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MAJOR RESEARCH PROJECT
CHRISTINE CATHERINE HUGHES

BSc Hons

Falls-related psychological concerns in the community-dwelling older adult
population

Section A: A theoretical and empirical review of falls-related psychological concerns
in community-dwelling older people and the associated psychological factors

Word count: 5499

Section B: Coping responses to falls-related psychological concerns in community-
dwelling older people: Do they mediate between falls-related psychological concerns
and falls incidence?

Word count: 7997

Section C: Critical appraisal of the major research project

Word count: 1999

Overall word count: 15,495

A thesis submitted in partial fulfilment of the requirements of Canterbury Christ
Church University for the degree of Doctor of Clinical Psychology

July 2012

SALOMONS

CANTERBURY CHRIST CHURCH UNIVERSITY

Acknowledgements

I would like to extend my greatest of thanks to everyone who contributed to my major research project. I would especially like to thank the day-centre staff and the participants who gave up their time to take part in this research, and for their support and enthusiasm.

I would like to thank Dr Fergal Jones for being an inspirational and enthusiastic research supervisor who offered on-going support and advice. I would also like to thank Dr Ian Kneebone for supporting this project, and providing the inspiration behind it. I would like to thank them both for their encouragement, time, commitment, guidance and for their considered comments on the drafts of this study. I would also like to thank Dr Sabina Hulbert for her helpful and enthusiastic statistical advice provided when managing the data for this research.

I would like to thank my parents Malcolm and Catherine for their endless belief in me, for their understanding and their on-going support. Finally, I would like to thank all of my friends, including my fellow trainees, for their understanding, and sharing in both the high and lows with me whilst completing this research.

Summary of the Major Research Project

Section A explores the theoretical underpinnings of the four concepts included within the umbrella term 'falls-related psychological concerns.' These are fear of falling, falls-related self-efficacy, balance confidence and outcome expectancy. It goes on to examine the empirical literature on psychological factors associated with falls-related psychological concerns, and the limited literature exploring how the psychological factors mediate between falls-related psychological concerns and falls. A model of falls-risk is presented to consider these mediating roles. The clinical and research implications of the review findings are considered.

Section B reports an empirical study, which explored cognitive coping responses employed by community-dwelling older people to manage their falls-related psychological concerns. It explores if these coping responses mediate the relationship between falls-related psychological concerns and falls. Correlation and regression analyses are employed to explore the relationships between these variables. Robust analysis is conducted using bootstrapping, and a bootstrapped mediation analysis, based Baron and Kenny's (1986) model is employed. Study limitations, theoretical and clinical implications, and suggestions for further research are provided.

Section C provides a critical appraisal of the entire project, considering the skills and competencies acquired and developed throughout the research and areas for improvement. Implications for clinical practice and further research extending from the project are also considered.

Section A Contents

Introduction.....	A4
Community-dwelling older people.....	A5
Falls: Links with FrPC.....	A5
FrPC: Theoretical origins.....	A6
Fear of falling.....	A7
Falls-related self-efficacy.....	A8
Balance confidence.....	A9
Outcome expectancy.....	A10
Summary.....	A10
Literature search.....	A11
Associated psychological factors.....	A11
Designs and methods.....	A12
Anxiety.....	A13
Fear of falling.....	A13
Falls-related self-efficacy.....	A14
Depression.....	A14
Fear of falling.....	A14
Falls-related self-efficacy.....	A15
Balance confidence.....	A16
Quality of life.....	A16
Fear of falling.....	A16
Falls-related self-efficacy.....	A17
Balance confidence	A17
Behavioural factors-Activity avoidance/restriction.....	A17

Fear of falling.....	A18
Falls-related self-efficacy.....	A19
Balance confidence	A19
Outcome expectancy.....	A19
Coping.....	A20
Fear of falling.....	A20
Summary.....	A21
Psychological factors mediating between FrPC and falls.....	A23
Implications.....	A24
Future research.....	A24
Clinical relevance.....	A25
Theoretical relevance.....	A26
Conclusion.....	A27
References.....	A28

Section B Contents

Introduction.....	B3
Background and context.....	B3
Falls and community-dwelling older people.....	B3
Falls-related psychological concerns in community-dwelling older people.....	B3
Coping.....	B5
Coping with falls-related psychological concerns in community-dwelling older people.....	B7
Study aims.....	B8
Hypotheses.....	B8
Method.....	B9
Design and participants.....	B9
Ethical approval.....	B9
Measures.....	B10
The Falls Efficacy Scale–International.....	B10
The revised-Ways of Coping Questionnaire.....	B10
The COPE ‘Turning to Religion’ subscale.....	B11
Falls questionnaire.....	B11
Demographics questionnaire.....	B11
Procedure.....	B12
Data analysis.....	B12
Results.....	B13
Demographics and falls-related variables.....	B13
Descriptive statistics.....	B15

Selecting coping subscales.....	B16
Bivariate results.....	B17
Demographic correlations with FSe and falls.....	B17
Hypothesis one: FrPC will be positively associated with falls.....	B18
Hypothesis two: FrPC will be positively associated with emotion- focused and avoidant coping and negatively associated with problem-focused coping	B19
Hypothesis three: Falls will be positively associated with emotion- focused and avoidant coping and negatively associated with problem-focused coping.....	B19
Multivariate results.....	B20
Hypothesis one: FrPC will be positively associated with falls.....	B21
Hypothesis two: FrPC will be positively associated with emotion- focused and avoidant coping and negatively associated with problem-focused coping	B24
Hypothesis three: Falls will be positively associated with emotion- focused and avoidant coping and negatively associated with problem-focused coping.....	B27
Mediation results.....	B30
Hypothesis four: Coping responses will mediate the relationship between FrPC and falls.....	B30
Discussion.....	B33
The main findings.....	B34
Limitations.....	B37
Theoretical implications.....	B39

Clinical implications.....	B40
Future research.....	B41
Conclusion.....	B42
References.....	B44

Section C Contents

Overview.....	C2
Development of research competencies and skills.....	C2
Proposal and ethical approval.....	C2
Administering questionnaires.....	C3
Data inputting and analysis.....	C3
Recruitment.....	C4
Writing the major research project.....	C4
Study improvements.....	C5
Cognitive abilities.....	C5
Measures.....	C6
Participants.....	C7
Recommendations and changes to clinical practice.....	C8
Future research.....	C9
References.....	C11

Contents of Tables and Figures

Section A

Figure 1: Bandura's (1986) self-efficacy theory.....	A9
Table 1: Empirical evidence for associations between FrPC constructs and psychological factors.....	A22
Figure 2: Hull and Kneebone's (2007) model of falls risk.....	A24

Section B

Figure 1: A model of falls risk (Hull & Kneebone, 2007).....	B5
Table 1: Participant demographics.....	B14
Table 2: Participant fall characteristics.....	B15
Table 3: Descriptive statistics of coping subscales.....	B16
Table 4: Internal reliability of coping subscales.....	B16
Table 5: Descriptive statistics and internal reliability of amended coping subscales.....	B17
Table 6: Correlation coefficients between demographic variables, FSe and falls.....	B18
Table 7: Correlation coefficients between coping, FSe and falls.....	B19
Figure 2: Significant bivariate correlations between coping, FSe and falls.....	B20
Figure 3: Mediation model based on Baron and Kenny's (1986) framework.....	B21
Table 8: Regression coefficients for predictor variables in regression model predicting falls.....	B22
Table 9: Non-bootstrapped and bootstrapped confidence intervals for regression model predicating falls.....	B24

Table 10: Regression coefficients for predictors in regression model predicting self-controlling.....	B25
Table 11: Non-bootstrapped and bootstrapped confidence intervals for regression model predicting self-controlling.....	B25
Table 12: Regression coefficients for predictors in regression model predicting escape-avoidance.....	B26
Table 13: Non-bootstrapped and bootstrapped confidence intervals for regression model predicting escape-avoidance.....	B27
Table 14: Regression coefficients for coping predictor variables in regression model predicting falls.....	B28
Table 15: Non-bootstrapped and bootstrapped confidence intervals for regression model of coping predicting falls.....	B29
Figure 4: Summary of the regression models with B values and bootstrapped confidence intervals.....	B29
Table 16: Regression coefficients of mediation model predicting falls.....	B31
Table 17: Non-bootstrapped and bootstrapped confidence intervals for mediation model predicting falls.....	B32
Table 18: Bootstrapped effect sizes and confidence intervals for pathways in the mediation model.....	B33
Figure 5: Diagram of the mediation model with bootstrapped effect sizes and confidence intervals	B33

Section D – Contents of Appendices

Appendix 1: Literature search strategy for Section A

Appendix 2: Summary table of measures of falls-related psychological concerns

Appendix 3: Summary table of the studies critiqued in Section A

Appendix 4: Empirical literature exploring the relationship between activity levels and falls-related psychological concerns

Appendix 5: Power calculations

Appendix 6: Ethical approval letters from Canterbury Christ Church University

Appendix 7: Falls-Efficacy Scale-International

Appendix 8: Revised-Ways of Coping Questionnaire

Appendix 9: WAYS subscale definitions

Appendix 10: COPE 'turning to religion' subscale

Appendix 11: Falls questionnaire

Appendix 12: Demographics questionnaire

Appendix 13: Information sheet for day-centre managers

Appendix 14: Consent form for day-centre managers

Appendix 15: Recruitment poster

Appendix 16: Information sheet for participants

Appendix 17: Consent form for participants

Appendix 18: Falls aftercare information

Appendix 19: Participants summary report of results of the study

Appendix 20: Data inspection for distribution of variables

Appendix 21: Diagnostic and assumption testing procedures of the multiple regression analysis

Appendix 22: Data inspection for assumptions for multiple regression

Appendix 23: Guidelines for the journal: Age and Aging

Appendix 24: Brief report sent to the Ethics Committee

Appendix 25: Research diary

MAJOR RESEARCH PROJECT

CHRISTINE CATHERINE HUGHES

BSc HONS

SECTION A: Literature review

Running Head: Falls-related psychological concerns in community-dwelling older
people

**A theoretical and empirical review of falls-related psychological concerns in
community-dwelling older people and associated psychological factors**

WORD COUNT: 5499

A thesis submitted in partial fulfilment of the requirements of Canterbury Christ
Church University for the degree of Doctorate of Clinical Psychology

July 2012

Salomons

Canterbury Christ Church University

Abstract

This paper details the theoretical bases of the four constructs encompassed by the term 'falls-related psychological concerns' (FrPC); 'fear of falling' (FOF), 'falls-related self-efficacy' (FSe), 'balance confidence' (BC) and 'outcome expectancy' (OE). FOF has the weakest theoretical underpinning.

Fifty empirical papers relating to psychological factors associated with FrPC in community-dwelling older people were reviewed. Four levels of evidence were used when evaluating the literature: good, moderate, tentative and none.

Evidence that anxiety predicted FOF and FSe was tentative. Good evidence was found for depression predicting FSe. Moderate and tentative evidence was found for depression predicting FOF and BC respectively. Good and moderate evidence was found for quality of life (QoL) being predicted by FOF and BC respectively. Tentative evidence was found for FSe predicting QoL. Good and moderate evidence was found for activity avoidance/restriction (AA/AR) being predicted by FOF and FSe respectively. Tentative evidence was found for BC predicting AA/AR, and tentative evidence suggested FOF predicted coping.

Literature relating to coping with FrPC and to the mediating role psychological factors play in the relationship between FrPC and falls was limited. Clinical and theoretical implications were discussed. Future research should employ theoretically grounded concepts, using multivariate analysis and longitudinal designs.

Introduction

Falls-related psychological concerns (FrPC) is an umbrella term (Moore & Ellis, 2008) encompassing the concepts 'fear of falling' (FOF; Tinetti & Speechley, 1989), 'falls-related self-efficacy' (FSe; Tinetti, Richmond & Powell, 1990), 'balance confidence' (BC; Powell & Myers, 1995) and 'outcome expectancy' (OE; Yardley & Smith, 2002). These will be defined shortly in relation to their theoretical underpinnings.

Up to 83% of community-dwelling older people (CDOP) experience FrPC's (Zijlstra et al., 2007b). Whilst FrPC's may encourage caution, when disproportionate to falls risk they may be detrimental, leading to activity avoidance and social withdrawal (Fessel & Nevitt, 1997). This can result in muscle deconditioning and reduced quality of life (Delbaere, Crombez, Vanderstraeten, Willems & Cambier, 2004). Approximately 10% of CDOP have excessive FrPC when compared with their physiological falls risk (Delbaere, Close, Brodaty, Sachdev, & Lord, 2010a). FrPC have been highlighted as risk factors for institutional admission (Cumming, Salkeld, Thomas & Szonyi, 2000), and guidelines highlight the importance of addressing FrPC in routine screening (Department of Health [DOH], 2001).

Identifying factors associated with FrPC could inform interventions to reduce these concerns. FrPC have commonly been explored in relation to physical factors (e.g. balance). A review in this area is warranted because a) previous reviews have dominantly focused on physical factors (Scheffer, Schuurmans, van Dijk, van der Hooft & de Rooij, 2008), neglecting psychological factors (Li, Fisher, Harmer, McAuley & Wilson, 2003), b) the most recent review included papers published until 2006 (Scheffer et al., 2008), and failed to consider some psychological factors (e.g. coping), c) substantial research has been conducted since 2006, d) this paper

extends previous reviews by considering how psychological factors mediate the relationship between FrPC and falls.

The review begins by defining relevant terms and discussing theoretical understandings of each separate FrPC construct (i.e. FOF, FSe, BC, OE). The evidence pertaining to psychological factors associated with each construct (i.e. FOF, FSe, BC, OE) is then reviewed. This is done to provide clarity on the evidence base, as research is often conducted in relation to only one concept. This also reflects recommendations for researchers to clearly identify which individual FrPC concept they are employing (Moore & Ellis, 2008). The limited research exploring mediating effects of psychological factors on the FrPC-falls relationship is also considered.

Community-dwelling older people

CDOP are older persons living in their homes/communal setting without assistance with activities of daily living (ADL's; World Health Organisation, 2004). Whilst an older person is often defined as aged 65 years or older, much research into FrPC includes people aged 60 years or older. Therefore this cut-off will be used here, as recommended by Roebuck (1979). Approximately 9.5million CDOP live in the UK (Dunnell, 2008).

Falls: Links with FrPC

A fall is "an unexpected event in which the individual comes to rest on the ground, floor, or lower level" (Lamb, Jørstad-Stein, Hauer, & Becker, 2005; p.1619). Approximately 30% of CDOP fall annually (Tremblay & Barber, 2006), resulting in disability, morbidity, mortality, and an annual cost of over £1.5billion to UK health

services (Davis et al., 2010). These factors have led to falls-reduction becoming a key government target (DOH, 2001).

Falls risk is multifactorial (Gillespie et al., 2003), including extrinsic (e.g. environmental hazards) and intrinsic factors (e.g. psychological factors; Faulkner et al., 2009). Physical factors such as increasing age (e.g. Rossat et al., 2010), female gender (e.g. Cesari et al., 2002) and poly-pharmacy (e.g. Riefkohl, Bieber, Burlingame, & Lowenthal, 2003) have been identified as risk factors.

There are mixed findings regarding the relationship between falls and FrPC. The relationship is considered bi-directional (Friedman, Munoz, West, Rubin & Fried, 2002); with falls predicting FrPC (e.g. Boyd & Stevens, 2009; Delbaere et al., 2010b), and FrPC predicting falls (e.g. Chou, Chi & Chiu, 2005; Rossat et al., 2010). However, some studies failed to find significant associations between FrPC's and falls (e.g. Arnold, Busch, Schachter, Harrison & Olszynski, 2005), and the relationship may not remain significant after adjusting for influences such as functional ability (Hadjistavropoulos, Delbaere & Fitzgerald, 2011). Therefore, additional variables may be influencing this relationship.

FrPC: Theoretical origins

'FrPC' incorporates four constructs: fear of falling (FOF; Tinetti & Speechley, 1989); falls-related self-efficacy (FSe; Tinetti et al., 1990); balance confidence (BC; Powell & Myers, 1995); and outcome expectancy (OE; Yardley & Smith, 2002). FrPC have been reported by 3-85% of CDOP (Scheffer et al., 2008; Zijlstra et al., 2007a). Varying methodologies and FrPC constructs measured (i.e. FOF, FSe, BC, OE) contribute to this variance.

Distinguishing the FrPC constructs from each other has been problematic, as inter-changeable use of terminology leads to confusion in the literature. Whilst significantly associated, the constructs are distinct (Lachman et al., 1998). Researchers have been encouraged to specify which FrPC construct they are measuring (i.e. FOF, FSe, BC or OE) to develop clarity within the evidence base (Moore & Ellis, 2008).

Fear of Falling (FOF)

FOF is 'a lasting concern about falling that leads to an individual avoiding activities that he/she remains capable of performing' (Tinetti & Powell, 1993, p.36). Initially FOF was considered a phobia of walking or standing following a fall (Bhala, O'Donnell & Thoppil, 1982; Murphy & Issacs, 1982). However, as subsequent research identified FrPC in people who had never fallen (Arfken, Lach, Birge & Miller, 1994), 'FOF' was expanded to include non-fallers.

The definition acknowledges 'avoidance;' a behavioural element, as a dominant feature, relating to avoidance of activities and community use. As 'FOF' includes emotional (i.e. anxiety) and behavioural (i.e. avoidance) elements, psychological factors associated with FOF may include emotional states (e.g. anxiety) and behavioural elements (e.g. activity avoidance). However, a clear theoretical model of FOF is lacking (Hadjistavropoulos et al., 2011). 'FOF' is often used to refer to all FrPC, resulting in confusion in the literature (Hadjistavropoulos et al., 2011).

Measures of FOF include single questions (Arfken et al., 1994) which have been criticised for lacking sensitivity (Jørstad et al., 2005), and comprehensive

scales assessing fear and activity avoidance which have good psychometric properties (Lachman et al., 1998). Measures are outlined in Appendix 2.

Fall-related self-efficacy (FSe)

With identification that some concerns about falling were not irrational or disproportionate (defining characteristics of a 'phobia;' American Psychological Association, 2000), alternative ways of defining FrPC were considered, leading to understanding of FrPC within a self-efficacy deficit model (Tinetti et al., 1990).

Falls-related self-efficacy (FSe) relates to someone's confidence in their ability to undertake activities of daily living (ADL's) without falling (Tinetti et al., 1990). Whilst FOF and FSe are correlated, they measure differing constructs (Hotchkiss et al., 2004; Li et al., 2002). FSe has been shown to mediate between FOF and activity engagement (Li, Fisher, Harmer & McAuley, 2005).

FSe is based on self-efficacy theory (SET; Bandura, 1977; 1986). Self-efficacy (SE) is a cognitive mechanism that mediates between thoughts/emotions and actions (Bandura, 1986). It is made up of two components; efficacy expectations (EE) and outcome expectancy (OE). FSe draws on the EE component, relating to an individual's perception of their ability to undertake an action required to achieve a certain performance (i.e. not falling; Bandura, 1986). These expectancies develop via performance and vicarious experience, verbal persuasion, emotional and physical arousal, and feedback. These influence choices and motivations, from which activity-specific action emerges.

OE refers to an individuals' perception that certain behaviour will result in a specific outcome. OE has received little attention in the FrPC literature to date, but

has recently been highlighted as important in understanding FrPC (Yardley & Kempen, 2006) and will be covered later.

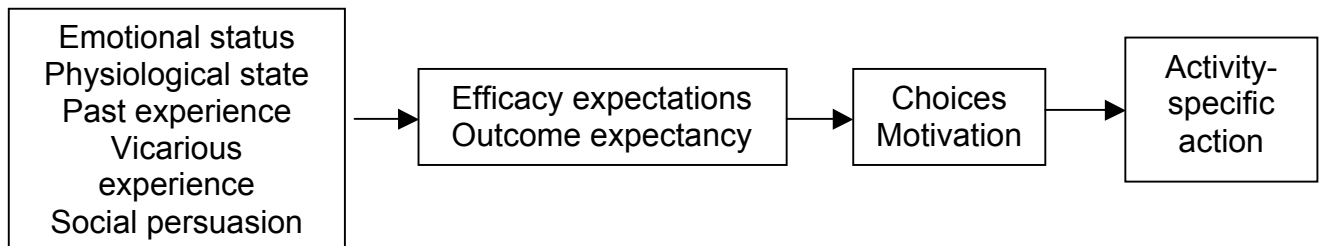


Figure 1: Bandura's (1986) self-efficacy theory

Empirical findings suggest SE plays a pivotal role in affective state regulation (e.g. anxiety; Bandura, 1992) and avoidance behaviour (Myers et al., 1996).

Research suggests, as people perceive inefficacy in their ability to gain a desired outcome, depression may occur (Bandura, 1991; Olioff & Aboud, 1991). Empirically, higher SE has been associated with perseverance in problem-solving (Bandura, 1992), leading to increased coping responses.

Various measures of FSe have been developed. The Falls-efficacy scale-International (FES-I; Yardley et al., 2005) has been translated and internationally validated and is acknowledged as the 'gold standard' FSe measure, with good psychometric properties (Moore & Ellis, 2008). Measures are detailed in Appendix 2.

Balance confidence (BC)

BC also draws from the EE component of SET, referring to situation-specific self-efficacy (Powell & Myers, 1995). BC is an individual's belief about their ability to maintain balance whilst performing ADL's. As it relates to the same fundamental construct as FSe (Hotchkiss et al., 2004), factors associated with BC may be anticipated to be similar to those hypothesised in relation to FSe, including emotional (e.g. depression) and behavioural (e.g. avoidance) factors. Measures of BC aimed to

address criticisms of the original FSe measure, which was considered biased towards low-functioning CDOP due to items producing ceiling effects in higher functioning CDOP (Powell & Myers, 1995). Measures of BC are reported to have good psychometric properties (Powell & Myers, 1995; Appendix 2).

Outcome expectancy (OE)

Outcome expectancy draws on the component of SET with the same name (i.e. OE), and considers beliefs about anticipated consequences of falling (e.g. social embarrassment; Yardley & Smith, 2002). Whilst this concept remains largely un-researched, it may be that OE could be associated with similar factors as FSe and BC, as it is also based on SET. The Consequences of Falling Scale (Yardley & Kempen, 2006), a measure of OE with good psychometric properties, is detailed in Appendix 2.

Summary

This section outlined the four constructs of FrPC. Whilst FOF has been criticised for lacking theoretical underpinning, FSe built on this limitation, drawing on SET. This incorporated beliefs about one's ability to manage a perceived threat (i.e. falling). BC and OE also draw on SET. BC is considered to measure the same construct as FSe (Hotchkiss et al., 2004). OE is a newly developing concept, having seen limited utilisation in research to date.

Relationships between the constructs are complex, and have generated confusion within the literature, with some researchers using terms interchangeably (Hadjistavropoulos et al., 2011). Whilst FOF has been correlated with FSe and BC, they measure distinct constructs (Li et al., 2002). Researchers are recommended to

clarify terminology and ensure measures are appropriately selected, suggesting employment of consistent measures of FrPC (Jørstad, Hauer, Becker & Lamb, 2005; Moore & Ellis, 2008). The FES-I, due to its international validation and theoretical grounding, may bring clarity if employed consistently (Yardley & Kempen, 2006).

The following section presents empirical evidence relating to psychological factors associated with FrPC. As researchers commonly only employ one concept of FrPC (e.g. FOF, *or*, FSE, *or* BC, *or* OE), the empirical evidence is presented in relation to individual concepts of FrPC (i.e. FOF, FSe, BC, OE). This reflects calls for empirical clarity by clearly specifying the individual construct from within the umbrella term 'FrPC' (Moore & Ellis, 2008).

Literature search

An advanced search identified relevant papers published up to December 2011-Week 3 using PsycINFO, Ovid Medline, Web of Knowledge, ASSIA and Cochrane Database of Systematic Reviews. Search terms included 'older people,' 'fall,' and derivatives of 'concern' (full search term list; Appendix 1). Cross-referencing of reference lists of all selected articles was under-taken to identify additional relevant papers. Inclusion and exclusion criteria were applied to abstracts (Appendix 1). Papers from previous reviews were included. Fifty relevant papers were identified.

Associated psychological factors

Due to considerable literature in the area, it was not possible to review each study in detail. However, studies are detailed in Appendix 3. Studies were reviewed in relation to the FrPC concept measured by the researcher (i.e. FOF, FSe, BC, OE).

Research has not been conducted into relationships between each psychological factor and each FrPC construct (e.g. OE has not been researched in relation to anxiety). Four levels of evidence were used when evaluating the literature: good, moderate, tentative and none (see Table 1, page A22).

Designs and methods

Research into psychological factors associated with FrPC have utilised similar methodologies, and given space constraints, it is not possible to fully describe each study's methodology. However, these are detailed in Appendix 3. Studies have employed bivariate, multivariate and qualitative analysis, utilising cross-sectional and longitudinal designs.

Bivariate analysis considers associations between two variables, exploring correlations between a measure of FrPC and a psychological factor (e.g. anxiety). Often they measure factors cross-sectionally. However, this analysis does not allow for inference of causality, or account for co-correlates potentially influencing relationships.

Multivariate analysis is more robust, considering numerous independent and dependent variables (Tabachnick & Fidell, 2001). Whilst unable to prove causation, multivariate analysis provides greater clarity to relationships between variables as researchers can control for other factors, to see if a specific variable predicts another (e.g. if anxiety predicts FOF when controlling for depression).

Longitudinal studies allow researchers to develop understanding of sequential relationships between variables, and imply causation (e.g. if developing FOF is predicted by depression). These factors result in longitudinal designs being considered the most robust quantitative design (Field, 2009).

Due to the large literature and space constraints, greatest focus will be on the most methodologically robust studies. Where there are multivariate analyses and longitudinal designs, there will be greater focus on these studies. However, all studies are detailed in Appendix 3. Relationships between each psychological factor and FrPC construct are summarised in Table 1 (page A22) for clarity.

Anxiety

Fear of falling (FOF). All eight studies exploring FOF in relation to anxiety found significant positive bivariate associations (e.g. Hellstrom, Vahlberg, Urell, & Emtner, 2009; see Appendix 3 for full list of studies).

However, more robust research suggests no clear evidence of a relationship between FOF and anxiety. Van Haastregt, Zijlstra, van Rossum, van Eijk and Kempen (2008) found anxiety significantly predicted FOF in multivariate analysis. However, when depression was included, anxiety was no longer a significant predictor. Additionally, Kempen, van Haastregt, McKee, Delbaere and Zijlstra (2009) found anxiety did not predict FOF in a sample of 540 CDOP. In the only longitudinal study, Murphy, Dubin and Gill (2003) found anxiety was not a significant predictor of FOF development.

Whilst anxiety was associated with FOF in bivariate analyses, multivariate analyses did not yield the same support. Positive findings in bivariate analysis may be explained by high co-morbidity between depression and anxiety in CDOP (Adamek & Slater, 2005), as when controlling for depression, the relationship between anxiety and FOF was not significant.

Falls related self-efficacy (FSe). FSe was significantly negatively correlated with anxiety in bivariate analysis (e.g. Miller & Pantel, 2003; Appendix 3). However, Burker et al. (1995) found anxiety did not significantly predict FSe in multivariate analysis. This more robust multivariate analysis suggests limited evidence for an association between FSe and anxiety. However, the few robust studies (e.g. multivariate analysis, longitudinal design), means further research is required. Whilst empirical evidence outside of the field of FrPC suggests anxiety may be negatively associated with self-efficacy (Bandura, 1992), evidence supporting this in relation to FSe was limited.

Depression

FOF. Eleven cross-sectional studies reported significant positive bivariate associations between FOF and depression (e.g. Deshpande et al., 2008b; Appendix 3). Two studies failed to find significant bivariate associations (Drozdzick & Edelstein, 2001; Miller & Pantel, 2003). However, their small samples may have limited detection of significant findings (Field, 2009).

Studies employing multivariate analysis produced mixed results. Three of the six studies conducting multivariate analysis found depression significantly predicted FOF (Chandler, Duncan, Sanders & Studenski, 1996; Deshpande, Metter, Laurentani, Bandinelli & Ferrucci, 2009; van Haastregt et al., 2008). However, Deshpande et al. (2009) only found this association with FOF whilst at home, and not with FOF whilst in the community. Chandler et al. (1996) only found this association in those with a falls history. Three studies found depression did not significantly predict FOF (Arfken et al., 1994; Deshpande et al., 2008b; Kempen et al., 2009). Differing results may relate to Deshpande et al. (2009) splitting FOF to

different situations (i.e. home, community). FOF at home may be more severe, or have greater personal impact. Additionally, Chandler et al. (1996) only found significant results in those with a falls history. Failure of other studies to make these distinctions limits comparisons.

Five of six longitudinal studies failed to find depression predictive of FOF development (Austin, Devine, Dick, Prince, & Bruce, 2007; Chou & Chi, 2008; Lach, 2005; Murphy et al., 2003; Reyes-Ortiz et al., 2006). Whilst Chou and Chi (2008) found depression predicted FOF, when adjusted for social/independent functioning, this association did not remain significant. Austin et al. (2007) found depression was a significant predictor of persistent FOF. However, it was unclear if they adjusted for baseline levels of depression.

Oh-Park, Xue, Holtzer and Verghese (2011) found depression significantly predicted FOF, both transient and persistent. Oh-Park et al. (2011) collected data every two-three months over two years. As 'persistent FOF' was defined as reporting FOF on two or more occasions, the increased data collection points may have increased the likelihood of persistent FOF identification.

In summary, depression was not consistently associated with FOF. Depression did not predict FOF development in five of six longitudinal studies, but was more consistently associated with persistent FOF.

FSe. All five studies exploring the association between FSe and depression that utilised multivariate analysis found depression negatively predicted FSe (Burker et al., 1995; Delbaere et al., 2010; Kressig et al., 2001; Miller & Pantel, 2003; Shin et al., 2010). This supports previous findings outside of the FrPC field relating

perceived inefficacy to depression (Bandura, 1991; Oloff & Aboud, 1991). However, the lack of longitudinal research limits inferences of causality.

Balance confidence (BC). Significant negative bivariate associations between BC and depression were identified in three studies (e.g. Fortinsky, Panzer, Wakefield, & Into, 2009). In the only multivariate analysis, Kressig et al. (2001) found depression was a significant predictor of BC. However, the predominantly female sample limits generalisability for men. The dearth of methodologically robust studies means firm conclusions are limited, suggesting further research is warranted.

Quality of life (QoL)

FOF. All ten studies exploring FOF and QoL found negative bivariate associations (e.g. Chang, Chi, Yang, & Chou, 2010). Three studies found FOF negatively predicted QoL in multivariate analysis (Chang et al., 2010; Lachman et al., 1998; Li et al., 2003). However, when FOF was utilised as the dependent variable in analyses, the findings were non-significant; two studies failed to find QoL predictive of FOF (Arfken et al., 1994; Howland et al., 1998) in multivariate analysis.

Using longitudinal designs, FOF was negatively predicted by QoL in individuals with persistent FOF (Austin et al., 2007; Iglesias, Manca & Torgerson, 2009). However, reduced QoL did not predict new FOF development (Austin et al., 2007). It is unclear if these studies controlled for baseline levels of FOF. Iglesias et al.'s (2009) all female sample limits generalisability to males.

Evidence suggests, whilst reduced QoL did not predict FOF development, FOF predicted reduced QoL over time. This highlights the potentially detrimental effect of FOF on QoL for CDOP.

FSe. Two studies found FSe was significantly positively associated with QoL in bivariate analysis (Lachman et al., 1998; Huang & Wang, 2009). However, no multivariate analysis of this relationship has been completed. The lack of robust methodological designs means firm conclusions cannot be drawn. Further research employing multivariate and longitudinal designs would explore whether findings remain significant when controlling from additional variables, and allow understanding of causality to develop.

BC. Two studies found significant positive bivariate associations between QoL and BC (e.g. Talley, Wyman & Gross, 2008). Two studies employing multivariate analysis found significant relationships between BC and QoL; Brouwer, Musselman and Culham (2004) found physical QoL predicted BC, whilst Davis, Marra and Liu-Ambrose (2011) found BC significantly predicted physical and mental QoL.

The predictive effect of physical QoL on BC may relate to functional ability, with physical QoL relating to physical function and pain. These may impair balance ability, in turn affecting someone's BC. However, the lack of longitudinal designs limits the ability to infer causality. Further research may identify if these results are replicated, and explore possible mediating or moderating factors in this association.

Behavioural factors-Activity avoidance/restriction

Behavioural factors associated with FrPC have been explored from two perspectives; activity levels and activity avoidance/restriction (AA/AR). Theoretical understandings of FrPC focus on AA/AR deeming 'avoidance' a key component to certain constructs (i.e. FOF). Drawing on these definitions, and due to space

constraints, AA/AR will be the focus here. Similar patterns in relation to activity levels and FrPC were found in the literature (Appendix 4).

FOF. Findings suggest 5-65% of respondents with FOF reported AA/AR due to this fear (e.g. Fletcher, Guthrie, Berg, & Hirdes, 2010; Appendix 3). This wide range may, in part, be due to variation in measures of FOF (e.g. yes/no responses, Survey of activities and fear of falling in the elderly [SAFFE] subscale).

Five studies found significant positive bivariate associations between FOF and AA/AR (e.g. Bertera & Bertera, 2008). Chandler et al. (1996) only found this in fallers, with results approaching significance in non-fallers. Their small sample may have limited statistical power to detect significant findings (Field, 2009).

Betera and Betera (2008) found FOF was a significant predictor of AA/AR in multivariate analysis. Using longitudinal designs, Yardley and Smith (2002) found FOF was a significant predictor of AA/AR. However, Hadjistavropoulos et al. (2007) found FOF was only a significant predictor when combined in a step with FSe, BC, activity level and baseline AA/AR. Yardley and Smith (2002) used a self-administered version of the SAFFE, whilst Hadjistavropoulos et al. (2007) used the interview-administered version. This may have altered participant reports.

