood et al., 2016), we used desirability ratings as a proxy for financial valuations because young children do not reliably understand monetary value (Berti & Bombi, 1981).

The experimenter presented and verbally labelled two pictures of objects – one of high desirability and the other of low desirability. The experimenter then presented cards depicting one gold star and five gold stars ("Here I have 1-star cards and here I have 5-star cards"). They then explained how the star cards represented the desirability of the two pictures and assigned them accordingly ("I'm going to give the [desirable item] 5 stars because it's the best. I'm going to give the [undesirable item] 1 star because it's the worst"). This process was repeated for a second pair of pictures depicting two desirable objects ("I'm going to give this [desirable item] 5 stars and this [desirable item] 5 stars. I like them both.") and a third pair depicting two undesirable objects ("I'm going to give this [undesirable item] 1 star and this [undesirable item] 1 star. I don't like them both"). The participant was then told it was their turn, and they were presented with three new pairs of pictures (a desirable object and an undesirable object, two desirable objects, two undesirable objects) in a random order. The experimenter named the objects in each pair, and asked children to use the star cards to indicate the desirability of each object ("Here you have 1-star cards and here you have 5-star cards. How many stars for [item A]? And how many stars for [item B]?"). We inferred that children understood the valuation system if they allocated 5 stars to desirable items and 1 star to undesirable items. If children responded differently, they were provided with corrective feedback and asked to try again ("Actually, I think this one is much better than this one, this one should get 5…").

The warm-up games preceding the ownership history and object qualities games were identical except that the photographs depicted different objects.

2.1.3.2. Ownership history game. The experimenter presented and verbally introduced two pictures of objects (e.g. “Here is a spatula. This spatula belongs to SpongeBob Squarepants. Here is a whisk. This whisk belongs to my brother”). Children were then asked to indicate the desirability of each object using the star cards (“Here you have 1-star cards and here you have 5-star cards. How many stars for my brother’s whisk? And how many stars for SpongeBob Squarepants’ spatula?”). No feedback was provided by the experimenter following the child’s response. Children valued 16 pairs of pictures in total. Four pairs belonged to each of four sets (1. famously good owner vs. non-famous owner, 2. famously bad owner vs. non-famous owner, 3. famously good owner vs. famously bad owner, 4. historical celebrity owner vs. modern celebrity owner). These sets were designed to probe how children’s object valuations are influenced by different owner characteristics. Pairs belonging to a set were presented in a block, with set order counterbalanced across participants. Order of pairs within sets was randomized, as was the order in which items within pairs were introduced and valued by children. If children spontaneously justified their valuations on a trial, their comments were recorded by the experimenter.

2.1.3.3. Object qualities game. This game was administered exactly as described for the ownership history game. However, when describing pairs of photographs, the experimenter provided information about the depicted objects’ properties rather than their owners (e.g. “Here is a watch. This watch is made from gold. Here is another watch. This watch is made from plastic”). Four pairs of photographs belonged to each of four sets (1). old vs. new, (2) expensive material vs. cheap material, (3) rare vs. common, and (4) distant location vs. local location. These sets were designed to probe children’s sensitivity to features (unrelated to ownership history) that often influence the perceived value of objects. If children spontaneously justified their valuations on a trial, their comments were recorded by the experimenter.

2.2. Results

2.2.1. Ownership history game

2.2.1.1. Item valuations. One child with ASD did not complete the task. The remaining 16 children with ASD and all TD children rated all 16 pairs of pictures. Participants' desirability ratings (1, 5) for each object were recorded. Every child completed each of the three warm-up trials on their first attempt.

For each set of items, children's average values were calculated for the four authentic items and the four inauthentic items (or the other four authentic items in the case of good vs. bad characters and modern vs historical celebrities; see Figure 1). These average values were entered into four 2(Population: ASD, TD) x 2(Owner: owner A, owner B) mixed ANOVAs.

For the famously good owner vs. non-famous owner set (1), a significant main effect of Owner, $F(1, 32) = 56.45$, MSE = 0.62, $p < .001$, $\eta_p^2 = .64$, was qualified by a significant Population x Owner interaction, $F(1, 32) = 61.45$, MSE = 0.62, $p < .001$, $\eta_p^2 = .66$. Bonferroni-adjusted pairwise comparisons revealed that items belonging to good owners received significantly higher valuations from TD children ($M = 4.67$, $SD = 0.49$) than children with ASD ($M = 3.50$, $SD = 1.03$; $t = 4.30$, $p < .001$). Conversely, children with ASD ($M = 3.56$, $SD = 1.09$) assigned significantly higher valuations to items belonging to non-famous people than TD children ($M = 1.72$, $SD = 0.83$; $t = 5.57$, $p < .001$). While TD children rated items belonging to good owners as significantly more valuable than items belonging to non-famous people ($t = 11.83$, $p < .001$), children with ASD considered these groups of items to be of similar value ($t = 0.21$, $p = .84$).

For the famously bad owner vs. non-famous owner set (2), a significant main effect of Owner, $F(1, 32) = 45.78$, MSE = 0.88, $p < .001$, $\eta_p^2 = .59$, was qualified by a significant Population x Owner interaction, $F(1, 32) = 29.13$, MSE = 0.88, $p < .001$, $\eta_p^2 = .48$. Bonferroni-adjusted pairwise comparisons showed that items belonging to bad owners received significantly higher valuations from TD children ($M = 4.67$, $SD = 0.49$) than children with ASD ($M = 3.63$, $SD = 0.96$; $t = 4.07$, $p < .001$). As above, children with ASD ($M = 3.31$, $SD = 1.08$) assigned significantly higher valuations to items belonging to non-famous people than TD children ($M = 1.89$, $SD = 1.02$; $t = 3.95$, $p < .001$). For TD children, items belonging to bad owners were significantly more valuable than items belonging to non-famous people ($t = 9.33$, $p < .001$), but these items were of similar value for children with ASD ($t = 0.89$, $p = .39$).

For the famously good owner vs. famously bad owner set (3), a significant main effect of Owner, $F(1, 32) = 21.70$, MSE = 1.46, $p < .001$, $\eta_p^2 = .40$, was qualified by a significant Population x Owner interaction, $F(1, 32) = 6.40$, MSE = 1.46, $p = .017$, $\eta_p^2 = .17$, which was investigated via a series of Bonferroni-adjusted pairwise comparisons. Items belonging to good owners received significantly higher valuations from TD children ($M = 4.67$, $SD = 0.77$) than children with ASD ($M = 3.50$, $SD = 1.15$; $t = 3.51$, $p = .001$). However, ratings for items belonging to bad owners were similar for TD children ($M = 2.56$, $SD = 1.09$) and children with ASD ($M = 2.88$, $SD = 1.09$; $t = 0.77$, $p = .45$). TD children's valuations were significantly higher for items belonging to good owners than bad owners ($t = 5.13$, $p = .001$). By contrast, valuations by children with ASD for good and bad owners' belongings did not significantly differ ($t = 1.50$, $p = .16$).

For the historical celebrity owner vs. modern celebrity owner set (4), there was a significant main effect of Population, $F(1, 32) = 5.57$, MSE = 1.35, $p = .025$, $\eta_p^2 = .15$. Average valuations of TD children ($M = 3.92$) were significantly higher than those of children with ASD ($M = 3.25$). There was no effect of Owner and no interaction.

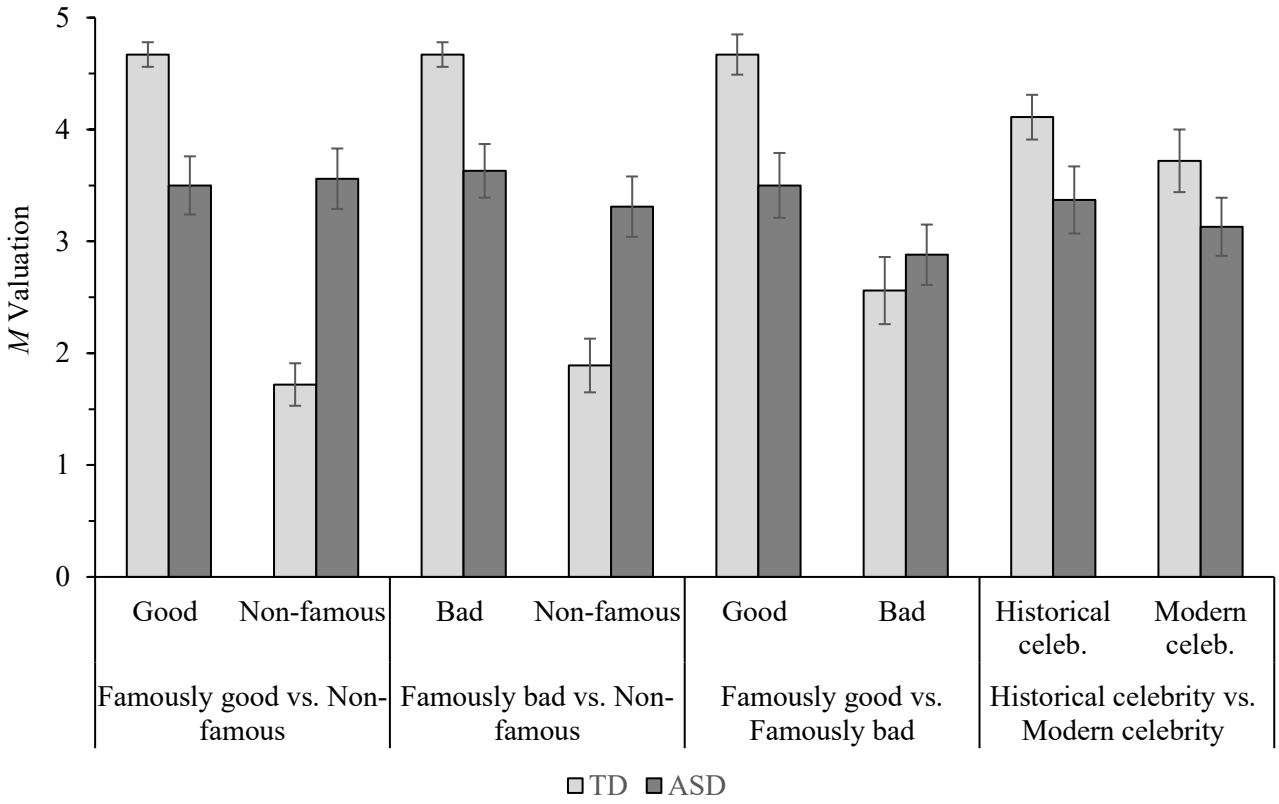

Fig. 1. Average valuations (1-5) for items in the ownership history game by typically developing (TD) children and children with autism spectrum disorder (ASD) in Study 1. Error bars show ± 1 SE.

