Psychological predictors of anxiety and depression in Parkinson's disease:

A systematic review

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Short Title: Anxiety and depression in Parkinson's disease

Keywords: Parkinson's disease; anxiety; depression; illness beliefs; social support; personality; coping

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Abstract

Objectives. Parkinson's disease (PD) is a neurodegenerative disorder, affecting the motor system with psychological difficulties also frequently reported. While explanations for psychological difficulties are historically situated within a biomedical framework, more recently the relevance of psychological determinants has become a research focus. This review therefore examines this relationship with the two most commonly reported psychological difficulties (anxiety and depression) in people with PD.

Methods. Databases were systematically searched up to 17 December 2013, identifying twenty-four studies meeting inclusion criteria.

Results. Significant predictors of heightened anxiety and depression included: increased emotion-focused coping; less problem-focused coping; lower perceived control; more dominant beliefs about PD as part of a person's identity, and influence on life; less social support and more avoidant personality types.

Conclusions. Relationships between some specific psychological predictors and depression and anxiety seem well supported. The complexity of relationships between these psychological determinants should be taken into consideration when delivering psychological interventions.

Psychological predictors of anxiety and depression in Parkinson's disease: A systematic review

Parkinson's disease (PD) is a chronic neurodegenerative disease typically characterized by manifestations of motor control problems such as tremor, muscular rigidity and bradykinesia (Jankovic, 2008; Stern, 1988). Although less reported, non-motor difficulties such as impulse control, sleep, anxiety and depression are common within the population (Chaudhuri, Healy, & Schapira, 2006). It is accepted that people with PD typically present with higher levels of depression than age-matched controls (Reijnders, Ehrt, & Weber, 2008). Moreover, despite being less frequently presented (or, at least, measured), anxiety is also a common problem, with a far greater prevalence than in the general population (Dissanayaka et al., 2010; Pontone, Williams, Bassett, & Marsh, 2006). Such high levels of distress are concerning in their own right but also because of their importance in determining health-related quality of life more generally (Simpson, Lekwuwa, & Crawford, 2013a). For example, a recent systematic review concluded that a higher level of depression in people with PD was the most significant predictor of poorer quality of life, over all other variables, including those related to physical function (Soh, Morris, & McGinley, 2011).

Anxiety and depression in PD have typically been considered as 'non-motor symptoms' resulting from the neurochemical changes found in the brains of people with PD (Chaudhuri et al., 2006; Chaudhuri & Schapira, 2009; Leentjens, Dujardin, Martinez-Martin, Richard, & Starkstein, 2011). However, there is an increasingly large body of evidence that psychological factors are useful determinants of the presence and level of anxiety and depression in people with PD (e.g., Brown & Jahanshahi, 1990; Simpson, MacMillan & Reeve, 2013b). Furthermore, achieving a more comprehensive understanding of the psychosocial predictive factors for anxiety and depression in PD could pave the way for developing interventions to support and improve quality of life and reduce levels of psychological distress in this group of people (Fitzpatrick, Simpson, & Smith, 2010).

Indeed, if psychological factors are useful determinants of the presence and level of anxiety and depression in people with PD, this knowledge could be incorporated into psychological interventions. While interventions such as cognitive behavioral therapy (CBT) have received some attention in recent years with one study reporting good results in people with PD with depression (Dobkin et al., 2011), these generally utilize more stringent manual-based approaches to therapy as part of RCTs rather than an individualized and formulation-based perspective that reflects more real-world working. For example, Simpson et al. (2013b) highlight the importance of taking a multifaceted stance to encompass the various effects of PD on the person’s well-being and mental health rather than following guidelines for what would ‘typically’ be expected for people with PD or those in the general population.

A wider understanding of the range (and relative frequency) of psychological determinants of (and their intra-structural relationship to) anxiety and depression would enable interventions to be formulation-based after an informed assessment process (Simpson et al., 2013b). Consequently, the current systematic review, using the robust search methodology described in a previous review on psychological adjustment in people with MS (Dennison, Moss-Morris, & Chalder, 2009), provides a narrative synthesis of the quantitative evidence assessing the relationship between psychological factors[1] and two measures of psychological distress, depression and anxiety, in people with PD.

Method

Search Strategy

A systematic literature search was conducted between 26 November and 17 December 2013 for original peer-reviewed papers published in English using electronic databases (PsycINFO, MEDLINE and EMBASE). Psychological adjustment terms ('social adjustment', 'occupational adjustment', 'emotional adjustment', 'social support', 'illness impact', 'illness perception'); predictive terms ('predict*', 'correlat*', 'determinat*'); and psychological distress terms ('depression', 'anxiety') as identified by Dennison et al. (2009) were included in the search. The term PD ('Parkinson's disease', 'parkinson*') was also included in the search and search terms were modified for each database. Reference lists and citations were also hand searched for relevant papers. Papers meeting the following criteria were included for review. The initial search yielded 4583 potential articles to be screened.