Kempen et al. (2009) found AA/AR significantly predicted FOF. However, Howland et al. (1998) found AA/AR did not significantly predict FOF. Additionally, two longitudinal studies failed to find AA/AR predictive of FOF (Lach, 2005; Shimada, Lord, Yoshida, Kim, & Suzuki, 2007), suggesting AA/AR did not lead to FOF development. Two qualitative studies identified AA/AR in CDOP (Faes et al., 2010; Lee, MacKenzie & James, 2008). However, respondents did not relate this avoidance to FOF, rather to other factors (e.g. health status; Lee et al., 2008).

Studies demonstrate, whilst FOF and AA/AR may be related, not all individuals experiencing FOF restrict activity. This raises questions about whether FOF 'leads to an individual avoiding activities that he/she remains capable of performing' (Tinetti & Powell, 1993, p.36), and suggests this link becomes more tentative (i.e. 'may lead to').

FSe. Three studies found significant negative bivariate associations between FSe and AA/AR (e.g. Hotchkiss et al., 2004). Delbaere, Crombez, van Haastregt, and Vlaeyen, (2009) found FSe had a direct effect on AA/AR in a structural equation model. However, Hadjistavropoulos et al. (2007) failed to identify FSe as a significant predictor of AA/AR at six-month follow-up. Differing measures of AA/AR may have contributed to contradictory findings. The inconsistent findings mean firm conclusions about associations between FSe and AA/AR are limited. Further exploration of this relationship is warranted.

BC. Three studies found significant negative bivariate correlations between BC and AA/AR (e.g. Hotchkiss et al., 2004). However, Hadjistavropoulos et al. (2007) failed to identify BC as a significant predictor of AA/AR at six-month follow-up. This more robust longitudinal design suggests limited evidence that reduced BC leads to increased AA/AR. However, sparse research utilising the concept 'BC' in relation to AA/AR indicates further research is warranted.

Outcome expectancy (OE). Delbaere et al. (2009) found a strong negative correlation between positive OE and AA/AR. However, in a structural equation model, OE did not have a direct effect on AA/AR. Rather, OE had an effect through

FSe. Yardley and Smith (2002) found AA/AR was significantly predicted by OE. However, unlike Delbaere et al. (2009) they did not control for FSe. Differing measures of AA/AR limits cross-study comparisons. The dearth of research relating to OE limits firm conclusions, meaning further research is required.

Coping

FOF. Coping has only been researched in relation to FOF. Drozdick and Edelstein (2001) found no significant differences in coping responses between fearful and non-fearful fallers. Filiatrault and Desrosiers (2011) found CDOP with FOF employed significantly more behavioural coping strategies than those without FOF. Whilst FOF predicted behavioural coping in multivariate analysis, FOF did not predict cognitive coping (Filiatrault & Desrosiers, 2011).

Whilst comparisons were made between fearful and non-fearful CDOP, researchers assessed coping with falls (Drozdick & Edlestein, 2001) or aging (Filiatrault & Desrosiers, 2011). Challenges to coping research are found if researchers do not specify what the respondents are coping with. If researchers want to understand coping with FrPC, it is important they clearly define the stressor as FrPC (Lazarus & Folkman, 1984). The small sample employed by Drozdick and Edlestein (2001) may have limited detection of significant between-group differences (Field, 2009).

The coping measure employed by Drozdick and Edelstein (2001) had not been validated on CDOP, and may have lacked sensitivity (Field, 2009). The measure employed by Filiatrault and Desrosiers (2011) only contained one scale of cognitive coping opposed to eight behavioural scales, potentially limiting sensitivity in

detecting cognitive coping. These limitations mean it is not yet possible to draw firm conclusions about coping with FrPC in CDOP.

Two qualitative studies reported CDOP attempted to cope with FOF by exercising caution, restricting activities and seeking social support (Huang, 2005; Ward-Griffin et al., 2004). CDOP also assigned blame for, and changed their attitudes toward their FOF (Huang, 2005; Ward-Griffin et al., 2004).

The limited participant and setting information in both qualitative studies restricts transferability of data (Williams & Morrow, 2009). It will be important for future research to explore how representative these findings are.

Coping should be assessed in relation to specific events/situations (Lazarus & Folkman, 1984). Therefore, measuring coping in relation to other factors (e.g. falls) means inferences cannot be made about coping with FrPC. Further studies are required to explore these links employing other FrPC concepts (i.e. FSe, BC, OE).

Summary

Research regarding psychological factors associated with FrPC has been dominated by cross-sectional designs predominantly utilising the concept FOF. Wide use of bivariate analysis means, in some relationships (e.g. FSe and QoL) understanding of complex associations between factors is limited. The associations between FrPC constructs and psychological factors are summarised in Table 1. The strongest evidence was found for depression predicting FSe, FOF predicting QoL and FOF predicting AA/AR. Variability in findings limits firm conclusions.

Table 1: *Empirical evidence for associations between FrPC constructs and psychological factors*

	FOF	FSe	BC	OE
Anxiety	Anxiety predicting FOF= Tentative FOF predicting anxiety= --	Anxiety predicting FSe= Tentative FSe predicting anxiety= --	--	--
Depression	Depression predicting FOF= Moderate FOF predicting depression= --	Depression predicting FSe= Good FSe predicting depression= --	Depression predicting BC=Tentative BC predicting depression= --	--
QoL	QoL predicting FOF= No evidence FOF predicting QoL= Good	QoL predicting FSe= Tentative FSe predicting QoL= Tentative	QoL predicting BC=Moderate BC predicting QoL= Moderate	--
AA/AR	AA/AR predicting FOF= Tentative FOF predicting AA/AR= Good	AA/AR predicting FSe= -- FSe predicting AA/AR= Moderate	AA/AR predicting BC= -- BC predicting AA/AR= Tentative	AA/AR predicting OE= -- OE predicting AA/AR= Tentative
Coping	Coping predicting FOF= -- FOF predicting coping= Tentative	--	--	--

-- = relationship not explored in any studies **Good evidence**=two or more studies show same findings with methodologically strong designs. This includes consideration of power, multivariate analysis and longitudinal designs
Moderate evidence=one or more studies show evidence but measures employed were not psychometrically robust, or if only one study was methodologically strong (e.g. well-powered, multivariate analysis, longitudinal designs) **Tentative evidence**=studies have methodological limitations (e.g. inadequate power, only bivariate analysis conducted) **No evidence**=no study confirming the association between these variables (Harvey, Watkins, Mansell & Shafran, 2004).

Psychological factors mediating between FrPC and falls

Identifying a constellation of psychological factors does not reflect their impact on the relationship between FrPC and falls. Mediation analysis allows for this relationship to be understood.

Employing this analysis, Wijulhuzen, de Jong and Hopman-Rock (2007) found physical activity mediated the relationship between FOF and falls. However, this 'mediation' has been criticised for finding no main effect of FOF on falls incidence (Lacherez & Wood, 2008). In the absence of a main effect, there is no relationship to mediate (Hafeman & Schwartz, 2008). The limited research into mediation highlights further research is required in this area.

Hull and Kneebone (2007) describe a model of falls risk (*Figure 3*), which considers these relationships. This highlights factors associated with FrPC leading to increased falls risk, including those they deem to have empirical support (e.g. postural changes) and factors which have received limited empirical attention (e.g. coping; *dotted line in Figure 3*).

This review explored elements of this model, namely AA/AR and coping. Findings suggested inconsistent evidence of the association between AA/AR and FrPC. This review noted difficulties drawing firm conclusions regarding the relationship between coping and FrPC due to limited number of studies and their methodological limitations. This reflects the uncertainty expressed by the model. Qualitative findings suggested CDOP attempt to cope with FrPC. However, generalisability of these results is unclear.

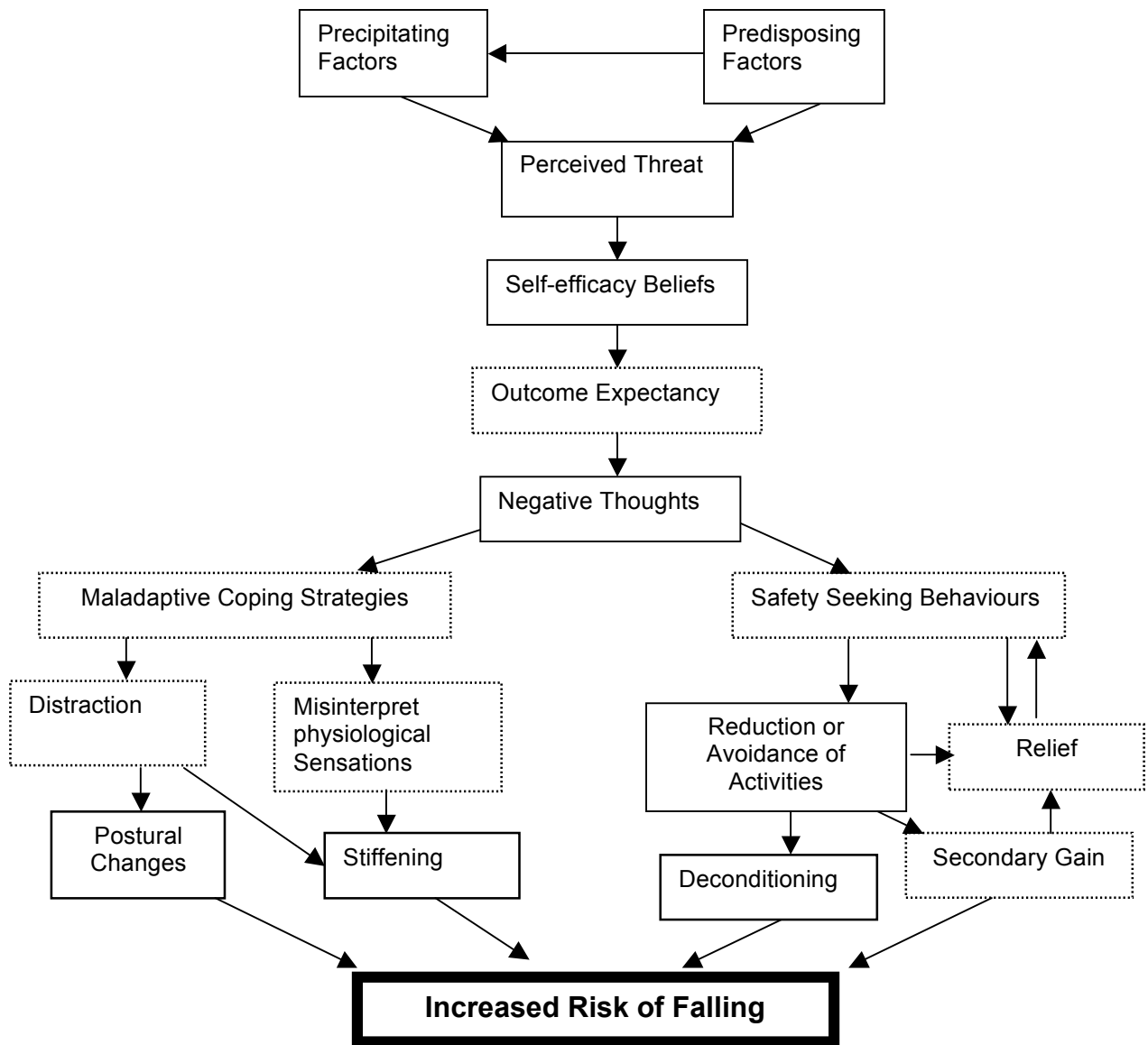


Figure 2: Hull and Kneebone's (2007) model of falls risk

Implications

Future research

Mixed evidence in relation to nearly every psychological factors means further research is required (Drozdzick & Edelstein, 2001). This should seek to clarify associations through consistent measurement of FrPC, with the FES-I being recommended due to its international translation, strong psychometric properties and

theoretical underpinnings (Moore & Ellis, 2008; Yardley & Kempen, 2006). Research including other FrPC concepts is also warranted (e.g. OE).

Coping with FrPC has received limited attention and requires continued exploration (Drozdzick & Edelstein, 2001). Gaining clarity on the role of coping, and how this influences outcomes seems pertinent, particularly with the increase in interventions including cognitive coping strategies (Zijlstra et al., 2007b).

Not all CDOP experiencing FrPC have experienced falls, suggesting the two are not always linked. It would be important to understand which factors contribute to this variation. Factors mediating this relationship could be areas for intervention if adequately understood. Future research may also benefit from multivariate analysis to allow understanding of the complex relationships depicted in Hull and Kneebone's (2007) model. Longitudinal designs would also allow for understanding regarding causation to develop.

Clinical relevance

Identifying psychological factors associated with FrPC is important when considering CDOP needs. For example, if anxiety, depression and reduced QoL were associated with FrPC, clinicians may wish to be mindful of these factors during assessment, and when developing individuals' clinical formulations. The multiple factors associated with FrPC highlights the need for multidisciplinary working to ensure the physical, psychological and social needs of CDOP with FrPC are managed effectively.

In view of the emphasis FrPC has been given in the context of falls prevention (DOH, 2001), it is important to explore factors potentially influencing the relationship between FrPC and falls. This may identify factors amenable to change in

interventions, and could inform psychologists and other professionals working to reduce falls incidence and FrPC in their clinical work and consultation with other professionals.

In providing targeted, effective interventions to prevent falls and reduce FrPC, this may subsequently address the sequelae of potentially adverse outcomes resulting from falls, including disability, morbidity and mortality. In finding areas amenable to non-medical interventions, this may provide alternative approaches to reduce the large annual economic costs of falls to the NHS, which appears even more pertinent in view of the current economic and political climate.

The older adult population is the fastest growing sector of society (Dunnell, 2008). In order to maintain independence and autonomy in CDOP, it is important to ensure research focuses on factors which can support their continued community presence (DOH, 2001). With FrPC being highlighted as a risk factor for admission to an institution (Cumming et al., 2000) it is important to address this issue in community populations to avoid admissions.

Theoretical relevance

With many terms used within the arena of FrPC, future research may assist in consolidating and agreeing appropriate constructs to employ. This may assist in identifying which construct is most theoretically relevant and therefore, best to focus on when exploring associated psychological factors. With FOF being criticised for its lack of theoretical underpinning, it may be helpful to consider more soundly based theoretical concepts (i.e. FSe, BC, OE).

Further research may provide clarity to recently proposed models of falls risk (Hull & Kneebone, 2007), informing theoretical understanding and identifying aspects

of these models that are most relevant to clinical practice. This may allow insight into how interventions addressing FrPC and falls may correspond with suggestions in theoretical models. Research could attempt to bridge the gap between theory and practice, highlighting areas to consider in multi-factorial interventions aimed at reducing falls risk.

Conclusion

This review details the associations between FrPC and psychological factors. Whilst often research has been undertaken in relation to the concept FOF, this term lacks theoretical underpinning. Drawing on theoretically grounded terms (i.e. FSE, OC, BC) would allow a stronger, more consistent evidence-base to develop (Moore & Ellis, 2008).

Whilst many psychological factors have been explored, mixed evidence has been found in their associations with FrPC. Strongest evidence was shown for depression predicting FSe, and FOF predicting QoL and AA/AR. Coping with FrPC has received limited attention to date. Understanding this may inform interventions and clinicians seeking to support individuals reporting FrPC.

Whilst this review listed psychological factors associated with FrPC, future research may advance findings by exploring their mediating role in the relationship between FrPC and falls. Longitudinal designs and multivariate analysis would allow robust understanding to develop.

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MAJOR RESEARCH PROJECT

CHRISTINE CATHERINE HUGHES

BSc HONS

Section B: Empirical paper

Running Head: Relationship between coping with falls-related psychological concerns and falls

Coping responses community-dwelling older people utilise to manage falls-related psychological concerns: Do they mediate between falls-related psychological concerns and falls?

Word count: 7997

For submission to the journal: Age and Ageing

A thesis submitted in partial fulfilment of the requirements of Canterbury Christ Church University for the degree of Doctorate of Clinical Psychology

July 2012

Salomons

Canterbury Christ Church University

Abstract

Background: Falls-related psychological concerns (FrPC) and falls are prevalent amongst community-dwelling older people (CDOP), and have been associated with one another. A model of falls risk suggests how people cope with FrPC may affect the number of falls they have, although this has limited empirical support. **Objective:** This study explored how CDOP cognitively cope with deficits in falls-related self-efficacy (FSe), a FrPC construct, and if this mediates between FSe and falls.

Design: This quantitative study employed a cross-sectional design. **Setting:** Participants were recruited from community-based day-centres across an English county. **Participants:** The sample constituted 160 self-selected CDOP. **Methods:** The Falls-Efficacy Scale-International, the Ways of Coping Questionnaire, and the COPE 'turning to religion' subscale were utilised. Falls in the preceding 12 months and demographic variables were recorded. Bivariate correlations and regression analyses with wild bootstrapping were conducted. A bootstrapped mediation analysis explored whether coping mediated between FSe and falls. **Results:** FSe significantly predicted falls, 'self-controlling' and 'escape-avoidance' coping. 'Self-controlling' coping predicted falls. 'Self-controlling' coping was a partial mediator of the FSe-falls relationship. **Conclusion:** FSe and falls were strongly associated, and 'self-controlling' coping was found to be a partial mediator of this relationship. Clinical implications include assessing and monitoring falls, FSe and 'self-controlling' coping in falls-reduction interventions. Longitudinal studies could develop understanding of causality in the relationship between these variables. Exploring the mediating role of behavioural coping would further define the model of falls risk.

Introduction

Background and context

Falls and community-dwelling older people. Community-dwelling older people (CDOP), those persons aged 65 years or older living in the community (World Health Organisation, 2004), experience a significant risk of falling; 30% fall annually (Tinetti, Speechley & Ginter, 1988). Falls are a leading cause of disability, morbidity and mortality (Department of Health [DOH], 2001). Combined with annual costs of £1.6billion to the UK National Health Service (Davis et al., 2010), it is unsurprising falls prevention is a UK government target (DOH, 2001). Falls risk is considered multi-factorial (Gillespie et al., 2003), involving extrinsic (e.g. environmental hazards) and intrinsic factors (e.g. age, gender, medication; Rossat et al., 2010; Cesari et al., 2002; Riefkohl, Bieber, Burlingame, & Lowenthal, 2003). However, psychological factors associated with falls have received less attention (Jung, Lee & Lee, 2009). Understanding these could inform fall-prevention interventions (Tanner, 2007).

Falls-related psychological concerns in CDOP. Falls-related psychological concerns (FrPC) is an umbrella term incorporating four concepts: 'fear of falling' (FOF; Tinetti & Speechley, 1989), 'falls-related self-efficacy' (FSe; Tinetti, Richmond & Powell, 1990), 'balance confidence' (BC; Powell & Myers, 1995) and 'outcome expectancy' (OE; Yardley & Smith, 2002). Up to 83% of CDOP experience FrPC (Zijlstra et al., 2007a) with 10% experiencing concerns that are inconsistent with their falls risk (Delbaere, Close, Brodaty, Sachdev, & Lord, 2010). When inconsistent with their risk of falling, these concerns may contribute to excessive activity avoidance (Jung et al., 2009) and reduced quality of life (Iglesias, Manca, & Torgerson, 2009).

Findings regarding the association between falls and FrPC are mixed. They have been found to be risk factors for each other (Friedman, Munoz, West, Rubin & Fried, 2002). However, some researchers have failed to find significant associations between FrPC and falls (Arnold, Busch, Schachter, Harrison & Olszynski, 2005). Understanding why some CDOP with FrPC fall and others do not may help identify factors which could be addressed in interventions to reduce falls and FrPC.

Current interventions addressing FrPC include exercise programs (e.g. Schoenfelder & Rubenstein, 2004), tai chi (Zhang, Ishikawa-Takata, Yamazaki, Morita & Ohta, 2006), balance training (Steadman, Donaldson & Kalra, 2003) and multi-factorial interventions incorporating cognitive-behavioural therapy (CBT) and exercise (Tennstedt et al., 1998). Multi-factorial interventions are considered more effective in reducing FrPC and falls than single-focus interventions (Jung et al., 2009; Sjosten, Vaapio, & Kivela, 2008; Zijlstra et al., 2007b). However, further understanding of which elements contribute to these favourable outcomes is required (Jung et al., 2009).

A model of factors associated with FrPC and falls has been developed by Hull and Kneebone (2007; *Figure 1*). Within this model, self-efficacy beliefs and outcome expectancy constitute the FrPC concepts, forming the initial stage in a stress response (Lazarus & Folkman, 1984) to which various cognitive and behavioural factors follow. Many factors within the model have empirical support linking them with FrPC and falls (e.g. activity-restriction; Betera & Betera, 2008; Yardley & Smith, 2002). The model highlights areas where continued research is required (boxes with dotted-lines *Figure 1*), with 'maladaptive coping' being one such area. The model does not define if this coping is behavioural or cognitive. Research literature suggests behavioural coping is often characterised by activity avoidance (Delbaere,

Crombez, van Haastregt & Vlaeyen, 2009a). However, the model notes this as a separate factor. Research into cognitive coping may develop understanding of this area and test predictions this model makes in relation to increasing falls risk.

Cognitive coping seems important to consider given these processes may become more prominent for CDOP as physical control reduces with age (Johnson & Barer, 1997).

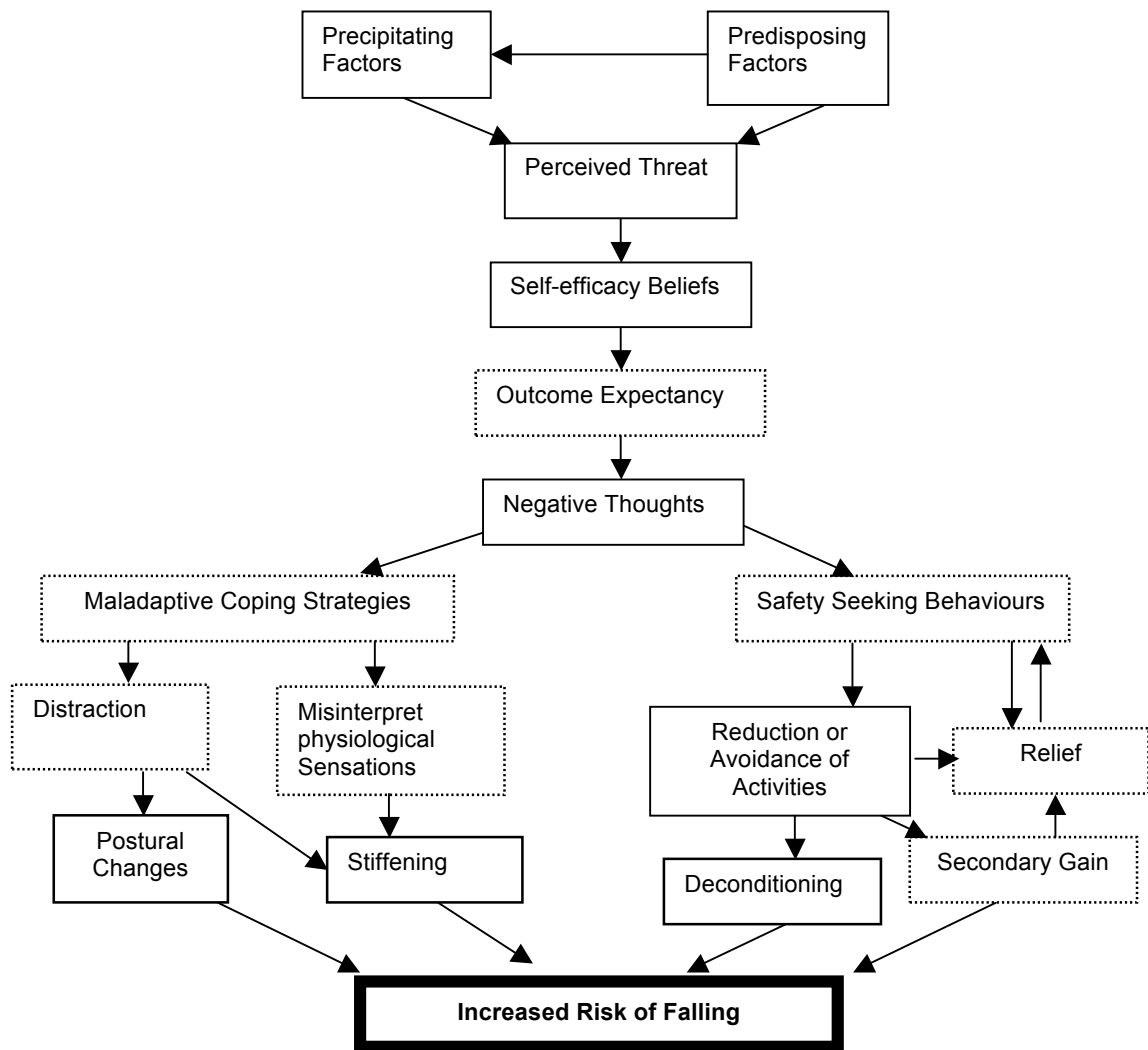


Figure 1: A model of falls risk (Hull & Kneebone, 2007)

Coping. Coping has been defined as "constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman,

1984, p.141). Lazarus and Folkman (1984) view coping as a process; a response to a specific stressor as opposed to a stable personality feature. Coping responses are initiated when a desired outcome is perceived to be challenged (Folkman & Moskowitz, 2004). Some responses may alleviate the problem, whilst others exacerbate it, or interfere with outcomes (Carver et al., 1993).

Coping strategies are considered to have two major functions: to deal with the problem causing distress (problem-focused) or to deal with the distressing emotion (emotion-focused; Lazarus & Folkman, 1984). Whilst coping responses are not considered universally 'bad' or 'good,' evidence suggests certain responses are more effective (Smedema, Catalano & Ebener, 2010). Coping 'effectiveness' can relate to outcomes such as reduced psychological distress, or a return to normative functioning (Pearlin & Schooler, 1978).

Coping responses of CDOP found to predict good emotional and physical health include problem-focused responses (Catanzaro, Horaney, & Creasey, 1995), staying active (Joens-Matre & Ekkekakis, 2002), utilising social support (Seligman, 2002), and religious engagement (Koenig, George & Peterson, 1998). Positive reappraisal has been negatively associated with psychological distress (Kraaij, Pruyboom & Garnefski, 2010) and problem-solving, and goal-setting have been negatively correlated with functional disability (Greenglass, Fiksenbaum & Eaton, 2006). Emotion-focused responses (escape/avoidance, distancing) have been negatively associated with well-being and psychological adaptation (Felton & Revenson, 1984), and positively associated with anxiety, distress and poor adjustment (Hsu & Tung, 2011).

Coping with FrPC in CDOP. Research into how CDOP cope with FrPC has often focused on behavioural avoidance (i.e. activity avoidance; Delbaere et al., 2009a). Research into cognitive coping with FrPC is in its infancy (Filiatrault & Desrosiers, 2011), and the few studies conducted have notable methodological and theoretical limitations.

CDOP with FrPC use more coping responses than those without FrPC (Filiatrault & Desrosiers, 2011). However, whilst comparing those with and without FrPC, these coping-related studies have defined the stressor as 'falls' (Drozdick & Edelstein, 2001), or 'aging' (Filiatrault & Desrosiers, 2011). Drawing on Lazarus and Folkman's (1984) conceptualisation of coping, coping strategies should be measured in the context of a specific stressor. If researchers wish to ascertain how CDOP cope with FrPC, it is vital they clearly define the stressor as FrPC.

Qualitative findings suggest at least some CDOP cope with FrPC by exercising caution, assigning blame for and minimising their FrPC and seeking social support (Huang, 2005; Ward-Griffin et al., 2004). They may also attempt to change their attitudes toward their FrPC (Huang, 2005) and use self-confidence to maintain their independence (Ward-Griffin et al., 2004). However, small samples mean it is unclear if these results are generalisable, and the limited setting and participant information reported by the authors limits transferability of the findings (Williams & Marrow, 2009).

All research exploring the FrPC-coping relationship has failed to employ theoretically robust concepts of FrPC (e.g. FSe), instead measuring 'FOF,' a concept lacking clear theoretical grounding (Hadjistavropoulos, Delbaere, & Fitzgerald, 2011). Additionally, the mediating role coping plays in the relationship between FrPC and falls has not been explored. It follows that it would be helpful to understand

which coping responses are associated with positive outcomes, as these could be promoted in interventions aimed at reducing FrPC and falls (Hsu & Tung, 2011), and unhelpful responses could be challenged (Kraaij et al., 2010).

Whilst research relating to the wider health context suggests avoidant and emotion-focused responses are associated with negative outcomes, and problem-focused responses are associated with favourable outcomes, this research has not been conducted in relation to coping with FrPC. In different contexts the same coping can differ in its effectiveness (Monat & Lazarus, 1991); hence the need to study coping in relation to FrPC, as we cannot assume findings can be generalised.

Study aims

This study aimed to explore coping responses CDOP utilise in response to FrPC. It also sought to investigate if coping mediated the relationship between FrPC and falls.

Hypotheses

Drawing from Hull and Kneebone's (2007) model of falls risk, coping theory (Lazarus & Folkman, 1984), and the empirical literature, the following hypotheses were generated:

1. FrPC will be positively associated with falls;
2. FrPC will be positively associated with emotion-focused and avoidant coping (e.g. 'escape-avoidance') and negatively associated with problem-focused coping (e.g. 'problem solving');
3. Falls will be positively associated with emotion-focused and avoidant coping and negatively associated with problem-focused coping;

4. Coping will mediate the relationship between FrPC and falls.

Method

Design and participants

A cross-sectional survey, with measures of FrPC, coping and falls, was undertaken. Recruitment occurred over 10 months from 21 day-centres within a semi-rural UK county. Participants were included if they were aged 65 years or older, community-dwelling and able to complete measures in English. Participants needed to achieve a score of 20 or more on the measure of FrPC, which is representative of at least 'moderate' FrPC (Yardley et al., 2005) to ensure participants had sufficient FrPC (the stressor) to make it meaningful to measure coping in response to. Respondents were excluded if they were unable to provide informed consent. These criteria were applied to ensure participants unlikely to meet the cognitive/communication demands of the study were screened out.

Conducting an a-priori power analysis for multiple regression using G* Power (Faul, Erdfelder, Lang & Buchner, 2007) indicated a sample of 160 participants was required for a medium effect (.80; Appendix 5). One-hundred and sixty self-selected CDOP completed the study, meaning it was deemed to have sufficient power. Demographics are reported in Table 1 of the Results section.

Ethical approval

Ethical approval was obtained from the Salomons Canterbury Christ Church University Ethics Committee in December 2010 (Appendix 6). All participants provided informed consent. British Psychological Society (BPS) ethics code (BPS, 2010) was followed throughout.

Measures

The Falls Efficacy Scale–International (FES-I). The measure of FrPC utilised was the FES-I (Yardley et al., 2005, Appendix 7). This self-report measure of falls-related self-efficacy (FSe) assesses respondents' confidence in avoiding falling when undertaking activities. From this point forward, the term 'FSe' will be used instead of 'FrPC' following recommendations to clearly specify the FrPC construct employed in research (Moore & Ellis, 2008).

The FES-I consists of 16 items, rated on a 4-point Likert scale ranging from 'not at all concerned' to 'very concerned.' Scores are based upon the sum of all items, ranging from 16 (high FSe) to 64 (low FSe). It demonstrates good reliability ($\alpha=.96$) and good inter-item correlations (range=.29 -.79; Yardley et al., 2005). Internal consistency in the current sample was good ($\alpha=.89$).

The revised-Ways of Coping Questionnaire (WAYS). The WAYS (Folkman & Lazarus, 1989) explores coping in relation to a specific stressor (Appendix 8). Sixty-three items are rated on a four-point Likert scale ranging from 'does not apply/not used' to 'used a great deal.' Questions cluster to form eight subscales: 'confrontive coping', 'distancing', 'self-controlling', 'seeking social support', 'accepting responsibility', 'escape-avoidance', 'planful problem-solving' and 'positive reappraisal' (definitions, Appendix 9).

The measure demonstrates acceptable internal reliability ($\alpha=.61-.79$; Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986). Internal reliability within this sample and action consequently taken are reported in the Results section.

The COPE 'Turning to Religion' subscale. The COPE (Carver, Scheier & Weintraub, 1989; Appendix 10) is a theoretically-based coping measure, utilising 60 items rated on a four-point scale, ranging from 'I haven't been doing this at all,' to 'I've been doing this a lot.' Items cluster to produce 14 subscales.

The 'turning to religion' subscale was used as literature suggests CDOP use religion to cope with health and life stressors (Koenig et al., 1998), and this response appeared absent from the WAYS. Internal reliability of this subscale reported by the authors ($\alpha=.92$; Carver et al., 1989), and within the current sample ($\alpha=.96$), was good.

Falls questionnaire. Following the approach routinely used in large-scale falls research (Shumway-Cook et al., 2009) and cross-sectional fall-related studies (e.g. Filiatrault & Desrosiers, 2011), falls incidence was assessed via self-report questionnaire (Appendix 11). A fall was defined as "an unexpected event in which the participants come to rest on the ground, floor, or lower level" (Lamb, Jørstad-Stein, Hauer, & Becker, 2005, p.1619). Participants were asked if they had fallen in the last 12 months, the key timeframe in assessing falls (National Institute for Clinical Excellence, 2004), and how many times. Questions relating to the fall (e.g. time to rise) were included. Recall of falls within 12 months has good specificity, though poorer sensitivity (Ganz, Higashi & Rubenstein, 2005).

Demographics questionnaire. Participants' demographic characteristics and information relating to falls risk factors identified in the literature were explored via self-report questionnaire (Appendix 12).