2.2.1.2. Verbal comments. Participants' spontaneous verbal justifications for their valuations were transcribed and a coding scheme was developed. Every comment was allocated to one of three categories: 1. Owner justification, 2. Object justification, or 3. Other (see Table 3 for category definitions and examples). The purpose of this coding system was to identify whether children with ASD and TD children differ in how they justify their valuations of authentic items belonging to different owners. Every comment was coded by the first author and an independent rater with relevant expertise. The second rater was blind to the objectives of the study and the details of each child (e.g. their age, population, background scores). Reliability of the coding scheme was assessed via Cohen's Kappa, which was calculated based on the two raters' categorical classifications for each comment (i.e. whether a statement was an 'Owner justification', 'Object justification', or 'Other'). Inter-rater reliability was high, $\kappa = .86$, $p < .001$, and disagreements in classifications were resolved by consensus between the two raters.

Table 3. Coding scheme for children's qualitative comments in the ownership history game in Study 1.

Category	Definition	Examples
Owner justification	Indicates preference with reference to the owner or owners. Justifications may be based on personality, attributes, fame, importance, or affection for the named individual.	"Because Snow White is a princess" "Because the real Harry Potter wore them" "He is a famous hero and he is a famous evil man" "They are wizards, so their things are important"
Object justification	Indicates preference with reference to the object or objects, without mentioning owners. Justifications may be based on visual attractiveness, function, interest, or material worth.	"Both good to wear" "This helmet is more good at protecting" "Pen is easier to use" "They are both pretty"
Other	Indicates preference without referring to owners or object properties.	"Like the hat the most" "I like this one better" "Both just as good" "I like the honey pot but I also like the cookies"

Fourteen children with ASD verbally justified their valuations across 53 discrete trials. These comments included 7 owner justifications (13.21%) and 40 object justifications (75.47%). Sixteen TD children verbally justified their valuations on 78 discrete trials. These comments included 54 owner justifications (69.23%) and 14 object justifications (17.94%). Thus, the two populations tended to

justify their valuations in contrasting ways. While TD children frequently explained their valuations with reference to object owners and referred to object properties relatively infrequently, the justifications of children with ASD rarely mentioned object owners and often highlighted object properties.

2.2.2. Object qualities game

2.2.2.1. Item valuations. Every child rated all 16 pairs of pictures. Participants' desirability ratings (1, 5) for each object were recorded. Every child completed each of the three warm-up trials on their first attempt, with the exception of two children with ASD (who required two attempts to complete the "two desirable objects" trial) and one TD children (who required two attempts to complete the "two undesirable objects" trial).

For each set of items, children's average values were calculated for each type of object (e.g. new objects and old objects in set 1; see Figure 2). These average values were entered into four 2(Population: ASD, TD) x 2(Quality: quality A, quality B) mixed ANOVAs.

For the old vs. new set (1), there was a significant main effect of Quality, $F(1, 33) = 300.51$, MSE = 0.63, $p < .001$, $\eta_p^2 = .90$, indicating that children across populations assigned significantly higher valuations to new objects ($M = 4.86$, $SD = 0.43$) than old objects ($M = 1.58$, $SD = 0.95$). There was no effect of Population and no interaction.

For the expensive material vs. cheap material set (2), a significant main effect of Quality, $F(1, 33) = 98.25$, MSE = 0.63, $p < .001$, $\eta_p^2 = .75$, was qualified by a significant Population x Quality interaction, $F(1, 33) = 8.85$, MSE = 1.13, $p = .005$, $\eta_p^2 = .21$, which was explored via Bonferroni-adjusted pairwise comparisons. Valuations for expensive materials by TD children ($M = 4.78$, $SD = 0.43$) and children with ASD ($M = 4.29$, $SD = 1.05$) did not significantly differ. However, valuations for cheap materials were significantly higher for children with ASD ($M = 2.53$, $SD = 1.50$) than TD children ($M = 1.50$, $SD = 0.71$; $t = 2.61$, $p = .01$). Both TD children ($t = 14.51$, $p < .001$) and children with ASD ($t = 3.79$, $p = .002$) assigned significantly higher valuations to expensive materials than cheap materials.

For the rare vs common set (3), a significant main effect of Quality, $F(1, 33) = 54.32$, MSE = 1.05, $p < .001$, $\eta_p^2 = .62$, was qualified by a significant Population x Quality interaction, $F(1, 33) =$

9.32, MSE = 1.05, $p = .004$, $\eta_p^2 = .22$. Bonferroni-adjusted pairwise comparisons showed that rare items received significantly higher valuations from TD children ($M = 4.56$, $SD = 0.78$) than children with ASD ($M = 3.82$, $SD = 0.95$; $t = 2.49$, $p = .02$), while common items tended to receive higher valuations from children with ASD ($M = 2.76$, $SD = 1.25$) than TD children ($M = 2.00$, $SD = 1.08$; $t = 1.94$, $p = .06$). Both TD children ($t = 7.03$, $p < .001$) and children with ASD ($t = 3.25$, $p = .005$) assigned significantly higher valuations to rare items than common items.

For the distant location vs. local location set (4), a significant main effect of Quality, $F(1, 33) = 141.68$, MSE = 0.97, $p < .001$, $\eta_p^2 = .81$, was qualified by a significant Population x Quality interaction, $F(1, 33) = 8.58$, MSE = 0.97, $p = .006$, $\eta_p^2 = .21$. Bonferroni-adjusted pairwise comparisons showed that items from distant locations received significantly higher valuations from TD children ($M = 4.78$, $SD = 0.55$) than children with ASD ($M = 3.88$, $SD = 1.32$; $t = 2.65$, $p = .01$), while items from local locations tended to receive higher valuations from children with ASD ($M = 1.76$, $SD = 0.9$) than TD children ($M = 1.28$, $SD = 0.46$; $t = 2.03$, $p = .05$). Both TD children ($t = 18.89$, $p < .001$) and children with ASD ($t = 4.76$, $p < .001$) assigned significantly higher valuations to items from distant locations items than items from local locations.

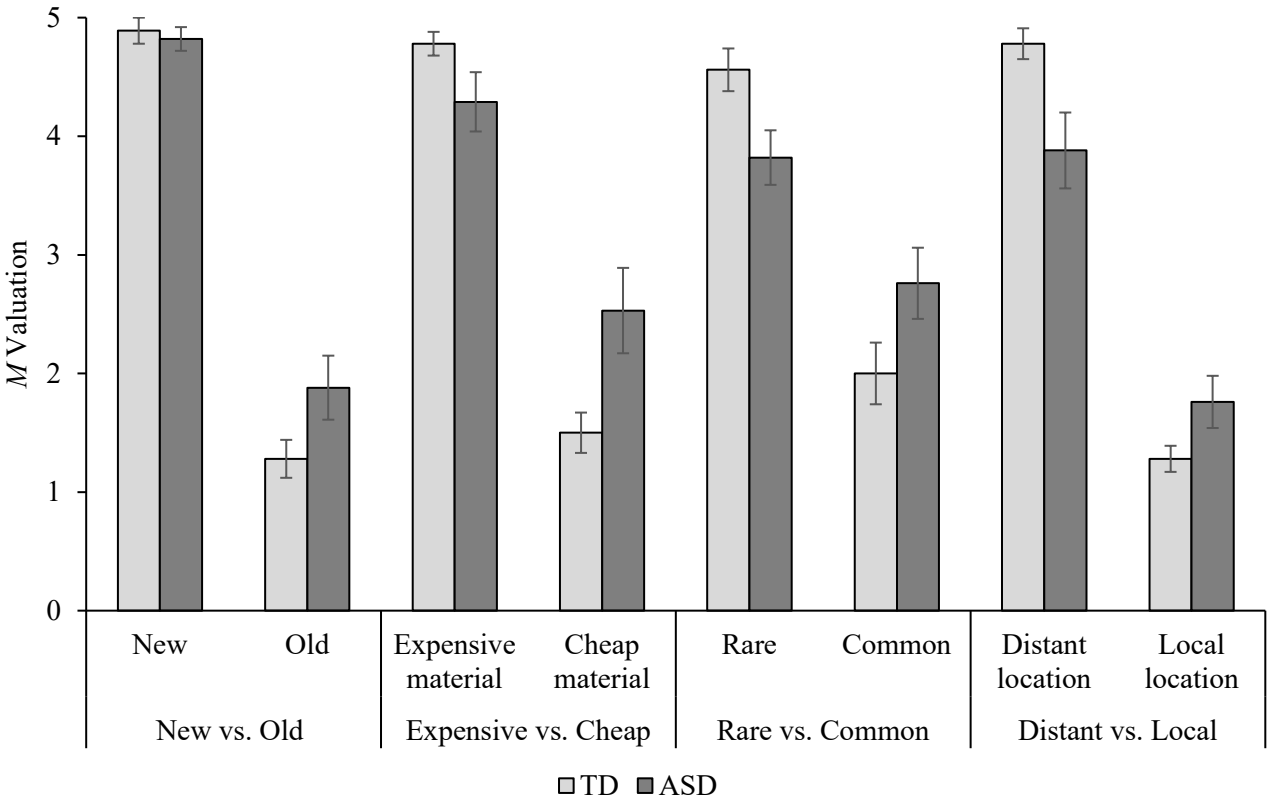

Fig. 2. Average valuations (1-5) for items in the object qualities game by typically developing (TD) children and children with autism spectrum disorder (ASD) in Study 1. Error bars show ± 1 SE.

2.2.2.2. Verbal comments. Participants' spontaneous verbal justifications for their valuations were transcribed and a coding scheme was developed. Every comment was allocated to one of three categories: 1. Quality justification, 2. Similarity justification, or 3. Other (see Table 4 for category definitions and examples). The purpose of this coding system was to identify whether the groups differed in how they justified their valuations based on object qualities. We sought to identify whether children with ASD referenced these qualities less frequently than TD children and instead focused on the functional similarities of items in each pair. Every comment was coded by the first author and an independent rater with relevant expertise. The second rater was blind to the objectives of the study and the details of each child (e.g. their age, population, standardised assessment scores). Reliability of the coding scheme was assessed via Cohen's Kappa, which was calculated based on the two raters' categorical classifications for each comment (i.e. whether a statement was an 'Quality justification',

'Similarity justification', or 'Other'). Inter-rater reliability was high, $\kappa = .82$, $p < .001$, and disagreements in classifications were resolved by consensus between the two raters.

Table 4. Coding scheme for children's qualitative comments in the object qualities game in Study 1.

Category	Definition	Examples
Quality justification	Indicates preference with reference to a contrast in quality. Justifications may be based on material worth, age, rarity, origin, or functional difference.	"the new car would be faster and work better" "rare things are worth the most money and are special" "wow, dust from Mars will be worth a lot of money" "a penny can't buy much, but rare coins are sometimes worth lots"
Similarity justification	Indicates preference with reference to similarity. Justifications may be functional or aesthetic in nature.	"Both nice and pretty" "Same because you eat off both" "Both rocks, don't do much" "Both tell the time"
Other	Indicates preference without explicitly referring to a contrast in quality or similarity.	"I like rocks" "I like comics so both 5" "I like blue" "not fun things"

Fourteen children with ASD verbally justified their valuations on 58 discrete trials. These comments included 19 quality justifications (32.76%) and 28 similarity justifications (48.28%). Fifteen TD children verbally justified their valuations on 30 discrete trials. These comments included 17 quality justifications (56.67%) and 6 similarity justifications (20%). Whilst both populations

assigned greater value to items with desirable qualities, the comments of children with ASD reflect their increased appreciation of items that were comparatively mundane. Children with ASD were much more likely to comment on the aesthetic or functional similarity of items in each pair, whilst TD children predominantly commented on the difference in quality (aligning with the greater disparity between their valuations for items differing in quality).