Inclusion Criteria

Studies were included if they investigated the relationship between '*psychological factors'* and '*anxiety or depression'* in people with a specified diagnosis of PD. This rationale was based on the previous review into psychological predictors in MS (Dennison et al., 2009). A diagnosis of PD from a neurologist was required for inclusion, in line with criteria outlined by

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[1] In order to clarify the terminology in this review, *psychological factors* are defined as adjustable phenomena that can be modified through psychological intervention.

the United Kingdom PD Society Brain Bank (see Hughes, Daniel, Kilford, & Lees, 1992). Where papers reported group comparisons, studies were included if they reported factors separately for the PD group. Studies could be included if they reported a prospective design, although cross-sectional studies were also eligible to be included. Studies reporting outcomes of interventions such as brain surgery (e.g., Berney et al., 2002) and CBT (e.g., Dobkin et al., 2011) on depression and anxiety levels were excluded, as were studies reporting results related to concurrent problems, such as dementia, mild cognitive impairment or psychosis, as it would not be possible to determine the effect of surgery or other illnesses on the psychological factors or anxiety/depression. Various studies reported an increased prevalence of apathy within the PD population (e.g., Starkstein & Brockman, 2011). However, it has been argued that apathy is a poorly defined construct in people with PD (Bogart, 2011; Simpson, McMillan, Leroi, & Murray, 2015) and therefore studies referring to apathy or those not making the distinction between apathy and depression were excluded.

Data Extraction

Figure 1 illustrates the filtering process used in the review. Upon removal of duplicates and screened titles and abstracts (where necessary) that were not appropriate, 152 articles were rated against the inclusion criteria. Reference lists were hand searched providing a further nine potential articles, with five meeting inclusion criteria. Hand searching the additional papers identified three more papers, of which one was included. A total of 24 studies were included for full-text review.

<< INSERT FIGURE 1 AROUND HERE >>

Quality Control

The quality of the studies was evaluated using existing guidelines for undertaking research outlined by the STROBE statement (von Elm, Altman, Egger, & Pocock, 2007). The STROBE statement provides researchers with a set of guidelines to improve methodological rigor in research and has therefore been used within this review to help identify studies which may have a poorer methodological design. The statement consists of 22 items, for which the reviewer awarded a point if the study had adhered to the criterion outlined in the statement. To ensure quality ratings across the studies were not biased by the reviewer, studies were grouped into domains per psychological predictor (see Table 1) and one paper from each domain was randomly selected and independently checked by a second reviewer (psychology graduate) also investigating psychological factors in PD. Inter-rater reliability analysis for each of the papers did not reveal any significant differences between the reviewers (Cohen's $K = .926$), with an overall agreement in rating of 94.8% across the four studies, reaching a 'very good' strength of agreement (Altman, 1991). Any differences were discussed to ensure reliability of ratings between the reviewed papers was maintained. As the differences between ratings were nominal, the scores obtained from the primary reviewer were therefore used to evaluate the papers presented in Table 1.

Results

<< INSERT TABLE 1 AROUND HERE >>

Overview

Table 1 summarizes the aims, sample populations, *psychological* variables, findings and quality assessment rating for each of the 24 reviewed studies. Studies are listed alphabetically in each domain, with study numbers referring to alphabetical order for ease of reference in Table 2. Studies reported sample sizes between 22 and 471 for PD groups, with an average of 99 participants with PD. Studies commonly reported a mean age between 60 and 75 years (n = 21). Four studies (Evans & Norman, 2009; Jacobs, Heberlein, Vieregge, & Vieregge, 2001; Krakow, Haltenhof, & Bühler, 1999; Zampieri & de Souza, 2011) reported results from samples with younger onset (45-59 years). Studies generally recruited participants with PD from neurology and movement disorder clinics with diagnosis of PD confirmed by a neurology physician, of which six reported using the diagnostic criteria specified by the United Kingdom PD Society Brain Bank (see Hughes et al., 1992).

Studies generally reported data collected via a cross-sectional design with self-report measures and only one study (Evans & Norman, 2009) reported longitudinal findings from multiple time points. Correlational-based statistics were mainly used to analyze the data. Eleven studies reported using between group analysis, making comparisons between people with PD and healthy controls (n = 3), people with other long-term health conditions (n = 6) or their carers (n = 2). The two studies (Sanders-Dewey, Mullins, & Chaney, 2001; Speer, 1993) reporting responses from people with PD and their carers were included as they reported patient-carer perspectives independently as well as relationally. One study also compared right and left sided onset of PD to investigate potential differences in dopamine distribution between hemispheres (Fleminger, 1991). Where between groups analysis was performed, studies also carried out correlational analysis within groups. No significant differences on variables for demographic data were reported between the PD and control groups, indicating their appropriateness as controls. However, the PD groups typically – and consistently with other studies – scored significantly higher on measures of anxiety and depression compared to controls and normative data. Further details of designs are presented in Table 1.

The reviewed studies generally reported good methodological procedures as identified by the STROBE statement. When awarded a point for each matched item from the statement, scores ranged between 13 and 20 (see Table 1) and were considered to be of adequate quality to be included within the review.

Articles reported a range of psychological determinants including *illness cognitions*, *social support*, *coping styles*, and *personality traits* (see Table 2). All 24 studies reported psychological outcomes for *depression*, most frequently using the Beck Depression Inventory (*n* = 7; BDI; Beck, Steer, & Carbin, 1988), Geriatric Depression Scale (*n* = 4; GDS; Parmelee & Katz, 1990), Hospital Anxiety and Depression Scale (*n* = 3; HADS; Zigmond & Snaith, 1983) and Depression Anxiety and Stress Scale (*n* = 2; DASS; Lovibond & Lovibond, 1995). Nine of the studies (asterisked in Table 2) also reported relationships with *anxiety*, commonly from the HADS and DASS scales. Articles will be summarized and synthesized into the thematically grouped psychological factors ranked by frequency of report to understand their relationship to anxiety and depression.