Procedure

Day-centres were invited to participate via email, telephone and in person. Centre managers were provided with information sheets and consent forms (Appendix 13 & 14). Posters displayed in day-centres invited attendees to participate (Appendix 15).

The study was explained by the author using an information sheet (Appendix 16) and informed consent was gained (Appendix 17) from those who wished to take part. Due to ethical constraints it was not possible to collect information about those who did not participate. Of the 38 people who spoke with the author and declined, main reasons were lack of time and conflict with another centre activity.

Following consent being obtained, the demographic questionnaire was completed, followed by the FES-I, the WAYS, the COPE subscale, and the falls questionnaire. To ensure consistency of administration, the author read questions and responses to participants one-to-one, whilst they had a copy to refer to. If possible, participants completed the measures themselves. If not possible, the author completed them on their behalf. Administration time was 15-25 minutes. Participants were offered falls prevention and aftercare information (Appendix 18). No participants were excluded for not fulfilling the FES-I inclusion scoring criteria.

Participants and day-centres were provided with summaries of the results (Appendix 19) and the opportunity of having results presented in a meeting.

Data analysis

Demographic variables were summarised using frequencies and measures of central tendency. To determine whether scores on measures were biased by errors, internal reliability, as assessed by Cronbach's alpha, was calculated.

Due to non-normal distribution of variables (Appendix 20), non-parametric tests were employed to explore bivariate correlations. Spearman's Rho was used where both variables were continuous and point-biserial correlations when one variable was continuous and one categorical (Field, 2009). All findings were evaluated using two-tailed analysis.

Following Baron and Kenny's (1986) mediation framework, a series of linear regressions were performed. Data were analysed using Statistical Package for Social Sciences (SPSS): version 20.0. Assumptions were checked, including diagnostics and generalisability (Appendix 21). Where residuals were non-normally distributed, wild bootstrapping was implemented as recommended for analysis of data that violate assumptions of regression (MacKinnon, 2008; Liu, 1988).

Results

Demographic and falls-related variables

The sample of 160 participants comprised 129 (80.6%) females and 31 (19.4%) males, with a mean age of 83.47 years (SD=7.16, median=85, range=65-101). Further demographic information is presented in Table 1.

Table 1: *Participant demographics*

Variable		N	Percentage (%)
Ethnicity	<i>White</i>	157	98.1
	<i>Black/Black British</i>	1	0.6
	<i>Mixed</i>	1	0.6
	<i>Other</i>	1	0.6
Wears glasses	<i>Yes</i>	112	70.0
	<i>No</i>	48	30.0
Wears hearing aid	<i>Yes</i>	40	25.0
	<i>No</i>	120	75.0
Living arrangements	<i>Living alone</i>	115	71.9
	<i>Not living alone</i>	45	28.1
Walking assistance	<i>Walk without an aid</i>	40	25.0
	<i>Walk with an aid</i>	120	75.0
Self-rated health	<i>Poor-fair</i>	83	51.9
	<i>Good-excellent</i>	77	48.1
Medications	<i>Less than four</i>	60	37.5
	<i>Four or more</i>	100	62.5
Diagnosed physical health problems	<i>Yes</i>	108	67.5
	<i>No</i>	52	32.5

Fifty-eight percent of the sample reported having fallen in the past 12 months. Approximately half required medical attention following these falls. The majority reported rising from a fall in less than one hour. Detailed falls-related characteristics are presented in Table 2.

Table 2: *Participant fall characteristics*

Variable		N	Percentage (%)
Fallen in last 12 months	<i>Yes</i>	93	58.1
	<i>No</i>	67	41.9
Of those who had fallen:			
<i>Needed medical attention after fall?</i>	<i>Yes</i>	45	48.4
	<i>No</i>	48	51.6
<i>Time to rise from fall</i>	<i>Less than one minute</i>	10	10.8
	<i>Less than one hour</i>	75	80.6
	<i>More than one hour</i>	8	8.6

Descriptive statistics

The FES-I was completed without missing data. Internal reliability of this measure in this sample was good ($\alpha=.885$). The mean FES-I score was 37.21 (SD=9.91, median=37, range=20-63), representing low/moderate FSe (Yardley et al., 2005).

The coping measures were completed without missing data. Descriptive statistics of individual subscales are presented in Table 3.

Table 3: *Descriptive statistics of coping subscales*

Subscale	Mean	SD	Median	Range
COPE <i>Turning to religion</i>	7.73	4.53	5	4-16
WAYS <i>Confrontive</i>	3.39	2.08	3	0-11
<i>Distancing</i>	13.24	3.65	14	0-18
<i>Self-controlling</i>	10.13	2.90	10	0-20
<i>Seeking social support</i>	4.49	4.25	3	0-18
<i>Accepting responsibility</i>	2.56	1.92	3	0-11
<i>Escape-avoidance</i>	3.16	3.56	2	0-18
<i>Planful problem-solving</i>	8.97	4.11	9	0-18
<i>Positive reappraisal</i>	4.21	3.12	4	0-18

Selecting coping subscales. The internal reliability of the coping subscales was explored. Cronbach's alpha values are reported in Table 4.

Table 4: *Internal reliability of coping subscales*

Measure	Subscale	Cronbach's alpha (α)
COPE	<i>Turning to religion</i>	.96
WAYS	<i>Confrontive</i>	.27
	<i>Problem-focused</i>	
	<i>Planful problem-solving</i>	.76
	<i>Distancing</i>	.74
	<i>Self-controlling</i>	.42
	<i>Emotion-focused/avoidant</i>	
	<i>Accepting responsibility</i>	.28
	<i>Escape-avoidance</i>	.72
	<i>Positive reappraisal</i>	.52
	<i>Seeking social support</i>	.84

The WAYS 'confrontive' coping subscale was excluded due to poor internal reliability. The 'self-controlling' coping subscale was improved by reducing this to two items. The same procedure was followed for the 'accepting responsibility' and 'positive reappraisal' coping subscales, reducing their items by one and two items respectively. This procedure of removing items is recommended to improve internal reliability of measures (Anderson & Gerbing, 1988). The Cronbach's alpha values for these amended subscales are indicated in Table 5.

Table 5: *Descriptive statistics and internal reliability of amended coping subscales*

Subscale	Mean	SD	Median	Range	α
<i>Self-controlling</i>	3.84	1.80	4	0-6	.61
<i>Accepting responsibility</i>	0.97	1.13	1	0-8	.44
<i>Positive reappraisal</i>	2.41	2.42	2	0-13	.58

Bivariate results

Demographic correlations with FSe and falls. FES-I scores were significantly positively correlated with using a walking aid and taking four or more medications (Table 6). Self-reported physical health and having diagnosed physical health problems were significantly negatively correlated with FES-I scores.

Falls were significantly positively correlated with using a walking aid and taking four or more medications, and significantly negatively correlated with diagnosed physical health problems. Self-reported physical health approached significant negative association with falls ($p=0.055$).

Table 6: Correlation coefficients between demographic variables, FSe and falls

Variable	FES-I	Falls
Age	-.02	.00
Gender	-.07	-.01
Ethnicity	.04	.01
Wearing glasses	-.11	-.08
Wearing a hearing aid	-.01	.04
Living alone	.15	.07
Assistance walking	.51**	.25**
Self-rated health	-.30**	-.15 [^]
Medication use	.21**	.19*
Diagnosed physical health problems	.31**	.26**

[^] =approaching significance at $p < 0.05$ ** = $p < 0.01$ * = $p < 0.05$

Using a Bonferroni correction to control for multiple comparisons, all significant correlations with FES-I (Table 6) remained significant. However, the correlation between medication use and falls no longer remained significant. Therefore, this result should be treated with caution. However, a Bonferroni correction can be overly conservative (Clark-Carter, 1997). Consequently we must not assume there was no effect.

Hypothesis One: FrPC will be positively associated with falls. There was a significant positive correlation between FES-I scores and falls ($r_s = .45$, $p < 0.01$), supporting Hypothesis One. In those who had fallen, FES-I scores were not significantly correlated with required medical attention ($r_{pb} = -.19$, $p = .073$), or time to rise after falling ($r_{pb} = .15$, $p = .164$).

Hypothesis Two: FrPC will be positively associated with emotion-focused and avoidant coping and negatively associated with problem-focused coping. There was mixed support for Hypothesis Two. FES-I scores were significantly positively correlated with ‘escape-avoidance’ and ‘self-controlling’ coping (Table 7), and significantly negatively correlated with ‘distancing’ and ‘problem-solving’ coping. No other coping responses were significantly associated with FSe.

Table 7: Correlation coefficients between coping, FSe and falls

Subscale		FES-I	Falls
<i>Problem-focused</i>	<i>Planful problem-solving</i>	-.16*	-.04
	<i>Escape-avoidance</i>	.20*	.32**
	<i>Self-controlling</i>	.18*	.24**
<i>Emotion-focused/avoidant</i>	<i>Positive reappraisal</i>	.07	.19*
	<i>Distancing</i>	-.19*	-.12
	<i>Accepting responsibility</i>	.03	.05
<i>Seeking social support</i>		.02	.03
<i>Turning to religion</i>		.10	.12

** = $p < 0.01$

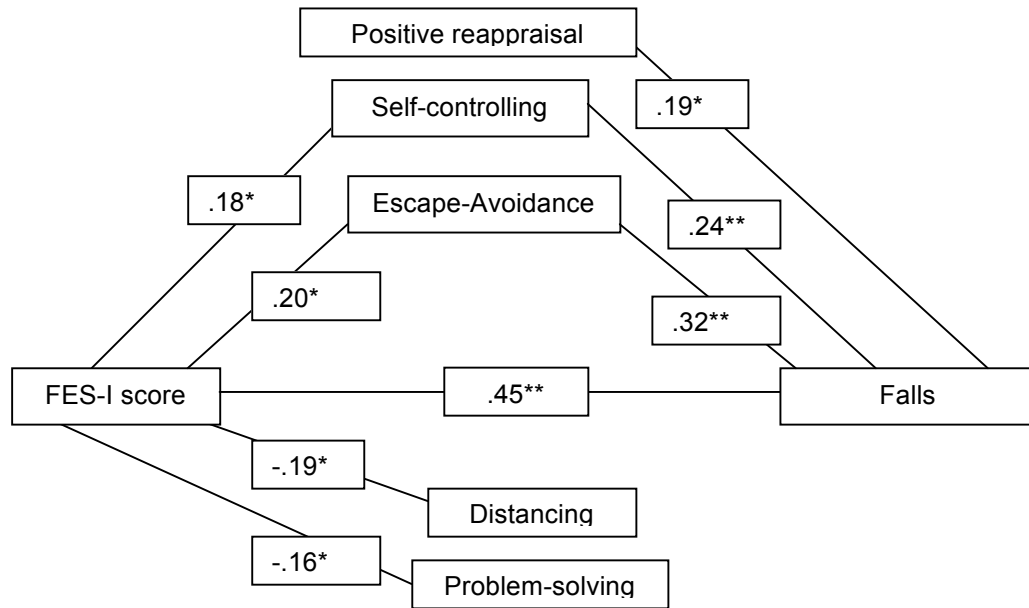
* = $p < 0.05$

Using a Bonferroni correction for multiple comparisons, none of the bivariate correlations with FES-I scores remained significant. We should therefore treat these results with caution. However, due to the critique of this correction noted previously, we cannot assume no effect (Clark-Carter, 1997).

Hypothesis Three: Falls will be positively associated with emotion-focused and avoidant coping and negatively associated with problem-focused coping. There was partial support for Hypothesis Three. Falls were significantly

positively correlated with ‘escape-avoidance,’ ‘self-controlling’ and ‘positive reappraisal’ coping (Table 7).

When controlling for multiple comparisons, the correlation with ‘positive reappraisal’ coping did not remain significant. However, as this correction can be overly conservative (Clark-Carter, 1997) we cannot assume no effect.



* = $p < 0.05$ ** = $p < 0.01$

Figure 2: Significant bivariate correlations between coping, FSe and falls

Multivariate results

To ensure findings of the bivariate analysis were robust, multivariate analyses were employed. A series of linear regressions were utilised to explore the association between FSe, falls, and coping, following the mediation method outlined by Baron and Kenny (1986; Figure 4).

Whilst Bonferroni corrections for multiple comparisons showed some bivariate correlations did not remain significant, we must not assume no effects given this correction can be overly conservative (Clark-Carter, 1997). To avoid omission of

potential significant predictors (Steyerberg, Eijkemans, Harrell, & Habbema, 2000), all variables significantly associated in bivariate analysis prior to this correction were considered in the multivariate analysis. Demographic variables significantly related to the dependent variable were included to partial out their effect.

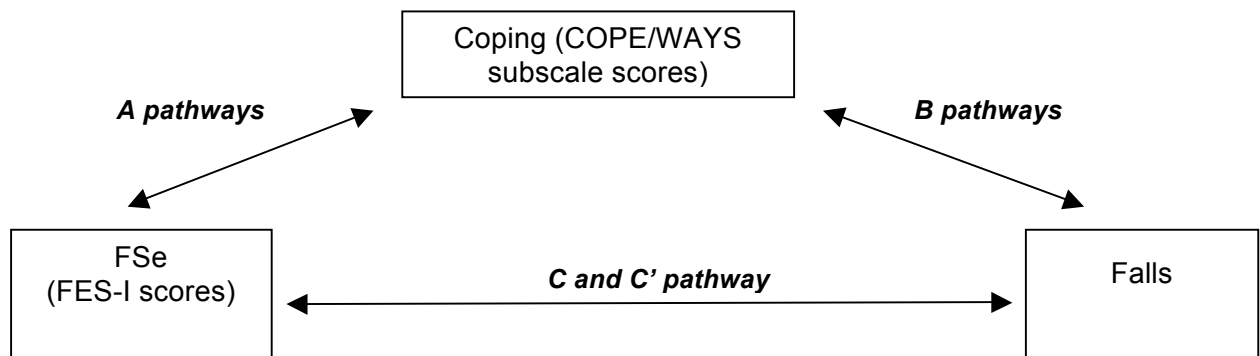


Figure 3: Mediation model based on Baron and Kenny's (1986) framework (arrows represent associations to be explored)

For mediation to be shown the following must be found: 1) the predictor must be significantly associated with the hypothesised mediator(s), (*A pathway*); 2) the predictor must be significantly associated with the dependent measure, (*C pathway*); 3) the mediator(s) must be significantly associated with the dependent variable, (*B pathway*); and 4) the impact of the predictor on the dependent measure is less after controlling for the mediator(s), (*C' pathway*; Baron & Kenny, 1986).

Hypothesis One: FrPC will be positively associated with falls. Linear regression was employed to explore the *C pathway*, with falls as the dependent variable, and FES-I score as the independent variable. Demographic variables significantly correlated with falls (i.e. assistance walking, taking four or more medications, diagnosed physical health problems) were included. This model

significantly predicted falls ($r=.46$, $F(1,155)=10.48$, $p<0.01$; adjusted $r^2=.19$), accounting for 21% of falls variance. Only the FES-I score significantly independently contributed to the model (Table 8), thus supporting Hypothesis One.

Table 8: *Regression coefficients for predictor variables in regression model predicting falls*

	B	Standard Error B (SEB)	Beta (β)
Step 1			
<i>(Constant)</i>	0.23	1.54	
<i>Assistance walking</i>	1.15	0.55	0.16*
<i>Medication use</i>	0.64	0.52	0.10
<i>Diagnosed physical health problems</i>	-1.09	0.53	-0.17*
Step 2			
<i>(Constant)</i>	-2.87	1.57	
<i>Assistance walking</i>	-0.29	0.59	-0.04
<i>Medication use</i>	0.50	0.49	0.08
<i>Diagnosed physical health problems</i>	-0.41	0.51	-0.06
<i>FES-I</i>	0.13	0.03	0.43**

*= $p<0.05$ **= $p<0.01$ Step 1 $R^2=0.09$, Step 2 $R^2=0.21$

Collinearity statistics indicated tolerance (>0.2) and variance inflation (<10) were within acceptable limits (Field, 2009). However, the model had cases with standardised residuals less than -2 or greater than +2 that exceeded the number acceptable for the model. It was shown that no cases had Cook's distance greater than one or leverage values three times the average, Mahalanobis Distance statistics fell within limits, and DFBeta statistics were all ± 1 . This suggests these

cases did not exert undue influence over the model, indicating the model was not unduly influenced by outliers or influential cases (Field, 2009).

When exploring the assumptions of regression, the residuals were non-normally distributed (Appendix 22). On this account, wild bootstrapping (Liu, 1988) was employed. Bootstrapping is a resampling technique which does not rely on inferences regarding sample distribution, meaning it does not need to meet assumptions of inferential statistics (e.g. normal distribution). Bootstrapping involves repeatedly sampling data from the original sample, with replacement, to create many new bootstrap samples (e.g. 2000). This generates the sampling distribution. Once this distribution is generated, the 'statistic of interest' (e.g. the mean; Field, Miles & Field, 2012, p.202) is computed for each resample. Ordering these values from smallest to largest allows confidence intervals (CI) for that statistic to be identified using the middle 95% of the values. The effect is considered significant if the CI's do not cross zero (Preacher & Hayes, 2004). Wild bootstrapping (Liu, 1988) is valid when data shows heteroscedasticity, as it replicates the original samples characteristics in the resample, preventing inaccurate distortion.

Using bootstrapping, the effect of FES-I scores on falls was considered significant with 95% confidence (Table 9), suggesting the original model was not affected by non-normal distribution. This provides evidence for the *C pathway* of the mediation model.

Table 9: *Non-bootstrapped and bootstrapped CI for the final regression model predicting falls.*

	Non-bootstrapped CI		Bootstrapped CI	
	Lower	Upper	Lower	Upper
(Constant)	-5.96	0.23	-5.01	-0.75
Assistance walking	-1.45	0.87	-1.16	0.51
Medication use	-0.46	1.45	-0.24	1.22
Diagnosed physical health problems	-1.42	0.61	-1.02	0.19
FES-I	0.08	0.19*	0.07	0.20*

* = $p < 0.05$

Hypothesis Two: FrPC will be positively associated with avoidant and emotion-focused coping and negatively associated with problem-focused coping. Relationships between FSe and coping (*A pathways*) were explored using separate linear regressions with coping responses as the dependent variables, and FES-I score as the independent variable. Demographic variables significantly associated with coping responses were included as covariates to partial out their effect. Prior to the inclusion of the confounding variables, FSe predicted ‘escape-avoidance’ and ‘self-controlling’ coping.

The FES-I and confounding demographic variables (medication use) significantly predicted ‘self-controlling’ coping ($r = .24$, $F(1, 157) = 4.99$, $p < 0.05$; adjusted $r^2 = .05$), accounting for 6% of the variance in this coping response (Table 10). FES-I scores significantly predicted 2.8% of the variance in ‘self-controlling’ coping.

Table 10: *Regression coefficients of predictors in regression model predicting 'self-controlling'*

	B	SEB	β
Step 1			
(Constant)	2.78	0.49	
Medication use	0.66	0.29	0.18*
Step 2			
(Constant)	1.84	0.65	
Medication use	0.51	0.29	0.14
FES-I	0.03	0.01	0.17*

*= $p < 0.05$ Step 1 $R^2 = 0.03$, Step 2 $R^2 = 0.06$

Due to the residuals being non-normally distributed (Appendix 22), bootstrapping was employed. This showed the FES-I had a true effect on 'self-controlling' coping ($p < .05$), suggesting the model was not unduly influenced by problems of non-normal distribution.

Table 11: *Non-bootstrapped and bootstrapped CI for regression model predicting 'self-controlling'*

	Non-bootstrapped CI		Bootstrapped CI	
	<i>Lower</i>	<i>Upper</i>	<i>Lower</i>	<i>Upper</i>
(Constant)	0.56	3.12	0.57	3.09
medication use	-0.07	1.10	-0.06	1.13
FES-I	0.00	0.06	0.00	0.06*

* = $p < 0.05$

The FES-I and confounding demographic variables (current living arrangements, self-reported physical health) significantly predicted 'escape-avoidance' coping ($r = .30$, $F(1, 156) = 5.00$, $p < 0.05$; adjusted $r^2 = .07$), accounting for 9%

of variance in 'escape-avoidance' coping. FES-I scores significantly independently predicted 4.5% of the variance in 'escape-avoidance' coping (Table 12).

Table 12: *Regression coefficients for predictors in regression model predicting 'escape-avoidance'*

	B	SEB	β
Step 1			
<i>(Constant)</i>	2.71	1.25	
<i>Current living arrangement</i>	1.27	0.62	0.16*
<i>Self-reported physical health</i>	-0.79	0.56	-0.11
Step 2			
<i>(Constant)</i>	-0.69	1.74	
<i>Current living arrangement</i>	1.04	0.62	0.13
<i>Self-reported physical health</i>	-0.33	0.57	-0.05
<i>FES-I</i>	0.08	0.03	0.23*

* = $p < 0.05$ Step 1 $R^2 = 0.04$, Step 2 $R^2 = 0.09$

Collinearity statistics for these models indicated tolerance and variance inflation were within acceptable limits (Field, 2009). Cook's distance, leverage values, Mahalanobis Distance statistics and DFBeta statistics fell within acceptable limits (Field, 2009) suggesting the models were not unduly influenced by outliers or influential cases. Due to non-normally distributed residuals (Appendix 22), bootstrapping was employed, showing the effect of FES-I scores on 'escape-avoidance' coping was significant ($p < 0.05$; Table 13) suggesting the original model was not materially affected by non-normal distribution.

Table 13: *Non-bootstrapped and bootstrapped CI for regression model predicting 'escape-avoidance'*

	Non-bootstrapped CI		Bootstrapped CI	
	Lower	Upper	Lower	Upper
<i>(Constant)</i>	-4.12	2.74	-4.43	2.77
<i>Current living arrangement</i>	-0.17	2.26	-0.16	2.33
<i>Self-reported physical health</i>	-1.46	0.80	-1.34	0.78
<i>FES-I</i>	0.02	0.14*	0.01	0.15*

* = $p < 0.05$

A diagrammatic summary (Figure 4) highlights FSe predicting 'escape-avoidance' and 'self-controlling' coping were significant *A pathways*.

Hypothesis Three: Falls will be positively associated with emotion-focused and avoidant coping and negatively associated with problem-focused coping. Direct relationships between the coping mediators and falls (*B pathways*) were explored using linear regression. Coping responses were independent variables, with falls as the dependent variable. Demographic variables significantly correlated with falls were included (i.e. assistance walking, taking four or more medications, diagnosed physical health problems).

Falls were significantly predicted by 'escape-avoidance,' 'self-controlling' and 'positive reappraisal' coping prior to consideration of demographic variables. This model significantly predicted falls ($r=.36$, $F(3,159)=7.57$, $p<0.01$; adjusted $r^2=.11$), accounting for 11% of falls variance.

When confounding variables (i.e. assistance walking, taking four or more medications, diagnosed physical health problems) were entered into the model, this improved the prediction of falls ($r=.42$, $F(6,153)=5.56$, $p<0.01$; adjusted $r^2=0.15$),

accounting for 18% of falls variance. 'Escape-avoidance' remained the only coping response to significantly independently predict falls (Table 14). However, due to the non-normal distribution of the residuals (Appendix 22), bootstrapping was utilised.

Collinearity statistics indicated tolerance and variance inflation were within acceptable limits (Field, 2009). All Cook's distance, leverage values, Mahalanobis Distance statistics and DFBeta statistics fell within acceptable limits (Field, 2009), suggesting this model was not unduly influenced by outliers or influential cases.

Table 14: *Regression coefficients of coping predictor variables in model predicting falls*

	B	SEB	β
Step 1			
<i>(Constant)</i>	0.23	1.54	
<i>Assistance walking</i>	1.15	0.55	0.16*
<i>Medication use</i>	0.64	0.52	0.10
<i>Diagnosed physical health problems</i>	-1.09	0.53	0.17*
Step 2			
<i>(Constant)</i>	-1.68	1.56	
<i>Assistance walking</i>	1.06	0.53	0.15*
<i>Medication use</i>	0.53	0.50	0.08
<i>Diagnosed physical health problems</i>	-0.70	0.52	-0.11
<i>Self-controlling</i>	0.22	0.13	0.13
<i>Escape-avoidance</i>	0.14	0.07	0.16*
<i>Positive reappraisal</i>	0.18	0.10	0.14

* = $p < 0.05$

Step 1 $R^2=0.09$, Step 2 $R^2=0.18$

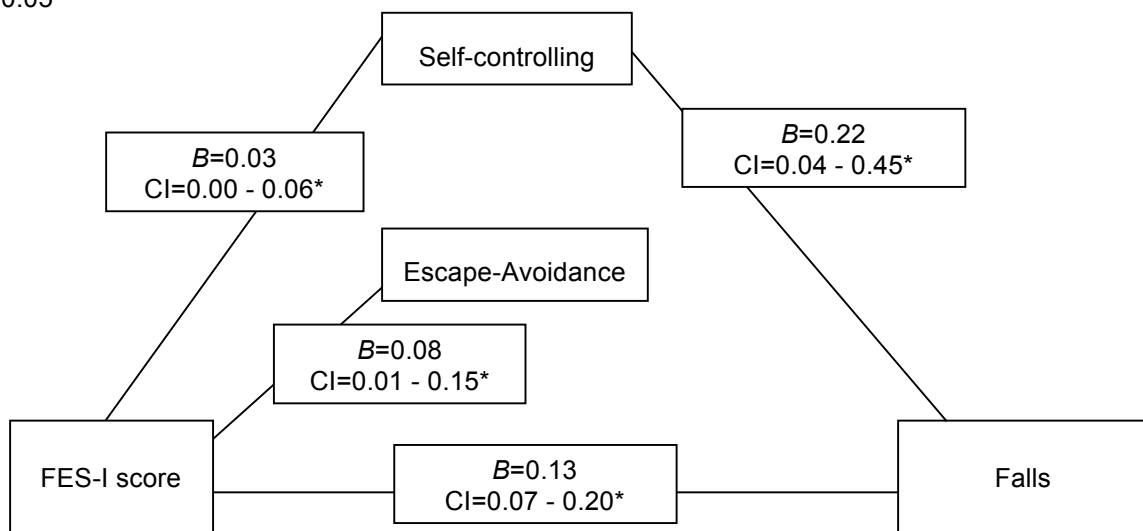
In the bootstrap analysis, 'escape-avoidance' coping no longer significantly predicted falls ($p > 0.05$; Table 15), suggesting this original relationship was affected by non-normal distribution. Using bootstrapping, 'self-controlling' coping was shown

to have a significant effect on falls ($p < 0.05$). As bootstrapping is the more robust test, and the original model violated assumptions of normality of residuals, ‘self-controlling,’ rather than ‘escape-avoidance’ coping should be considered a significant predictor of falls. This suggests ‘self-controlling’ coping predicting falls was the only significant *B pathway* of the mediation model (Figure 4).

Table 15: Non-bootstrapped and bootstrapped CI for regression model of coping predicting falls

	Non-bootstrapped CI		Bootstrapped CI	
	Lower	Upper	Lower	Upper
(Constant)	-4.74	1.39	-3.97	0.52
Assistance walking	0.01	2.11*	0.43	1.82*
Medication use	-0.47	1.52	-0.34	1.29
Diagnosed physical health problems	-1.72	0.33	-1.48	-0.06*
Self-controlling	-0.04	0.48	0.04	0.45*
Escape-avoidance	0.01	0.28*	-0.01	0.35
Positive reappraisal	-0.02	0.38	-0.09	0.30

* = $p < 0.05$



* = $p < 0.05$

Figure 4: Summary of the regression models with *B* values and bootstrapped CI

Mediation results

Hypothesis Four: Coping responses will mediate the relationship between FrPC and falls. As previously noted, for mediation to be shown: 1) FES-I scores must be significantly associated with coping, (*A pathway*); 2) FES-I scores must be significantly associated with falls, (*C pathway*); 3) coping must be significantly associated with falls, (*B pathway*); and 4) the impact of FES-I scores on falls must be less after controlling for coping, (*C' pathway*; Baron & Kenny, 1986). Evidence was found for the *A pathway* through FES-I significantly predicting 'self-controlling' and 'escape-avoidance' coping. The *B pathway* was shown through 'self-controlling' coping significantly predicting falls. The *C pathway* was significant, suggesting a relationship to provide a basis for mediation to be explored (Wijlhuizen, Chorus & Hopman-Rock, 2008). The role of coping as a mediator of this relationship (*C' pathway*) was explored using multiple regression. Mediators were chosen based upon significant *A* and *B pathways*, resulting in 'self-controlling' coping being the only potential mediator included, along with confounding variables (i.e. assistance walking, taking four or more medications, diagnosed physical health problems).

The mediation model including 'self-controlling' coping as a potential mediator significantly predicted falls ($r=.48$, $F(1,154)=9.26$, $p<0.01$; adjusted $r^2=.21$), accounting for 23% of falls variance (Table 16). Given the previous pathways have been affected by non-normal distribution, and the current residuals also reflected this (Appendix 22), bootstrapping was employed.

Table 16: Regression coefficients of mediation model predicting falls

	B	SEB	β
Step 1			
(Constant)	0.23	1.54	
Assistance walking	1.15	0.55	0.16*
Medication use	0.64	0.52	0.10
Diagnosed physical health problems	-1.09	0.53	-0.17*
Step 2			
(Constant)	-0.82	1.57	
Medication use	1.11	0.54	0.16*
Assistance walking	0.46	0.52	0.07
Diagnosed physical health problems	-0.99	0.52	-0.15
Self controlling coping	0.33	0.13	0.20*
Step 3			
(Constant)	-3.34	1.58	
Assistance walking	-0.23	0.58	-0.03
Medication use	0.38	0.49	0.06
Diagnosed physical health problems	-0.38	0.51	-0.06
Self-controlling coping	0.24	0.12	0.14^
FES-I score	0.12	0.03	0.40**

**= $p < 0.01$ ^=approaching significance at $p < 0.05$; $p = 0.057$

Step 1 $R^2 = 0.09$ Step 2 $R^2 = 0.13$,

Step 3 $R^2 = 0.23$

When utilising bootstrapping, 'self-controlling' coping significantly predicted falls (Table 17). The *C'* pathway was shown to be smaller when 'self-controlling' coping was entered as a mediator (Figure 5), suggesting evidence of mediation. As *C'* was not zero, complete mediation cannot be inferred. However, results suggest evidence of partial mediation (Shrout & Bolger, 2002).

Table 17: *Non-bootstrapped and bootstrapped CI for mediation model predicting falls*

	Non-bootstrapped CI		Bootstrapped CI	
	<i>Lower</i>	<i>Upper</i>	<i>Lower</i>	<i>Upper</i>
<i>(Constant)</i>	-6.55	-0.31	-5.85	-1.27
<i>FES-I</i>	0.07	0.18	0.06	0.18*
<i>Medication use</i>	-0.58	1.34	-0.30	1.11
<i>Assistance walking</i>	-1.34	0.93	-0.96	0.56
<i>Diagnosed physical health problems</i>	-1.39	0.63	-0.98	0.28
<i>Self-controlling</i>	-0.01	0.48	0.08	0.43*

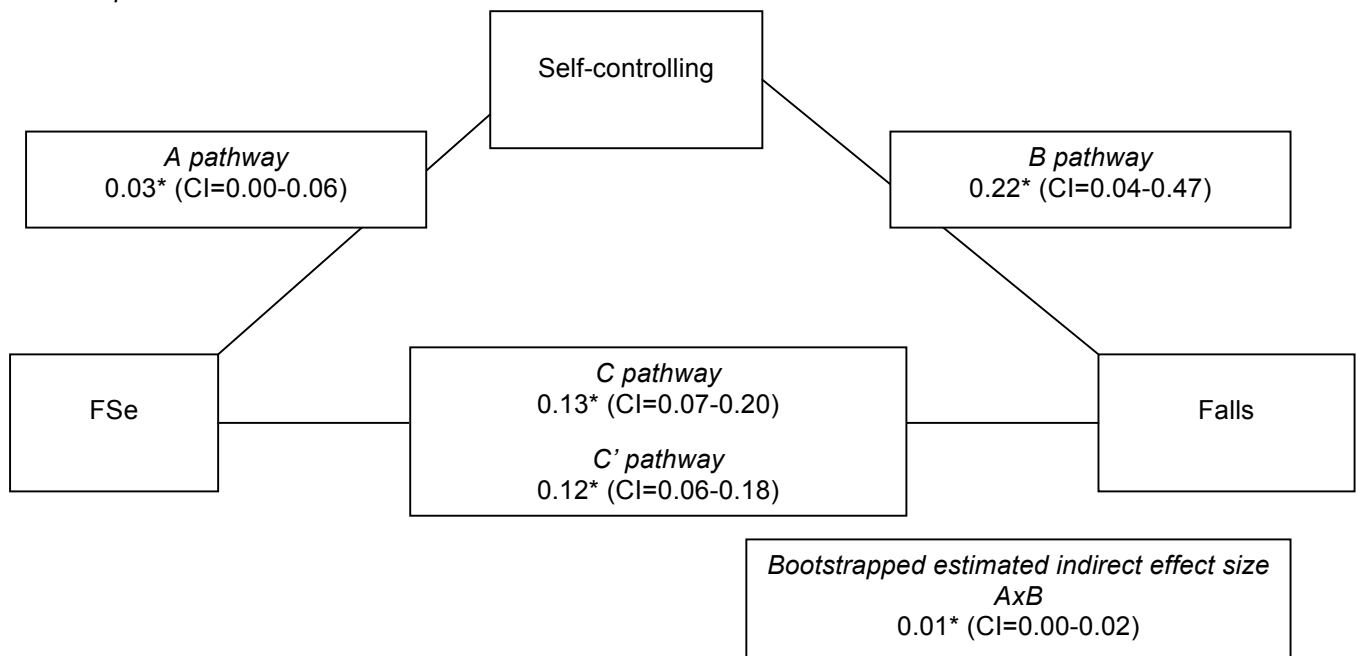
*= $p < 0.05$

A test of the significance of the indirect effect of the mediator can be conducted. One such test, the Sobel test is considered overly conservative, and is based upon assumptions of normal distribution (Preacher & Hayes, 2004). The results of this study showed that the residuals of regression models used to explore the mediation were not normally distributed, suggesting the Sobel test would be likely to yield underpowered testing of mediation (Preacher & Hayes, 2004). A bootstrapping framework is considered a more robust method, which does not rely on assumptions of normal distribution. The findings of the bootstrap analysis calculate the mean effect size of 'self-controlling' coping as 0.01 (Table 18), with the true indirect effect estimated to lie between 0.00 and 0.02 with 95% confidence. Because the CI do not contain zero, and the estimated effect falls within these limits, we can conclude that the indirect effect of the mediator 'self-controlling' coping is significantly different from zero (Preacher & Hayes, 2004), acknowledging this a partial mediator of the FSe-falls relationship.