2.3. Discussion

Study 1 investigated whether item valuations by children with ASD and language-matched TD children are reliably influenced by (a) associations with famously good and bad owners, and (b) object qualities that are unrelated to ownership history. The findings of the ownership history game revealed that children with ASD do not over-value authentic objects with special ownership histories. By contrast, TD children reliably perceived items belonging to famous characters (irrespective of their personality) to be more valuable than similar items belonging to non-famous individuals. However, comparisons between authentic items suggested that values were moderated by TD children's perceptions of famous owners. In the object qualities game, both populations assigned significantly higher valuations to new objects (vs. old objects), objects made from valuable materials (vs. cheap materials), rare objects (vs. common objects), and objects from distant geographical locations (vs. local locations). However, differences in average valuations between items contrasting in quality were smaller for children with ASD than TD children in three of four conditions.

The ownership history game was designed to test whether children value celebrity possessions because their owners are famous, or because they have valuable personal qualities. Our finding that TD children considered items belonging to both "good" and "bad" owners to be significantly more valuable than similar items belonging to non-famous owners lends weight to the former hypothesis. This suggests that an historical relationship to a well-known owner is sufficient to confer authentic status to an item, enhancing its value. Nevertheless, the latter hypothesis was supported by TD children's comparisons between items belonging to famously good and bad owners. In this condition, the average value of authentic items belonging to bad owners dropped to 2.56 (out of 5) from 4.67 when compared against inauthentic items. Conversely, items belonging to good owners received average values of 4.67 both when compared against items belonging to bad owners

and non-famous owners. This interesting response pattern highlights a preferential hierarchy that aligns with essentialist theory (Bloom & Gelman, 2008). That is, the personal qualities of owners clearly moderated the perceived value of authentic items when directly compared, with TD children privileging items belonging to individuals who are well-known for being kind and heroic rather than mean and villainous. Furthermore, TD children's similarly high valuation of items belonging to modern and historical celebrities suggests that their preference for new over old objects (Frazier & Gelman, 2009) does not generalise to evaluations based on ownership history.

Unlike for TD children, historical connections to famous owners had little influence on how children with ASD valued items. There was relatively little variation in the average values for items belonging to each class of owner (2.88-3.63), with no significant differences between owners in any condition. These findings support our theory that relationships to specific owners – the self or revered others – do not enhance the perceived value of authentic items for children with ASD. This view is supported by the nature of children's qualitative verbal comments; just 13% of value justifications by children with ASD referred to owners, while 75% referred to object qualities (e.g. appearance, usefulness, material worth). The justifications of TD children showed the opposite trend, with 69% of their justifications citing the owners of items and 18% mentioning object properties. Taken together, the valuation data and verbal comments suggest that children with ASD may have disregarded ownership information when appraising authentic and inauthentic items, and instead focused on physical and instrumental qualities. Indeed, the object qualities game demonstrated that children with ASD are sensitive to qualities that relate to the nature of objects, rather than their owners.

In line with Frazier and Gelman's (2009) finding that TD children prefer to own new objects, we observed that children with both typical development and autism consider new objects to be more valuable than older counterparts. While this response pattern reflects the pervasive desire for newness that characterises Western culture (Campbell, 1992), we suspect that children's valuations may have been motivated by logical assumptions about function. Participants in both groups often commented on functional differences between new and old objects of the same type, indicating their awareness that property may deteriorate, or be upgraded, over time (e.g. "the new car would be faster and work better", "old things don't work as well", "old things will break, so new things are better"). Moreover,

the observed bias in favour of newness suggests that increased valuation of antiques emerges later in development, or requires specific contextual information to elicit. Unlike Echelbarger and Gelman (2017), we found that children were highly sensitive to item rarity. Although children may not prefer or choose scarce items over abundant items, our findings imply that they nonetheless appreciate that rarity mediates an item's value. We also reported the first evidence, to our knowledge, that TD children and children with ASD are influenced by constituent material and location of origin when valuing objects. The fact that children with ASD were reliably influenced by abstract qualities such as rarity and origin shows that their valuations are not exclusively informed by visual information (indeed, they may be specifically inattentive to abstract information concerning ownership). Overall, these findings demonstrate that both TD children and children with ASD are sensitive to a range of qualities that influence the material value of property in adult society.

At a group level, our data indicate that children with and without autism understand that value is not prescribed by an item's type and appreciate that items belonging to the same category can differ in value depending on a range of characteristics. However, in comparison to TD children, children with ASD tended to perceive smaller differences in value between items of contrasting quality. This pattern suggests that object quality may have a weaker, or less consistent, influence on the property valuations of children with ASD. It is possible that some children with ASD may have perceived the similarity of paired items to be more important to their value than their difference in quality. Indeed, 48% of verbal justifications made by the ASD group highlighted shared features of paired items (e.g. "both good for cooking", "can still read both", "both are toy bears, so they are the same"). This finding is congruent with Hartley and Fisher's (2018) observation that children with ASD valued identical copies of self-owned toys as highly as their authentic counterparts. In that case, the items likely received equivalent values because they were literally identical (aside from ownership history). Here, the paired items were visually distinct and differed on a characteristic that was explicitly highlighted, but they belonged to the same category and may have received identical values on that basis (e.g. both are books, so they are both worth X). By contrast, TD children were increasingly focused on differences in quality between items and reliably assigned contrasting values irrespective of functional similarity. These results support our claims that children with ASD value property via an

economically-rational strategy that places greater emphasis on an object's category (i.e. what it is and can do) and is less sensitive to qualities that enhance the value of commodities in consumer culture.

However, an alternative explanation for the responses of children with ASD in the object history game could be that they simply did not know who the famous owners were. Personalising the stimuli to include famous owners that were definitely known by each participant would address this concern. We also acknowledge the modest sample sizes involved in this study and the inability to claim from these data that differences in how children with ASD value objects would endure into adulthood. These three limitations are addressed in Study 2 and Study 3.

The objective of Study 2 was to replicate the findings from Study 1's ownership history game with personalised stimuli and new samples of TD children and children with ASD. As in Study 1, children valued pairs of items that belonged to owners that differed on personality traits (famously good vs. non-famous, famously bad vs. non-famous, famously good vs. famously bad). However, unlike Study 1, children were presented with pictures of objects belonging to famous characters who they were definitely familiar with and definitely regarded as good or bad. We expected to observe the same pattern of results as reported in Study 1: children with ASD would not over-value authentic items with special ownership histories, while the valuations of language-matched TD children would be strongly influenced by who an item belongs to.

3. Study 2: Examining the influence of ownership history on item valuations by TD children and children with ASD using personalized stimuli.

3.1 Method

3.1.1. Participants

Participants were 20 children with Autism Spectrum Disorder (18 males; *M* age = 9.68 years, *SD* = 1.80, range = 6.00-13.33 years) and 20 TD controls (15 males, *M* age = 7.18, *SD* = 0.83, range = 5.92-8.83) recruited from two specialist schools and one mainstream school in the Cheshire area. Samples were closely matched on receptive vocabulary as measured by the BPVS (ASD: *M* age equivalent = 7.15 years, *SD* = 2.21; TD: *M* age equivalent = 6.60 years, *SD* = 1.46; Dunn et al., 2009). All children with ASD were diagnosed by a qualified educational or clinical psychologist using standardized instruments (Lord et al., 2002; Lord et al., 1994) and expert judgement. Diagnoses were

confirmed via the CARS (Schopler et al., 2010), which was completed by each participant's class teacher (ASD *M* score: 31.58; TD *M* score: 15.55). Children with ASD were significantly older than TD children, $t(38) = 5.63$, $p < .001$, $d = 1.78$, and had significantly higher CARS scores, $t(38) = 9.31$, $p < .001$, $d = 2.94$. The samples did not differ on receptive vocabulary, $t(38) = 0.94$, $p = .36$.

3.1.2. Materials

A questionnaire was sent to caregivers that included the names of 40 fictional characters that feature in popular children's media (see Appendix A). Stimuli for the warm-up game were exactly as described for Study 1. Stimuli for the ownership history game were personalized for each child based on their caregiver's questionnaire responses. Every child viewed 30 photographs of objects organized into 15 pairs. Five pairs belonged to each of three sets as described in Study 1: (1) famously good owner vs. non-famous owner, (2) famously bad owner vs. non-famous owner, (3) famously good owner vs. famously bad owner. Items within pairs were matched on function and estimated material value disregarding ownership history. Children were only presented with characters that they were familiar with and regarded as good or bad (as indicated by their caregiver). Children's valuations were indicated via four laminated pictures: two depicting 1 star and two depicting 5 stars.

3.1.3. Procedure

Children were tested individually in their own schools and were accompanied by a familiar adult. They were verbally praised for attention and good behaviour. Children completed the BPVS in session one and the ownership history game in session two (on a different day). Session two began with a warm-up game.

Prior to administration of the ownership history game, caregivers received a questionnaire asking them to indicate which of 40 fictional characters their child recognised (see Appendix A). Caregivers were also asked to state whether their child regarded the characters as "good" or "bad". Based on this data, the stimuli for each child was personalised to ensure that they were presented with characters that they knew and regarded positively or negatively. The characters in the famously good vs. non-famous and famously bad vs. non-famous sets were associated with different TV shows or films to prevent specific media-related preferences from influencing responses across trials. The pairs

of characters in the famously good vs. famously bad set belonged to the same TV show or film franchise to prevent media preferences from biasing responses within trials.

The warm-up game administered with children was exactly as described in Study 1. The ownership history game was also exactly as described in Study 1, except for the omission of historical celebrity vs. modern celebrity trials.

3.2. Results

3.2.1 Item valuations.

Every participant rated all 15 pairs of pictures. Participants' desirability ratings (1, 5) for each object were recorded. Every child completed each of the three warm-up trials on their first attempt.

For each set of items, children's average values were calculated for the five authentic items and the five inauthentic items (or the other five authentic items in the case of good vs. bad characters and modern vs. historical celebrities; see Figure 3). These average values were entered into three 2(Population: ASD, TD) x 2(Owner: owner A, owner B) mixed ANOVAs.