<< INSERT TABLE 2 AROUND HERE >>

Coping Style

Coping was the most frequently reported psychological factor in the reviewed studies (*n* = 12). Coping is argued to mediate the relationship between stressful situations, such as chronic health conditions, and psychological well being through the cognitive and emotional responses to the condition (Lazarus & Folkman, 1984). Strategies to cope with the distress are dependent on the relationship between the individual and the stressor. Problem-focused coping is usually used when people feel that circumstances are changeable, compared to fixed situations which have the tendency to evoke more emotion-focused coping strategies (Parker & Endler, 1992). However, it is argued that dichotomizing strategies into a binary categorization undermines the complexity of living with chronic illnesses and ignores the relationships that may exist between strategies (de Ridder, 1997). Although measures such as the COPE questionnaire (Carver, Scheier, & Weintraub, 1989) have aimed to address this problem by assessing and describing coping as a range of approaches, only two of the reviewed studies (Evans & Norman, 2009; Simpson et al., 2013a) reported using a measure that addresses the complex nature of coping, with the ten remaining adopting the more traditional and limited approaches.

Eleven of the reviewed studies reported consistent relationships between the use of specific coping strategies and depression, of which five studies also reported anxiety as an outcome. Only one study failed to identify a significant relationship (Herrmann, Freyholdt, Fuchs, & Wallesch, 1997) although the authors suggest this may be due to their measurement of coping assessing a more stable trait-like construct rather than a state measure. However, studies generally reported that increased use of wishful thinking, emotion-focused, and avoidant coping strategies were related to higher levels of anxiety and depression. In particular, more emotion-focused coping was related to increased symptoms of anxiety and depression in PD.

While problem-focused coping has often been found to be a more adaptive strategy, MacCarthy and Brown (1989) suggest that this strategy alone may not be sufficient at all stages and various strategies may need to be used to foster a more adaptive overall set of strategies. However, in five of the reviewed papers, less problem-focused coping was indeed related to higher depression scores, with five also reporting a similar relationship with anxiety (Evans & Norman, 2009; Hurt et al., 2011, 2012; Sanders-Dewey et al., 2001; Simpson et al., 2013a).

Expanding on the notion that successful coping involves a sophisticated combination of strategies, it is important to consider avoidance or withdrawal within chronic illness. Tobin, Holroyd and Reynolds (1989) argue that along with using problem and emotion focused strategies, people can withdraw and become disengaged as a way of managing increased psychological distress. Increased use of avoidance-based strategies was related to higher levels of anxiety and depression in eight studies. Although increased wishful thinking, a form of avoidance (see Tobin et al., 1989), was related to higher levels of depression in one study (Krakow et al., 1999), two other studies did not find a significant relationship (Moore & Seeney, 2007; Pusswald et al., 2012). Consistent with the models described above, increased use of active-focused and task-oriented coping strategies were related to reduced levels of anxiety (Ehmann, Beninger, Gawel, & Riopelle, 1990; Hurt et al., 2011, 2012; Pusswald et al., 2012).

In summary, a generally consistent finding emerged across the reviewed studies. Where significant results were reported, there was a relationship between more task-orientated, less emotion-orientated coping and lower levels of anxiety and depression in people with PD.

Although more emotion-focused coping was related to increased anxiety and depression (Hurt et al., 2011; de Ridder, Schreurs, & Bensing, 2000; Sanders-Dewey et al., 2001; Simpson et al., 2013a), where participants reported using a mix of coping strategies, lower anxiety and depression scores were also reported (MacCarthy & Brown, 1989).

Illness Cognitions

Given the breadth of terminology that can be used to describe illness cognitions, for the purpose of this review the term includes *cognitions*, *representations*, *perceptions* and *beliefs* a person has about their PD. As with coping, illness cognitions have received growing attention in research (de Ridder, Geenen, Kuijer, & van Middendorp, 2008) and were the second most frequently measured psychological factor related to depression (*n* = 11) and anxiety (*n* = 3) in the reviewed studies. The relationship between illness cognitions and psychological outcomes in people with chronic illnesses has been widely studied (see Broadbent, Petrie, Main, & Weinman, 2006; de Ridder et al., 2008), and described in a number of chronic neurological conditions including, for example, MS (e.g., Dennison et al., 2009), Huntington's disease (e.g., Helder et al., 2010; Arran, Craufurd, & Simpson, 2014) and epilepsy (e.g., Kemp, Morley, & Anderson, 1999; Mirnics, Békés, Rózsa, & Halász, 2001).

Leventhal's self-regulatory model (Leventhal, Meyer, & Nerenz, 1980; Leventhal, Nerenz, & Steele, 1984) is the most comprehensive model to specify the nature and function of illness beliefs. It suggests that in order to adjust to chronic illnesses, such as PD, people develop their own representations and perceptions of the illness and, based on their perception of the illness, make psychological changes to facilitate coping. The revised Illness Perceptions Questionnaire (IPQ-R; Moss-Morris et al., 2002) has been developed to assess illness cognitions quantitatively, grouping cognitions into, for example, domains of identity, consequences, controllability, cause and timeline. However, few studies have adapted the measure for PD and only two of the reviewed studies (Evans & Norman, 2009; Simpson et al., 2013a) report use of the measure, drawing attention to the lack of research currently available for a comprehensive assessment of illness cognitions in PD. Other studies have, however, used a range of scales and single-concept measures. Within the reviewed studies, *identity* and *controllability* were the most dominant factors.