Table 18: *Bootstrapped effect sizes and CI for pathways in the mediation model*

Effect	Estimate	Standard error	Bootstrapped 95% CI	
			Lower	Upper
A	0.03	0.17	0.00	0.06
B	0.22	0.13	0.04	0.47
C'	0.12	0.03	0.06	0.18
AxB	0.01*	0.01	0.00	0.02
C	0.13	0.03	0.07	0.20

*= $p < 0.05$



*= $p < 0.05$ **= $p < 0.01$

Figure 5: Diagram of the mediation model with bootstrapped effect sizes and CI

Discussion

This is the largest quantitative study known to date to explore coping with FSe in CDOP and the first to consider if coping mediates the relationship between FSe and falls. It has previously been shown FSe significantly predicts falls, and this was strongly supported in this study. A key finding from this study showed ‘self-controlling’ coping partially mediates this relationship.

A discussion of the main findings will now be presented relating to each hypothesis. The limitations of the study will then be addressed. Subsequently theoretical, clinical and research implications of the findings will be considered.

The main findings

This study's first hypothesis was that FrPC would be positively associated with falls. Finding FSe and falls were highly associated is consistent with previous findings (Delbaere, Crombez, Vanderstraeten, Willems & Cambier, 2004), supporting Hypothesis One. This may reflect findings that suggest self-confidence helps achieve positive outcomes in relation to FrPC (Ward-Griffin et al., 2004). Whilst directionality cannot be inferred from these findings, it may be, as concerns increase, physiological changes resulting from these concerns (e.g. stiffening, tension) increase the likelihood of falling (Hadjistavropolous et al., 2011). Conversely, falls may reduce one's efficacy expectations in relation to ability to avoid falling. However, reported FSe levels may accurately reflect one's physical ability and falls risk (Hadjistavropolous et al., 2011).

The second hypothesis predicted FrPC would be positively associated with emotion-focused and avoidant coping and negatively associated with problem-focused coping. FSe significantly predicted two emotion-focused strategies; 'escape-avoidance' and 'self-controlling' coping, suggesting partial support for Hypothesis Two. Whilst causal connections cannot be assumed, 'escape-avoidance' coping may reflect CDOP's attempts at avoiding emotional distress caused by FrPC (Kong, Lee, Mackenzie & Lee, 2002; Ward-Griffin et al., 2004). This finding differed from those of Drozdick and Edelstein's (2001), who failed to find significant associations between FrPC and 'escape-avoidance' coping. The current study's larger sample may have

increased statistical power to uncover this association. Additionally, the current study employed a measure of FSe, whilst Drozdick and Edelstein (2001) utilised measures of FOF. Whilst both are 'FrPC' concepts they measure distinct constructs, with FSe commended for its stronger theoretical underpinnings (Hadjistavropolous et al., 2011).

'Self-controlling' coping was measured by two responses; 'I tried to keep my feelings to myself,' and 'I kept others from knowing how bad things were.' CDOP's use of this response may reflect attempts to minimise their concerns (Huang, 2005). Whilst unable to infer directionality from the findings, the association between FSe and 'self-controlling' coping may reflect CDOP thinking that, if other people knew about their concerns about falling there would be adverse consequences (e.g. embarrassment, confirmation of perceived inefficacy, loss of independence). This links with the theoretical concept 'outcome expectancy,' which has recently been highlighted as important in understanding CDOP's FrPC (Yardley & Smith, 2002).

The failure to find a range of coping responses significantly associated with FSe contradicts suggestions that individuals with FrPC employ more coping strategies (Filiatrault & Desrosiers, 2011). However, previous studies utilised measures of FOF, a distinct construct from FSe (Hotchkiss et al., 2004) which may have contributed to these differing findings. Additionally, previous studies did not define the 'stressor' as FrPC. As coping should be measured in relation to a specific stressor (Lazarus & Folkman, 1984), when defining this as FSe, coping may differ.

The third hypothesis, which suggested increased falls would be predicted by higher levels of emotion-focused and avoidant coping and lower levels of problem-focused coping, received partial support by finding the emotion-focused strategy, 'self-controlling' coping, significantly predicted falls. Again, whilst this association

cannot determine causality, this strategy, which was characterised by the responses: 'I tried to keep my feelings to myself,' and 'I kept others from knowing how bad things were,' may result in CDOP not gaining advice about how to avoid falls and continuing with activities beyond their physical capabilities. Subsequently, this may place them at increased falls risk.

The inclusion of demographic variables improved the prediction of falls, suggesting the importance of physical and psychological components in falls incidence. Continuous changes in emotions and cognitions brought about by coping processes involve reciprocal interaction between the individual and their environment (Lazarus & Folkman, 1984). These transactions may lead to inter-variable dependency (Schwarzer, 1998), resulting in personal characteristics influencing falls and coping. This reflects the multi-factorial nature of falls (Gillespie et al., 2003), and the complexity Hull and Kneebone's (2007) model depicts.

Hypothesis Four, which predicted coping would mediate between FrPC and falls, was somewhat supported by finding 'self-controlling' coping was a partial mediator of the FSe-falls relationship. Whilst causality cannot be proven by the correlational design, the mediation analysis findings are consistent with the possibility that decreased FSe leads to increased 'self-controlling' coping, which subsequently causes increased falls. One possible explanation of these findings could be, as concerns increase, CDOP think there may be adverse consequences of others knowing their concerns (e.g. embarrassment). This may prevent them accessing support to manage their falls risk, which may result in increased likelihood of falling. Further research is needed to test this hypothesis, preferably using longitudinal designs to allow for causal inferences.

As the mediation model only predicted 23% of falls variance, and 'self-controlling' coping was only a partial mediator, additional factors are likely to be involved in explaining the FSe-falls relationship. Other coping responses may contribute to this additional variance. For example behavioural coping (e.g. mobility restriction, changing activities to reduce burden, using assistive devices; Filiatrault & Desrosiers, 2011; Haung, 2005) may mediate the FSe-falls relationship, as these responses have been associated with both FrPC (Filiatrault & Desrosiers, 2011; Haung, 2005) and falls (Fletcher & Hirdes, 2004). The association between FrPC and falls incorporates a range of psychological, physical and behavioural factors (Hull & Kneebone, 2007), which may be reflected in coping responses employed.

Limitations

Whilst the sample's ethnic diversity was not unusual for the region's population (Scott, Pearce & Goldblatt, 2001), the predominantly White-British sample limited exploration of ethnic differences. The largely female sample prevented consideration of gender differences. These factors limit generalisation of the findings to other ethnic groups and community-dwelling older males.

Falls, FrPC and coping were measured cross-sectionally, meaning conclusions cannot be drawn regarding causality or temporal ordering of the variables. As coping is a complex, dynamic process (Lazarus & Folkman, 1984) this design may limit the ability to detect clear relationships (Schwarzer, 1998).

Longitudinal studies are needed to explore these associations.

Whilst falls are commonly measured via self-report, CDOP often under-report falls (Hannan et al., 2010) and recall bias may have introduced error (Barrett, Crucian, Wingard, Graybealm & Heilman, 2003). Future studies could employ

methods that allow cross-validation (e.g. carer reports, cross-referencing medical records). However, this study showed nearly three quarters of participants lived alone, and over half did not seek medical attention thereby potentially limiting usefulness of cross-validation checks. As cognitive coping is based on self-perception there would be limited scope to employ independent ratings (Kraaij, Garnefski & Maes, 2002).

Using an FES-I cut-off score of 20 was to provide a level of 'stressor' to consider coping in relation to. However, this can be easily attained as the response 'not at all' is coded '1.' This may have resulted in individuals with low FrPC, or those expressing concern in one area (e.g. walking on slippery surfaces) being included. Future research may examine coping in samples with higher levels of concern.

Whilst the WAYS was selected following a review of measures, caution may be warranted when interpreting the mediating role of 'self-controlling' coping because amendments to this scale to improve internal reliability resulted in only two items remaining in this scale. However, a lack of reliability usually results in failure to detect significant relationships (Ferguson, 2009), which was not the case in this study. Using more accurate measures that contain more items may lead to identification of stronger relationships.

Whilst efforts were made to informally screen for cognitive impairments, no formal cognitive testing was undertaken. This could have resulted in some participants having impairments that may have impacted on their completion of questionnaires. Additionally, coping may be affected by cognitive performance, as individuals with cognitive impairments have been found to employ significantly less problem-focused and more emotion-focused strategies (deSouza-Talanco, Chaves, Nitri & Caramelli, 2008). Formal cognitive screening may overcome this limitation.

Theoretical implications

The model proposed by Hull and Kneebone (2007) highlights the complexity involved in falls risk, and makes attempts to integrate psychological, physical and social factors. Whilst not able to indicate causality, finding a significant FSe-falls relationship supports the inclusion of FSe in this model.

This study explored cognitive coping under the 'maladaptive coping' area of this model. Whilst directionality cannot be suggested from these findings, the significant associations FSe had with 'escape-avoidance' and 'self-controlling' coping, and the significant association between falls and 'self-controlling' coping suggests these strategies may be included in this area. Finding 'self-controlling' coping to be a partial mediator of the FSe-falls relationship means the sequence depicted by this model may be supported. This adds definition to the area of 'maladaptive coping,' which was previously absent. The current study's findings develop this model, highlighting cognitive coping responses which should be considered (i.e. 'self-controlling'), and ones which could be excluded.

Exploring the mediating role of behavioural coping may facilitate further definition of this area of the model. The cross-sectional design of this study means causality cannot be inferred, and exploring the role of coping responses in the FSe-falls relationship using longitudinal designs would further define this model. The mediation model only predicted 23% of falls variance, suggesting additional factors influence the FSe-falls relationship, which is reflected in Hull and Kneebone's (2007) model.

Clinical implications

Due to the highly significant association between FSe and falls, health professionals should consider assessing these areas together. It may be important for clinicians to determine if CDOPs' level of FSe is proportionate to their falls risk (Hadjistavropolous et al., 2011). This would involve multidisciplinary assessment of psychological, functional and physical factors. If their FSe was considered excessive compared with their physical falls risk, interventions may seek to improve FSe. Multi-factorial interventions have been shown to increase FSe (Tennstedt et al., 1998). Strengthening FSe may encourage individuals to approach situations with greater confidence, enabling them to apply their skills more successfully (Bandura, 1992) and facilitate more effective coping (Brennan, Schutte, & Moos, 2006). Multi-factorial interventions could be provided to those with low FSe irrespective of their physiological risk as lowered FSe may influence physical factors (e.g. balance), which may exacerbate falls risk (Delbaere, Sturnieks, Crombez & Lord, 2009b). It would be important for these interventions to be tested with regards to their impact on falls. As outcomes increasingly inform commissioning (DOH, 2011), clinicians should consider monitoring falls in order to generate this practice-based evidence.

If CDOPs' FSe was considered commensurate with their falls risk, interventions could address physical risk factors (e.g. balance training). Individuals with high falls risk should be followed-up with assessment of their FSe, to develop understanding of directionality of the FSe-falls relationship, and ensure these concerns were appropriately managed.

Finding 'self-controlling' coping acted as a partial mediator of the FSe-falls association suggests interventions aimed at reducing FrPC and falls could seek to reduce use of potentially unhelpful responses, such as 'self-controlling' coping. As

this is an emotion-focused response, interventions should not concentrate solely on problem-focused strategies and medical interventions, which are often common focuses in falls-prevention (Jung et al., 2009).

Future research

Due to this study's cross-sectional design, inferences regarding causality were limited. Longitudinal studies may develop understanding of the temporal relationship between variables. Measuring FSe, falls and 'self-controlling' coping at baseline, and conducting follow-up measurement would allow causal inferences to be made. This could be conducted in clinical settings through outcome measures in falls clinics.

Coping can affect outcomes in differing ways, and may play a moderating role in relation to a stressor (Holmbeck, 1997). As 'self-controlling' coping was significantly associated with FSe, future research may consider the interaction between these factors to identify a causal link (Kraaij et al., 2010), exploring if coping leads to reappraisal of this stressor (Brennan et al., 2006). This would require longitudinal designs, with baseline assessment of coping and FSe, with repeated measurement at follow-up.

When considering the positive impact of multi-factorial interventions for CDOP with low FSe (Tennstedt et al., 1998), assessing coping responses over the course of these interventions could explore if any strategies are associated with positive outcomes. Of particular interest would be if 'self-controlling' coping was associated with outcomes of these interventions. Research may consider the effect of these interventions on falls. This may inform Hull and Kneebone's (2007) model, bridging the gap between theory and practice.

Many factors may influence FSe and falls, and this is depicted in Hull and Kneebone's (2007) model. This model did not define 'maladaptive coping,' and the current study only explored cognitive coping. Further research could investigate the associations between FSe, falls and behavioural coping, and explore if behavioural coping mediated the FSe-falls relationship. It would be helpful to employ longitudinal designs to develop understanding of causality. This would contribute to Hull and Kneebone's (2007) model.

Conclusion

Investigating falls and FrPC is of timely importance due to the increasing aging population, and high prevalence rates of both falls and FrPC for CDOP. This large quantitative study explored cognitive coping responses to FSe and if these mediated between FSe and falls. FSe strongly predicted falls, and 'self-controlling' coping was found to be a partial mediator of this relationship.

Clinicians may wish to consider multi-disciplinary assessment and intervention to address the psychological, functional and physical factors associated with falls and FSe. Clinicians should assess for changes in FSe and falls together, monitoring changes in these areas when providing interventions designed to address them. Ascertaining changes in 'self-controlling' coping across interventions could develop understanding of the association this has with outcomes.

Future research may seek to replicate findings of this study in more diverse populations, utilising longitudinal designs to develop understanding of causality in the reported associations between FSe, 'self-controlling' coping and falls. Further research could also explore the mediating role of behavioural coping in the FSe-falls

relationship, to further define the area of 'maladaptive coping' in Hull and Kneebone's (2007) model.

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MAJOR RESEARCH PROJECT

CHRISTINE CATHERINE HUGHES

BSc HONS

SECTION C: Critical appraisal of the major research project

Running Head: Critical appraisal

Coping responses community-dwelling older people utilise to manage falls-related psychological concerns: Do they mediate between falls-related psychological concerns and falls?

Word count: 1999

A thesis submitted in partial fulfilment of the requirements of Canterbury Christ Church University for the degree of Doctorate of Clinical Psychology

July 2012

Salomons

Canterbury Christ Church University

Overview

This study explored coping responses community-dwelling older people (CDOP) employ in relation to their falls-related self-efficacy (FSe), and if this mediates the relationship between FSe and falls. This paper reflects on the process of undertaking the study, my learning and development, and future clinical and research implications.

Development of research competencies and skills

The skills I have developed and those I would like to improve following this study will now be considered.

Proposal and ethical approval

In the early stages of my research, I learnt about designing a study, formulating research proposals and gaining ethical approval. This developed my understanding of the range of areas to be accounted for early in the research process, such as consulting with service users, designing information sheets, consent forms and recruitment posters, selecting measures and considering ethical issues. In writing information sheets and my proposal I developed skills in presenting research in accessible and concise ways for the reader. On reflection, I feel my information sheets were of considerable length. Whilst I consulted with service users regarding the information sheets content, discussing the length with them may have been helpful. I feel more confident about writing future proposals and ethics applications, but would strive to write more concise information sheets.

I would like to develop my knowledge of applying to other organisations' research and ethics panels (e.g. National Health Service) to familiarise myself with their processes.

Administering questionnaires

To ensure understanding and avoid missing responses, I sat one-to-one with participants when completing questionnaires. The majority requested I complete questionnaires on their behalf. This may have influenced responses, with an expected increase in reported emotion-focused coping when questionnaires are administered via interview (Folkman & Lazarus, 1988). I noted my interviewing style developed as I undertook more interviews, improving my delivery, speed and engagement with participants. Interviewing and interacting with a range of people with varying experiences was extremely rewarding, and the rapport I developed felt important in ensuring participant understanding.

Data inputting and analysis

Inputting data was a long, intricate task. However, my speed and skills in doing this improved. Considerable time was devoted to the complex data analysis and my quantitative statistics skills greatly improved as a result. At times, the complexities of the analyses felt overwhelming, requiring me to reflect on my analysis in great depth. However, uncovering the relationships I sought to explore was rewarding. I developed understanding of multivariate analysis and bootstrapping, which was my first experience of these analyses. I would like to continue practicing these skills to build upon my understanding and interpretation of these analysis methods.

Whilst allowing me to develop my quantitative research skills, this study did not afford opportunities to develop skills utilising qualitative methodologies (e.g. grounded theory; Glaser & Strauss, 1967), which I would like to consider in future.

Recruitment

Due to the large sample required, I began contacting centres and collecting data early. The recruitment of such large numbers felt daunting, and so I invested significant time in meeting centre managers and attendees to discuss the study, and build relationships. This appeared invaluable in engaging centre staff and attendees, and ensuring their informed consent was gained.

In the early stages of data collection, I felt disheartened by the limited numbers of people who appeared available and willing to complete my questionnaires. However, as data collection progressed, this feeling reduced. I related this to the enthusiasm centre staff and attendees had about the study. They felt falls and falls-related psychological concerns (FrPC) were very common, and were keen to discuss the study and potential findings. Such enthusiasm motivated me, as I became aware of their sense of being valued by being involved in the study. Consequently, I became more confident about my ability to recruit participants. These experiences developed my understanding of the recruitment process and the challenges and rewards in data collection for large samples.

Writing the major research project

Writing Section A improved my broad literature searching skills and my ability to cover large volumes of literature clearly and succinctly, whilst still allowing for elements of critical consideration. This was challenging and required constant

redrafting and re-evaluation of the literature. However, I would feel more competent in future if required to undertake such a review again.

My skills of interpreting and presenting findings of complex data analysis improved when writing Section B. Linking these to my hypotheses allowed me to consider the importance of having a coherent narrative within research.

When reviewing drafts of each section, I was aware of the importance of flow between them, whilst allowing them to be stand-alone papers. This presented challenges in avoiding repetition whilst maintaining clarity in each section. Whilst continually revisiting other sections of this thesis when writing another section was time-consuming, this was important in maintaining flow. Feedback from my supervisors was invaluable, and highlighted the importance of gaining external perspectives when undertaking research. This also developed my skills of integrating others feedback.

Study improvements

Cognitive abilities

The cognitive abilities of participants were considered by speaking with centre staff who knew participants well, and when gaining an individual's consent. Whilst all participants were considered capable of consenting and completing questionnaires, the lack of formal cognitive assessment means responses may have been affected by cognitive difficulties. It may have been helpful to formally assess individuals' cognitive abilities. However, this would have been time-consuming and increased the burden on participants.

Measures

Originally two coping measures were employed; the COPE (Carver, Scheier, & Weintraub, 1989) and the Ways of Coping Questionnaire (WAYS; Folkman & Lazarus, 1988). When administering these together, participants felt questions were repetitive (e.g. “are you trying to catch me out? I answered that already”).

Additionally the time taken to complete both measures was considerable and participants noted the process took longer than they had hoped. I reflected on this within supervision and decided to remove the COPE. This was due to its poorer psychometric properties compared with the WAYS. The COPE ‘turning to religion’ subscale was retained because it was felt the WAYS did not fully capture this. As religion has been suggested to be used by CDOP to manage physical and mental health difficulties (Musick, Traphagan, Koeing & Larson, 2000) it felt important to explore this response.

The WAYS was chosen following discussions within supervision and after a review of coping measures (Schwarzer & Schwarzer, 1996). The theoretical underpinnings and psychometric properties reported by the authors indicated this to be the most suitable measure. Whilst the reviews of available measures did not identify a more suitable measure for this research, the study could have been improved by utilising coping measures with improved reliability with this population. Piloting the two coping measures (the COPE and the WAYS) may have been helpful if more time had been available (Peat, Mellis, Williams, & Xuan, 2002), to ascertain which had improved reliability with this population.

Participants

A limitation of this study was the lack of ethnic diversity within the sample and limited number of male participants. Had more time been available, continuing recruitment could have been advantageous to allow for gender comparisons, and enabled recruitment of a more ethnically diverse sample. This may have permitted generalisability to more ethnically diverse communities and community-dwelling older males. Prior to approaching centres for recruitment, it may have been helpful to identify centres in areas where populations were known to be more ethnically diverse or spreading recruitment over several areas (e.g. north, south, east and west of county).

Recruitment was challenging in some centres due to certain days having a greater proportion of attendees with significant cognitive impairment. Consideration of this with centre managers prior to visiting centres may have avoided me attending on days where there were increased numbers of individuals with high levels of need. This may have reduced additional work for the staff, and minimised confusion of some attendees who were unable to participate but were unsure why I was there.

Some centres provided a private space for me to interact with attendees and complete questionnaires, whilst others did not have such facilities. On occasion, questionnaires were completed in the corner of a large communal room. Whilst participants were always asked if they were happy to complete questionnaires in this way, this may have affected their ability to openly discuss their concerns and coping. Arranging a more private area with centre managers prior to my visits may have helped overcome this.

Recommendations and changes to clinical practice

With falls and FrPC being costly to the NHS and CDOP, there is a need to focus on reducing them and improving their management (Department of Health [DOH], 2001). The complexity of FrPC and falls is apparent from the reviewed literature and this study's findings, and highlights the need for holistic assessment and intervention, including the provision of psychological support alongside commonly provided medical and physical interventions (National Institute for Clinical Excellence, 2004). Working closely with other professionals would facilitate consideration of CDOP's physical, psychological and social needs.

Interventions should aim to address emotion-focused as well as problem-focused coping, in reflection of the findings that 'self-controlling' coping, an emotion-focused response, partially mediated the FSe-falls relationship. Clinical Psychologists are well placed in teams to facilitate psychological thinking about these difficulties, and provide training to other professionals working with them. This training may be in the use of specific skills (e.g. cognitive-behavioural thought challenging techniques), but also in generating holistic formulations of CDOP's difficulties.

In light of this study's findings, it may be helpful for clinicians to monitor FSe, 'self-controlling' coping and falls when individuals present with FrPC or after falling. Monitoring these factors following interventions aimed at addressing FSe and falls using outcome measures may develop understanding of the interventions impact upon the aforementioned factors. This would enable practice-based evidence to inform evidence-based practice (DOH, 2011). Monitoring these factors over an extended follow-up may develop understanding of causality between these variables.

Future research

Whilst this study found 'self-controlling' coping partially mediated the FSe-falls relationship, much of the association between FSe and falls is still not understood. Future research may seek to explore the mediating role other coping responses (e.g. behavioural strategies; Filiatrault & Desrosiers, 2011), play in the FSe-falls relationship.

Whilst multi-factorial interventions have been shown to increase FSe (Tennstedt et al., 1998), there is limited understanding of which components are effective in producing this outcome (Jung, Lee & Lee, 2009). These interventions currently address some coping strategies (e.g. problem-solving). The role these coping strategies play in the reported positive outcomes could be explored using randomised-controlled designs (e.g. problem-solving alone, problem-solving combined with physical exercise, physical exercise alone), measuring changes in FSe and falls as outcomes.

Researching the role family members play in CDOP's levels of FSe and 'self-controlling' coping may be important, since the findings from this study show that 'self-controlling' coping, which related to not sharing how bad things were with others, was found to be a partial mediator of the FSe-falls relationship. Research suggests family members and carers may discourage CDOP from engaging in activities or take over roles for the CDOP (e.g. shopping trips), which may impact on the individual's FSe (Tanner, 2007), and their willingness to share their concerns. Whilst not formally documented due to using standardised questionnaires, several respondents commented that their family encouraged them not to undertake activities, or took on roles on their behalf due to their families' concerns about their likelihood of falling. They reported this impacted on their belief that they would fall,

and their associated feelings of competence. The role these individuals play in the development and course of CDOP's FSe and coping may be important to consider when ascertaining how best to foster CDOP's sense of self-efficacy, and facilitate more effective coping. This could be explored using interpretative phenomenological analysis (Smith, Flowers, & Larkin, 2009). Semi-structured interviews could seek to ascertain who or what influences CDOP's FSe and willingness to share their concerns, and what the messages from these sources were. Interviews could explore how CDOP perceive these messages have impacted on their FSe, and willingness to share their concerns.

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MAJOR RESEARCH PROJECT

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BSc HONS

Falls-related psychological concerns in the community-dwelling older adult
population

SECTION D: Appendices

A thesis submitted in partial fulfilment of the requirements of Canterbury Christ
Church University for the degree of Doctorate of Clinical Psychology

July 2012

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Appendix 1: Literature search strategy for Section A

Search strategy

An advanced search was conducted to identify relevant papers that were published between no start date and December 2011-Week 3 using PsycINFO, Ovid Medline, Web of Knowledge, ASSIA and Cochrane Database of Systematic Reviews (CSDR). They were searched using the same strategy. Additionally the reference lists of all selected articles were reviewed to identify any additional relevant papers. Key search terms were chosen by reviewing MeSH headings, and also identifying key words from previous reviews (Scheffer et al., 2008). These included words relating to 'older people' in order to define the population and 'fall,' 'fear' and additional related terms (e.g. 'efficacy'). Studies were limited to those published in the English language.

MeSH terms and words used to search electronic databases

1	2	3	4
Elderly	Fall	Anxiety	'falls self-efficacy'
Frail	Falls	Fear	'falls-related efficacy'
Aged	Accidental fall	Concern	'fear of falling'
Older person/s		Worry	'FOF'
Older adults		Anxious	'Balance-confidence'
		Efficacy	
		Self-efficacy	
		Confidence	
		Balance confidence	

Columns two and three were combine with 'and,' and the results if this were combined with column for with 'or.' The results of this search were then combined with column one with 'and.'

Search	Number of studies generated
Column 1	9929548
Column 2	808947
Column 3	5049872
Column 4	23732
Column 4 combined using 'or' with Column 3	5050835
Column 1, 2, combined 3 and 4 combined using 'and'	3798

When limited to those studies published in English and removing duplicates, this reduced the total search to 2376 papers, of which 50 papers were selected for review of the empirical factors associated with FrPC.

Inclusion/exclusion criteria

Abstracts were read and inclusion and exclusion criteria applied. Papers were included where the authors measured or explored the psychological correlates or themes associated with FrPC in CDOP. These included anxiety, depression, quality of life, activity avoidance/restriction and coping. As behaviour is considered related to psychological constructs, this is included for the basis of this review. Papers were excluded if they did not address psychological factors, or only addressed physical factors (e.g. balance, gait, age, gender). Papers were also excluded if participants were aged under 60 years, they were not CDOP (e.g. they were inpatients or resided in a supported care facility such as a nursing home) or the papers were not published in the English language. Intervention studies were also excluded

Appendix 2: Summary table of measures of falls-related psychological concerns

Concept	Measure name	Number of item	Response scale	Reliability	Validity
<i>Fear Of</i>	Yes/no question	1	Yes/no	-	-
<i>Falling (FOF)</i>					
	Closed ended question	1	3 point scale Not at all, somewhat, very much	Test-retest (at two weeks)=0.66	Convergent Concurrent
	Has fear of falling made you avoid any activities?	1	Yes/no	Test-retest (at 4-7 days)=0.36	
	Survey of activities and fear of falling in the elderly (SAFFE)	33	4 point likert scale (range 0-3)	Cronbach's $\alpha=0.91$	Concurrent Convergent Criterion
	Modified SAFFE (m SAFFE)	17	3 point likert scale (range 1-3)	Cronbach's $\alpha=0.91-0.92$ Test retest (at 6 months)=0.75	Concurrent Construct
	University of Illinois at Chicago Fear of Falling measure	16	3 point likert (range 1-3)	Cronbach's $\alpha=0.93$	
	Geriatric Fear of Falling measure	41	Range 1-5	Cronbach's $\alpha=0.86-0.88$ Test retest (at	Concurrent Construct

				two weeks)=0.88	
<i>Falls-related</i>	Falls Efficacy	10	10 point	Cronbach's	Concurrent
<i>Self Efficacy</i> (FSe)	Scale (FES)		numerical rating (range=1-10)	$\alpha=0.90$ Test retest (at 4-7 days)=0.71	Convergent Construct
	Amended FES (amFES)	10	4 point likert scale (range 1-4)		Convergent
	Revised FES (rFES)	10	11 point numerical rating (range=0-10)	Cronbach's $\alpha=0.95$ Test retest=0.88	Discriminant
	Modified FES (mFES)	14	11 point numerical rating (range=0-10)	Cronbach's $\alpha=0.95$ Test retest=0.95	Discriminant
	FES- international (FES-I)	16	4 point likert scale (range 1-4)	Cronbach's $\alpha=0.96$ Test- retest=0.96	Discriminant
<i>Balance</i> <i>Confidence</i>	Activities-specific Balance Confidence Scale (ABC)	16	101 point numerical rating (range 0-100)	Cronbach's $\alpha=0.96$ Test retest=0.95	Concurrent Convergent Discriminant Construct
	ABC-6	6	101 point numerical rating (range	Cronbach's $\alpha=0.90-0.91$	Discriminant

			0-100)		
	Modified ABC (mABC)	16	21 point scales (range 0-100)	Cronbach's $\alpha=0.95$	Discriminant
	Balance Self- Perceptions Test	12	5 point rating scale (range 1-5)		Convergent
<i>Outcome</i> <i>Expectancy</i> <i>(OE)</i>	Consequences of falling scale	12	4-point likert scale (range 1-4)	Cronbach's $\alpha=0.86-0.94$ Test re-test (at 6 months) $r=0.61-0.64$	

Appendix 3: Summary table of the studies critiqued in Section A

Variable	Study	Population	Study design	How variable measured	FrPC construct measured	Method of analysis	Association
<i>Depression</i>	Arfken, Lach, Birge & Miller, 1994	N=890 CDOP Fell into four age groups 66-70 years: N=243 71-75 years: N=240 76-80 years: N=203 81+ years: N=204	Cross-sectional	GDS	FOF: at the present time are you very fearful, somewhat fearful or not fearful that you may fall?	Chi-squared or Kruskal-Wallis Rank Test, multivariate logistic regression	Those who were very fearful of falling significantly likely to have increased levels of depression ($p < 0.0001$) at bivariate level. Still true after adjusted for age and gender. However, depression was not a significant predictor of FOF in multivariate analysis.
<i>Depression</i>	Austin, Devine, Dick, Prince & Bruce, 2007	1282 community dwelling older women aged 70 years and over	longitudinal 3 year follow-up	SF-36 mental component summary used to assess depression	FOF=single questions: are you afraid of falling (yes/no) Do you limit any household activities because you are frightened you may fall? (yes/no) Do you limit any outside activity because you are frightened you may fall? (yes/no)	Chi-squared, ANOVA, Kruskal-Wallis H test, logistic regression	Cross sectional: At bivariate level, FOF associated with depression (with FOF MCS score: 51.6 ± 9.4 , without FOF: 54.4 ± 8.0 , $p < 0.01$). Depression significantly predicted FOF in multivariate analysis. Longitudinal: those with persistent FOF (reported at time one and at follow up) FOF associated with higher frequency of depression (Never FOF MCS=6.2, Persistent FOF MCS=16.9, $p < 0.05$) in univariate analysis. For persistent FOF, MCS score (depression) was significant independent predictor of FOF (OR=2.58, 95% CI=1.56-4.28). Depression did not predict new-onset FOF ($p > 0.05$) in bivariate or multivariate analysis.
<i>Depression</i>	Burker, Wong, Sloane, Mattingly, Preisser & Mitchell, 1995	N=126 CDOP Dizzy N=60 Non dizzy N=66 Mean age 75.5 years (SD=7.4)	Cross-sectional	Depression subscale of SCL-90-R	FSe: three questions from FES: Indicate how confident they were they could complete the following tasks without falling: cleaning house, getting dressed/un	Stepwise multiple regression	SCL-90-R depression score significantly independently predicted FSe in multiple regression in dizzy participants ($p = 0.008$) Higher depression scores were predictive of higher FSe scores and there individual affect remained consistent across groups (dizzy v non-dizzy).