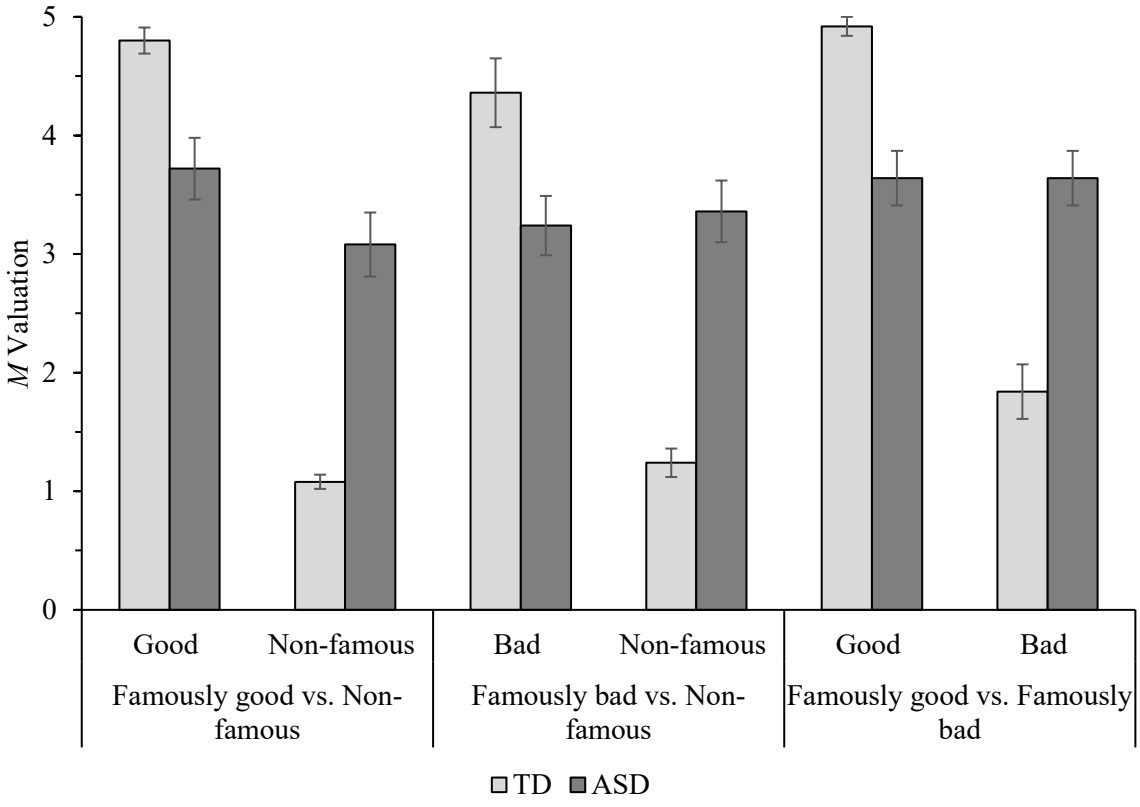

Fig. 3. Average valuations (1-5) for items in the ownership history game by typically developing (TD) children and children with autism spectrum disorder (ASD) in Study 2. Error bars show ± 1 SE.

For the famously good owner vs. non-famous owner set (1), a significant main effect of Owner, $F(1, 38) = 177.05$, MSE = 0.54, $p < .001$, $\eta_p^2 = .82$, was qualified by a significant Population x Owner interaction, $F(1, 38) = 88.35$, MSE = 0.54, $p < .001$, $\eta_p^2 = .70$. Bonferroni-adjusted pairwise comparisons showed that items belonging to good owners received significantly higher valuations from TD children ($M = 4.80$, $SD = 0.51$) than children with ASD ($M = 3.72$, $SD = 1.14$; $t = 3.86$, $p < .001$). By contrast, children with ASD ($M = 3.08$, $SD = 1.23$) assigned significantly higher valuations to items belonging to non-famous people than TD children ($M = 1.08$, $SD = 0.25$; $t = 7.14$, $p < .001$). Items belonging to good owners were considered to be significantly more valuable than items belonging to non-famous owners by TD children ($t = 31.00$, $p < .001$) and children with ASD ($t = 2.10$, $p = .049$).

For the famously bad owner vs. non-famous owner set (2), a significant main effect of Owner, $F(1, 38) = 43.68$, MSE = 1.03, $p < .001$, $\eta_p^2 = .54$, was qualified by a significant Population x Owner interaction, $F(1, 38) = 50.94$, MSE = 1.03, $p < .001$, $\eta_p^2 = .57$. Bonferroni-adjusted pairwise comparisons showed that items belonging to bad owners received significantly higher valuations from TD children ($M = 4.36$, $SD = 1.29$) than children with ASD ($M = 3.24$, $SD = 1.12$; $t = 2.94$, $p = .006$). Children with ASD ($M = 3.36$, $SD = 1.17$) assigned significantly higher valuations to items belonging to non-famous people than TD children ($M = 1.24$, $SD = 0.53$; $t = 7.37$, $p < .001$). For TD children, items belonging to bad owners were significantly more valuable than items belonging to non-famous people ($t = 11.00$, $p < .001$), but these items were of similar value for children with ASD ($t = 0.34$, $p = .74$).

For the famously good owner vs. famously bad owner set (3), a significant main effect of Owner, $F(1, 38) = 63.61$, MSE = 0.75, $p < .001$, $\eta_p^2 = .63$, was qualified by a significant Population x Owner interaction, $F(1, 38) = 63.61$, MSE = 0.75, $p < .001$, $\eta_p^2 = .63$, which was investigated via a series of Bonferroni-adjusted pairwise comparisons. Items belonging to good owners received significantly higher valuations from TD children ($M = 4.92$, $SD = 0.36$) than children with ASD ($M = 3.64$, $SD = 1.01$; $t = 5.35$, $p < .001$). However, children with ASD ($M = 3.64$, $SD = 1.01$) assigned significantly higher valuations to items belonging to bad owners than TD children ($M = 1.84$, $SD = 1.02$; $t = 5.61$, $p < .001$). TD children's valuations were significantly higher for items belonging to

good owners than bad owners ($t = 13.58$, $p < .001$). By contrast, mean valuations by children with ASD for good and bad owners' were identical.

3.2.1 Verbal comments.

Participants' spontaneous verbal justifications for their valuations were transcribed and coded via the scheme described in Table 3. Every comment was coded by the first author and an independent rater with relevant expertise. The second rater was blind to the objectives of the study and the details of each child. Reliability of the coding scheme was assessed via Cohen's Kappa, which was calculated based on the two raters' categorical classifications for each comment (i.e. whether a statement was an 'Owner justification', 'Object justification', or 'Other'). Inter-rater reliability was high, $\kappa = .91$, $p < .001$, and disagreements in classifications were resolved by consensus between the two raters.

Fifteen children with ASD spontaneously verbally justified their valuations across 40 discrete trials. These comments included 7 owner justifications (17.50%) and 29 object justifications (72.50%). Nineteen TD children provided verbal justifications for their valuations across 39 discrete trials. This included 33 owner justifications (84.62%) and 2 object justifications (5.13%). These results mirror those observed in Study 1. When children with ASD justified their valuations, they almost-always referred to the objects' qualities and almost-never mentioned the objects' owners. Conversely, TD children often justified their valuations with reference to an object's owner rather than its physical or functional qualities.

3.3. Discussion

Study 2 replicated the majority of results reported in Study 1 with new samples of children and personalized stimuli. TD children assigned higher valuations to objects belonging to famous owners than non-famous owners. They also thought that items belonging to famously good owners were more valuable than items belonging to famously bad owners when compared. In comparison to TD children, children with ASD were much less concerned about who an object belonged to when assigning value ratings. These findings increase our confidence that reduced sensitivity to ownership history is a characteristic that may generalise across many children with ASD.

The results of Study 2 differed from those of Study 1 in just two ways. Firstly, children with ASD assigned significantly higher ratings to objects belonging to famously good owners than non-famous owners. This effect was observed in the control group and indicates that children with ASD were influenced by ownership history when valuing items in this set. However, the difference in valuations for these items was much narrower for children with ASD (3.08 vs. 3.72) than TD children (4.80 vs. 1.08) and they were not reliably influenced by ownership history in either of the other two sets. Secondly, when comparing objects belonging to famously good and famously bad owners, children with ASD assigned significantly higher valuations to the property of bad owners than TD children. However, the ASD samples in Study 1 and Study 2 assigned very similar valuations to the belongings of bad owners in this set (3.65 vs. 3.64). The difference in effect was due to the increased influence of owner personality on TD children's object valuations in Study 2, where objects belonging to bad owners were rated less favourably in comparison to property of good owners.

The findings from Study 2 broadly support our theory that the influence of ownership history is significantly reduced for many children with ASD. These data also suggest that participants in Study 1 were familiar with the famous fictional characters whose possessions they were asked to evaluate (although they may not have known the real-life celebrities). Next, we extend our investigation of ownership history and autism from children to adults.

In Study 3, we examine whether adults with ASD tend to disregard celebrity status and owner personality when evaluating objects (as was the case for children with ASD). Observing this response profile would indicate that ASD has a lifelong impact on perceptions of ownership and support our theory that associations with "special" owners (either the self or others) are of reduced concern to individuals with ASD. As in the previous studies, we presented pairs of items that belonged to owners that differed on personality traits (famously good vs. non-famous, famously bad vs. non-famous, famously good vs. famously bad). Participants answered a series of questions about each item. Each question probed an important factor that contributes to object valuations (Frazier et al., 2009; Newman et al., 2011): 1) the object's monetary worth, 2) whether the object is worth keeping, 3) whether others would be impressed by ownership of the object, and 4) whether one would be happy to own the object. Based on studies 1 and 2, in comparison to neurotypical adults, we predicted that

adults with ASD would perceive objects belonging to non-famous owners to be of similar functional value (and therefore be just as worth keeping) as celebrity possessions. If adults with ASD prioritise what an object is over whom it belongs to, we may also expect them to report that owning items associated with famous people would not necessarily make them happier than owning similar objects associated with non-famous people. However, as children with ASD are sensitive to object qualities that moderate the value of commodities in consumer culture, we anticipated that both adults with ASD and neurotypical adults would assign higher monetary values to objects belonging to famous owners than non-famous owners. Given this knowledge, adults with ASD may be as aware as neurotypical adults that other people would be impressed by their ownership of objects associated with famous individuals.

4. Study 3: Investigating the influence of ownership history on item valuations by adults with, and without, ASD.

4.1. Method

4.1.1. Participants

Participants were 53 neurotypical adults (13 males; *M* age = 25.13 years, *SD* = 4.60; range = 18-33) and 26 adults with ASD (7 males; *M* age = 21.81 years, *SD* = 4.03, range = 18-37) recruited through social media and University services. Autism symptoms were confirmed via the Adult Autism Spectrum Quotient (AQ; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001), which was completed by each participant. The adults with ASD scored significantly higher on the AQ (*M* = 36.35; *SD* = 7.09) than the neurotypical adults (*M* = 18.38; *SD* = 6.07), $t(66) = 11.69$, $p < .001$, $d = 2.72$.

A pilot study was conducted before the main study to (a) identify famous fictional characters that are widely known and (b) gauge whether those characters are reliably regarded as good or bad. Participants were 20 neurotypical adults (9 males; *M* age = 35.1 years, *SD* = 11.75 years, range = 19-55 years) recruited through opportunity sampling.