Identity. As described in the IPQ-R, illness identity relates to the perceived number of symptoms that are related to the illness, with an increased number of symptoms related to a more disabling perception of the illness. Two of the eight studies assessing illness identity reported a relationship between a stronger illness identity and increased depression and anxiety in PD (Evans & Norman, 2009; Simpson et al., 2013a). Other studies did not report findings for anxiety. A greater number of self-perceived physical and cognitive impairments were also related to increased depression (Gamarra, Molski, & Hilbig, 2009; MacCarthy & Brown, 1989; McQuillen, Licht, & Licht, 2003; Schrag, Jahanshahi, & Quinn, 2001) with one study reporting both increased anxiety and depression (Simpson et al., 2013a).

Sense of coherence is argued to be vital for people to understand and know how to relate to their illness (Antonovsky, 1979) and was reported in three studies. Although Evans and Norman (2009) found no significant relationship with anxiety or depression, two studies reported a lower sense of coherence to be linked to increased depression (Pusswald et al., 2012; Simpson et al., 2013a). Illness uncertainty, a related concept although measured differently, was not significantly related with anxiety or depression in a separate study (Sanders-Dewey et al., 2001).

Controllability. A significant component of illness cognitions relates to the level of control a person believes they have over their illness (Eccles & Simpson, 2011). This can be the amount of control people believe they have (internal) as well as their perception of the extent of control exercised by others, such as medical professionals or as a result of chance or 'bad luck' (Moss-Morris et al., 2002).

Control was measured in six studies (Evans & Norman, 2009; Krakow et al., 1999; MacCarthy & Brown, 1989; McQuillen et al., 2003; Simpson et al., 2013a; Zampieri & de Souza, 2011). Reduced internal control was found to be a significant predictor for increased anxiety in one study (Evans & Norman, 2009). However, the only other study (Simpson et al., 2013a) investigating the relationship between control and anxiety did replicate the findings. Four other studies reporting relationships between reduced internal control and increased depression (Krakow et al., 1999; McQuillen et al., 2003; Simpson et al., 2013a; Zampieri & de Souza, 2011). Lower external control and increased 'chance' control were also significantly correlated with higher scores for depression (Krakow et al., 1999; Zampieri & de Souza, 2011).

Cause. Only three studies (Evans & Norman, 2009; MacCarthy & Brown, 1989; Simpson et al., 2013a) reported relationships between beliefs in specific groups of causes (e.g., biomedical, environmental pollutants) and psychological outcomes. No significant relationships were found between non-psychological causal attributions and anxiety or depression. However, increased psychological attributions for the cause of PD (e.g., stress or worry) were significantly related to higher levels of anxiety (Evans & Norman, 2009; Simpson et al., 2013a).

Consequences. As with *cause*, there was little consideration for the perceived consequences of illness in the reviewed studies. This may be due to the limited methods available to assess illness cognitions using cross-sectional questionnaires. Out of the four studies assessing the determinants of consequences, only one study (Evans & Norman, 2009) investigating anxiety and depression reported a higher belief in serious consequences and higher levels of anxiety and depression. Greater perceived stigma as a consequence of PD was also a significant predictor of higher depression scores in two studies (Pusswald et al., 2012; Schrag et al., 2001).

Summary. The reviewed studies show that there is a generally consistent relationship between some elements of illness cognitions and anxiety and depression. For example, a more symptom-heavy illness identity, as well as lower perceived internal and external control, can predict increased symptoms of anxiety and depression.

Social Support

It is widely reported that increased social support is linked to improved psychological and physical health (Uchino, 2006; White, Richter, & Fry, 1992), acting as a protective factor against the negative psychological influence of chronic illness (Dennison et al., 2009). However, social support is not without costs and increased support may not necessarily reduce psychological distress due to the complex interaction between the person and their support networks (Burg & Seeman, 1994). For this reason, the perception of the appropriateness of support is often seen as more determinative than a quantifiable assessment. Nine of the reviewed studies addressed the relationship between social support and depression, of which two also included anxiety. Seven studies (Cheng et al., 2008; Fleminger, 1991; Moore & Seeney, 2006; Schrag et al., 2001; Simpson et al., 2006; Simpson et al., 2013a; Speer, 1993) found a significant relationship between a lower perception of the quality of social support and higher levels of depression, with three studies (Fleminger, 1991; Simpson, Haines, Lekwuwa, Wardle, & Crawford, 2006;

Simpson et al., 2013a) reporting similar relationships with anxiety. Moore and Seeney (2007) found a significant association between fewer intimate relationships and increased depression scores. This adds to findings (e.g., Simpson et al., 2006) speculating that the quality of relationships is more predictive of well-being than quantity.

In summary, there was a clear and consistent indication of an association between perceived higher quality social support and improved psychological outcomes. In relation to its putative mechanism, Cheng et al. (2008) suggested that social support acts as a moderator between coping strategies and depression. Although the methodological quality for this study was not deemed to be as high as other studies, three additional studies also suggest a this moderation effect could be supported (Ehmann et al., 1990; MacCarthy & Brown, 1989; Moore & Seeney, 2007). Where social support was measured against other predictors (including coping and illness beliefs) it was largely found to make a non-significant contribution.