					dressed and preparing meals (6 point likert scale: extremely [1], not at all [6])		
<i>Depression</i>	Chandler, Duncan, Sanders & Studenski, 1996	N=149 male CDOP aged 70-104 years	Cross-sectional	GDS	FOF: would you say that you are somewhat afraid, not afraid or very afraid of falling?	Independent t-test, logistic regression	Data spilt between previous fallers and those without a falls history. Non-fallers: Depression significantly greater in those who were very FOF (p=0.03) in bivariate analysis. Fallers: Depression was significantly associated with FOF in bivariate analysis (p=0.002). In logistic regression analysis, depression was a significant predictor of FOF (OR=1.4, 95% CI=1.2-1.7, p=not reported).
<i>Depression</i>	Chou & Chi, 2008	N=321 community dwelling older people aged 65 years or older. Mean age=72.6 years (SD=5.5)	Longitudinal 12 month follow-up	MDS depression rating scale assessed at baseline and 12 month follow up	FOF: 'do you limit going outdoors due to fear of falling?' (0=does not limit, 1=limits activity). Assessed at baseline and 12 month follow up	Multiple regression	FOF at baseline predicted depression at 12 month follow up (b=0.10; p<0.05) in multiple regression analysis, but this disappeared if adjusted for IADL limitation or social functioning Depression at baseline predicted FOF at 12 month follow up (b=0.25, p<0.01) in multiple regression analysis but when adjusted for baseline depression level, no longer significant.
<i>Depression</i>	Delbaere, Close, Brodaty, Sachdev & Lord, 2010a	N=500 aged 70-90 years CDOP	Cross-sectional	GDS	FES-I to measure perceived risk of falling	Logistic regression	Depression significantly and independently predicted FES-I scores (p<0.001) in multivariate analysis.
<i>Depression</i>	Deshpande, Metter, Bandinelli, Laurentani, Windham & Ferrucci, 2008b	N=926 CDOP aged 65 years or over Stratified into four age groups: 65-70, 71-80, 81-90, 90 years+	Cross-sectional	CES-D	FOF: SAFFE	'Correlation analysis,' multiple linear regression	Participants with higher levels of FOF had significantly more depressive symptoms (p<0.001) in bivariate analysis. However, in multivariate regression analysis it was found that depression did not significantly predict FOF.
<i>Depression</i>	Deshpande Metter, Laurentani, Bandinelli & Ferrucci,	342 CDOP aged 65 years and older	Cross sectional	CES-D	FOF: SAFFE Categorise to FOF related to	'general linear model multivariate analysis'	In multivariate analysis, higher depressive symptoms were independently predicted FOF exclusively for activities within the home

	2009				activities in the home environment, FOF related to activities in the community environment.		environment (p<0.01).
<i>Depression</i>	Downton & Andrews, 1990	N=203 CDOP aged 75-84 years	Cross-sectional	Schwab Depression Inventory	Do you limit your activity due to FOF? (yes/no)	Mann-Whitney U-Wilcoxon rank sum test	FOF was significantly associated with higher depression scores (5.57 v 9.34, p<0.0001) in bivariate analysis.
<i>Depression</i>	Drozdzick & Edelstein, 2001	34 CDOP mean age 74.35, (SD=8.88) all fallers	Cross-sectional	GDS-15	FOF: three item questionnaire scored on 5 point likert scale. Measured frequency, severity and impact of FOF. Severity was used as one measure and the other two questions combined as a composite score	ANOVA	No significant difference between high and low fear fallers on the GDS-15 F(1,32)=0.775, p>0.05).
<i>Depression</i>	Fortinsky, Panzer, Wakefield & Into, 2009	N=329 CDOP mean age 79.1, SD 7.1	Cross-sectional	CES-D	BC: ABC	Pearsons correlation	ABC score negatively correlated with DES-D score (p<0.0001) at bivariate level.
<i>Depression</i>	Hellstrom, Vahlberg, Urell & Emtner, 2009	N=80 CDOP aged 65 years with COPD	Cross-sectional	Hospital Anxiety and Depression Scale-Depression subscale (HADS-HAD-D)	FOF: single question 'are you afraid of falling?' (yes/no) Categories: FOF or no FOF	Unpaired t-test	Those with FOF as measured by single question had significantly higher levels of depression (p=0.012) at bivariate level. Did not compare FOF scores with depression in multivariate analysis.
<i>Depression</i>	Kempen, van Haastregt, McKee, Delbaere & Zijlstra, 2009	N=540 CDOP aged 70 years or over with 'at least mild FOF'	Cross-sectional	HADS-HAD-D	FOF: are you afraid of falling? (never, almost never, sometimes, often, very often)	t-test/chi-squared, logistic regression	In bivariate analysis, depression was significantly correlated with increased FOF level (6.1 v 7.7, p<0.05). However, depression did not predict FOF in logistic regression analysis
<i>Depression</i>	Kressig, Wolf,	N=287 community	Cross-sectional	Center for Epidemiologi	FSE: FES BC: ABC	Pearson or Spearmans	Significant association between depression and

	Sattin, O'Grady, Greenspan, Curns & Kutner, 2001	dwelling older people aged 70 years and over		cal Studies Depression Scale (CES-D)		rank correlation, logistic regression	FES score (p=0.007) and ABC score (p<0.001) at bivariate level. Depressed individual twice as likely to be fearful of falling compared to those who were not depressed (FES: OR:2.1, 95% CI=1.2-3.6; ABC: OR:2.6, 95% CI=1.5-4.4) in bivariate analysis. For ABC, depression remained significant predictor in multivariable logistic regression (OR: 1.6, 95% CI=1.3-2.3, p=0.012) For FES, OR = 'comparable' (p1460) with OR for ABC, suggesting depression was a significant predictor of FSe.
<i>Depression</i>	Lach, 2005	N= 1358 time one N=890 time 2 N=842 at time three N=600 at time four CDOP aged 65-80 years	Longitudinal -follow up after 4 years	GDS-30	FOF: At the present time are you very fearful, somewhat fearful, or not fearful that you might fall (again)?	t-test	At time two in cross-sectional analysis, GDS score was significantly positively correlated with level of FOF (12.21 v 13.6, p=0.000) in bivariate analysis. Not explored in longitudinal data
<i>Depression</i>	Lee, MacKenzie & James, 2008	N=9 CDOP who were high or moderately fearful of falling	Cross-sectional	NA-semi-structured interviews comprising open ended questions: Would you describe yourself as depressed?	FOF: how afraid are you that you will fall and hurt yourself in the next year? (very, fairly, a little, not at all). Very and fairly responses were classified as having a high or moderate level of FOF	Phenomenological analysis	Only two participants acknowledged extended periods of felling low and depressed. All were satisfied with their lives and had positive views of the future. Those who reported depression stated it was a short-term effect
<i>Depression</i>	Miller & Pantel, 2003	58 CDOP (M=79.2, range 71-96 years)	Cross-sectional	Geriatric Depression Scale (GDS)	FSe: mFES FOF: worry about falling scale of Modified falls interview schedule-worry (MFIS-W)	Pearson correlation	mFES significantly positively correlated with depression (p<0.01) at bivariate level. MFIS-W was not significantly correlated with depression at bivariate level.
<i>Depression</i>	Murphy, Dubin &	N=313 female	Longitudinal -	CES-D	FOF: are you afraid	Chi-squared	Depression was not significantly associated with

	Gill, 2003	CDOP aged 72 years and older	1 year follow up		of falling? (yes/no)		the development of FOF at follow up (p=0.19) in bivariate analysis.
<i>Depression</i>	Murphy, Williams & Gill, 2002	N=1064 CDOP aged 72 years and older	Population based cross-sectional	CES-D	FOF: are you afraid falling (yes/no)	Chi-squared	Significantly different scores on CES-D in no fear v fear of falling v fear with activity restriction with those with FOF and activity restriction significantly higher scores (17.0 v 24.8 v 39.6, p=0.001) in bivariate analysis. However, all scored over the clinical cut of (16) for depression.
<i>Depression</i>	Oh-Park, Xue, Holtzer & Verghese, 2011	N=380 CDOP without FOF at baseline aged 70 years or older	Longitudinal	GDS	FOF: did you have any FOF in the last two months since our last interview? (yes/no) FOF incident=reporting of FOF Transient FOF= only reporting FOF during one interview for the minimum two years Persistent FOF= reporting two or more times presence of FOF	'correlation methods' and Cox proportional hazards regression, polytomous logistic regression	Developing FOF was associated with increased depression (p<0.01) in bivariate analysis. Depression was an independent risk factor for incident FOF (p<0.01) in multivariate analysis. 20.6% reported transient FOF, 30.9% reported persistent FOF. Depression was associated with increased risk of transient and persistent FOF (p<0.01) in multivariate analysis. Depression predicted transient and persistent FOF.
<i>Depression</i>	Reyes-Ortiz, Ayele, Mulligan, Espino, Berges & Markides, 2006	1341 CDOP aged 70 years and older	Longitudinal with two year follow up	CES-D	FOF: How afraid of you of falling? (not at all, somewhat, fairly or very afraid)	Chi-squared, logistic regression	FOF was associated with high depressive symptoms in bivariate analysis (p<0.001). However, depression was not a significant independent predictor of FOF in a logistic regression analysis.
<i>Depression</i>	Shin, Kang, Kim, Jung, Kim, Hong, Yun & Ma, 2010	N=213 CDOP aged 60 years or older	Cross-sectional	K-GDS (Korean version of GDS)	FSE but referred to as FOF: FES	'correlation and hierarchical regression analyses'	Depression significantly correlated with FES scores (r=0.501, p<0.001) in bivariate analysis. In hierarchical multiple regression analysis, when depression was added to the model, the variance explained increased. Additionally depression remained a statistically

							significant influence on FOF ($\beta=0.348$, $p<0.001$).
<i>Depression</i>	Talley, Wyman & Gross, 2008	N=272 CDOP females aged 70-98 (M=78.7, SD=4.9)	Cross-sectional	GDS	FOF=SAFF E BC=ABC	Pearson or point-biserial correlation coefficients	FOF was significantly positively associated with depression in bivariate analysis BC was significantly negatively correlated with depression in bivariate analysis
<i>Depression</i>	van Haastregt, Zijlstra, van Rossum, van Eijk & Kempen, 2008	N=540 CDOP aged 70-92 years (mean=77.6, SD=4.8)	Cross-sectional	HADS HAD-D scale	FOF: single question 'are you afraid of falling?' (yes/no) 'Do you avoid certain activities due to fear of falling?' (yes/no)	Independent samples t-test, logistic regression	Symptoms of depression occurred 'considerably more' ($p=0.189$) in persons with severe FOF compared to those with mild FOF (26.1% v 12.2%) and was depression was a significant independent predictor of FOF (OR=2.74, 95% CI=1.69-4.47, $p<0.001$) in multivariate analysis (increased depression associated with increased severity of FOF). When anxiety and depression were included in the multivariate analysis, only depression remained independently associated with FOF (OR=2.43, 95% CI=1.44-4.13, $p<0.001$).
<i>Anxiety</i>	Burker et al., 1995	N=126 CDOP Dizzy N=60 Non-dizzy N=66 Mean age 75.5 years (SD=7.4)	Cross-sectional	Anxiety subscale of SCL-90-R	FSe: three questions from FES: Indicate how confident they were they could complete the following tasks without falling: cleaning house, getting dressed/un dressed and preparing meals (6 point likert scale: extremely [1], not at all [6])	ANOVA and two sample t-test, Stepwise multiple regression	SCL-90-R anxiety score were significantly associated with FSe in bivariate analysis (p =not stated). However, anxiety did not significantly predict FSe for dizzy participants in multivariate analysis.
<i>Anxiety</i>	Downton & Andrews, 1990	N=203 CDOP aged 75-84 years	Cross-sectional	Anxiety subscale of General Health Questionnaire	FOF: Do you limit your activity due to FOF? (yes/no)	Mann-Whitney U-Wilcoxon rank sum test	FOF was significantly associated with higher anxiety scores (2.65 v 4.39, $p=0.0007$) in bivariate analysis.

Anxiety	Drozdzick & Edelstein, 2001	34 CDOP mean age 74.35, SD=8.88) all fallers	Cross-sectional	State-trait anxiety index (STAI)	FOF: three item questionnaire scored on 5 point likert scale. Measured frequency, severity and impact of FOF. Severity was used as one measure and the other two questions combined as a composite score	ANOVA	General anxiety differed significantly between those with high and low fear (F(1,32)=6.95, p<0.01).
Anxiety	Hellstrom et al., 2009	N=80 CDOP aged 65 years with COPD	Cross sectional	Hospital Anxiety and Depression Scale: Anxiety subscale (HADS-HAD-A)	FOF: single question 'are you afraid of falling?' (yes/no) Categories: with FOF or no FOF	Unpaired t-test	Those with FOF as measured by single question had significantly higher levels of anxiety (p=0.008) at bivariate level Did not compare FOF scores with anxiety in multivariate analysis
Anxiety	Kempen et al., 2009	N=540 CDOP aged 70 years or over with at least mild 'FOF	Cross-sectional	HADS-HAD-A	FOF: are you afraid of falling? (never, almost never, sometimes, often, very often)	Chi-squared/ independent t-tests, logistic regression	In univariate analysis, anxiety was significantly correlated with increased FOF level (6.5 v 8.4, p<0.05). However, anxiety did not predict FOF in a logistic regression analysis
Anxiety	Miller & Pantel, 2003	58 CDOP (M=79.2, range 71-96 years)	Cross-sectional	Beck Anxiety Inventory (BAI)	FSe: mFES FOF: worry about falling scale of Modified falls interview schedule-worry (MFIS-W)	Pearson correlation	mFES significantly positively correlated with anxiety in bivariate analysis (p<0.01) MFIS-W was significantly correlated with anxiety in bivariate analysis (p<0.01)
Anxiety	Murphy, et al., 2003	N=313 female CDOP aged 72 years and older	Longitudinal baseline and 1 year follow up	STAI	FOF: are you afraid of falling? (yes/no)	Chi-squared, binominal regression	Anxiety was significantly associated with developing FOF at follow up in bivariate analysis (p=0.02). However, anxiety did not predict FOF in multivariate analysis (RR=1.41, 95% CI=1.35-2.84, p>0.05).
Anxiety	Murphy, et al., 2002	N=1064 CDOP aged 72 years and older	Cross-sectional	STAI	FOF: are you afraid falling (yes/no)	Chi-squared	Significantly different scores on STAI in no fear v fear of falling v fear with activity restriction with those with FOF and activity restriction significantly higher scores

							(38.4 v 59.7 v 70.2, p=0.001) However, all scored over the clinical cut of (32) for anxiety. They did not explore anxiety in relation to FOF in multivariate analysis, rather anxiety in relation to activity restriction associated with FOF.
Anxiety	van Haastregt et al., 2008	N=540 CDOP aged 70-92 years (mean=77.6, SD=4.8)	Cross-sectional	HADS HAD-A scale	FOF: single question 'are you afraid of falling?' 'Do you avoid certain activities due to fear of falling?' Responses to both questions: never, almost never, sometimes, often, very often	Independent samples t-test, logistic regression	Symptoms of anxiety occurred 'considerably more' (p189) in persons with severe FOF compared to those with mild FOF (28.2% v 16.6%) and anxiety significantly independently predicted FOF (OR=1.84, 95% CI=1.18-2.87, p=0.007) in multivariate analysis. When anxiety and depression were included in the analysis, anxiety was no longer significantly independently predictive of FOF (OR=1.32, 95% CI=0.81-2.15, p=0.273).
QoL	Arfken et al., 1994	N=890 CDOP Fell into four age groups 66-70 years: N=243 71-75 years: N=240 76-80 years: N=203 81+ years: N=204	Cohort study	QoL measure focusing on frequency of leaving home building but not yard, frequency of leaving home and yard and satisfaction with life ('very,' 'somewhat' or 'not at all' satisfied)	FOF: at the present time are you very fearful, somewhat fearful or not fearful that you may fall?	Chi-squared, multiple logistic regression	Those who were very fearful were most likely to have decreased QoL at bivariate level: Infrequently leave building but not yard (p<0.0001) Infrequently leave building and yard (p<0.0001) Less than very satisfied with life (p<0.0001) Still true after adjusted for age and gender. However, QoL did not significantly predict FOF in a multiple logistic regression.
QoL	Austin, et al., 2007	1282 community dwelling older women aged 70 years and over	longitudinal 3 year follow up	SF-36 MCS scores	FOF: single questions: are you afraid of falling (yes/no) Do you limit any household activities because you are frightened you may fall? (yes/no) Do you limit any outside	Chi-squared/AN OVA/ Kruskal Wallis H Tests, forward-step logistic regression	In bivariate analysis at baseline, FOF was associated with reduced QoL (p<0.01). MCS score (which was related to depression presence by the authors), remained a significant predictor of FOF in multivariate analysis for those with persistent FOF compared to those who never reported FOF (p<0.05). However MCS scores did not predict new FOF development.

					activity because you are frightened you may fall? (yes/no)		
QoL	Brouwer et al., 2004	N=25 CDOP who reported being FOF of falling aged 65 years or older Control group who did not report FOF N=25 CDOP mean age 76.3 (SD=5.2 years)	Cross-sectional	SF-36 Physical summary component (PCS) Mental summary component (MCS)	BC: ABC	Independent t-test, stepwise multiple regression	Significant differences were found between those with FOF and those without with regard physical summary scores ($p<0.001$) in bivariate analysis. However, scores on the mental component summary were not significantly different ($p=0.538$) in bivariate analysis. In stepwise multiple regression, the strongest indicator of ABC scores was the physical component scores of the SF-36 (accounting for 48.7% of the variance).
QoL	Chang, Chi, Yang & Chu, 2010	N=4056 CDOP aged 65 years and over	Cross-sectional	SF-36 PCS and MCS	FOF: are you afraid of falling? (yes/no)	Chi-squared, ANOVA, multiple linear regression	FOF had significant negative affect on HrQoL on both subscales (PCS and MCS) ($p<0.001$) at bivariate level. Subjects with FOF had lower PCS scores, secondary only to falls history Subjects with FOF had lower MCS scores In multiple linear regressions, FOF was an independent risk factor for PCS after adjustment for confounders ($p<0.001$). Also FOF was independent risk factor for MCS after adjustment for confounders ($p<0.001$). For MCS, FOF was the only significant predictor in the multivariate analysis.
QoL	Davis, Marra & Liu-Ambrose, 2011	N=135 female CDOP aged 65-75 years	Cross-sectional	EuroQoL-5D	BC: ABC	Pearson product moment correlation co-efficient, multiple linear regression	Bivariate: ABC scores were significantly correlated with HrQoL ($p<0.01$) In multivariate linear regression, ABC scale scores was a significant and independent predictor for HrQoL ($p<0.01$).
QoL	Howland, Lachman, Walker-Peterson, Cote, Kasten & Jette, 1998	N=266 CDOP aged 62-93 years	Cross-sectional	Mental Component Scale (MCS) of SF-36	FOF: how afraid are you that you will fall and hurt yourself in the next	t-tests, logistic regression	In bivariate analysis, reduced SF-36 MCS significantly associated with FOF v those who denied FOF (mean score=66.9 v 77.5, $p=0.000$) In logistic regression

					<p>year? (very to not at all on 4 point scale)</p> <p>Perceived control over the likelihood of falling asked to rate the validity of the following statements:</p> <p>I can reduce my risk of falling, I can overcome my worry about falling, there are things I can do to keep myself from falling, falling is something I can control (definitely true, mostly true, unsure, mostly false, definitely false)</p>		<p>analysis QoL did not predict FOF (OR=0.990, 95% CI=0.975-1.005, p=0.181)</p>
QoL	Huang & Wang, 2009	N=168 CDOP aged 60 years or older	Cross-sectional (Baseline data from longitudinal measure validation study)	World health organization QOL-BREF Subscale score: Physical health (PH) Psychological (P) Social relationships (SR) Environment (E) Total (T)	FSE: FES BC: ABC FOF: geriatric fear of falling measurement (GFFM)	Pearson correlation	<p>The FES scores were significantly correlated with all WHOQOL subscale scores, except social relationships (PH r=0.58, p<0.001; P r=0.45, p<0.001; SR r=0.15, p>0.05; E r=0.29, p<0.01; T r=0.46, p<0.001) in bivariate analysis.</p> <p>The ABC scores were significantly correlated with all WHOQOL subscale scores (PH r=0.61, p<0.001; P r=0.48, p<0.001; SR r=0.23, p<0.01; E r=0.25, p<0.01; T r=0.48, p<0.001) in bivariate analysis.</p> <p>The GFFM scores were significantly correlated with all WHOQOL subscale scores (PH r=-0.63,</p>

							p<0.001; P r=-0.36, p<0.001; SR r=-0.22, p<0.01; E r=-0.30, p<0.01; T r=-0.46, p<0.001) in bivariate analysis.
QoL	Iglesias, Manca & Torgerson, 2009	Female CDOP	<p>Paper combining data from two randomised controlled trials and one cohort study- Longitudinal designs</p> <p>Calcium and vitamin d study: N=3314 women mean age 76.8. data collected at baseline and every 6 months for between two years and 42 months (mean follow up 24 months)</p> <p>Hip protector study: N=4196 women mean age 77.8 Follow up between two years and 42 months (median 28 months). Data collected at 6 monthly intervals.</p> <p>Epidemiological risk factor study: prospective comprehensive, cohort study N=4292 women, mean age 76.9 years. Data collected at baseline and</p>	Subscales of EuroQol-5D	FOF: 6 point likert scale: worried about falling all the time- worried none of the time	Hierarchical 'multilevel' regression or ANCOVA	<p>In hip protector trial: Significant association between reduced QoL and increased FOF in bivariate analysis. FOF was a significant predictor of reduced QoL in multivariate analysis.</p> <p>Calcium and vitamin D prevention trial: Higher fear of falling was significantly associated with lower EQ-5D score at bivariate level. Anxiety/depression dimension had strongest impact. FOF predicted reduced QoL in multivariate analysis.</p> <p>Epidemiological risk factors study: FOF was significantly negatively correlated with QoL in bivariate analysis. Largest quality of life lost was for FOF when compared with falls and fractures</p>

QoL	Lachman, Howland, Tennstedt, Jette, Assmann, & Peterson., 1998	N=270 CDOP aged 62-93 (M=76.16 SD=7.91)	12 months Cross-sectional	MOS SF-36	FSe= FES FOF= SAFFE FOF=single questions: Are you afraid of falling? (very- not at all, 4 point likert scale), Are there things you don't do because you are afraid you might fall? (yes/no) Are there things you have stopped doing because you are worried you might fall? (yes/no)	'correlation' analysis, multiple regression analysis	All QoL subscales were significantly correlated with SAFFE FOF subscale scores and FES scores in bivariate analysis. All but 'inactive leisure' QoL subscale was significantly correlated with FOF as assessed using single question in bivariate analysis. SAFFE subscales (FOF) were significant independent risk factor for poor quality of life in multiple regression analysis.
QoL	Li, Fisher, Harmer, McAuley & Wilson, 2003	N=256 CDOP aged 70-92 years (mean=77.5 years, SD=5.0)	Cross-sectional	SF-12 mental and physical component scores reported	FOF: SAFFE which looked at FOF level and associated activity restriction	ANOVA, MANOVA	Significant differences found between high fear and low fear groups on QoL measures In an ANOVA: High fear of falling group had significantly poorer QoL as measured on both physical and mental component subscales (MCS: p=0.0003; PCS: p=0.0001). In a MANOVA: Significant difference between low and high fear groups with regards their level of QoL, with Low fear showing significantly higher QoL. QoL was a dependent variable and groups were 'low fear' and 'high fear.'
QoL	Suzuki, Ohyama, Yamada & Kanamori, 2002	N=49 CDOP aged 60 and older	Cross-sectional	SF-36 (Japanese version)	FOF: at the present time are you very fearful, somewhat fearful or not fearful that you may fall?	The Dunnet test	Males: For role limitations and social functioning subscales, those with no FOF had higher scores than those who were moderately fearful (p<0.05) in bivariate analysis. Females: Physical functioning, role limitations, general health perceptions, vitality were

							significantly higher scores for those with no fear of falling v those moderately or very fearful ($p < 0.05$). Social functioning was significantly higher in those with no fear v those who were very fearful ($p = 0.005$) in bivariate analysis.
QoL	Talley, Wyman & Gross, 2008	N=272 CDOP females aged 70-98 (M=78.7, SD=4.9)	Cross-sectional (Baseline data from randomised control trial)	SF-36	FOF=SAFFE BC=ABC	Pearson or point-biserial correlation coefficient	FOF was significantly negatively associated with all domains of QoL in bivariate analysis. BC was significantly positively correlated with all domains of QoL in bivariate analysis.
Coping	Drozdzick & Edelstein, 2001	34 CDOP mean age 74.35, SD=8.88) all fallers	Cross-sectional	Ways of Coping Checklist-Revised	FOF: three item questionnaire scored on 5 point likert scale. Measured frequency, severity and impact of FOF. Severity was used as one measure and the other two questions combined as a composite score FSE: FES	ANOVA	No difference in coping styles used by low or high fear group
Coping	Filiatrault & Desrosiers, 2011	N=288 CDOP aged 65 years or older	Cross-sectional	Inventory of coping strategies used by the elderly 69 behavioural strategies 25 cognitive strategies	FOF: are you afraid of falling? (never, occasionally, often, very often)	Student t-test, linear regression, multivariate regression	Those with FOF use more behavioural coping strategies than those who are not afraid of falling, including avoidance and restriction strategies (e.g. I no longer go upstairs, I reduce the amount of time I move around). The percentage of individuals with FOF was higher for 83% (58) of the coping strategies from the ICSUE. Mean number of cognitive and behavioural strategies was also significantly higher among participants who were afraid of falling (behavioural: 18.6 v 21.5, $p < 0.001$; cognitive: 14.4 v 15.3, $p = 0.03$) in bivariate

							<p>analysis.</p> <p>Mean frequency scores for behavioural coping strategies was significantly higher in those with FOF compared to those without FOF (0.47 v 0.56, $p < 0.001$) in bivariate analysis. However, the mean frequency score for cognitive strategies was not significantly different for those with and without FOF (0.95 v 1.00, $p = 0.10$) in bivariate analysis.</p> <p>In multiple linear regression, FOF was an independent predictor of coping strategies in two performance domains (mobility and movement: $r = 0.52$, $p = 0.001$; and transportation and driving: $r = 0.19$, $p = 0.007$), meaning those with FOF use a larger range of behavioural coping strategies than those without FOF in these two domains.</p> <p>FOF did not significantly predict global diversity scores relating to the use of cognitive coping strategies ($r = 0.57$, $p = 0.19$) in multivariate analysis, meaning those with FOF did not employ a wider range of cognitive strategies than those without FOF.</p> <p>FOF significantly predicted global frequency of use scores for behavioural strategies ($r = 0.05$, $p = 0.006$) this was also significant for the frequency of use of three performance domains: mobility and movement ($r = 0.12$, $p < 0.001$); transportation and driving ($r = 0.23$, $p = 0.004$) and elimination ($r = 0.07$, $p = 0.05$) in multivariate analysis.</p> <p>FOF did not significantly predict global frequency of use of cognitive coping strategies in multivariate analysis ($r = 0.04$, $p = 0.22$).</p>
<i>Coping</i>	Huang, 2005	N=25 CDOP aged 65-82 years	Cross-sectional	What kind of strategies did you choose to deal with FOF? Did you	FOF: Are you fearful of falling? (only those who answered	Grounded theory	<p>Engaged in a dynamic process called 'managing FOF'</p> <p>Developed four strategies: 1. Develop psychosomatic</p>

				<p>change to other kinds of strategies? Why?</p> <p>How did you adjust your life in order to deal with FOF? What are your comments about dealing with FOF for CDOP?</p>	<p>yes entered the study)</p>		<p>symptoms: physical (shaking, sweating, goose bumps, palpitations, heightened awareness of surroundings, sleeping disturbance, headaches and appetite disturbance): emotional (frequent worry about falling, increased psychological pressure, insecurity, irritability, inability to concentrate)</p> <p>2. Adopting attitude of risk prevention: increased vigilance (taking precautions such as arriving places earlier, take smaller, slower steps, pay more attention when walking); readiness for emergencies (better late than never attitude, using support from others).</p> <p>3. Paying attention to environmental safety: environmental modification (eliminating dangerous factors such as slippery floors); use of safety devices (e.g. handrails).</p> <p>4. Modifying behaviour: adjustment of behaviour (change habits to minimise hazardous factors, self restraint or avoiding activities that they felt would lead to a fall); limiting social activities (significantly reduced and changed their pattern of interacting with the outside world, less dynamic and more static, reduced exercise, reduced visits to friends, encourage others to visit then rather than they go to their friends).</p> <p>Dealing with FOF v suffering with FOF was drawn out.</p> <p>Dealing with FOF related to minimising the impact of FOF and trying to manage this FOF 'to the best of the individual's ability,' and that individuals are satisfied with the methods they use to manage.</p> <p>Suffering with FOF related to low satisfaction for the individual with regards the management strategy, negative consequences to the individual and physical or mental 'torment' related to FOF.</p>
<i>Coping</i>	Ward-	N=9 CDOP	Cross-	N/A-open	FOF: How	Phenomen-	Exercising precaution:

	Griffin, Hobson, Melles, Kloseck, VanderVoorst & Critty, 2004	aged 72-92 years	sectional	ended, semi-structured interviews	worried are you about falling? (open ended responses)	logical study-interpretative analysis	<p>Depended on help from others (relying on others to undertake activities of daily living or to monitor activities), resisted activities (avoiding certain social activities and/or physical environments), eliminated hazards (removal of dangerous objects such as throw rugs), selected safe spaces (avoiding unsafe environments) and assigned blame (self-blame, blame of health conditions or blame of external conditions such as the weather).</p> <p>Striving for independence: Self confidence encouraged them to be active-minimized impact of the fall (calling falls slips or trips because this made falls appear less severe), used assistive devices (introduced devices within and outside of the home allowing increased mobility and safety), resisted confinement (put aside or live with FOF-not letting FOF control them), 'ran the risk' (acknowledging that an activity held a certain level of risk but, after considering advantages and disadvantages, decided the risk was worth taking) and accessed resources (securing and using the supports that were put in place by self, family or the community).</p>
<i>Activity avoidance/restriction</i>	Austin et al., 2007	1282 community dwelling older women aged 70 years and over	Longitudinal 3 year follow up	Activity restriction: Do you limit any household activities because you are frightened you may fall? (yes/no) Do you limit any outside activities because you are frightened you may fall? (yes/no)	FOF=single questions: are you afraid of falling (yes/no) Do you limit any household activities because you are frightened you may fall? (yes/no) Do you limit any outside activity because you are frightened you may	Descriptive statistics	51% of those with FOF reported activity restriction in the household and 45% limited outside activities

					fall? (yes/no)		
<i>Activity avoidance/restriction</i>	Bertera & Bertera, 2008	N=3474 CDOP aged 65 years and older	Cross-sectional	Do you do things less often or more slowly? Do you avoid lifting heavy objects? Do you avoid bending or stooping? Do you avoid walking? Do you avoid using stairs? Do you avoid reaching overhead? Do you avoid going outside? Do you avoid gripping and opening things? Do you avoid taking medications that make you dizzy? (yes/no)	FOF: 'did you fear falling in the last year?' (everyday, once/twice per week, one/twice per month, a few times, never)	Linear regression model.	In multivariate analysis (regression) FOF in the past year predicted avoidance of common activities ($\beta 0.37$, $p < 0.001$). However, there was significant interaction between FOF and falls history ($F[19, 1976]=53.8$, $p < 0.001$) and a stepwise interaction between the number of falls and FOF such that activity avoidance was lowest for those with no falls at each level of fear.
<i>Activity avoidance/restriction</i>	Chandler, Duncan, Sanders & Studenski, 1996	N=149 male CDOP aged 70- 104 years	Cross-sectional (Baseline data from longitudinal study)	Restriction of activity: Asked if been out of his bedroom without help, outside of house/apartment without help, outside neighbourhood without help 'In the past two years, have you cut back on any of the things you do inside your house? (yes/no)	FOF: would you say that you are somewhat afraid, not afraid or very afraid of falling? FOF was dichotomised to very or not FOF (very= positive response as very, not= positive response to somewhat or not)	Chi-squared	Data split between previous fallers and those without a falls history. Non-fallers: Restricted activity level and those who were very FOF were significantly associated in bivariate analysis ($p=0.045$) Decreased activity level within the home and FOF showed a trend towards significance ($p=0.09$), with those with higher FOF having decreased activity levels less. Fallers: Restricted activity level and those who were very FOF were significantly associated in bivariate analysis ($p=0.03$). Decreased activity level within the home and FOF was significantly correlated ($p=0.02$), with those with higher FOF having decreased activity levels less.
<i>Activity avoidance/</i>	Curcio et al., 2009	N=1668 CDOP	Cross-sectional	If yes to FOF question:	FOF: are you afraid	Descriptive statistics	Activity restriction related to FOF was reported in 52.2%.

<i>restriction</i>		mean age 70.9 (SD 7.4)		Do you think this fear has made you cut down on any activities that you used to do?' (yes/no) to assess fear related activity restriction. Also: How is your physical activity compared with one year before? (increased/ equal/ less/ much less) less or much less combined as decreased physical activity.	of falling? (not at all, a little, quite a bit, very much) followed up with: 'do you think this fear has made you cut down on any activities that you used to do?' (yes/no) to assess fear related activity restriction. Then dichotomised into fear of falling with activity restriction and fear of falling without activity restriction		Increasing activity restriction was associated with increasing severity of FOF (36.4% v 43.6% v 56.9%).
<i>Activity avoidance/restriction</i>	Delbaere, Crombez, van Haastregt & Vlaeyen, 2009	N=896 CDOP aged 70 years and older mean age 76.2 (SD=4.7)	Cross-sectional	Mobility range subscale from SIP-68	FSE: mFES OE: catastrophizing about falls scale	Pearson's or Spearman's rho, structural equation modelling using AMOS	mFES and CFS scores were strongly correlated with mobility restrictions during daily activities (mFES/mobility range inter-correlation=0.54, p<0.01; CAF/mobility range inter-correlation=0.35, p<0.01) in bivariate analysis. In a structural equation model, found that concerns about falls (mFES scores) had a direct effect on mobility restrictions (p<0.001). However catastrophizing about falls (CFS scores) only affected mobility restrictions through concern about falling, and did not have direct effect on mobility restrictions.
<i>Activity avoidance/restriction</i>	Deshpande Metter, Bandinelli, Lauretam, Windham & Ferruci, 2008b	N=926 CDOP aged 65 years or over Stratified into four age groups: 65-70, 71-	Cross-sectional (follow-up data from a wider epidemiological study).	Activity subscale of SAFFE	FOF: SAFFE	Descriptive statistics	65% of those reported FOF also reported fear-related activity restriction.