4.1.2. Materials

Stimuli for the pilot rating task included a list of 46 famous fictional character names. Stimuli for the main valuation task included 24 photographs of objects organised into 12 pairs. Four pairs

belonged to each of three sets. The sets differed in terms of who owned the depicted objects: (1) famously good owner vs. non-famous owner (e.g. Gandalf's staff vs. my grandad's walking stick), (2) famously bad owner vs. non-famous owner (e.g. Dracula's cape vs. my dad's dressing gown), (3) famously good owner vs. famously bad owner (e.g. Batman's cape vs. Joker's jacket). Each pair elicited comparison between an authentic item owned by a famous character and an inauthentic item owned by someone of no significance to the participant, or two authentic items whose owners differ on important qualities that impact children's valuations. Items within pairs were matched on function and estimated material value disregarding ownership history. Characters were selected based on the results of the pilot rating task described below.

4.1.3. Procedure

4.1.3.1. Pilot rating task. We conducted a pilot study to identify 16 fictional characters that are frequently-known by adults and widely regarded as "good" or "bad". Participants were presented with a list of 46 fictional character names in a random order. The experimenter asked if the participant knew who the character was and, if so, rate their personality on a five-point Likert scale (1 = very good, 2 = quite good, 3 = neither good nor bad, 4 = quite bad, 5 = very bad). Our objective was to select four good characters to be paired with non-famous people (famously good vs. non-famous set), four bad characters to be paired with non-famous people (famously bad vs. non-famous set), and four pairs of good and bad characters (famously good vs. famously bad set). The characters in the famously good vs. non-famous and famously bad vs. non-famous sets needed to be associated with different TV shows or films to prevent specific media-related preferences from influencing responses across trials. The pairs of characters in the famously good vs. famously bad set needed to belong to the same TV show or film franchise to prevent media preferences from biasing responses within trials. With these criteria in mind, we identified the most frequently-recognised characters with the most extreme good and bad personality ratings.

The final sample of 16 characters that were included in the main valuation task are provided in Table 5. The mean recognition rate for the eight good characters was 89.4% and their mean personality rating was 1.77 (*SD* = 0.19). The mean recognition rate for the eight bad characters was 83.2% and their mean personality rating was 4.27 (*SD* = 0.33). Independent *t*-tests showed that good

and bad characters significantly differed on personality rating, $t(14) = 18.46$, $p < .001$, $d = 9.28$, but not recognition rate ($t = 0.96$, $p = .35$).

Table 5. Sets of item pairs in the valuation game in Study 3.

Set	Object pair
1. Famously good character vs. Non-famous character	Captain America's shield vs. My brother's shield
	Doctor Who's bow-tie vs. My friend's scarf
	Gandalf's staff vs. My grandad's walking stick
	Superman's boots vs. dad's shoes
2. Famously bad character vs. Non-famous character	Pennywise's tunic vs. My husband's suit
	Freddy Krueger's jumper vs. My teacher's jumper
	Dracula's cape vs. My dad's dressing gown
	Sweeney Todd's razor vs. My uncle's scissors
3. Famously good character vs. Famously bad character	Harry Potter's glasses vs. Voldermort's cloak
	Thor's chest plate vs. Loki's head-dress
	Batman's cape vs. Joker's jacket
	Luke Skywalker's belt vs. Darth Vader's helmet

4.1.3.2. Valuation task. Individuals who responded to the study's advert were sent a hyperlink directing them to computer-based experimental resources. After providing their informed consent, participants progressed to the valuation task. Participants were told that they would be

presented with pictures of objects owned by well-known fictional characters and would be asked questions about their value. The task included 12 trials divided evenly across the three sets outlined in Table 5. Trial order was randomised for each participant. On each trial, participants were presented with photographs of two objects with corresponding labels. Below the photographs was a text statement: "On the left is a [object A]. This [object A] belongs to [owner A]. On the right is a [object B]. This [object B] belongs to [owner B]." Positioning of objects belonging to each category of owner (good, bad, non-famous) to the left and right was counterbalanced within each set, as was the order of introduction in the text descriptions. One of the object photographs was then highlighted by a red border and participants answered a series of questions about that object in a fixed order. First, participants were asked to estimate the monetary value of the object (e.g. "How much do you think Doctor Who's bow-tie is worth? (Estimate in pounds, £)."). Second, they were asked "Is the item worth keeping or would you throw it out?" (response options were "keep" or "throw out"). Third, they were asked "would other people be impressed if they knew that you owned this item?" (response options were "yes" or "no"). Fourth, they were asked "would owning this item make you feel happy?" (response options were "extremely happy", "somewhat happy", "neither happy nor unhappy", "somewhat unhappy", "extremely unhappy"). The photographs were then presented again with the other object highlighted by a red border. The same series of four questions were then asked about the second object.

After completing all 12 trials, participants were presented with a list of the famous characters and were asked to rate their personality on a five-point Likert scale ("very good", "quite good", "neither good nor bad", "quite bad", "very bad"). This measure was included to check that participants reliably regarded the characters in each set as good or bad. Finally, participants completed the AQ before indicating their age, gender, and whether they had ASD.

4.2. Results

Responses to the four questions were analysed separately in each of the three sets. As the groups were not matched on cognitive ability and we were unable to present personalised stimuli, we investigated the influence of Population (neurotypical, ASD) and Personality (famously good, famously bad, non-famous) on participants' responses via mixed-effects models. All models

contained by-subject and by-item random intercepts to account for variation across participants and stimuli. All models were conducted using the glmer and lmer functions from the lme4 package in R (Bates, Maechler, Bolker, & Walker, 2015). Population was always coded as 0 (neurotypical) and 1 (ASD). Coding of Personality varied across sets. For famously good/bad vs. non-famous trials, the famous owner was coded as 1 and the non-famous owner was coded as 0. For famously good vs. famously bad trials, the good owner was coded as 1 and the bad owner was coded as 0.

For each analysis, we started with a baseline model containing only the random effects. Fixed effects were added individually and we tested whether their inclusion significantly improved predictive fit. Please refer to Supplementary Materials for full details of our model building sequences.

4.2.1. How much is the object worth?

There was enormous variation in object valuations between trials and across participants (from £0 to £8m). Consequently, we compared the values of objects in each pair. The item with the higher value scored 1 and the item with the lower value scored 0. If items in a pair were estimated to be of identical value, they both scored 1 (see Figure 4). These data were analysed by conducting generalized linear mixed-effects models.

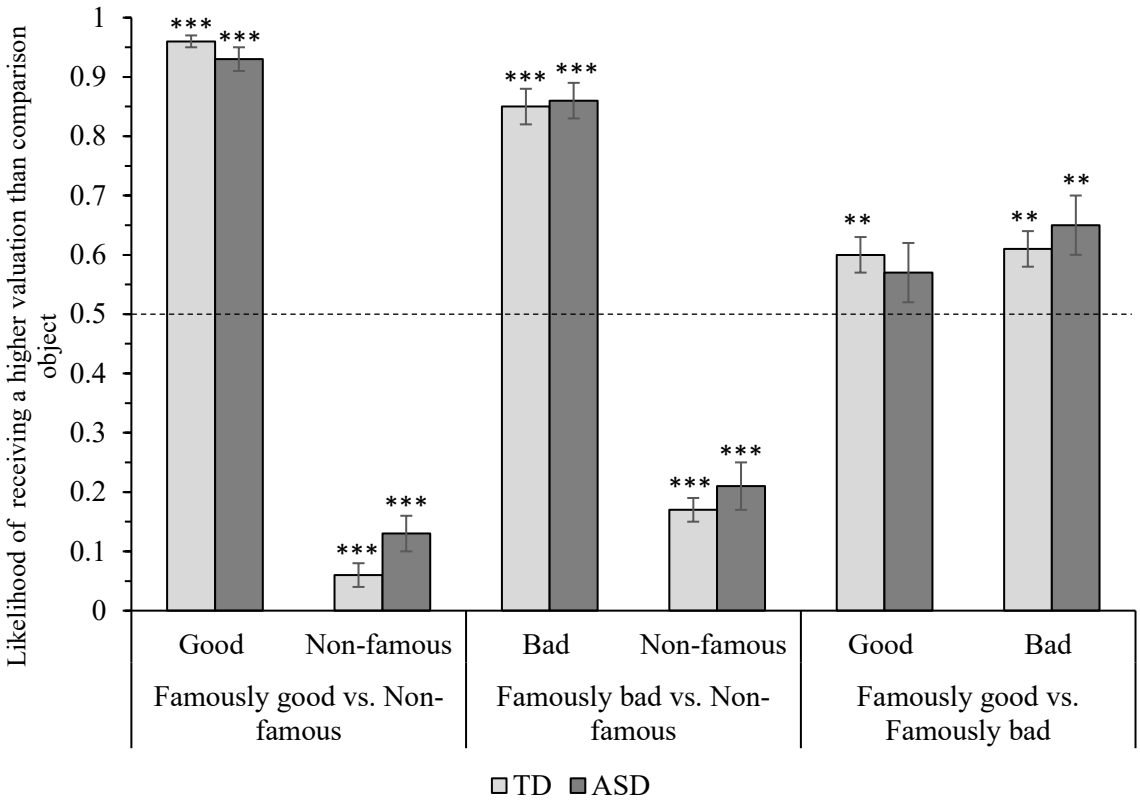

Fig. 4. Likelihood of an object receiving a higher valuation than its comparator based on owner personality in each stimuli set for adults with typical development (TD) and adults with autism spectrum disorder (ASD) in Study 3. Error bars show ± 1 SE. Stars above columns indicate where performance was significantly different from chance, indicated by the dotted line (** $p < .01$; *** $p < .001$).

For the famously good vs. non-famous owners set, a model containing only Personality as a fixed effect provided the best fit to the observed data (see Table 6). Items belongs to famously good owners were rated as higher value than items belonging to non-famous owners by both groups.

For the famously bad vs. non-famous owners set, a model containing only Personality as a fixed effect provided the best fit to the observed data (see Table 6). Items belongs to famously bad owners were rated as higher value than items belonging to non-famous owners by both groups.

For the famously good vs. famously bad owners set, a baseline model containing only random effects provided the best fit to the observed data – including fixed effects did not significantly

improve fit (see Table 6). Participants' valuations of objects in this set were not consistently influenced by Population or owner Personality.

Table 6. Summaries of the final generalized linear mixed-effects models (log odds) predicting the likelihood of objects receiving a higher value than their comparators for each stimuli set.

	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously good vs. Non-famous owners	(Intercept)	-2.42	0.28	-8.79	< .001
	Personality	5.49	0.43	12.83	< .001
		AIC	**BIC**	**logLik**	**deviance**
		311.9	329.7	-152.0	303.9
	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously bad vs. Non-famous owners	(Intercept)	-1.66	0.49	-3.40	< .001
	Personality	3.68	0.70	5.27	< .001
		AIC	**BIC**	**logLik**	**deviance**
		540.4	558.2	-266.2	532.4
	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously good vs. Famously bad owners	(Intercept)	0.68	0.54	1.27	.21
		AIC	**BIC**	**logLik**	**deviance**
		704.9	718.3	-349.5	698.9

4.2.2. Is the item worth keeping or would you throw it out?

"Keep" was coded as 1 and "throw out" was coded as 0. These data were analysed using generalized linear mixed-effects models (see Figure 5).