Personality

It is argued that personality affects both emotional reactions and coping style when people experience chronic illness (e.g., Blakely et al., 1991; Erlen et al., 2011). Personality characteristics such as *novelty seeking* and *harm avoidance* behaviors have been linked to problematic psychological adjustment in other chronic illnesses due to less use of more successful coping styles, causing difficulty with overall psychological functioning (e.g., Lazarus & Folkman, 1984). Although personality has been investigated in PD populations (see Menza, 2000, for review), there has generally been no comprehensive assessment, with studies commonly reporting individual aspects rather than personality constructs. Only five (Hubble, Venkatesh, Hassanein, Gray, & Koller, 1993; Jacobs et al., 2001; Menza & Mark, 1994; de

Ridder et al., 2000; Robottom et al., 2012) of the 24 reported studies measured personality in relation to to anxiety and depression. Although the studies described significant relationships with depression, only two studies (Menza & Mark, 1994; Robottom et al., 2012) reported a relationship with anxiety.

Increased pessimism was positively correlated with anxiety and depression (de Ridder et al., 2000; Robottom et al., 2012). One study found that personality characteristics such as being 'down to earth' or 'self-confident' with concurrent 'enthusiasm' and 'affection' were related to lower scores for depression (Hubble et al., 1993). Two studies (Jacobs et al., 2001; Menza & Mark, 1994) reported increased depression scores for people with more harm avoidant personality characteristics. However, no significant relationships were found on other personality measures such as novelty seeking behaviors (Menza & Mark, 1994).

In summary, few studies reported relationships between aspects of personality and anxiety or depression. However, more avoidant personality characteristics were more likely to have lower levels of psychological wellbeing, while increased levels of characteristics such as optimism showed the reverse effect.

Discussion

The current review has revealed some consistent relationships between psychological factors (including coping, illness cognitions, social support and personality) and increased anxiety and depression in PD. For example, and consistent with previous research in people with other chronic illnesses, increased use of emotion focused coping and less use of problem focused or active coping was related to increased reports of anxiety and depression in the reviewed studies (de Ridder & Schreurs, 2001). A stronger perception of the presence of PD symptoms was also related to higher levels of anxiety and depression and lower perceived control (internal and external) was particularly related to increased psychological distress. The reviewed studies also generally found increased social support (and satisfaction with social support) to be related to lower levels of anxiety and depression. However, studies also suggested that social support exerts its effect through coping, rather than as a direct predictor. Less evidence was present for a relationship between aspects of personality and and anxiety and depression scores.

Although the findings support the presence of psychological factors being related to depression and anxiety, it is important to note that there are complex relationships between the predictor variables and, despite the linear design of many of the studies, these predictors cannot simply be assumed to be independent of each other. This was exemplified in the few studies which did report the complex interactions between psychological factors and their multifaceted relationships with anxiety and depression (e.g., Ehmann et al., 1990; Evans & Norman, 2009).

Given the high number of studies (*n* = 13) reporting just correlation analysis without further analysis using methods such as multiple regression or structural equation modeling, it is not possible for conclusions to be drawn on the direction of the relationship between the predictor psychological factors and outcomes of anxiety and depression. The wide use of cross-sectional data is also somewhat problematic and does not offer insight into the stability of the psychological factors presented in the reviewed studies.

Studies reporting further analyses most frequently used multiple regression (e.g., Simpson et al., 2013a), which do enable some specification of the independent effect of the psychological factors on anxiety and depression measures, but their essentially associative design renders any assumptions regarding causal directionality premature. Structural equation modeling was only used in one study (Hurt et al., 2012), allowing a more in-depth understanding of the relationships between illness cognitions and coping on psychological distress outcomes. However, although the use of such statistical approaches helps explain the multidimensional relationships, recruitment numbers needed to achieve statistical power are high and difficult to obtain within the clinical population. Understanding the relationships using correlation and regression analyses is therefore likely to continue.

Clinical Implications

The current review has a number of clinical implications. As the review suggests, a complex relationship between psychological factors relating to depression and anxiety in PD exists. To take these findings into consideration a formulation based approach to therapy is needed, assessing coping, illness beliefs and social support on an individual basis and planning a therapeutic approach based on the individual's understanding of their illness and their coping resources. While studies such as the recent RCT using CBT for depression in PD (Dobkin et al., 2011) have shown significant improvements following a manualized intervention for depression, findings from Fitzpatrick et al. (2010) and Simpson et al. (2013b) show the importance of using a formulation and case conceptualized approach to working with aspects related to the chronic health condition (i.e. illness beliefs and ways of coping with living with PD etc.) rather than simply depression or anxiety symptoms themselves.