		80, 81-90, 90 years+					
<i>Activity avoidance/restriction</i>	Deshpande Metter, Laurentani, Bradinelli, Guralinik & Ferrucci., 2008a	N=673 CDOP aged 65 years and over	Cross-sectional	Activity restrictions subscale of SAFFE	FOF: SAFFE	Descriptive statistics	Of those with FOF, 25% did not restrict activity, 59.6% reported moderate activity restriction, 14% reported severe activity restriction
<i>Activity avoidance/restriction</i>	Faes, Reelick, Banningh, de Gier, Esselink & Rikkert, 2010	N=10 CDOP aged 70-80 and 10 carers aged 40-90	Cross-sectional	NA	FOF	Grounded theory	Described constant fear of falling and fear of the consequences of falling Described social withdrawal which was attributed to their FOF
<i>Activity avoidance/restriction</i>	Fletcher et al., 2010	N=559 CDOP mean age 81.0 (SD=6.4)	Cross-sectional	FOF: do you limit going outdoors due to FOF? (dichotomised to limited/restricted activity due to FOF or did not limit/restrict activity due to FOF)	FOF: do you limit going outdoors due to FOF? (dichotomised to limited/restricted activity due to FOF or did not limit/restrict activity due to FOF)	Descriptive statistics	35% responded positively to FOF question regarding limiting their activities due to fear of falling
<i>Activity avoidance/restriction</i>	Friedman, Munoz, West, Rubin & Fried, 2002	2212 CDOP aged 65-84 years	Longitudinal 20 months follow-up	If responded positively to FOF question asked: 'do you ever limit your activities, for example, what you do or where you go, because you are afraid of falling?'	FOF: 'apart from being in a high place, in the past 12 months, have you been worried or afraid you might fall?' (yes/no)	Descriptive statistics	Of those who reported FOF at baseline (20.8%), 46.2% (N=212) reported activity restriction due to this fear.
<i>Activity avoidance/restriction</i>	Hadjistavrou-poulos, Martin, Sharpe, Lints, McCreary & Asmundson, 2007	N=571 CDOP aged 69 years and over (mean=76.6 years, SD=5.4)	Longitudinal 6 month follow-up	Avoidance subscale of SAFFE	FOF: SAFFE BC: ABC FSE: FES	Hierarchical multiple regression	In hierarchical multiple regression analysis SAFFE FOF scale, FES and ABC scores were entered in same step as SAFFE activity level and activity restriction subscales of SAFFE. This step was significant (F[14, 541]=21.00, p<0.001) in predicting activity restriction at time two but all were not significant independent predictors. Only SAFFE activity restriction at time one from this block was predictive of activity restriction at time two (p<0.01).

<i>Activity avoidance/restriction</i>	Hellstrom et al., 2009	N=80 CDOP aged 65 years with COPD	Cross-sectional	If you are afraid of falling, does it prevent you from doing activities you would like to do? (yes/no)	FOF: single question 'are you afraid of falling?' (yes/no)	Chi-squared	50% of those who reported FOF reported restricting their activity. This was 0% in those without FOF (p=0.001) in bivariate analysis.
<i>Activity avoidance/restriction</i>	Hotchkiss, Fisher, Robertson, Rutten-cutter, Schuffert & Barker, 2004	N=118 CDOP 60-99 (M=75.8)	Cross-sectional	How many of the following places do you not go to because you are afraid of falling? Church, mall, movie theatre, restaurant etc	FOF=SAFE FSe=FES BC=ABC	Pearson product moment correlation	Activity restriction was significantly correlated with SAFE, FES and ABC scores in bivariate analysis (p<0.01).
<i>Activity avoidance/restriction</i>	Howland et al., 1998	N=266 CDOP aged 62-93 years	Cross-sectional	Are there things you don't do because you might fall? (yes/no) Are there things you have stopped doing because you are worried you might fall? (yes/no)	FOF: how afraid are you that you will fall and hurt yourself in the next year? (very to not at all on 4 point scale) Perceived control over the likelihood of falling asked to rate the validity of the following statements: I can reduce my risk of falling, I can overcome my worry about falling, there are things I can do to keep myself from falling, falling is something I can control (definitely true, mostly true, unsure, mostly	Chi-squared, logistic regression	55% reported FOF (very=9%, somewhat=17%, slightly=29%). 56% of these people reported activity restriction due to this fear. Those who curtailed activity differed significantly from those who did not curtail activity with regards intensity of FOF (very afraid=20.7% v 9.4%; somewhat afraid=36.6% v 23.4%; slightly afraid= 42.7% v 67.2%; p=0.011) in bivariate analysis. However, FOF did not predict activity curtailment.

					false, definitely false)		
<i>Activity avoidance/restriction</i>	Jang, Cho, Oh, Lee & Baik, 2007	N=732 CDOP aged 60 years or older Range=60-99 M=70.2, SD=5.8	Cross-sectional	Do you ever limit your activities-either what you used to do or what you wish to do-because you are afraid of falling? (yes/no)	FOF: How much are you afraid of falling? (not at all, slightly, somewhat, very much)	Descriptive statistics	39.7% of those reporting FOF restricted their activity because of this
<i>Activity avoidance/restriction</i>	Kempen, van Haastregt, McKee, Delbaere & Zijlstra, 2009	N=540 CDOP aged 70 years or over with at least mild 'FOF	Cross-sectional	Groningen activity restriction scale Do you avoid certain activities due to fear of falling?	FOF: are you afraid of falling? (never, almost never, sometimes, often, very often)	Chi-squared/independent t-tests, logistic regression	42% reported 'severe activity avoidance in response to single item avoidance question Activity restriction scores were significantly correlated with increased FOF (15.9 v 19.0, p<0.05) In logistic regression analysis, activity restriction remained a significant independent predictor of FOF (OR1.17, 95% CI=1.11-1.23, P not reported)
<i>Activity avoidance/restriction</i>	Lach 2005	N= 1358 time one N=890 time 2 N=842 at time three N=600 at time four CDOP aged 65-80 years	Longitudinal -follow-up after 4 years	Do you participate in social activities more, the same, or less than you used to a year ago? During the past 12 months have you cut down on things you would like to do because of your age?	FOF: At the present time are you very fearful, somewhat fearful, or not fearful that you might fall (again)?	Chi-squared, binary logistic regression analysis	At time two in cross-sectional analysis, cutting down on activities was significantly positively correlated with FOF level (11.1 v 25.1, p=0.000). Cutting down activities was not significant in predicting the development of FOF in the longitudinal analysis (OR=0.53, 95% CI 0.24-1.17, p>0.05)
<i>Activity avoidance/restriction</i>	Lachman, Howland, Tennstedt, Jette, Assmann, & Peterson., 1998	N=270 CDOP aged 62-93 (M=76.16 SD=7.91)	Cross-sectional	SAFFE subscale FOF assessment questions: Are there things you don't do because you are afraid you might fall? (yes/no) Are there things you have stopped doing because you are worried you might	FSe=FES FOF= SAFFE FOF=single questions: Are you afraid of falling? (very - not at all, 4 point likert scale), Are there things you don't do because you are afraid you might fall? (yes/no)	'correlation analysis'	Higher fear scores were related to increased activity restriction in bivariate analysis. Greatest amount of fear was found in the group who reported restricting their activities due to fear of falling in bivariate analysis.

				fall? (yes/no)	Are there things you have stopped doing because you are worried you might fall? (yes/no)		
<i>Activity avoidance/restriction</i>	Lee, Mackenzie & James, 2008	N=9 CDOP who were high or moderately fearful of falling	Cross-sectional	NA-semi-structured interviews comprising open ended questions: Did your levels of activity decrease before you realised you were afraid of falling? Have you decreased your occupations since you began to fear falling? Were you encouraged to decrease you activity by family or friends? Do you participate in any activities during which you feel you might fall?	FOF: how afraid are you that you will fall and hurt yourself in the next year? (very, fairly, a little, not at all). Very and fairly responses were classified as having a high or moderate level of FOF	Phenomenological approach	Activities they engaged in had changed over time All had begun to limit their activity levels but this did not relate to FOF, rather other factors relating to aging Participants reported phasing out activities that made participants feel they might fall Moderated the speed to which they completed activities which made them feel concerned they would fall Non-essential activities were initially avoided while more essential activities tend to be undertaken at a slower pace and with care if there is a risk of falling All made changes to activities but the degree to which this happened varied greatly. Most appeared to avoid activities they felt put them at direct risk of falls, but several reasons for restriction of activity were identified.
<i>Activity avoidance/restriction</i>	Lim, Jang, Park, Kyun, Kang & Paik, 2011	N=828 CDOP aged 65 years or older	Cross-sectional	Do you ever limit your activities either in terms of what you used to do or what you would like to do because you are afraid of falling? (yes/no)	FOF: to what extent are you afraid of falling? (not at all, slightly, somewhat, very much)	Descriptive statistics	31% of subjects with FOF reported restricting their activities due to FOF
<i>Activity avoidance/restriction</i>	Murphy, Williams & Gill, 2002	N=1064 CDOP aged 72 years and older	Cross-sectional	If positive to FOF question, asked: has this fear caused you to cut down on your activities	FOF: are you afraid falling (yes/no)	Descriptive statistics	44% of individuals reporting FOF restricted their activities

<p><i>Activity avoidance/restriction</i></p>	<p>Myers, et al., 1996</p>	<p>N=60 CDOP aged 65-95 years</p>	<p>Cross-sectional</p>	<p>(yes/no) Activity restriction: Has fear of falling made you avoid any activities? (yes/no) Extent of avoidance of activities on ABC (0%=never, 100%=always)</p>	<p>FOF: Are you afraid of falling? (yes/no) FSE: FES BC: ABC</p>	<p>t-test</p>	<p>29% of fallers reporting FOF reported activity avoidance due to this fear. 31% of non-fallers reporting FOF reported activity avoidance due to this fear. Subjects who avoided activities due to FOF had significantly lower ABC scores compared with non-avoiders (M=30.8 v 71.0, t=7.19, p<0.001) in bivariate analysis. Significant relationships were also found between FES scores and activity avoidance versus non-avoidance (M=43.4 v 19.9, t=5.46, p<0.001) in bivariate analysis. Total balance confidence scores were highly related to total avoidance ratings (r=-0.92, p=not stated) in bivariate analysis.</p>
<p><i>Activity avoidance/restriction</i></p>	<p>Rochat, Bula, Martin, Seematter-Bagnoud, Karmaniola Aminian, Piot-Ziegler & Santos-Eggimanin, 2010</p>	<p>N=860 CDOP aged 65-70 years</p>	<p>Cross-sectional</p>	<p>If yes to FOF question: Because of your FOF, have you restricted any activities? (yes/no)</p>	<p>FOF: are you afraid of falling? (no fear, moderately fearful, very fearful) FSE: FES-I</p>	<p>Kruskal-Wallis test</p>	<p>24.4% of the whole sample reported FOF without activity restriction, 5.2 % (N=45) reported FOF with activity restriction FES-I scores significantly decreased as FOF severity increased, with FOF with activity restriction deemed to be most severe (p<0.001) in bivariate analysis.</p>
<p><i>Activity avoidance/restriction</i></p>	<p>Shimada, Lord, Yoshida, Kim & Suzuki, 2007</p>	<p>N=582 CDOP aged 70 years or over</p>	<p>Baseline survey and two year follow up survey on activity levels</p>	<p>Do you carry out physical activity (yes/no), frequency of activities (times per week) and nature of activities undertaken (golf, ball games, hiking, home-based or group exercise, dancing, swimming, martial arts, jogging, walking, other exercise). Regular physical activity</p>	<p>FOF; fear of falling (yes/no)</p>	<p>Chi-squared/independent sample t-test, multiple logistic regression</p>	<p>Those who had ceased regular activity were more likely to report FOF at baseline. In bivariate analysis, those who reported FOF at baseline were more likely to cease regular activity (p=0.033) but in multivariate analysis (multiple logistic regression), FOF did not significantly and independently predict activity restriction.</p>

				defined as carrying out any type of physical activity 5 times or more per week.			
<i>Activity avoidance/restriction</i>	Talley, Wyman & Gross, 2008	N=272 CDOP females aged 70-98 (M=78.7, SD=4.9)	Cross-sectional (Baseline data from randomised control trial)	SAFFE activity restriction subscale	FOF= SAFFE BC=ABC	Pearson or point biserial correlation	FOF was significantly positively associated with activity restriction in bivariate analysis. BC was significantly negatively correlated with activity restriction in bivariate analysis.
<i>Activity avoidance/restriction</i>	Tinetti et al., 1994	N=1103 CDOP aged 72 years or over	Cross-sectional	If responded yes to 'are you afraid of falling?' then asked if this fear had made them cut down on activities	FOF; are you afraid of falling (yes/no) FSE: FES	Contingency table analysis	Of those who reported FOF, 24% of fallers reported restricting activity, amongst non-fallers this was 15% ($\chi^2=13.1$, $p<0.001$). Mean FES score for those who acknowledged activity restriction due to FOF was 69.3(SD=25.1). Compared to those who denied FOF, or reported FOF but denied activity restriction, this was significantly lower ($f=101.17(2,1005$, $p<0.0001$) in bivariate analysis.
<i>Activity avoidance/restriction</i>	Yardley & Smith 2002	CDOP aged 75 years and older. Initially 224 (mean age: 80.7, SD=4.25), at 6 month follow up N=166 (mean age: 80.7, SD=4.16)	Longitudinal 6 month follow-up	Activity avoidance subscale of the SAFFE	FOF: In general, are you afraid of falling over? (not at all, a little, quite a bit, very much) OE: consequences of falling scale	ANOVA, multiple regression,	To single question (FOF) positively related to activity avoidance ($f=2-209=43.67$, $p<0.001$). Increased FOF related to substantial increase in activity avoidance in ANOVA In cross-sectional regression analyses, FOF explained significant additional variance in activity restriction scores at Time one (R^2 change=0.072, $F=21.79$, $P<0.001$) in multivariate analysis. In longitudinal analyses, significant variance in SAFFE scores (level of activity avoidance) was predicted by FOF score (R^2 change=0.019, $F=6.70$, $P<0.05$) and both subscales on COF scale (Damage to identity= R^2 change=0.19, $F=7.27$, $p<0.01$; Loss of functional independence= R^2 change=0.036, $F=13.92$, $p<0.001$) in multivariate analysis.
<i>Activity avoidance/restriction</i>	Zijlstra, van Haastregt, van Eijk, van	N=4031 CDOP aged 70 years or	Cross-sectional	Do you avoid certain activities due to FOF	FOF: Are you afraid of falling? (never,	Descriptive statistics	For those experiencing FOF (54.3% of total sample), 65.5% reported avoiding their activities due to this

	Rossum, Stalenhoef & Kempen, 2007a	older		(never, almost never, sometimes, often, very often)	almost never, sometimes, often, very often)		fear.
<i>Activity level</i>	Arfken et al., 1994	N=890 CDOP Fell into four age groups 66-70 years: N=243 71-75 years: N=240 76-80 years: N=203 81+ years: N=204	Cross-sectional	Subscale of wider questionnaire addressing QoL that recorded: frequency of participating in social activities (religious or club meeting, visiting family or friends, eating with other people, going to a social event, having friends in) Infrequent= less than three times a week	FOF: at the present time are you very fearful, somewhat fearful or not fearful that you may fall?	Chi-squared, multivariate logistic regression	Infrequent social activities was not associated to changes in FOF level in bivariate analysis (p=0.11, NS). Level of social activities did not predict level of FOF (OR=0.90, 95% CI=0.62-1.31, p=not stated) in multivariate analysis.
<i>Activity level</i>	Austin et al., 2007	1282 community dwelling older women aged 70 years and over	Longitudinal 3 year follow-up	Activity level: Do you participate in any sports recreation or regular physical activity? (yes/no)	FOF=single questions: are you afraid of falling (yes/no) Do you limit any household activities because you are frightened you may fall? (yes/no) Do you limit any outside activity because you are frightened you may fall? (yes/no)	Chi-squared/AN OVA/ Kruskal-Wallis H Tests, forward step logistic regression	In univariate analysis lack of participation in physical activity was associated with FOF at baseline (OR=1.95, 95% CI=1.50-2.55, p=not stated). Activity level significantly predicted FOF in multivariate analysis (OR1.48, 95% CI=1.09-2.02, p=not stated). When analysing longitudinal relationships, those with persistent FOF undertook significantly less physical activity compared to those who had never reported FOF (never FOF M=19.4 v persistent FOF M=34.0, p<0.05) in bivariate analysis. However, level of physical activity was not associated with the development of FOF at bivariate level, and did not predict new FOF development in multivariate analysis (p>0.05).
<i>Activity levels</i>	Bruce, Devine & Prince, 2002	N=1500 female CDOP aged 70-85 years	Cross-sectional	Activity levels: 'do you participate in any sports recreation or regular physical activity,	FOF: 'are you afraid of falling?' (yes/no) 'Do you limit any household activities' because	Chi-squared, multiple logistic regression, multiple linear regression	Significant differences in activity level in those reporting FOF. Those with highest activity levels were less likely to have FOF (sedentary v active<200 v active>200: 45.2% v 33.3% v 27.0%, p=0.001) in bivariate analysis.

				<p>including walking, that you undertook in the last three months?' (yes/no)</p> <p>If yes, asked to list up to four activities and the duration (hours/week) that they engaged in these activities. Calculated activity level based on kcal/day taking into account body weight and published energy costs of the activities reported.</p> <p>Classified to sedentary, active with energy expenditure <200 kcal/day and active >200 kcal/day</p>	<p>you are frightened you might fall?' (yes/no)</p> <p>'Do you limit any outside activities because you are frightened you may fall?' (yes/no)</p> <p>If positive to all three classified as FOF</p>		<p>In multiple logistic regression, when comparing those who were sedentary and those who were active (both <200 and >200 kcal/day), FOF significantly predicted activity levels, with increased FOF negatively associated with being active (OR=0.70, 95% CI=0.53-0.90, p=0.006). FOF significantly predicted sedentary lifestyle.</p> <p>In multiple linear regression, FOF significantly predicted lower energy expenditure (activity level) in the two 'active' groups (β0.09, p=0.003).</p> <p>Mean energy expenditure in those with FOF=183 (SD=87-386) kcal/day v 216 (SD=106-442) kcal/day in active women who did not report FOF (p=0.001).</p> <p>These results remained significant when explored in those without disability.</p>
<i>Activity levels</i>	Brouwer, Musselman & Culham, 2004	N=25 CDOP who reported being FOF of falling aged 65 years or older Control group who did not report FOF N=25 CDOP mean age 76.3 (SD=5.2 years)	Cross-sectional	Human activity profile	BC: ABC	Independent t-test	Those with FOF (experimental group) showed greater activity curtailment than those without. However, this was not significant (p=0.109) in bivariate analysis.
<i>Activity level</i>	Deshpande Metter, Bandinelli, Lauretam, Windham & Ferruci, 2008b	N=926 CDOP aged 65 years or over Stratified into four age groups:	Cross-sectional (follow-up data from a wider epidemiological study).	Affirmative responses on SAFFE regarding if the activity was performed	FOF: SAFFE	'Correlation analysis,' multiple linear regression	Those who reported higher levels of FOF performed fewer activities (p=0.001). However activity level did not predict FOF in multivariate analysis.

		65-70, 71-80, 81-90, 90 years+					
<i>Activity levels</i>	Downton & Andrews, 1990	N=203 CDOP aged 75-84 years	Cross-sectional	Frequency of trips outside the house	FOF: Do you limit your activity due to FOF? (yes/no)	Chi-squared	FOF was significantly associated with mobility levels (0.73 v 1.15, p=0.011) in bivariate analysis.
<i>Activity levels</i>	Filiatrault, Desrosiers & Trottier, 2009	N=288 CDOP aged 65 years or older	Cross-sectional	Perceived activity levels Unclear of how questioned	FOF: are you afraid of falling? (never, occasionally, often, very often)	Chi-squared, logistic regression	Perceived activity level was not significantly different between fearful and non-fearful participants at any level of activity (p=0.16) in bivariate analysis. Perceived activity level did not predict FOF in multivariate analysis (logistic regression).
<i>Activity level</i>	Hadjistavrou et al., 2007	N=571 CDOP aged 69 years and over (mean=76.6 years, SD=5.4)	Longitudinal 6 month follow-up	Activity level subscale of SAFFE	FOF: SAFFE BC: ABC FSE: FES	Hierarchical multiple regression	In hierarchical multiple regression analysis SAFFE FOF scale, FES and ABC scores were entered in same step as SAFFE activity level and activity restriction subscales of SAFFE. This step was significant in predicting activity level at time 2 (F[14, 541]=4.94, p<0.001). From this block, SAFFE FOF subscale and SAFFE activity level subscales scores were significant predictors of activity level at time two (FOF p<0.05, activity level p<0.01).
<i>Activity levels</i>	Hotchkiss, Fisher, Robertson, Rutten-cutter, Schuffert & Barker, 2004	N=118 CDOP 60-99 (M=75.8)	Cross-sectional	How often did you leave your home last week?	FOF= SAFFE FSe=FES BC=ABC	Pearson correlation	Activity level was significantly correlated with FES (p<0.01) and ABC (p<0.05) scores in bivariate analysis. Activity level was not significantly correlated with SAFE scores.
<i>Activity levels</i>	Lachman, Howland, Tennstedt, Jette, Assmann, & Peterson., 1998	N=270 CDOP aged 62-93 (M=76.16 SD=7.91)	Cross-sectional	Leisure instrument developed from Kansas City Studies of Aging & Normative Aging Study with three indexes: active, inactive and social activities.	FSe=FES FOF= SAFFE FOF=single questions: Are you afraid of falling? (very- not at all, 4 point likert scale), Are there things you don't do because you are afraid you might fall? (yes/no) Are there things you	'correlation'	Those with higher fear scores engaged in fewer activities. SAFE FOF subscale correlated with SAFFE number of activities subscale (significance not reported) in bivariate analysis. FES correlated with SAFFE number of activities subscale (significance not reported) in bivariate analysis.

					have stopped doing because you are worried you might fall? (yes/no)		
<i>Activity level</i>	Li et al., 2003	N=256 CDOP aged 70-92 years (mean=77.5 years, SD=5.0)	Cross-sectional (Baseline assessments reported for a wider scale physical activity trial)	Activity level subscale of SAFFE	FOF: SAFFE which looked at FOF level and associated activity restriction	Pearson's correlation, ANOVA,	Correlation between SAFFE activity level and FOF score was negatively statistically significant ($r=-0.20$, $p<0.001$). Individuals with higher fear engaged in fewer activities. In an ANOVA, significant group differences in activity level between the high-fear and low-fear groups were reported ($F(1,254)=5.26$, $p<0.02$) showing participants in high fear group had significantly lower activity levels compared with the low fear group.
<i>Activity level</i>	Lim, Jang, Park, Kyun, Kang & Park, 2011	N=828 CDOP aged 65 years or older	Cross-sectional	International physical activity questionnaire	FOF: to what extent are you afraid of falling? (not at all, slightly, somewhat, very much)	Logistic regression, multiple linear regression	Physical activity level was not associated with FOF in bivariate analysis.
<i>Activity levels</i>	Lim & Taylor., 2005	8881 CDOP aged 65 years or older (M=72.9 in active group, M=74.7 in inactive group)	Cross-sectional	Number of days in the last week that spent exercising for at least 30 minutes in each of the following: Walking, moderate activity (golf, dancing, lawn bowls) or vigorous activity (gardening, yard work). Dichotomised into adequate and inadequate activity level. Adequate is at least 30 minutes walking, moderate or vigorous activity at	FOF: are you afraid of falling? (yes/no)	'Descriptive statistics,' Cox's proportional hazards regression	In bivariate analysis, adequate physical activity was significantly more common in those who denied FOF ($p<0.001$). However, FOF did not significantly predict activity levels in multivariate analysis.

				least five out of seven days			
<i>Activity levels</i>	Maki, 1997	N=75 CDOP aged 62-96 years	Cross-sectional (baseline data from longitudinal study)	Those who walk outside (in good weather) less than once per week. Not reported how this was questioned	FOF: are you afraid of falling? (not at all, somewhat, very much)	Fisher exact test	The difference between fearful and fearless participants was not significant with regards those responding to walking outside less than once per week ($p=0.68$) in bivariate analysis.
<i>Activity level</i>	Murphy, et al., 2003	N=313 female CDOP aged 72 years and older	Longitudinal 1 year follow-up	Frequency of participation in IADL's: How often do you undertake light housework, heavy housework, light yard work, heavy yard work, heavy home repair and driving? (dichotomised to participate or do not participate; response options not reported) Considered sedentary if did not participate in any stretching exercises/ calisthenics or any sports within the previous month, and in an average day, reported walking less than one city block and no stair climbing	FOF: are you afraid of falling? (yes/no)	Chi-squared, binomial regression	Developing FOF at follow up was significantly associated with sedentary lifestyle in bivariate analysis (no FOF 23.9%, FOF 42.3%, $p=0.01$). Sedentary lifestyle predicted FOF development, with sedentary lifestyle found to be predisposing to developing FOF at follow up in multivariate analysis (OR=1.96, 95% CI=1.35-2.84, $p<0.05$)
<i>Activity level</i>	Myers, Powell, Maki, Holliday, Brawley & Sherk, 1996	N=60 CDOP aged 65-95 years with two groups: high and low mobility	Cross-sectional	High mobility: those recruited from senior centres and a walking club. Did not require assistance	FOF: Are you afraid of falling? (yes/no) FSE: FES BC: ABC	Spearman's correlation, chi-squared	BC (ABC scores) was related to frequency of doing various activities. When looking at two selected activities (sweeping the floor, shopping), those who reported these activities more regularly had higher balance confidence scores (sweeping floor: $r=0.70$,

				<p>when leaving the home.</p> <p>Low mobility: those at home-care and day care services. Did not leave home without assistance or used assistive devices</p>			<p>p<0.001; shopping: r=0.54, p<0.001) in bivariate analysis.</p> <p>When groups dichotomised to low/high mobility, those with low mobility were more likely to report FOF (67% v 47%) however, this was not significant in bivariate analysis.</p> <p>High mobility groups had significantly better balance confidence and falls-efficacy score (p=not reported) in bivariate analysis.</p>
<i>Activity levels</i>	Reyes-Ortiz, Ayele, Mulligan, Espino, Berges & Markides, 2006	1341 CDOP aged 70 years and older	Longitudinal two year follow-up	How often do you attend church or a religious service? (never or almost never, several times a year, once or twice a month, almost every week, more than once a week)	FOF: How afraid of you of falling? (not at all, somewhat, fairly or very afraid)	Chi-squared, logistic regression	<p>Frequency of church attendance was associated with an increase in the percentage of subjects that were not afraid of falling, and a decrease in the percentage of subjects who were very afraid of falling at a univariate level.</p> <p>In bivariate analysis, lower FOF was associated with frequent church attendance (p=0.005).</p> <p>In a logistic regression analysis, frequent church attendance was a significant independent predictor of lower FOF (OR=0.73, 95% CI=0.58-0.92, p=0.008).</p>
<i>Activity level</i>	Tinetti et al., 1994	N=1103 CDOP aged 72 years or over	Cross-sectional	<p>Physical and social activity assessed: Physical= Yale physical activity survey (light and heavy yard work, light and heavy housework, heavy home repair, sports, number of flights of stairs climbed per day and distance walked per day)</p> <p>Social: Frequency of participation in eight events</p>	<p>FOF; are you afraid of falling (yes/no)</p> <p>FSE: FES</p>	Contingency table analysis/ ANOVA, backward-selected multiple linear regression	<p>Correlation between FES score and social activity was significant in bivariate analysis (b=0.34, p=not reported).</p> <p>Correlation between FES score and physical activity was significant in bivariate analysis (b=0.49, p=not reported).</p> <p>FES significantly predicted social functioning in a multiple linear regression (partial correlation=0.088, p<0.01, model R²=0.302).</p> <p>However, FOF did not significantly predict social functioning in multivariate analysis.</p> <p>FES independently predicted physical functioning in a multiple linear regression (p<0.001). However, data was not provided to support this.</p>

				(attending events, paid work, volunteering, visiting friends, attending religious services, participating in groups, going to museums/shows; not at all/ 1-4 times a month/ greater than once a week)			FOF did not significantly predict physical functioning in multivariate analysis
<i>Activity level</i>	Wijhuizen, de Jong & Hopman-Rock, 2007	1752 CDOP mean age 73.0 years all aged 65 years and older	Cross-sectional (Prospective follow-up study over 10 months. Data relating to activity level was only explored cross-sectionally).	Asked 'how often you walk outside for at least half an hour' and 'how often you bicycled during the winter and summer months' (both questions responded to on scale: each day, once or twice a week, once or twice a month, seldom, never)	FOF: how often are you afraid of falling? (never, seldom, regular, very often)	Polytomous logistic regression,	FOF significantly predicted physical activity levels: Individuals with higher FOF were more often active (OR=1.5, 95% CI=1.1-2.2, p=0.02) or low to moderately active (OR=2.9, 95% CI=2.1-4.2, p=0.00) than those with low FOF, appose to being very active. Those with low FOF were more likely to be very active.

Appendix 4: Empirical literature exploring the relationship between activity levels and

FrPC

Activity level

FOF. Seventeen studies explored activity level in relation to FOF. Thirteen studies exploring this association found significant negative bivariate correlations (e.g. Austin et al., 2007). Austin, Devine, Dick, Prince and Bruce, (2007) and Reyes-Ortiz, Ayele, Mulligan, Espino, Berges and Markides, (2006) found activity level significantly predicted FOF in multivariate analysis, with lower activity levels predictive of higher FOF. Li, Fisher, Harmer, McAuley and Wilson, (2003) found membership to a high fear group as opposed to a low fear group, was significantly predicted by lower levels of activity.

Bruce, Devine and Prince, (2002) and Wijlhuizen, Jong and Hopman-Rock (2007) found FOF significantly predicted activity levels, with increased activity being predicted by lower FOF.

Four longitudinal studies found mixed results. Murphy, Dubin and Gill, (2003) found sedentary lifestyle significantly predicted the development of FOF. Reyes-Ortiz et al., (2006) found increased church attendance significantly predicted FOF, with increased church attendance associated with lower levels of FOF. However, Austin et al., (2007) found reduced physical activity predicted persistent FOF, but not FOF development.

Additionally, Hadjistavropoulos, Martin, Sharpe, Lints, McCreary and Asmundson, (2007) found activity levels were significantly predicted by FOF.

With seven studies failing to find significant associations at bivariate level (e.g. Filiatrault, Desrosiers, & Trottier, 2009), and mixed multivariate and longitudinal results, the variation may be explained by widely ranging measures of activity level

and FOF. This makes findings difficult to compare. Some defined activity in terms of much lower demand activities (e.g. going outside of the bedroom), with others relating this to higher demand activities (e.g. engagement in exercise) resulting in very different meaning of 'low activity.'

Church attendance in Reyes-Ortiz et al's. (2006) study may relate to two concepts: activity levels (practice of attendance) or religion (purpose of attendance). Religion is a suggested coping response to physical and mental health issues in CDOP (Koenig et al., 1992; Musick, Traphagan, Koeing & Larson., 2000). Therefore, Reyes-Ortiz et al., (2006) may have assessed use of religion appose to physical activity.

Findings partially suggest lower activity levels were associated with increased FOF. However, differing measures of activity limits comparability of findings. Activity level was inconsistently associated with development of FOF, but again this may relate to the variance in measures of activity.

FSe. Of the four studies exploring FSe and activity levels, all found significant positive bivariate associations (e.g. Hotchkiss et al., 2004). Only Tinetti et al., (1994) employed multivariate analysis, where activity level remained a significant independent predictor of FSe. However, in longitudinal analysis, Hadjistavropoulos et al., (2007) found FSe did not independently predict activity levels.

Lower activity levels were associated with reduced FSe. However, FSe failed to predict activity levels. Significant associations were commonly found at bivariate level, meaning results should be considered tentatively.

BC. Two studies exploring BC in relation to activity levels found significant positive bivariate correlations (Hotchkiss et al., 2004; Myers et al., 1996). In multivariate analysis, Brouwer, et al., (2004) found BC was not significantly independently predicted by activity levels, and Hadjistavropoulos et al., (2007) found activity levels were not predicted by BC. Significant associations were only found at bivariate level and the failure to conduct more stringent analysis means results should be interpreted with caution. Activity levels were not consistently associated with, or predicted by, BC. Limited studies measuring BC means further exploration of BC in relation to psychological associated factors is warranted.

Appendix 5: Power calculations

A prior power calculation

Anticipated effect size (f^2) = 0.15

Desired statistical power level = 0.8

Number of potential predictors = 21

Probability level = 0.05

Sample size required = 160

Appendix 6: Ethical approval letters from Canterbury Christ Church University

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Appendix 7: The Falls Efficacy Scale-International

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Appendix 8: Revised Ways of Coping Questionnaire

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Appendix 9: WAYS subscale definitions

1. **Confrontive Coping:** describes aggressive efforts to alter the situation and suggests some degree of hostility and risk-taking.
2. **Distancing:** describes cognitive efforts to detach oneself and to minimise the significance of the situation.
3. **Self-Controlling:** describes efforts to regulate one's feelings and actions.
4. **Seeking Social Support:** describes efforts to seek informational support, tangible support, and emotional support.
5. **Accepting Responsibility:** acknowledges one's own role in the problem with a concomitant theme of trying to put things right.
6. **Escape-Avoidance:** describes wishful thinking and efforts to escape or avoid the problem. Items on this scale contrast with those on the Distancing scale, which suggest detachment.
7. **Planful Problem Solving:** describes deliberate problem-focused efforts to alter the situation, coupled with an analytic approach to solving the problem.
8. **Positive Reappraisal:** describes efforts to create positive meaning by focusing on personal growth. It also has a religious dimension.