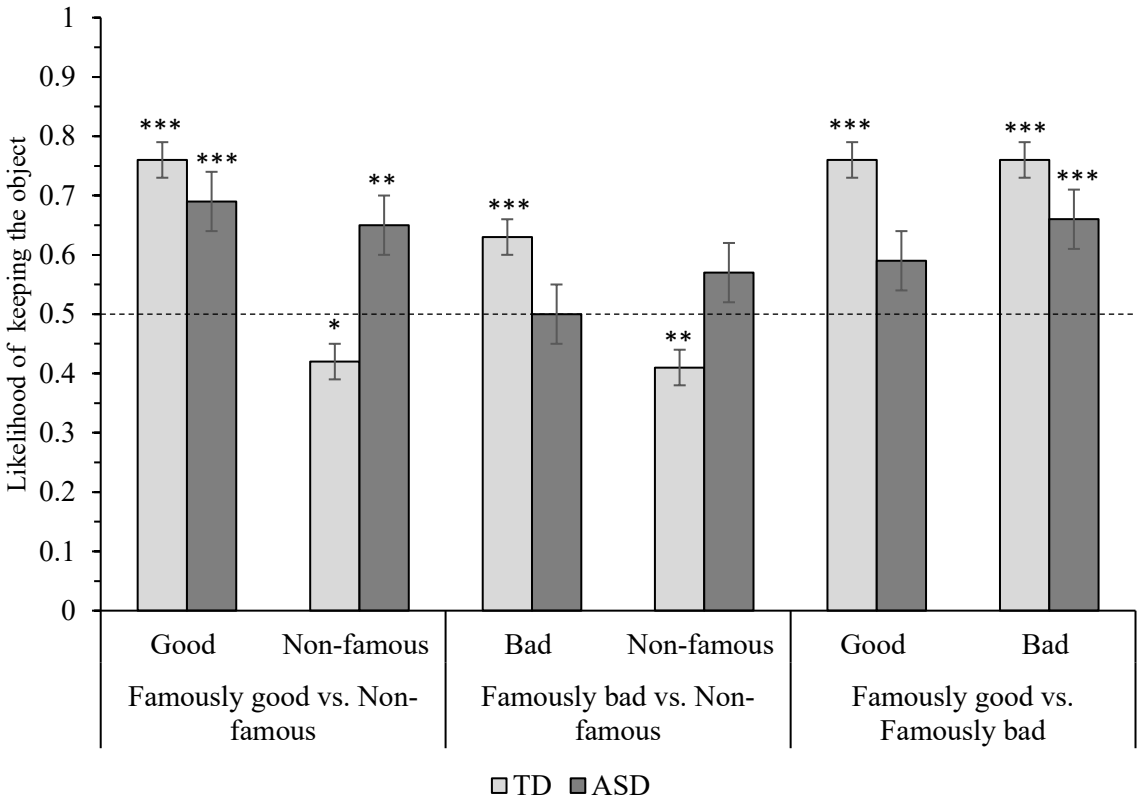

Fig. 5. Likelihood of keeping an object based on owner personality in each stimuli set for adults with typical development (TD) and adults with autism spectrum disorder (ASD) in Study 3. Error bars show ± 1 SE. Stars above columns indicate where performance was significantly different from chance, indicated by the dotted line (* $p < .05$; ** $p < .01$; *** $p < .001$).

For the famously good vs. non-famous owners set, a model containing Population, Personality, and Personality x Population as fixed effects provided the best fit to the observed data (see Table 7). The interaction was deconstructed by testing the effect of Population on responses for objects belonging to good and non-famous owners separately, and exploring the effect of Personality on each population separately. These models had the same random effects structure as the initial model containing all data. Neurotypical adults were more likely to "keep" items belonging to famously good owners than non-famous owners ($Z = 5.56$, $p < .001$), however, Personality did not significantly influence the responses of adults with ASD ($Z = 0.60$, $p = .55$). The likelihood of neurotypical adults and adults with ASD keeping items belonging to famously good owners did not

differ ($p = .33$), but adults with ASD were significantly more likely to keep items belonging to non-famous owners ($Z = 3.30$, $p < .001$).

For the famously bad vs. non-famous owners set, a model containing Population, Personality, and Personality x Population as fixed effects provided the best fit to the observed data (see Table 7). The interaction was deconstructed as described above. Neurotypical adults were more likely to "keep" items belonging to famously bad owners than non-famous owners ($Z = 2.68$, $p = .007$), however, Personality did not significantly influence the responses of adults with ASD ($Z = -1.03$, $p = .30$). The likelihood of neurotypical adults and adults with ASD keeping items belonging to famously bad owners did not differ ($p = .09$), but adults with ASD were significantly more likely to keep items belonging to non-famous owners ($Z = 2.14$, $p = .033$).

For the famously good vs. famously bad owners set, a baseline model containing only random effects provided the best fit to the observed data (see Table 7). Participants' judgements about whether objects in this set should be kept or thrown out were not consistently influenced by Population or owner Personality.

Table 7. Summaries of the final generalized linear mixed-effects models (log odds) predicting the likelihood of keeping items in each stimuli set.

	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously good vs. Non-famous owners	(Intercept)	-0.40	0.24	-1.64	.10
	Personality	1.78	0.31	5.73	< .001
	Population	1.16	0.34	3.45	< .001
	Personality x Population	-1.57	0.38	-4.10	< .001
		AIC	**BIC**	**logLik**	**deviance**
		767.0	793.7	-377.5	755.0
	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously bad vs. Non-famous owners	(Intercept)	-0.45	0.28	-1.60	.11
	Personality	1.05	0.37	2.86	.004
	Population	0.78	0.32	2.40	.016
	Personality x Population	-1.38	0.36	-3.81	< .001
		AIC	**BIC**	**logLik**	**deviance**
		831.7	858.3	-409.8	819.7
	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously good vs. Famously bad owners	(Intercept)	1.98	0.37	5.40	< .001
		AIC	**BIC**	**logLik**	**deviance**
		558.5	571.9	-276.3	552.5

4.2.3. Would other people be impressed if they knew that you owned this item?

"Yes" was coded as 1 and "no" was coded as 0. These data were analysed using generalized linear mixed-effects models (see Figure 6).

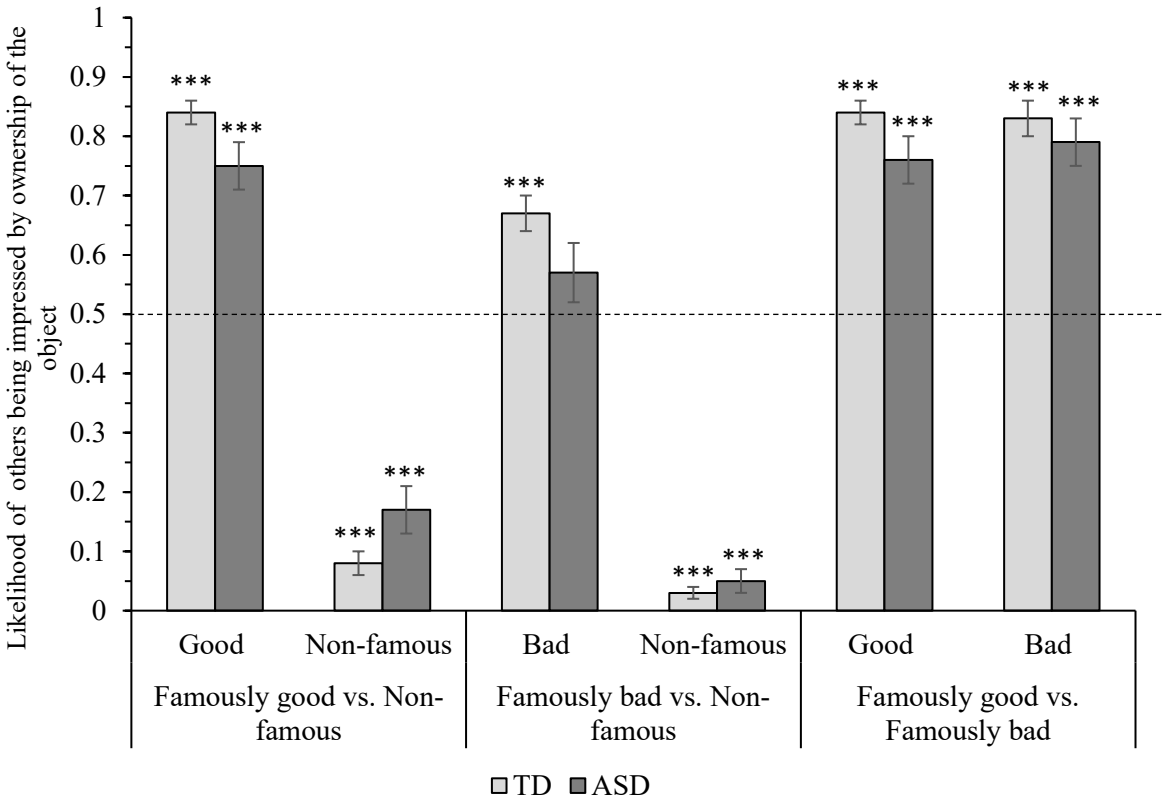

Fig. 6. Likelihood of other people being impressed by ownership of an object based on previous owner's personality in each stimuli set for adults with typical development (TD) and adults with autism spectrum disorder (ASD) in Study 3. Error bars show ± 1 SE. Stars above columns indicate where performance was significantly different from chance, indicated by the dotted line (*** $p <$ .001).

For the famously good vs. non-famous owners set, a model containing Population, Personality, and Personality x Population as fixed effects provided the best fit to the observed data (see Table 8). Both neurotypical adults ($Z = 7.47$, $p < .001$) and adults with ASD ($Z = 5.29$, $p < .001$) were more likely to think that other people would be impressed by their ownership of objects associated with famously good owners than non-famous owners. Adults with ASD and neurotypical adults were as likely to think that other people would be impressed by their ownership of objects associated with famously good owners ($p = .14$). However, adults with ASD were significantly more likely than neurotypical adults to think that other people would be impressed by their ownership of objects associated with non-famous owners ($Z = 2.25$, $p = .024$).

For the famously bad vs. non-famous owners set, a model containing only Personality as a fixed effect provided the best fit to the observed data (see Table 8). Both groups thought that other people would be significantly more impressed by their ownership of objects associated with famously bad owners than non-famous owners.

For the famously good vs. famously bad owners set, a baseline model containing only random effects provided the best fit to the observed data (see Table 8). Participants' judgements about whether other people would be impressed by their ownership of objects in this set were not consistently influenced by Population or owner Personality.

Table 8. Summaries of the final generalized linear mixed-effects models (log odds) predicting the likelihood of other people being impressed by owning objects in each stimuli set.