A number of elements of potentially useful interventions could then be combined in the treatment package. While some elements of CBT might be useful (particularly psycho-education on unhelpful illness behaviors, illness beliefs and maladaptive coping strategies), techniques from interventions such as mindfulness and acceptance and commitment therapy (ACT) might also be worth incorporation. These have been successful in addressing the relationship between psychological factors such as coping and illness beliefs in people with other chronic conditions including diabetes, chronic pain and MS (Dahl, Wilson, & Nilsson, 2004; Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007; Sheppard, Forsyth, & Hickling, 2010), with one prospective study taking place in PD (Advocat et al., 2013). Interventions should focus on using mindfulness techniques, such as those identified in mindfulness-based cognitive therapy (MBCT) to reduce avoidance and reoccurrence of anxiety/depression symptoms (see Bucks et al., 2011; Fitzpatrick et al., 2010) and center on increasing perceptions of internal control related to the illness (McQuillen et al., 2003)**.** ACT can also support development of more positive illness cognitions and adjustment to living with PD, as has been found in other health conditions such as MS (e.g. Pakenham & Fleming, 2011). Understanding the relationship of social support can also play a significant role in delivering an improved intervention. Where caregivers have been involved in supporting CBT interventions to improve psychological outcomes in PD, significant enhancements on delivery of the intervention have been found (Dobkin et al., 2011; 2012). Similar results may therefore be found using other interventions.

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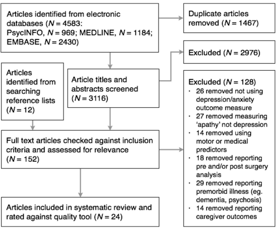
Articles identified from electronic databases ($N = 4583$: PsycINFO, $N = 969$; MEDLINE, $N = 1184$; EMBASE, $N = 2430$)
Duplicate articles removed ($N = 1467$)
Excluded ($N = 2976$)
Articles identified from searching reference lists ($N = 12$)
Article titles and abstracts screened ($N = 3116$)
Excluded ($N = 128$)
· 26 removed not using depression/anxiety outcome measure
· 27 removed measuring 'apathy' not depression
· 14 removed using motor or medical predictors
· 18 removed reporting pre and/or post surgery analysis
· 29 removed reporting premorbid illness (eg. dementia, psychosis)
· 14 removed reporting caregiver outcomes
Full text articles checked against inclusion criteria and assessed for relevance ($N = 152$)
Articles included in systematic review and rated against quality tool ($N = 24$)

Table 1

Data extraction table grouping reviewed papers (N = 24) into psychological factors for coping style, illness cognitions, social support and personality traits

Study/ Country	Sample (%male, *M* age)[a]	Design/Analysis	Psychological: Predictor(s)	Outcome(s)	Findings	Rating
Coping Style						
2. Ehmann et al. (1990). Canada	*N* = 45 (48.89%, 67.35) *N* = 24 (41.67%, 65.42) chronically disabled	Cross-sectional, between groups with correlation.	• BM-CQ • LSSS	• BDI	Demographic variables were not significant predictors of depression. People with PD showed significantly lower use of active coping strategies. Types of coping were inversely correlated with depression scores.	17
3. Evans et al. (2009). UK	*N* = 58 (48.28%, 58.64)	Cross-sectional, longitudinal with correlation and multiple regression.	• IPQ-R • MCMQ	• HADS	Coping had a mediating effect on anxiety and depression for cross-sectional data at times one and two when controlling for illness representations.	19
6. Herrimann et al. (1997). Germany	*N* = 54 (61.11%, 64)* *N* = 50 (68%, 61.50) CVA	Cross-sectional between groups and within groups correlation.	• FQCI	• CDS	Depression correlated with family and emotion-cognitive changes. Active, problem focused and distraction-based coping dominated both groups. Coping style did not correlate with depression, motor impairment and psychosocial changes in the PD group.	18

8. Hurt et al. (2011). UK	*N* = 471 (66.03%, 67.40)*	Cross-sectional factor analysis and correlation.	• CISS	• HADS	Increased emotion-focused coping was related to greater anxiety and depressive symptoms, while more task-orientated coping was associated with better psychological outcomes.	17
9. Hurt et al. (2012). UK	*N* = 461 (48.59%, 65.80)*, independent from study 8 sample	Cross-sectional correlation and structured equation modeling.	• CISS	• HADS	Less use of task-orientated coping was related to greater risk of depression and anxiety. Mild-moderate cognitive impairment may reduce ability to task-orientate.	18
11. Krakow et al. (1999). UK	*N* = 45 (60%, 55.80) *N* = 40 (52.50%, 36.60) with refractory epilepsy	Cross-sectional between groups correlation and analysis of covariance.	• FQCI • IPC	• ZSDS	Active, problem-focused and compliance coping strategies were reported as helpful. Depression was positively correlated with 'maladaptive' coping strategies.	18
12. MacCarthy et al. (1989). UK	*N* = 136 (55%, 64.50)	Cross-sectional correlation and hierarchical regression.	• WOC[1] • BPAS • Social support • Illness cognitions • RSEC	• BDI • BPA • AOI	Increased use of 'maladaptive coping' and lower self-esteem accounted for a significantly greater variance in higher depression than physical impairment and stage of illness.	19
15. Moore et al. (2007). Australia	N = 82 (69.51%, 68)	Cross-sectional correlation and multiple regression.	• WOC[2] • SSQ6 • PAIR	• POMS	Increased avoidance coping, wishful thinking, self-blame accounted for a significant amount of variation in higher depression scores.	16