Appendix 10: COPE 'turning to religion' subscale

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Appendix 11: Falls questionnaire

A fall is “an unexpected event in which the participants come to rest on the ground, floor, or lower level.”

When answering the following questions, I want you to consider if you have experienced a fall in the last 12 months, and if so how many times. Please answer as honestly as you can.

1. Have you fallen during the past year?

- a) Yes. (Please answer questions below)**
- b) No**

(If you answered yes to question 1):

2. How many times have you fallen in the last 12 months?

.....

3. Did any of these falls require medical attention?

- a) Yes**
- b) No**

4. Over the past year, what was the longest delay in getting up after a fall?

- a) Less than one minute**
- b) Less than one hour**
- c) More**

Appendix 12: Demographics questionnaire

Demographics questionnaire

Please answer each question by marking an option. Please provide extra details if requested.

1. What is your date of birth?.....

2. Are you:

- a) Male**
- b) Female**
- c) Other**

3. What ethnicity are you?

- a) White**
- b) Black or Black British**
- c) Asian or Asian British**
- d) Chinese or Chinese British**
- e) Mixed**
- f) Other**

4. What is your current living arrangement?

- a) Living alone**
- b) Living with a partner**
- c) Living with family**
- d) Living with friends**
- e) Living with other**
- f) Warden-controlled residence**
- g) Other please specify.....**

5. Do you wear glasses?

- a) Yes**
- b) No**

6. Do you wear hearing aids?

- a) Yes**
- b) No**

7. Do you require assistance to walk?

- a) Walk without an aid**
- b) Walk slowly or use a stick**
- c) Walk with a frame**
- d) Cannot walk**

8. Are you currently taking any prescribed medication?

- a) Yes. One medication**
- b) Yes, two medications**

- c) Yes, three medications
- d) Yes, four or more medications
- e) No

9. How do you rate your overall physical health?

- a) Poor
- b) Fair
- c) Good
- d) Very good
- e) Excellent

10. Do you have one or more diagnosed physical health problems?

- a) Yes. Please state

.....
b) No



Information Sheet: version 1, date Dec 2010

Coping with worrying about falling

Study title: Coping responses to falls-related psychological concerns (FrPC) in community-dwelling older people: Do they mediate between falls-related psychological concerns and falls incidence?

I would like to invite people who attend your day centre to take part in a research study. Before you decide, it is important for you to understand why the research is being conducted, and what it will involve. Please take the time to read the following information carefully and discuss it if you wish. Ask if there is anything you are not clear about, or if you would like more information.

I am doing this study as part of my training to become a clinical psychologist, which I am carrying out at the Department of Psychology, Canterbury Christ Church University, Tunbridge Wells (Salomons) campus.

What is the study about?

The aim of the study is to explore the relationship between concerns about falling, coping and falls incidence. A fall is defined as “an unexpected event in which the participants come to rest on the ground, floor, or lower level.”

Why has our centre been chosen?

Your centre has been approached to take part in this study because people who attend this centre include individuals aged 65 years or older, who live in the community (not in care). It is not a requirement to have fallen in the past.

Does the centre have to take part?

It is up to you if you decide to give permission for your centre to take part in this study or not. If you do decide to take part, you will be given this information sheet to keep and asked to sign a consent form. Throughout the study you are free to withdraw at any time without giving a reason. This means that you can say you no longer want the centre to take part in the research. This will not affect the centre in any way.

What will taking part involve?

If you agree to take part, it would mean giving your consent for me to advertise the study in your centre, and for me to meet with people in the centre to invite them to take part in this study. People wanting to take part in this study will be asked to complete four simple questionnaires about any concerns they have about falling, how they cope with these concerns, and how many falls they

have experienced. It will also involve completing a brief questionnaire about their background, e.g. date of birth. It will take approximately 20 minutes to complete the questionnaires with me.

They will be given the questionnaires by the researcher and will complete them with me. Once the consent form and questionnaires are complete, this is the end of the study.

Is this study confidential?

Yes. The names of the centres and individuals will not be used on the questionnaires. Information collected will be kept private and secure. This information will be destroyed after a period of 10 years. All answers to the questionnaires will be treated as confidential, unless there is reason to think there is a significant risk of harm to the individual or someone else.

What will happen to the results of the study?

The information we get from participants will be used to understand the way people cope with concerns about falling. This can be used when designing care and support for older people who worry about falling. This study will be published in a report, and if possible be used in a conference paper or professional journal article.

You will be asked if you wish to receive a brief report of the results of the study. If you do, we will write to you about these once the study has been completed. If you supply us with an email or postal address for this purpose, we will only keep it for as long as necessary and will destroy it once the results have been sent to you. If you would prefer me to meet with you to discuss the results, I will be able to arrange a time to come and talk to you and the people involved about the results at your day centre.

What are the benefits of taking part?

Taking part will help professionals to develop an understanding of how the way people cope with worries about falling relates to how many falls they have. I hope this will give individuals an opportunity for their experiences to be valued, with them helping to inform future services that are offered to people experiencing concerns about falling.

What are the risks of taking part?

It is not anticipated that the questions asked will be upsetting, but sometimes our emotions can be stirred up when we think about experiences or talk about them with other people. If this were to happen whilst completing the questionnaires, individuals would be asked if they wanted to continue and I will find out from them what sort of extra help they needed at this point, if any. They will also be given the researchers contact details in case they wanted to discuss these concerns after the questionnaires have been completed.

Who is organising the study?

Ms Christine Hughes, Trainee Clinical Psychologist at Department of Applied Psychology, Canterbury Christ Church University, Tunbridge Wells (Salomons) Campus

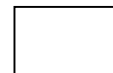
What should I do now?

Think about if you would like your centre to take part in this study. If you do not wish for your centre to participate no further action will be taken. If you would like your centre to take part in the study, please sign the consent form that the researcher will provide for you. You have the right to withdraw at any time without reason.

What if I have any more questions about taking part?

Please contact Ms Christine Hughes by email (ch303@canterbury.ac.uk) or post: Ms Christine Hughes, Trainee Clinical Psychologist, Department of Applied Psychology, Canterbury Christ Church University (Salomons Campus) Broomhill Road, Tunbridge Wells TN3 0TG. You can also contact Christine Hughes by telephone on 01892 507673. This number is for a secure voicemail service. It is important when you leave a message to say that the message is for CHRISTINE HUGHES, and leave your name and contact number.

If you have any complaints about the conduct of the research, please contact: Prof. Paul M. Camic (paul.camic@canterbury.ac.uk), Research Director, Department of Applied Psychology, Canterbury Christ Church University, Tunbridge Wells.



Consent Form for Participation in Research

Study title: Coping responses to falls-related psychological concerns (FrPC) in community-dwelling older people: Do they mediate between falls-related psychological concerns and falls incidence?

Researcher: Ms Christine Hughes, Trainee Clinical Psychologist, Department of Applied Psychology, Salomons, Canterbury Christ Church University

Please mark box

- I have read the Information Sheet (version 1, date Dec 2010) about the above study and have a copy I can refer to.
- I have had the opportunity to ask questions. I have received satisfactory answers to my questions.
- I understand that taking part in the study is voluntary and that I can withdraw at any time, without giving a reason.
- I understand that whether the centre takes part or not in the study, it no way affects the services the centre, or its staff will receive or might be entitled to receive from [redacted], any hospital or any educational opportunities at Canterbury Christ Church University, the sponsor of this research.
- I understand that all the information in the study is anonymous and kept confidentially and securely, so that centres cannot be identified.
- I agree for individuals at this centre to be invited to take part in the above study.
- I agree for the study to be advertised to the centre attendees through the use of posters
- I understand and agree that data from research may be submitted for presentation at a conference and/or written up for a professional journal publication. I also understand that the centre will not be identified by name or association in these media.

Name of centre manager (please print):.....

Signature of centre manager:.....

Date:.....

Name of researcher (please print):

Signature of researcher:

Date:.....

Do you worry about having a fall?



How do you cope with these worries?

Are you over 65 years old?



I would like to hear from you about your concerns about falling, and how you cope with them.

We know that some people have concerns about having a fall, and we would like to know more about how people cope with these concerns.

How concerned are you that you might fall when going to the shop?

How concerned do you feel that you might fall when cleaning the house?

How much have you been criticising yourself?

How much have you been getting advice and help from other people?

It will take about 20 minutes to tell me about your concerns and the ways you cope.

If you would like to talk to me about taking part, I will be attending your centre on **DATE**

I will then be attending your centre to meet people who would like to take part, to complete some brief questionnaires on: **DATE**



Information Sheet: version 1, date Oct 2010
Coping with worrying about falling

Study Title: Coping responses to falls-related psychological concerns (FrPC) in community-dwelling older people: Do they mediate between falls-related psychological concerns and falls incidence?

I would like to invite you to take part in a research study. Before you decide, it is important for you to understand why the research is being conducted, and what it will involve. Please take the time to read the following information carefully and discuss it if you wish. Ask if there is anything you are not clear about, or if you would like more information.

I am doing this study as part of my training to become a clinical psychologist, which I am carrying out at the Department of Psychology, Canterbury Christ Church University, Tunbridge Wells (Salomons) campus.

What is the study about?

The aim of the study is to explore the relationship between concerns about falling, coping and falls incidence. A fall is defined as “an unexpected event in which the participants come to rest on the ground, floor, or lower level.”

Why have I been chosen?

You have been invited to take part in this study because you are 65 years or older, and living in the community (not in care). It is not a requirement to have fallen in the past.

Do I have to take part?

It is up to you if you decide to take part in this study or not. If you do decide to take part, you will be given this information sheet to keep and asked to sign a consent form. Throughout the study you are free to withdraw at any time without giving a reason. This means that you can say you no longer want to take part in the research, and none of the information about you will be kept by the researcher. This will not affect the care or services you receive in any way.

What will taking part involve?

If you agree to take part, it would mean giving your consent to complete four simple questionnaires about any concerns you have about falling, how you cope with these concerns, and how many falls you have experienced. It will also involve completing a brief questionnaire about your background, e.g. your date of birth. It will take you approximately 20 minutes to complete the questionnaires with me.

You will be given the questionnaires by the researcher. If you are happy to take part, please sign the consent form. Once the consent form and questionnaires are complete, this is the end of the study.

Is this study confidential?

Yes. Your name will not be used on the questionnaires. Information collected will be kept private and secure. This information will be destroyed after a period of 10 years. All answers to the questionnaires will be treated as confidential, unless there is reason to think there is a significant risk of harm to yourself or someone else.

What will happen to the results of the study?

The information we get from participants will be used to understand the way people cope with concerns about falling. This can be used when designing care and support for older people who worry about falling. This study will be published in a report, and if possible be used in a conference paper or professional journal article.

You will be asked if you wish to receive a report of the results of the study. If you do, we will write to you about these once the study has been completed. If you supply us with you email or postal address for this purpose, we will only keep it for as long as necessary and will destroy it once the results have been sent to you.

If you would prefer me to meet with you to discuss the results, I will be able to arrange a time to come and talk to people about the results at your day centre.

What are the benefits of taking part?

Taking part will help professionals to develop an understanding of how the way people cope with worries about falling relates to how many falls they have. I hope this will give you an opportunity for your experiences to be valued, with them helping to inform future services that are offered to people experiencing concerns about falling.

What are the risks of taking part?

It is not anticipated that the questions asked will be upsetting, but sometimes our emotions can be stirred up when we think about experiences or talk about them with other people. If this were to happen whilst completing the questionnaires, you would be asked if you wanted to continue and I would find out from you what sort of extra help you needed at this point, if any. You will also be given the researchers contact details on the bottom of this sheet in case you wanted to discuss these concerns after the questionnaires have been completed.

Who is organising the study?

Ms Christine Hughes, Trainee Clinical Psychologist at Department of Applied Psychology, Canterbury Christ Church University, Tunbridge Wells (Salomons) Campus

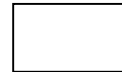
What should I do now?

Think about if you would like to take part in this study. If you do not wish to participate no further action will be taken. If you would like to take part in the study, please come and see the researcher. You have the right to withdraw at any time without reason.

What if I have any more questions about taking part?

Please contact Ms Christine Hughes by email (ch303@canterbury.ac.uk) or post: Ms Christine Hughes, Trainee Clinical Psychologist, Department of Applied Psychology, Canterbury Christ Church University (Salomons Campus) Broomhill Road, Tunbridge Wells TN3 0TG. You can also contact Christine Hughes by telephone on 01892 507673. This number is for a secure voicemail service. It is important when you leave a message to say that the message is for CHRISTINE HUGHES, and leave your name and contact number.

If you have any complaints about the conduct of the research, please contact: Prof. Paul M. Camic (paul.camic@canterbury.ac.uk), Research Director, Department of Applied Psychology, Canterbury Christ Church University, Tunbridge Wells.



Consent Form for Participation in Research

Study title: *Coping responses to falls-related psychological concerns (FrPC) in community-dwelling older people: Do they mediate between falls-related psychological concerns and falls incidence?*

Researcher: Ms Christine Hughes | Trainee Clinical Psychologist, Department of Applied Psychology, Salomons, Canterbury Christ Church University

Please mark box

- I have read the Information Sheet (version 1, date Oct 2010) about the above study and have a copy I can refer to.
- I have had the opportunity to ask questions. I have received satisfactory answers to my questions.
- I understand that taking part in the study is voluntary and that I can withdraw at any time, without giving a reason.
- I understand that whether I take part or not in the study in no way affects the services that I receive or might be entitled to receive from ██████████, any hospital or any educational opportunities at Canterbury Christ Church University, the sponsor of this research .
- I understand that I will complete four questionnaires
- I understand that all the information in the study is anonymous and kept confidentially and securely, so that I cannot be identified. Instead I will be allocated a code.
- I agree to take part in the above study.
- I understand and agree that data from research may be submitted for presentation at a conference and/or written up for a professional journal publication. I also understand that I will not be identified by name or association in these media.

Name of participant (please print):.....

Signature of participant:.....

Date:.....

Name of researcher (please print):

Signature of researcher:

Date:.....

Appendix 18: Falls aftercare information

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Department of Applied Psychology
Canterbury Christ Church University
Salomons Campus at Tonbridge Wells
Broomhill Road
Southborough
Tonbridge Wells
Kent
TN3 0TG

01 July 2012

**Coping responses to falls-related psychological concerns (FrPC) in
community-dwelling older people: Do the mediate between falls-related
psychological concerns and falls incidence?**

Dear participant,

I would like to take the opportunity to thank you for taking part in my study by completing questionnaires with me at your centre. I greatly appreciated your time and valued hearing about your concerns about falling and how you coped with these.

You may remember I was hoping to understand how older people who live in the community manage their concerns about falling. I also hoped to find out how this was related to how often they had fallen in the last 12 months. I have now finished collecting data for my research and I have now produced my results based on this. Below I have summarised the main findings from this research.

Summary of the findings

Concerns about falling and coping

This study explored how participants coped with their concerns about falling using a questionnaire that listed lots of coping strategies, and participants needed to say how much they thought they used that strategy to cope with their concerns. We found that the coping responses significantly associated with being concerned about falling were using escape/avoidance and self-controlling. Escape-avoidance describes wishful thinking and efforts to escape or avoid the problem. Self-controlling strategies were trying not to let other people know how bad things were, and trying to keep feeling to oneself. No other coping responses were significantly associated with concerns about falling.

Coping and reporting having had a fall in the last 12 months

From the same coping questionnaire, the responses were explored to see if any

were significantly associated with participants reporting having had a fall in the last 12 months. We found that the only coping response significantly associated with reporting of having had a fall in the last 12 months was using self-controlling strategies. No other coping responses were significantly associated with reporting having had a fall in the last 12 months.

The effect coping has on the relationship between concerns about falling and reporting having had a fall in the last 12 months

The study found that having concerns about falling and reporting having had a fall in the last 12 months were significantly associated. We wanted to see if the way people coped with their concerns about falling could explain why these were related. To look at this we carried out a mediation analysis. A mediation analysis aims to identify and explain how or why falls and having concerns about having a fall may be related. We found that the coping response self-controlling explained part of this relationship. This means there was evidence that self-controlling significantly contributed to the variance in falls incidence in the preceding 12 months.

Summary

Overall, the study suggests that the most highly associated factors were being concerned about falling and reporting having had a fall in the preceding 12 months. We need to do more research to find directionality of this relationship (i.e. does concerns about falling cause falls to happen, or do falls make people concerned?).

The study found that self-controlling was significantly associated with concerns about having a fall and reporting having had a fall in the last 12 months, and explained some of the association between concerns about falling and falls. Research in the future might seek to identify the direction of this relationship (i.e. what causes what, which comes first), and seek to identify other things which may explain the remaining association between having reported a fall in the last 12 months and having concerns about falling, including behavioural ways of coping with these concerns.

If you have any questions or would like to feedback or comment on any of these results, please do not hesitate to contact me.