	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously good vs. Non-famous owners	(Intercept)	-3.50	0.58	-6.00	< .001
	Personality	5.91	0.75	7.91	< .001
	Population	1.03	0.56	1.83	.067
	Personality x Population	-1.74	0.59	-2.97	.003
		AIC	**BIC**	**logLik**	**deviance**
		466.4	493.1	-227.2	454.4
	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously bad vs. Non-famous owners	(Intercept)	-4.48	0.46	-9.76	< .001
	Personality	5.35	0.46	11.72	< .001
		AIC	**BIC**	**logLik**	**deviance**
		460.3	478.1	-226.2	452.3
	Fixed effects	**Estimated coefficient**	**Std. error**	**Z**	**Pr(>|z|)**
Famously good vs. Famously bad owners	(Intercept)	6.90	1.04	6.65	< .001
		AIC	**BIC**	**logLik**	**deviance**
		378.8	392.1	-186.4	372.8

4.2.4. Would owning this item make you feel happy?

Participants' responses were coded as follows: "extremely happy" = 5, "somewhat happy" = 4, "neither happy nor unhappy" = 3, "somewhat unhappy" = 2, "extremely unhappy" = 1. These data were analysed using linear mixed-effects models (see Figure 7).

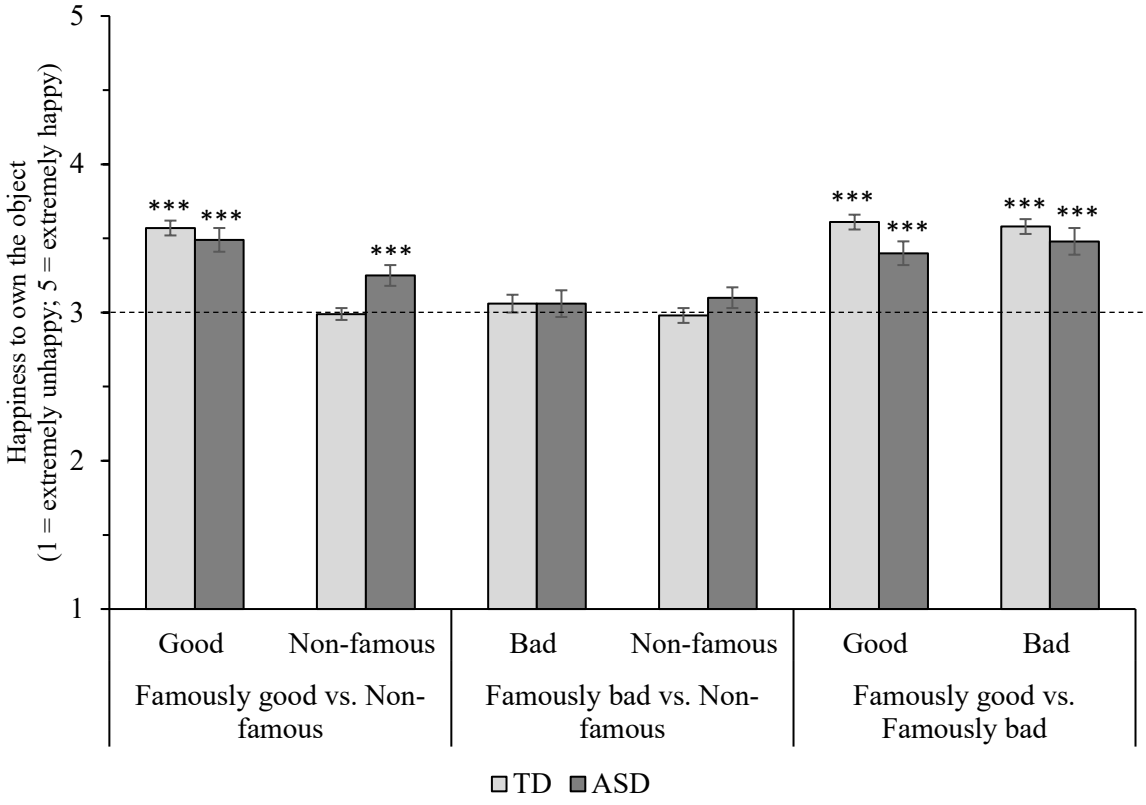

Fig. 7. Happiness to own an object based on previous owner's personality in each stimuli set for adults with typical development (TD) and adults with autism spectrum disorder (ASD) in Study 3. Error bars show ± 1 SE. Stars above columns indicate where performance was significantly different from chance, indicated by the dotted line (*** $p < .001$).

For the famously good vs. non-famous owners set, a model containing Population, Personality, and Personality x Population as fixed effects provided the best fit to the observed data (see Table 9). Neurotypical adults indicated that owning objects associated with famously good people would make them significantly happier than owning objects associated with non-famous people ($t = 4.26$, $p = .003$). However, for adults with ASD, there was no difference in happiness

associated with owning objects previously belonging to famously good people and non-famous people (p = .083). While neurotypical adults and adults with ASD did not differ on happiness associated with owning objects belonging to famously good people (p = .56), adults with ASD indicated that they would be significantly happier to own objects belonging to non-famous people than neurotypical adults (t = 2.49, p = .015).

For the famously bad vs. non-famous owners set, a baseline model containing only random effects provided the best fit to the observed data (see Table 9). Participants' happiness associated with owning objects in this set was not consistently influenced by Population or owner Personality.

For the famously good vs. famously bad owners set, a baseline model containing only random effects provided the best fit to the observed data (see Table 9). Participants' happiness associated with owning objects in this set was not consistently influenced by Population or owner Personality.

Table 9. Summaries of the final generalized linear mixed-effects models (log odds) predicting the likelihood of participants' happiness to own objects in each stimuli set.

	Fixed effects	**Estimated coefficient**	**Std. error**	***t***	**Pr(>|z|)**
Famously good vs. Non-famous owners	(Intercept)	2.99	0.10	29.99	< .001
	Personality	0.58	0.13	9.31	.001
	Population	0.26	0.11	2.47	.015
	Personality x Population	-0.34	0.11	-3.19	.002
		AIC	**BIC**	**logLik**	**deviance**
		1324.1	1355.2	-655.0	1310.1
Famously bad vs. Non-famous owners	**Fixed effects**	**Estimated coefficient**	**Std. error**	***t***	**Pr(>|z|)**
	(Intercept)	3.04	0.07	45.13	< .001
		AIC	**BIC**	**logLik**	**deviance**
		1398.4	1416.2	-695.2	1390.4
Famously good vs. Famously bad owners	**Fixed effects**	**Estimated coefficient**	**Std. error**	***t***	**Pr(>|z|)**
	(Intercept)	3.55	0.08	45.95	< .001
		AIC	**BIC**	**logLik**	**deviance**
		1290.1	1307.9	-641.0	1282.1

4.2.5. Famous owner personality ratings

Participants rated the personality of each famous owner on a five-point Likert scale (5 = "very good", 4 = "quite good", 3 = "neither good nor bad", 2 = "quite bad", 1 = "very bad").

For the famously good vs. non-famous owners set, the mean personality ratings for the famously good characters were 4.42 (*SD* = 0.49) for neurotypical adults and 4.13 (*SD* = 0.53) for adults with ASD. One-sample *t*-tests showed that these ratings significantly exceeded a test value of 3 (neurotypical adults: $t = 20.91$, $p < .001$; adults with ASD: $t = 10.91$, $p < .001$), demonstrating that both groups considered these characters to be "good" in nature.

For the famously bad vs. non-famous owners set, the mean personality ratings for the famously bad characters were 1.81 (*SD* = 0.75) for neurotypical adults and 1.88 (*SD* = 0.90) for adults with ASD. These ratings were significantly below a test value of 3 (neurotypical adults: $t = -11.50$, $p < .001$; adults with ASD: $t = -6.30$, $p < .001$), demonstrating that both groups considered these characters to be "bad" in nature.

For the famously good vs. famously bad owners set, the mean personality ratings for the famously good characters were 4.33 (*SD* = 0.44) for neurotypical adults and 3.95 (*SD* = 0.54) for adults with ASD. These ratings significantly exceeded a test value of 3 (neurotypical adults: $t = 21.98$, $p < .001$; adults with ASD: $t = 8.94$, $p < .001$), demonstrating that both groups considered these characters to be "good" in nature. The mean personality ratings for the famously bad characters were 2.02 (*SD* = 0.94) for neurotypical adults and 1.92 (*SD* = 0.78) for adults with ASD. These ratings were significantly below a test value of 3 (neurotypical adults: $t = -7.59$, $p < .001$; adults with ASD: $t = -7.04$, $p < .001$), demonstrating that both groups considered these characters to be "bad" in nature. Paired-samples *t*-tests showed that famously good characters received significantly more positive personality ratings than famously bad characters from both neurotypical adults ($t = 16.89$, $p < .001$) and adults with ASD ($t = 9.00$, $p < .001$).

4.3. Discussion

The results revealed a profile of similarities and differences in how neurotypical adults and adults with ASD appraise objects based on their ownership history. Both groups consistently assigned higher monetary values to objects belonging to famous owners (irrespective of their personality) than non-famous owners. Both groups also reported that other people would be more impressed by their ownership of items associated with famous owners than non-famous owners. However, adults with ASD were significantly more like to keep objects associated with non-famous owners than neurotypical adults. Indeed, adults with ASD rated items belonging to non-famous owners more favourably than neurotypical adults on every metric across sets (although not all between-group comparisons were significant). On one hand, these findings demonstrate that adults with ASD are sensitive to ownership history when evaluating objects on numerous dimensions. On the other hand, increased willingness to keep objects that lack special ownership histories – despite recognising their lower financial value – hints that adults with ASD may be more likely to appraise objects based on their functional worth.

Mirroring the responses of TD children in studies 1 and 2, both adult groups considered items belonging to famously good and bad owners to be of significantly higher financial value than similar items belonging to non-famous individuals. However, unlike children, our adult participants

considered items belonging to good and bad owners to be of similarly high value when directly compared. Moreover, both groups felt that other people would be impressed if they were to own objects associated with famous individuals. This finding shows that both neurotypical adults and adults with ASD are aware that people evaluate one another based on their property and that ownership of authentic items is a signal of social status (Belk, 1988; Csikszentimihalyi & Rochberg-Halton, 1981).

While adults with ASD showed clear awareness of how special ownership histories can influence economics and others' perceptions, their responses to "keep or throw out" questions indicate increased willingness to view "inauthentic" objects as having worth. Adults with ASD were as likely to keep items belonging to famously good and bad owners as similar items belonging to non-famous owners. By contrast, neurotypical adults were significantly more likely to keep items belonging to famously good and famously bad owners than non-famous owners. Unlike for adults with ASD, the likelihood of neurotypical adults keeping objects associated with non-famous owners was significantly below-chance across sets.