16. Pusswald et al. (2012). Austria	*N* = 57 (50.88%, 67.71)* *N* = 59 (non-neurological chronic illness)	Cross-sectional between groups and within groups correlation and multiple regression.	• SOC-29 • FQCI • PDQ-39	• GDS	PD patients with higher SOC used neither depressive coping nor strategies such as dissimulation or wishful thinking. Less active coping also correlated with higher levels of depression.	18
17. de Ridder et al. (2000). The Netherlands	*N* = 70 (54%, 62.40) *N* = 96 (24%, 45.20) with MS	Cross-sectional between groups correlation and regression.	• LOT-R • CISS	• BDI	Increased emotion-focused and less task-orientated coping related to higher depression scores. Coping strategy was also predicted by level of optimism.	20
19. Sanders-Dewey et al. (2001). USA	*N* = 44 patient-carer dyads (70.46%, 72.80)	Cross-sectional between groups multivariate analysis of variance, correlation and regression.	• MUIS-CF • WOC[1]	• SCL-90-R	More emotion-focused coping (but not problem-focused) was a significant predictor of increased psychological distress (anxiety and depression) when controlling for demographic and illness variables.	18
22. Simpson et al. (2013a). UK	*N* = 81 (72.8%, 66.17)	Cross-sectional correlation and hierarchical regression.	• Abbreviated COPE • LOT-R • PDQ-39 • IPQ-R	• PANAS • DASS • PDQ-39	More emotional coping was related to increased depression scores. Increased use of distancing was related to increased anxiety. Distancing, self-esteem and optimism explained 22% additional variance in emotional well being, but did not find significant causal effect for anxiety or depression.	19

Illness Cognitions						
3. Evans et al. (2009).	*See above*				Illness representations explained a large amount of variance in baseline anxiety and depression.	
5. Gamarra et al. (2009). Brazil	*N* = 26 (57.70%, 67.30)* *N* = 22 (59.10%, 66.40) controls	Cross-sectional between groups correlation.	• FSCS	• BDI	A significant relationship was found between lower self-concept and increased depression.	14
11. Krakow et al. (1999).	*See above*				Internal locus of control negatively correlated with state depression.	
12. MacCarthy et al. (1989).	*See above*				Lower self-esteem and increased ‘maladaptive coping’ accounted for a significantly greater variance in depression.	
13. McQuillen et al. (2003). USA	*N* = 74 (66.20%, 66.36)	Cross-sectional correlation and multiple regression.	• Adapted control scale	• BDI	Perceived internal control had a significant indirect effect on symptoms of depression and life satisfaction scores.	18
16. Pusswald et al. (2012).	*See above*				PD participants had significantly higher depression scores compared to controls. SOC negatively predicted depressive coping style and strategy in PD group.	
19. Sanders-Dewey et al. (2001).	*See above*				No significant relationships were found between illness uncertainty and anxiety or depression in patients. However, significant relationships were reported for carers.	

20. Schrag et al. (2001). UK	*N* = 97 (51.55%, 73)	Cross-sectional correlation.	- PDQ-39	- BDI	Depression was strongly influenced by self-perception of handicap despite clinician observed severity.	20
22. Simpson et al. (2013a).	*See above*				Satisfaction with social support and illness beliefs in cause of illness were predictors of anxiety. Satisfaction of social support, optimism and self-esteem also predicted depression.	
24. Zampieri et al. (2011). Brazil	*N* = 30 (56.67%, 57.93)*	Cross-sectional correlation.	- LMLCS	- GDS	Locus of control was found to correlate with depression scores for internal and external control measures.	18
Social Support						
1. Cheng et al. (2008). China	*N* = 121 (69.42%, 65.20)*	Cross-sectional correlation and multiple regression.	- Adapted social support scale	- HAMD	Increased symptoms and lower social support were associated with depression. Objective depression and duration of disease correlated with level of depression.	13
2. Ehmann et al. (1990).	*See above*				No significant effect was found between social support and depression. However, social support was significantly related to coping style (see below).	
4. Fleminger (1991). UK	*N* = 17 (right handed, 64.71%, 63.90) *N* = 13 (left handed, 61.54%, 62.50)	Cross-sectional between groups, analysis of covariance between left and right hemisphere.	- SSSI	- BDI - PSE	Evidence for a negative self-view along with higher social support stress significantly correlated with increased anxiety and depression independent of side of disease.	17

12. MacCarthy et al. (1989).	*See above*				Little evidence for a direct relationship between social support and psychological adjustment, with the suggestion of a link to psychological well-being via reduced independence when there is more social support.	
15. Moore et al. (2007).	*See above*				Satisfaction with social support was not significantly correlated with other variables. However, recreational intimacy with partners was found to be a significant predictor along with coping strategies to explain increased depression scores.	
20. Schrag et al. (2001).	*See above*				Less social support was significantly related to increased depression scores.	
21. Simpson et al. (2006). UK	*N* = 34 (70.59%, 64.29)	Cross-sectional correlation.	• PDQ-39	• PANAS • DASS • PDQ-39	Lower social support satisfaction was observed compared to relative norms. Reduced social support was positively correlated with increased scores for anxiety, depression and stress.	17
22. Simpson et al. (2013a).	*See above*				Satisfaction with social support explained significant additional variance on scores for anxiety and depression.	
23. Speer (1993). USA	*N* = 26 (89%, 70.50) and caregivers (mean age 67.30)	Cross-sectional between groups correlation and hierarchical regression.	• SSS	• GDS	Initial correlations revealed negative relationships between patient depression and amount of social support. Caregiver burden was also related to increased levels of depression for the caregiver. Patient and caregiver levels of depression were also related. Baseline scores predicted adjustment at one-year follow-up.	15