Excluding items associated with celebrity figures, it is generally accepted in consumer culture that brand new commodities are preferable to pre-owned commodities. In some cases, this preference may be functional (e.g. a brand new car may be less likely to break down than a car that has travelled 150,000 miles and has worn-out parts). In other cases, this preference may be driven by the association with a prior owner. According to the extended self hypothesis, establishing ownership forges a connection between a person and an item, transforming the item into a physical marker of their identity (Belk, 1988; Hood et al., 2016; Sartre, 1956). In turn, an abstract trace of the self transfers to the object (Argo, Dahl, & Morales, 2008). Unless an object's previous owner has a special identity (e.g. they are famous or a cherished relative), neurotypical adults may prefer new objects because they are relatively averse to keeping items that already represent the identity of another unknown person. Conversely, adults with ASD may not be as strongly influenced by abstract connections to unknown others when deciding whether objects are worth keeping. Given that processing objects in relation to the self does not increase the likelihood of adults with ASD remembering an object (Grisdale et al, 2014), it follows that processing objects in relation to others

may not necessarily confer negative biases that reduce the desirability of keeping such objects. We recommend that future research explores self-related ownership effects in adults with ASD to validate this explanation.

When comparing items belonging to famously good and non-famous characters, adults with ASD indicated that they would be happy to own both types of item whereas neurotypical adults would only be happy to own the possessions of famously good characters. The groups' responses for this set align with the hypothesis that adults with ASD are relatively more favourable when evaluating items with "non-desirable" ownership histories (although their happiness ratings for non-famous objects did not exceed chance when compared against property of famously bad characters). Interestingly, happiness ratings associated with objects belonging to famously bad owners did not exceed chance when compared against possessions of non-famous characters, but they did significantly exceed chance when compared against possessions of famously good characters. One possibility is that the villains in the "vs. good" set were perceived to be "less bad" than the villains in the "vs. non-famous" set. The mean personality ratings for neurotypical adults hint that this could be the case (1.81 vs. 2.02), however, the personality ratings for adults with ASD were very similar (1.88 vs. 1.92). The fact that both groups displayed a sizeable difference in their happiness ratings for famously bad owners between sets weakens this explanation. Alternatively, and perhaps more likely, participants may have assigned higher values to the belongings of villains in the "vs. good" set because they were increasingly fond of the media they were associated with or the actors that portrayed the characters. Whilst the likes of Dracula and Freddy Krueger are extraordinarily well-known villains, their respective horror franchises may not be as popular as the ubiquitous and family-friendly Harry Potter and Star Wars series. Consequently, participants' positive feelings towards the media may have outweighed their negative appraisal of the item's owner, eliciting an increase in its value. This could also explain why the perceived monetary worth of property belonging to good and bad owners was similar when directly compared.

5. General discussion

This research investigated why children and adults over-value objects belonging to famous owners and explored how this cultural phenomenon is affected by ASD. In Study 1 we discovered

that children with ASD do not over-value authentic items with special ownership histories, while the valuations of TD children are strongly influenced by who an item belongs to. We also observed that object valuations of children with ASD are moderated by qualities that are unrelated to ownership history, but to a lesser extent than TD children. Study 2 replicated the results of Study 1, suggesting that reduced sensitivity to ownership history may be a characteristic that generalizes across many children with ASD. Study 3 revealed that adults with ASD are as sensitive to ownership history as neurotypical adults when evaluating the economic and social value of authentic objects. However, adults with ASD consistently rated inauthentic items more favorably than neurotypical adults, and their willingness to keep objects that lack special ownership histories implies an increased focus on functional worth. These results demonstrate that ownership history has a powerful influence on object valuation in typical development that emerges in childhood and endures into adulthood. Conversely, individuals with ASD appear to be relatively unconcerned by ownership history in childhood, but may develop an appreciation for authenticity by adulthood.

Our studies were designed to elucidate whether TD individuals ascribe higher values to authentic objects because their owners are famous or because they are imbued with their owners' qualities. The responses of TD children indicate a preferential hierarchy that lends partial support to both explanations. While association with a famous good or bad owner was sufficient to elevate an item's value above that of a similar inauthentic item, TD children clearly felt that this value was moderated by the owner's traits. TD children may have perceived Peter Pan's t-shirt to be more valuable than Captain Hook's hat because Peter Pan's personality, skills, and/or reputation are considered more socially desirable than Captain Hook's. In contrast, neurotypical adults consistently assigned high values to authentic items irrespective of their owners' personalities. It is possible that this heightened valuation of authentic items is underpinned by adults' awareness that exclusive and unique items are usually financially valuable and socially desirable (but may not necessarily reflect the amount that they would pay for the object themselves). However, this effect requires replication with objects belonging to "real life" owners (rather than fictional characters) to rule out preferential biases related to media and confirm whether a developmental difference is observed when stimuli are conceivably purchasable.

Our research was the first to explore how ASD affects sensitivity to authenticity when valuing objects belonging to others. Hartley and Fisher (2018) reported that ownership-induced associations with the self do not reliably influence the preferences and value judgements of children with ASD. The results of Study 1 and Study 2 clearly show that associations with famous owners also have little bearing on their object valuations. Taken together, these findings demonstrate that children with ASD are not irrationally biased by ownership history when evaluating objects. Unlike TD individuals, we propose that children with ASD may value objects based on their material or functional properties, independent of associations with their owners. This claim is supported by their comparable valuations of property belonging to famous and non-famous owners in three out of four conditions, their spontaneous verbal justifications, and their sensitivity to object qualities unrelated to ownership history. This strategy may be attributable to differences in 'self' and 'other' understanding that characterize early development in ASD (Lind, 2010; Lind & Bowler, 2009). Establishing ownership forges a mentalistic connection between a person and their property, causing self- and other-related cognitive biases to transfer to those items (Diesendruck & Perez, 2015; Hood et al., 2016). If understanding of the self develops differently, mere ownership may not be sufficient to enhance an object's value or psychological salience (Hartley & Fisher, 2018). If ownership does not bias valuation of one's own property, it follows that ownership is unlikely to bias judgements about the property of others, irrespective of authenticity.

Interestingly, the results of Study 3 suggest that adults with ASD are acutely aware of the value afforded by authentic ownership histories when appraising objects. This finding suggests that the emergence of ownership history as a significant influence on object evaluation may be developmentally delayed in ASD rather than completely absent. Ownership is a cultural phenomenon that is acquired through interactions with others during childhood (Kanngiesser et al., 2015). However, ASD is characterized by decreased social motivation and social-cognitive difficulties that may reduce the frequency and quality of interactions through which children learn the importance and norms of ownership (APA, 2013; Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012). Furthermore, early differences in developing an extended self-concept may reduce the psychological importance of property ownership in childhood. As a consequence of these early developmental differences, it may

take longer for individuals with ASD to recognize the importance of ownership history to the economic value and desirability of objects. Nevertheless, we observed signs that subtle differences in the influence of ownership history may endure into adulthood. Adults with ASD showed increased appreciation for inauthentic items that lacked special ownership histories, potentially indicating a greater concern for functional or practical value that aligns with the judgements of children with ASD.

Naturally, we must address the weaknesses of this research. It is possible that between-population differences observed in studies 1 and 2 were related to general differences in cognitive development rather than autism per se. We acknowledge that including samples of children with learning difficulties matched to children with ASD on non-verbal intelligence would have mitigated this issue. Including control groups of TD children matched on chronological age would have also enabled us to rule out potential age-related differences. However, the omission of age-matched controls is perhaps mitigated by the fact that the response profiles of TD children and neurotypical adults displayed strong, and broadly similar, effects associated with ownership history. As Study 3 was conducted remotely, we were limited in the amount of information we could collect about participants' characteristics and we were unable to match groups on cognitive ability. Given the platforms through which the study was advertised (i.e. University Services and social media), we are confident that the sample of adults with ASD had the intellectual capacity to fully understand the task. Having drawn an initial comparison between adults with typical development and autism, further research is required to understand additional factors that may influence their appraisal of property. Finally, we recognize that children with ASD do form strong attachments to items with specific histories or qualities, particularly if those items are linked to stereotypic routines or special interests. Our claim is that the influence of authenticity on object valuation is generally weaker and less pervasive in comparison to TD children.

6. Conclusions

The findings from this research provide new insight into how autism and ownership history interact to influence valuations of property. Whereas children with ASD in studies 1 and 2 showed little concern for ownership history when evaluating objects, adults with ASD in study 3 demonstrated clear awareness that abstract connections with certain individuals mediate the status of

an object in several ways. However, both children and adults with ASD showed greater appreciation for objects that lacked special ownership histories, suggesting that heightened consideration of material or functional worth may be a lifelong characteristic of ASD. By contrast, neurotypical children and adults assigned significantly lower ratings to objects associated with non-famous owners than celebrity possessions on virtually every metric, suggesting that ownership history has an extremely potent and enduring influence on typical development.

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Appendix A

Please tick the boxes next to the characters listed below that your child is familiar with, and indicate whether they consider them to be a "goodie" or "baddie" (in terms of their personality or behaviour) by circling either '**G**' for 'goodie or '**B**' for 'baddie'. This will allow us to tailor our object valuation game to include only characters that your child is familiar with. Please tick as many that you feel your child will be aware of and return this form alongside the signed consent form.

- ☐ G / B Captain America (Avengers)
- ☐ G / B Waluigi (Supermario Brothers)
- ☐ G / B Iron Man (Avengers)
- ☐ G / B Wicked Witch of the West (Wizard of Oz)
- ☐ G / B Swiper (Dora the Explorer)
- ☐ G / B Dora the Explorer (Dora the Explorer)
- ☐ G / B Emperor Zurg (Toy Story)
- ☐ G / B Supermario (Supermario Brothers)
- ☐ G / B Harry Potter (Harry Potter)
- ☐ G / B Voldemort (Harry Potter)
- ☐ G / B Minions (Despicable Me)
- ☐ G / B Mary Poppins (Mary Poppins)
- ☐ G / B Peter Pan (Peter Pan)
- ☐ G / B Mayor Humdinger (Paw Patrol)
- ☐ G / B Luke Skywalker (Star Wars)
- ☐ G / B Cruella de Vil (101 Dalmatians)
- ☐ G / B Lisa Simpson (The Simpsons)
- ☐ G / B Mr Incredible (The Incredibles)
- ☐ G / B Bob the Builder (Bob the Builder)
- ☐ G / B Captain Hook (Peter Pan)
- ☐ G / B Loki (Avengers)
- ☐ G / B Thanos (Avengers)
- ☐ G / B Red Skull (Avengers)
- ☐ G / B Dorothy (Wizard of Oz)
- ☐ G / B Jafar (Aladdin)
- ☐ G / B Aladdin (Aladdin)
- ☐ G / B Woody (Toy Story)
- ☐ G / B Thor (Avengers)
- ☐ G / B Batman (Batman)
- ☐ G / B Joker (Batman)
- ☐ G / B Scar (The Lion King)
- ☐ G / B White Witch (Narnia)
- ☐ G / B Elsa (Frozen)
- ☐ G / B Marshall (Paw Patrol)
- ☐ G / B Darth Vader (Star Wars)
- ☐ G / B Evil Queen (Snow White)
- ☐ G / B Mr. Burns (The Simpsons)
- ☐ G / B Ursula (The Little Mermaid)
- ☐ G / B Snow White (Snow White)
- ☐ G / B Maleficent (Sleeping Beauty)