Personality Traits						
7. Hubble et al. (1993). USA	*N* = 35 (74.29%, 61) Matched controls (mean age 60)	Cross-sectional correlation and analysis of variance.	• Personality inventory	• GDS	The authors note that personality changes occur following disease onset, and there are various personality traits both pre and post onset that relate to increased depression scores.	17
10. Jacobs et al. (2001). Germany	*N* = 122 (71%, 44.90)* matched healthy controls (mean age 44.5)	Cross-sectional between groups correlations.	• TPQ	• ZSDS	Those found with higher harm-avoidance personality types were also found to have increased depression scores. Differences in personality traits were found between the two groups.	16
14. Menza et al. (1994). USA	*N* = 104 (55.77%, 64.90) *N* = 61 (54.10%, 64.70) with osteoarthritis	Between groups cross-sectional correlations and multiple regression.	• TPQ	• Zung • SAS	Harm avoidance personality traits were significantly correlated with increased depression scores when controlling for anxiety (a covariate to harm-avoidance personality traits).	17
17. de Ridder et al. (2000).	*See above*				Increased pessimism was significantly related to increased depression. Level of optimism predicted coping style.	
18. Robottom et al. (2012). USA	*N* = 83 (60%, 66.30)	Cross-sectional correlation.	• RS-15	• BSI-18	Increased levels of resilience correlated with significantly lower levels of anxiety and depression.	14

Note. a = Samples marked with an asterisk report PD diagnosis inline with criteria of United Kingdom PD society brain bank (see Hughes et al., 1992). *Measures in alphabetical order:* AOI = Acceptance of Illness Scale (Felton & Revenson., 1984); BDI = Beck Depression Inventory (Beck et al., 1988); BM-CQ = Billings & Moos Coping Questionnaire (Billings & Moos, 1981); BPAS =

Bradburn Positive Affect Scale (Bradburn, 1969); BSI-18 = Brief Symptom Inventory – 18 (Derogatis, 2001); CDS = Cornell Depression Scale (Alexopoulos, Abrams, Young, & Shamoian, 1988); CISS = Coping Inventory for Stressful Situations (Endler & Parker, 1990); COPE = Brief COPE (Carver, 1997); DASS = Depression, Anxiety & Stress Scale (Lovibond & Lovibond, 1995); FSCS = Factorial Self-Concept Scale (Tamayo, 1981); FQCI = Freiburg Questionnaire on Coping with Illness (Muthny, 1988); GDS = Geriatric Depression Scale (Parmelee & Katz, (1990); HADS = Hospital Anxiety & Depression Scale (Zigmond & Snaith, 1983); HAMD = Hamilton Depression Scale (Hamilton, 1960); IPC = Locus of Control Beliefs (Krampen, 1981); IPQ-R = Illness Perceptions Questionnaire – Revised (Moss-Morris et al, 2002); LMLCS = Levenson Multidimensional Locus of Control Scale (Levinson, 1973); LOT-R = Life Orientation Test (Scheier & Carver, 1985); LSSS = Louisville Social Support Scale (Norris & Murrell, 1985); MCMQ = Medical Coping Modes Questionnaire (Feifel, Strack, & Nagy, 1987); MUIS = Mishel Uncertainty in Illness Scale – Community Form (Mishel, 1981); PAIR = Personal Assessment of Intimacy & Relationships (Schaefer & Olson, 1981); PANAS = Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988); PDQ-39 = Parkinson's disease questionnaire (Jenkinson et al., 1997); POMS = Profile of Mood States (McNair, Lorr, & Droppleman, 1971); RSEC = Rosenberg's Self-Esteem Checklist (Rosenberg, 1967); RS-15 = Resilience Scale-15 (Wagnild & Young, 1993); SAS = Anxiety Scales (Zung, 1971); SCL-90/R = Symptom Checklist 90/Revised (Derogatis, 1994); SOC-29 = Sense of Coherence (Antonovsky & Franke, 1997); SSQ6 = Abbreviated Social Support Questionnaire (Sarason et al., 1987); SSS = Social Support Scales (Cohen, Mermelstein, Kamarck, & Hoberman, 1985); SSSI = Social Stress & Support Interview (Jenkins, Mann, & Belsey, 1981); TPQ = Tridimensional Personality Questionnaire (Dufeu, Kuhn, & Schmidt, 1995); WOC^{1} = Ways of Coping Checklist (Folkman & Lazarus, 1988); WOC^{2} = Ways of Coping Checklist (Vitaliano, Russo, Carr, Maiuro, & Becker, 1985); ZSDS = Zerssen state depression scale (von Zerssen, 1976); Zung = Zung Self-rated Depression (Zung, 1965).

Table 2

Psychological factors investigated in relation to anxiety/depression outcomes

Psychological factor	*n* studies	Study reference numbers [a]
Coping style	12	2, 3*, 6, 8*, 9*, 11, 12, 15, 16, 17, 19*, 22*
Illness cognitions	11	3*, 5, 11, 12, 13, 16, 19*, 20, 22*, 23, 24
Identity	8	3*, 5, 12, 13, 16, 19, 20, 22*
Controllability	6	3*, 11, 12, 13, 22*, 24
Cause	3	3*, 12, 22*
Consequence	4	3*, 16, 20, 23
Social support	9	1, 2, 4*, 12, 15, 20, 21*, 22*, 23
Personality traits	5	7, 10, 14*, 17, 18*

Note. a = Study reference numbers correspond to studies identified in Table 1. Studies marked with an asterisk reported relationships with anxiety and depression.