Yours sincerely

Christine Hughes
Trainee Clinical Psychologist
Email: ch303@canterbury.ac.uk

Appendix 20: data inspection for distributions of variables

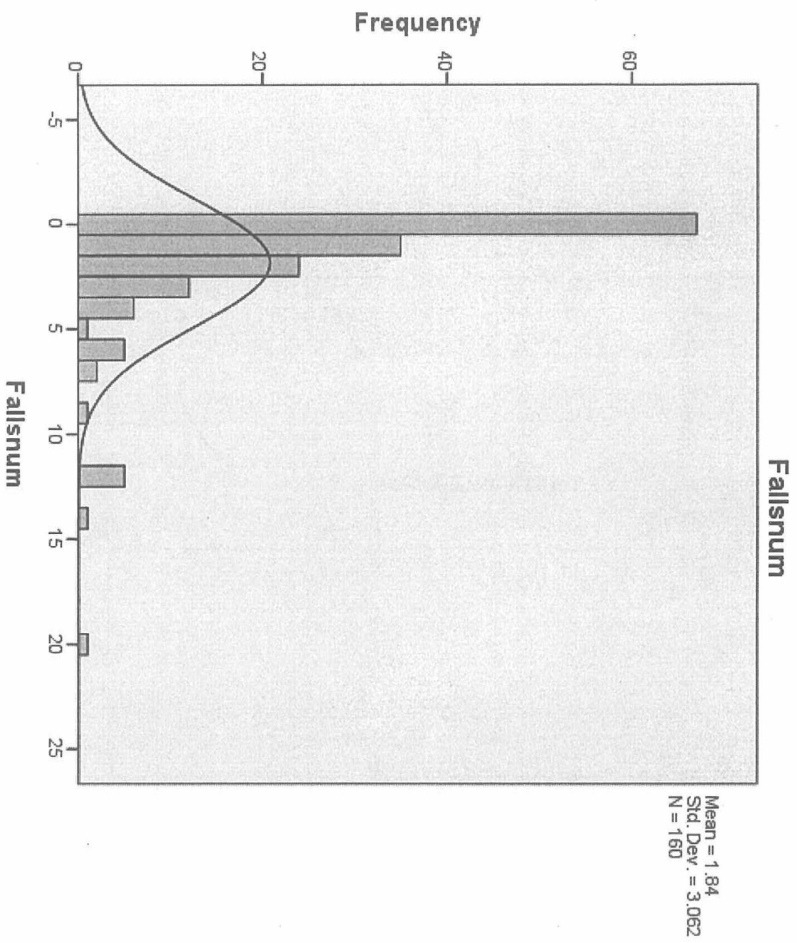


Figure A1: Histogram of number of falls reported

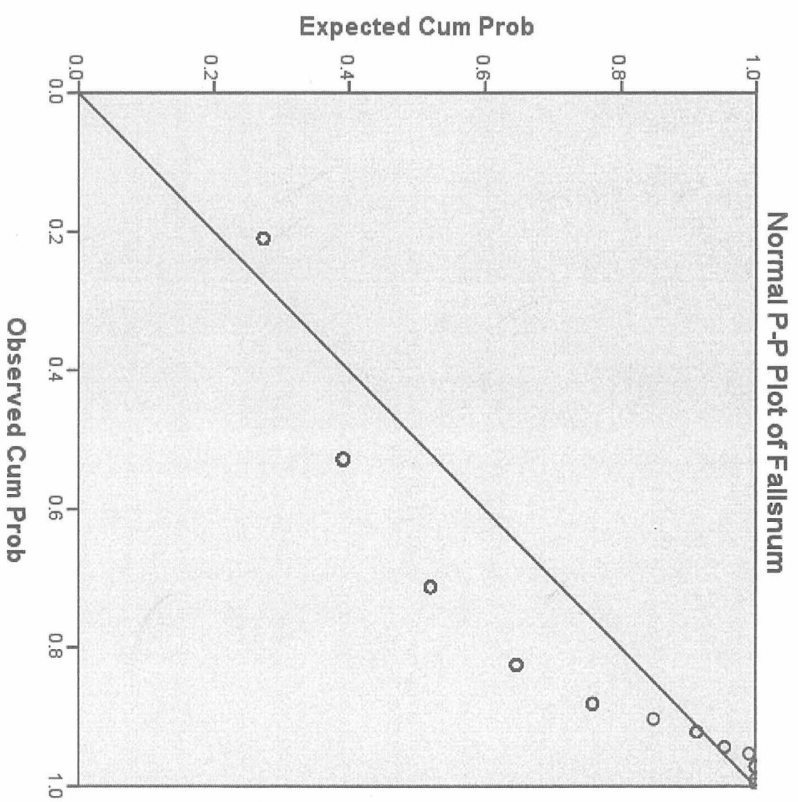


Figure A2: P-P plot of number of falls reported

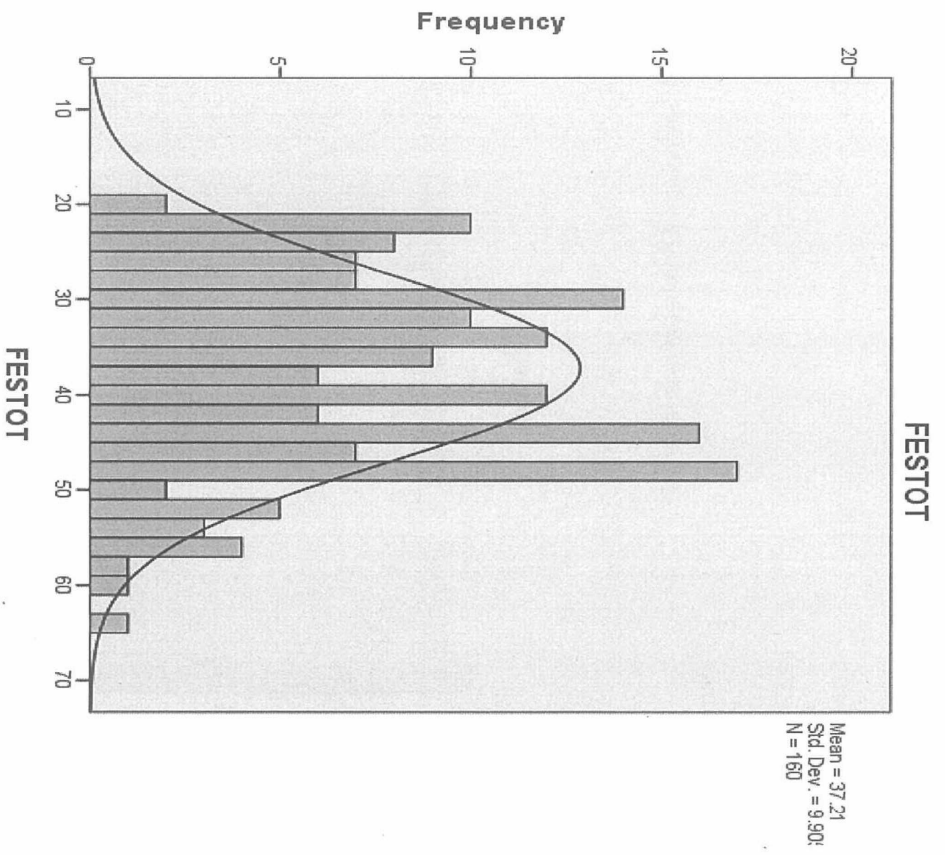


Figure A3: Histogram of FES-1 total scores

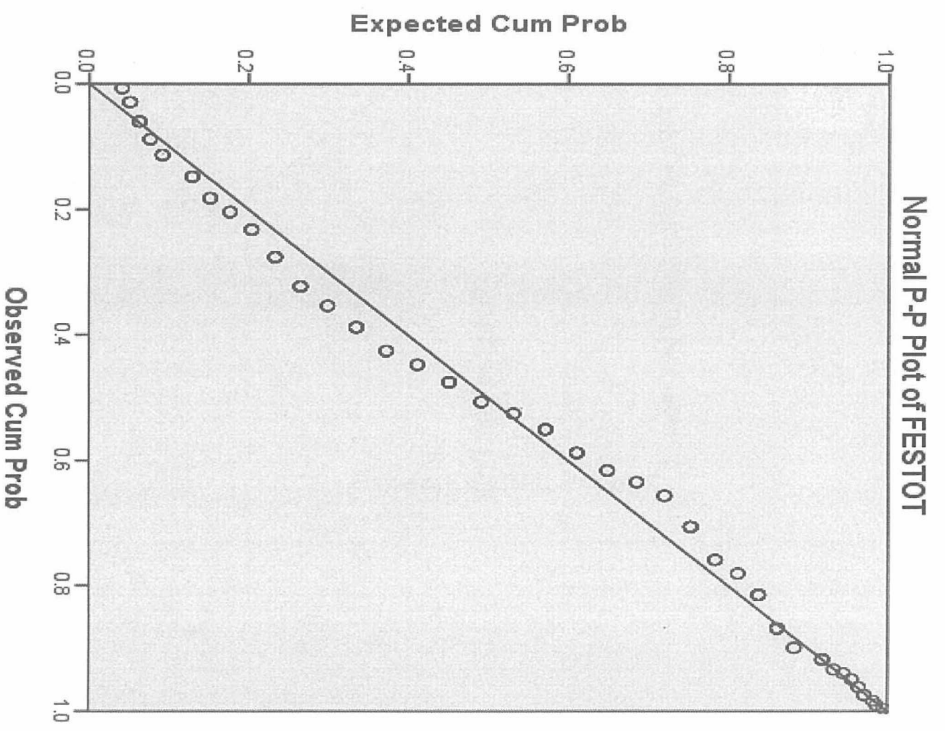


Figure A4: P-P plot of number of FES-1 total scores

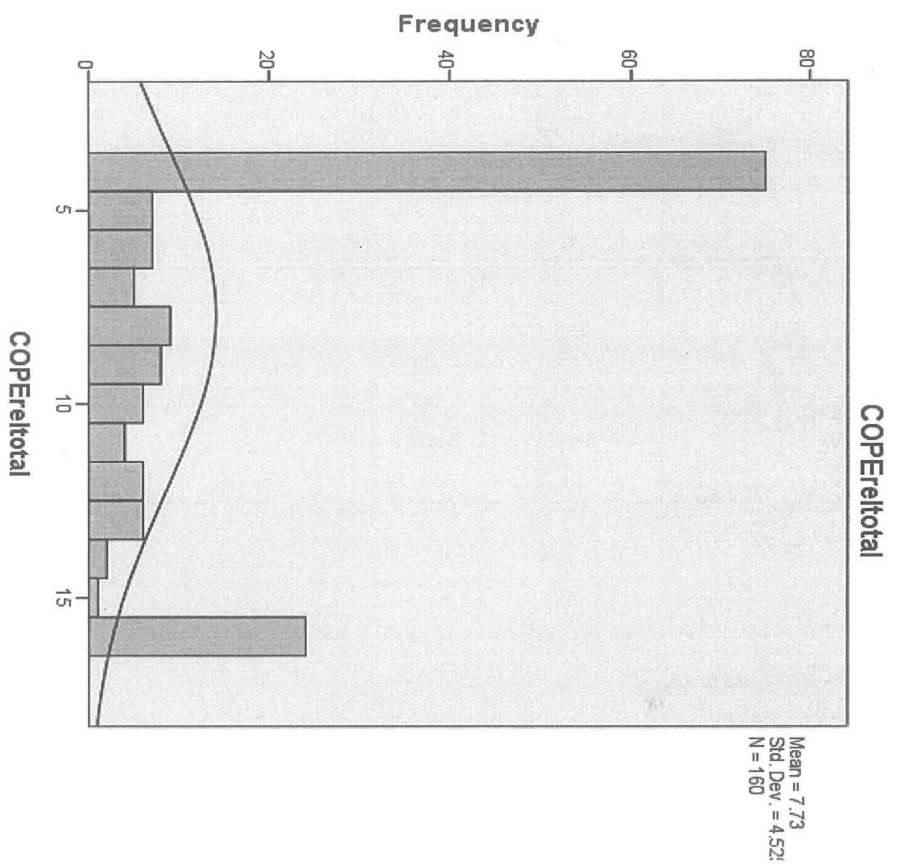


Figure A5: Histogram of COPE 'turning to religion' subscale total scores

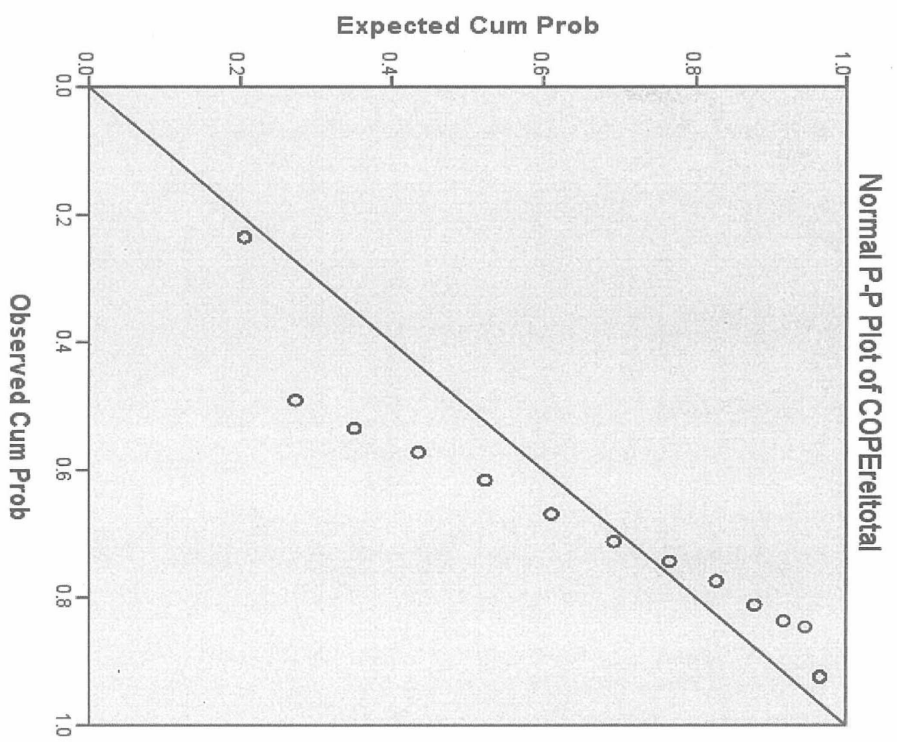


Figure A6: P-P plot of COPE 'turning to religion' subscale total scores

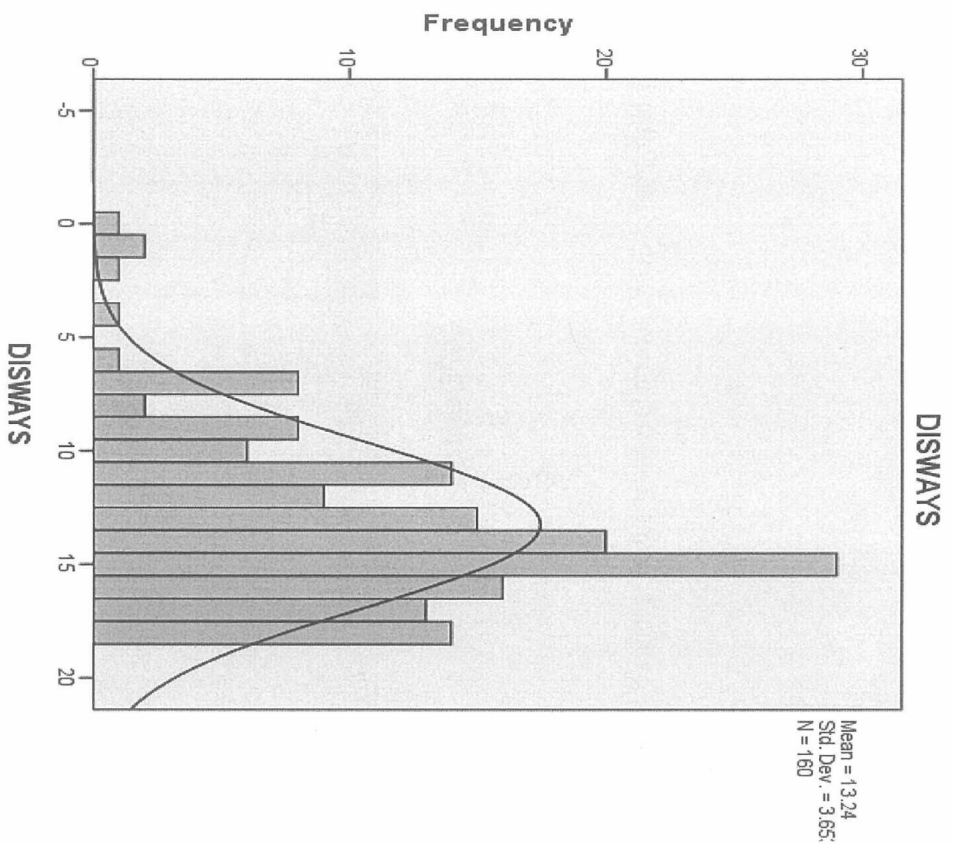


Figure A7: Histogram of 'distancing' coping total scores

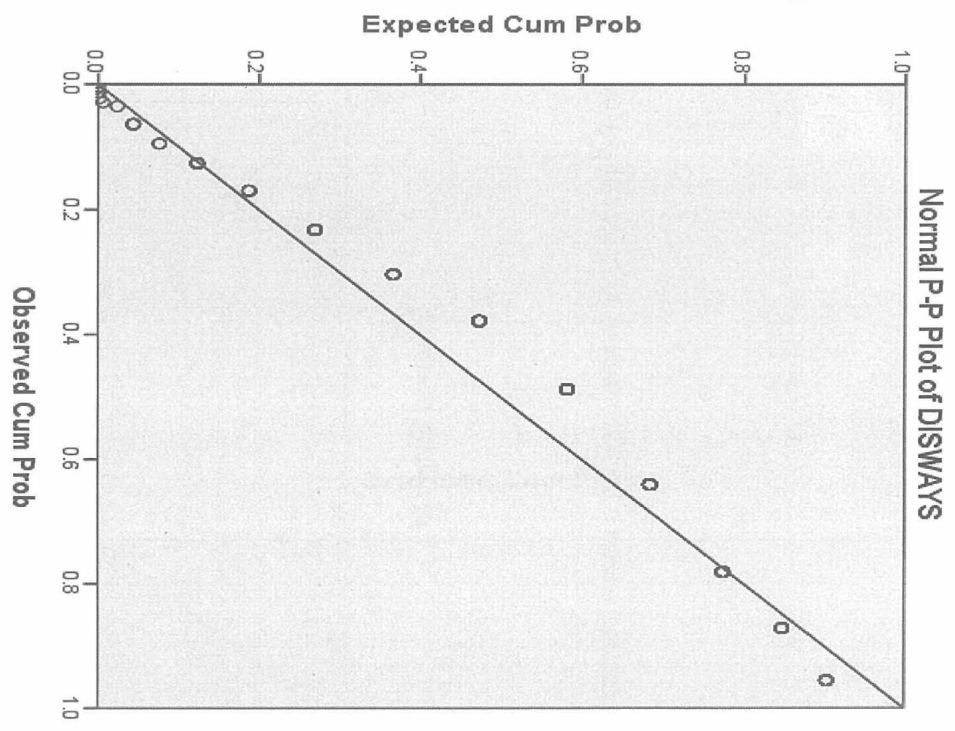


Figure A8: P-P plot of 'distancing' coping total scores

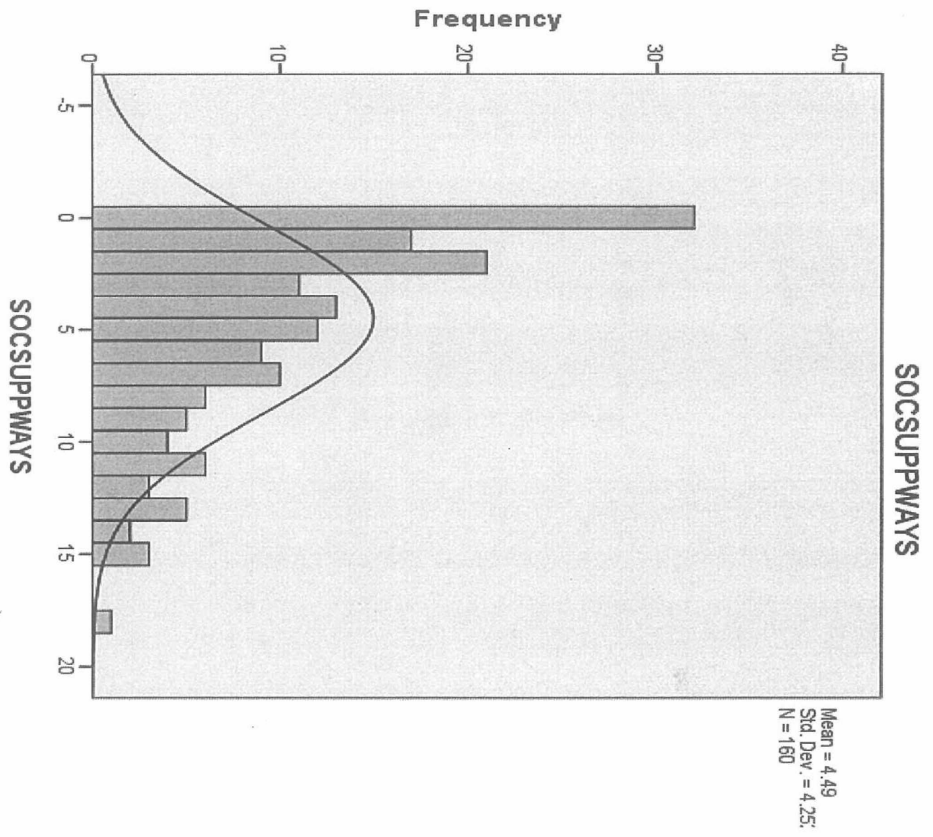


Figure A9: Histogram of number of 'social support' coping total scores

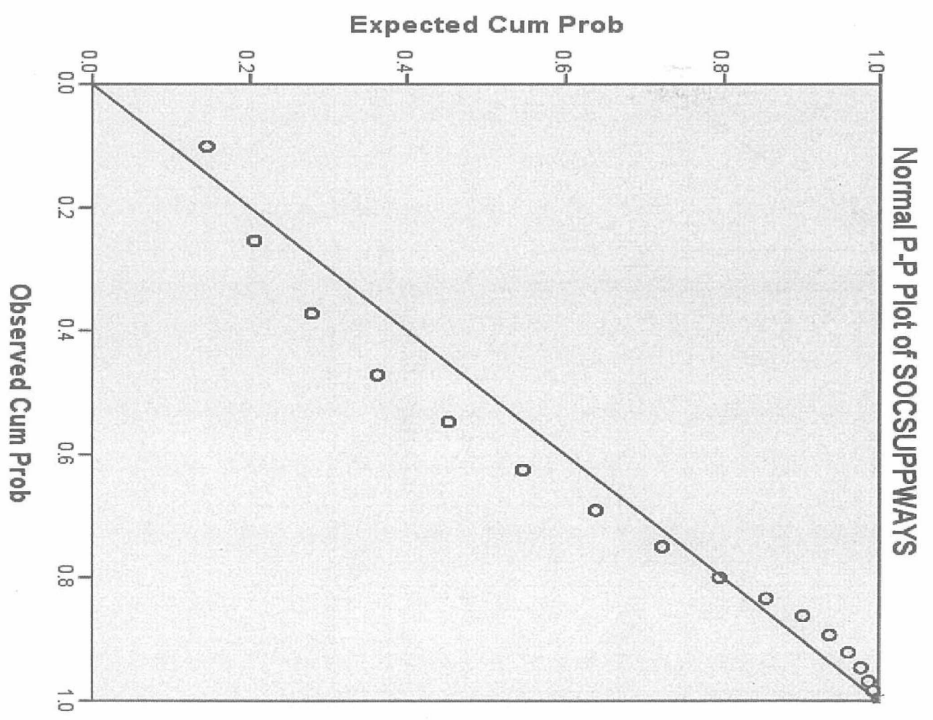


Figure A10: P-P plot of 'social support' coping total scores

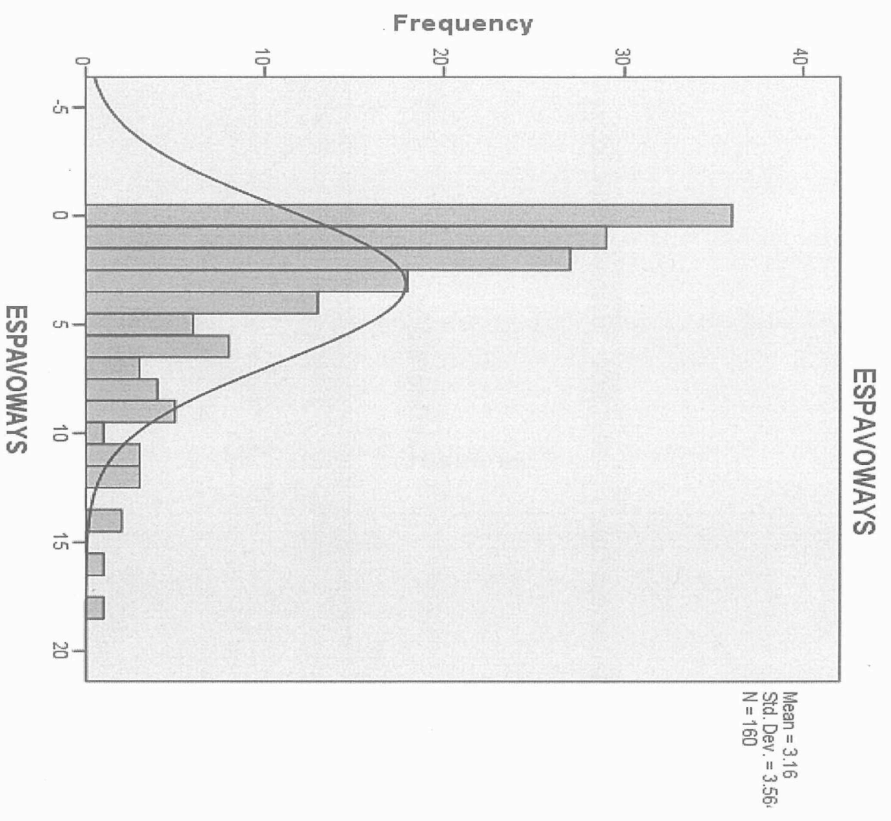


Figure A11: Histogram of number of 'escape-avoidance' coping total scores

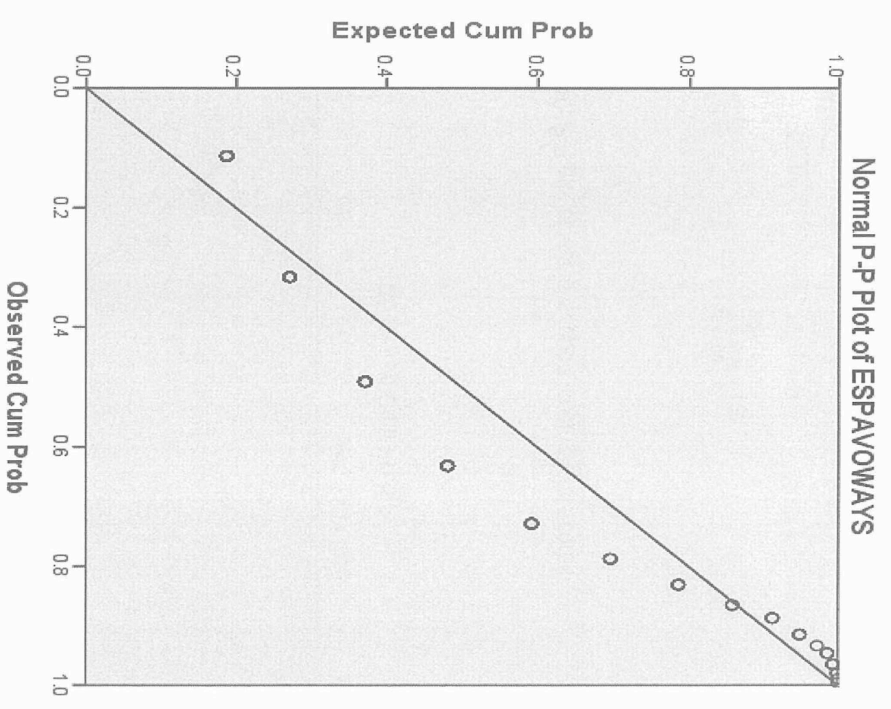


Figure A12: P-P plot of number of 'escape-avoidance' coping total scores

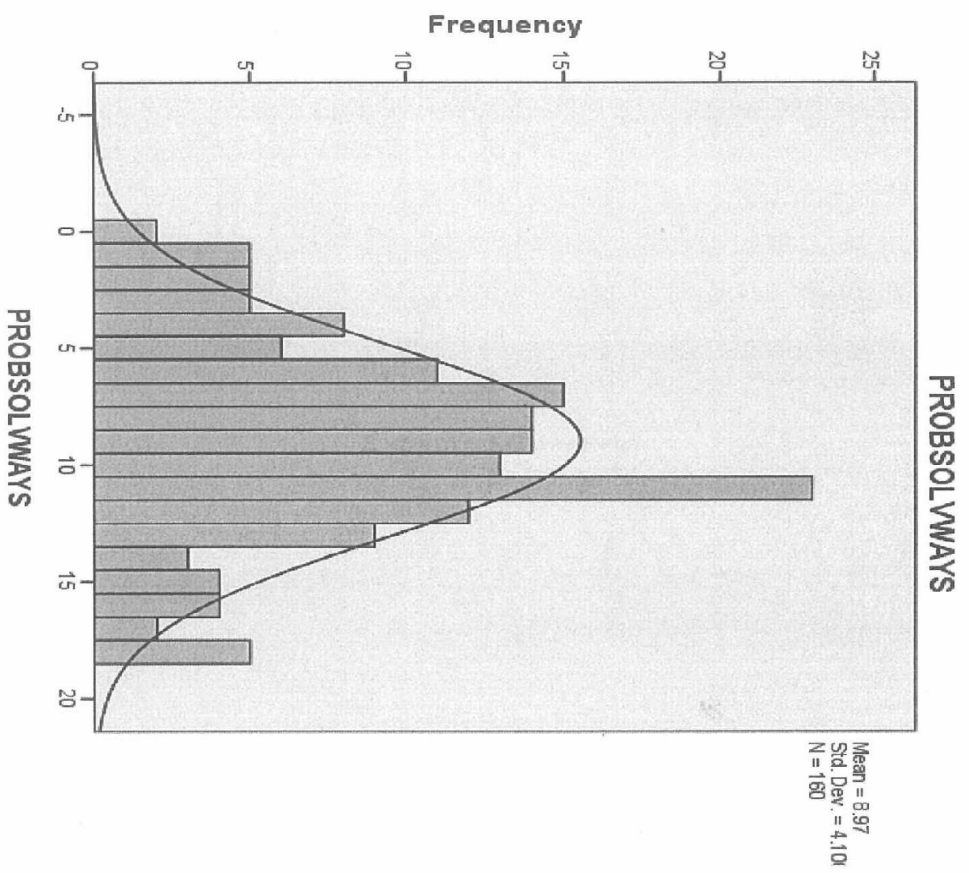


Figure A13: Histogram of 'problem solving' coping total scores

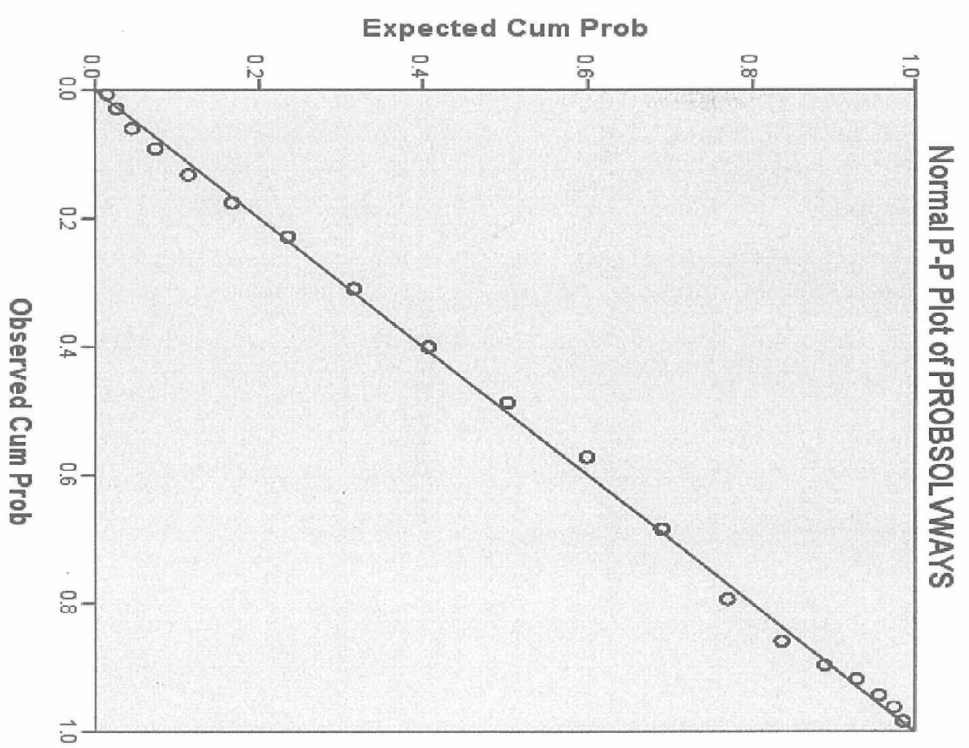


Figure A14: P-P plot of 'problem solving' coping total scores

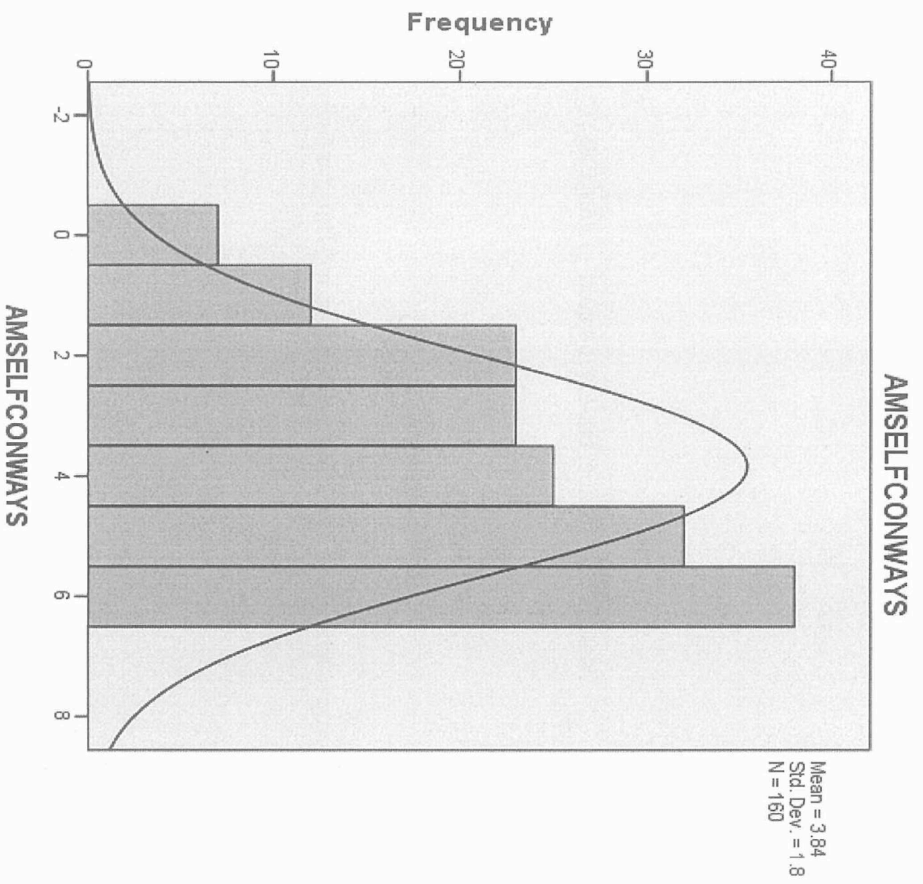


Figure A15: Histogram of 'self-controlling' coping total scores

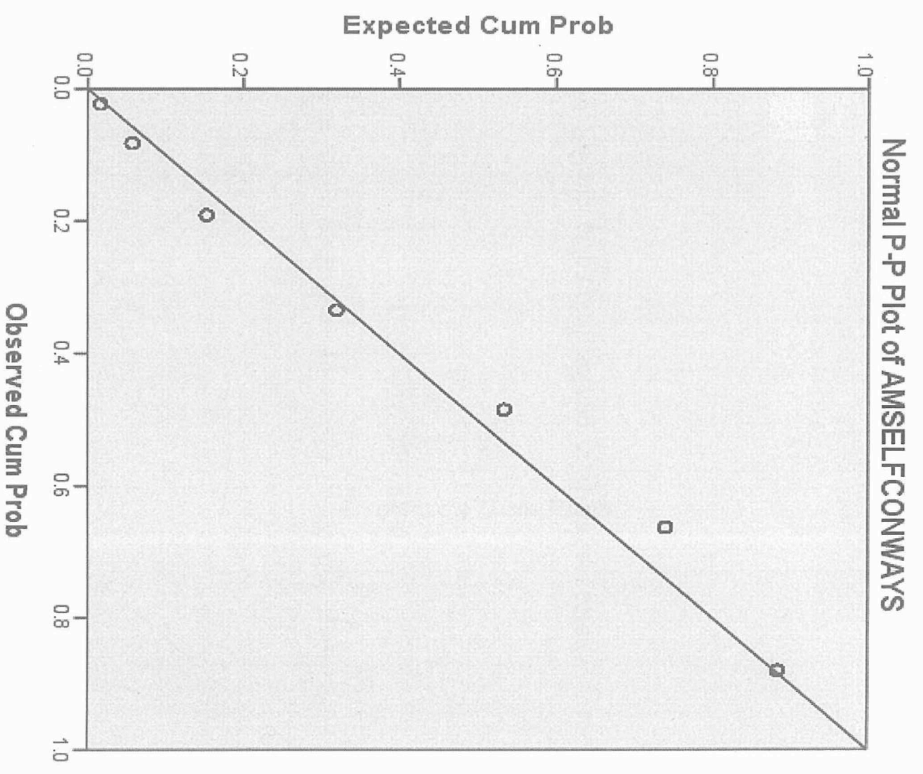


Figure A16: P-P plot of 'self-controlling' coping total scores

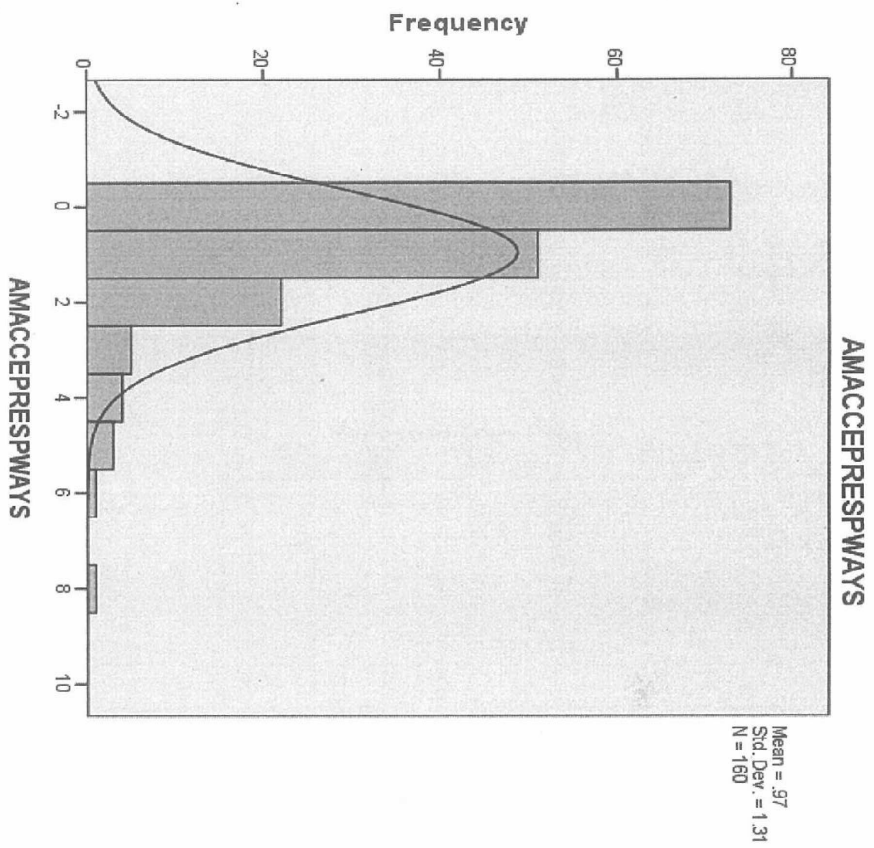


Figure A17: Histogram of 'accepting responsibility' coping total scores

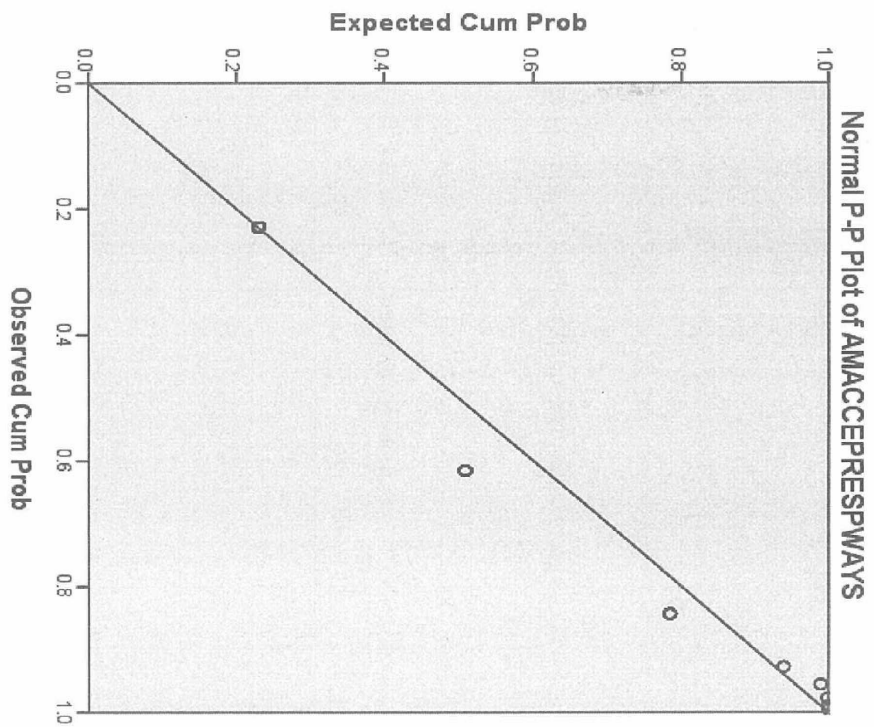


Figure A18: P-P plot of 'accepting responsibility' coping total scores

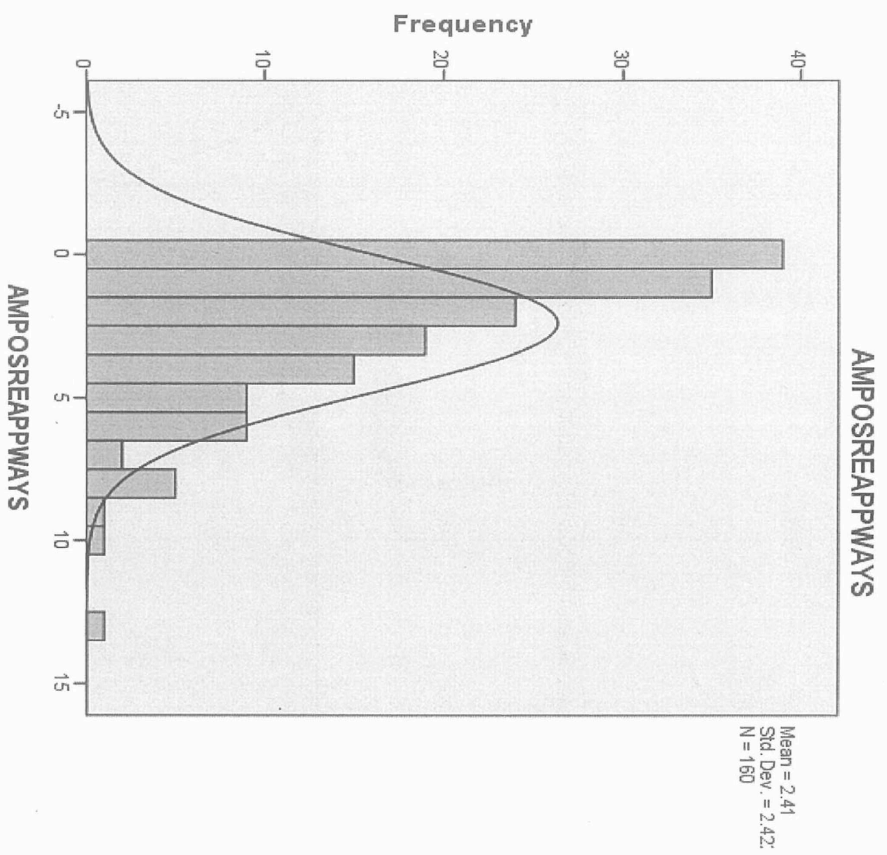


Figure A19: Histogram of 'positive reappraisal' coping total scores

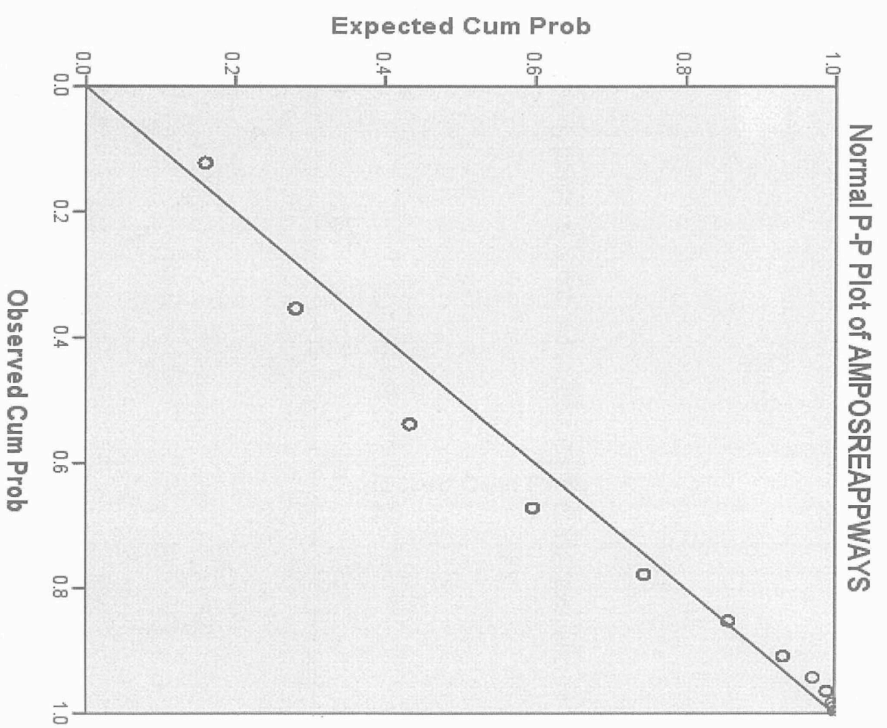


Figure A20: P-P plot of 'positive reappraisal' coping total scores

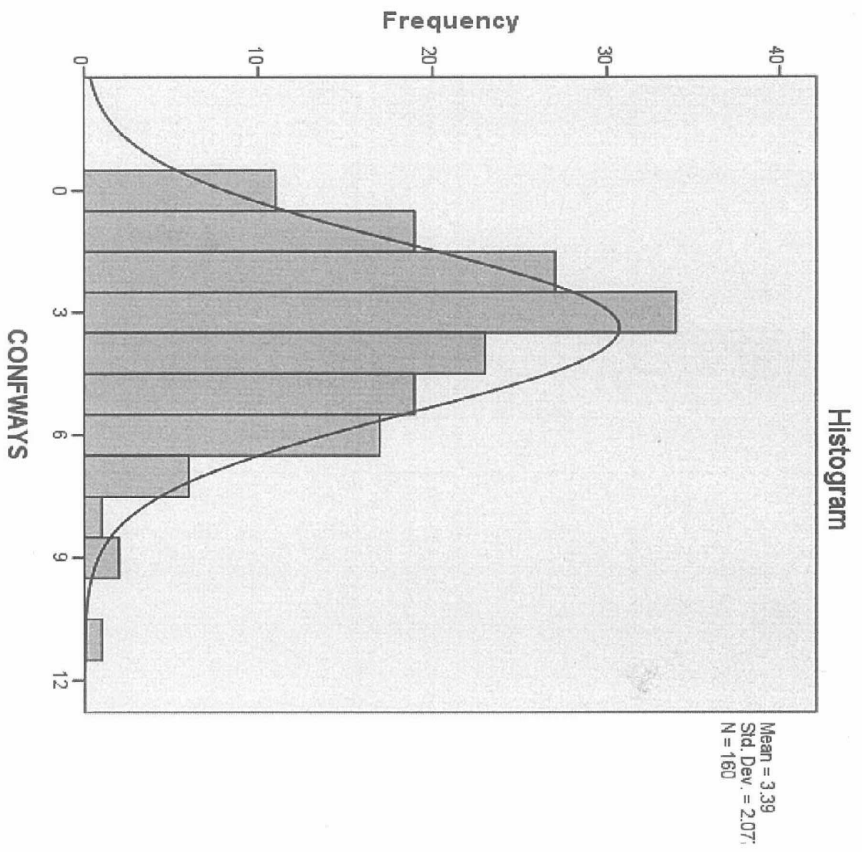


Figure A21: Histogram of 'confrontive' coping total scores

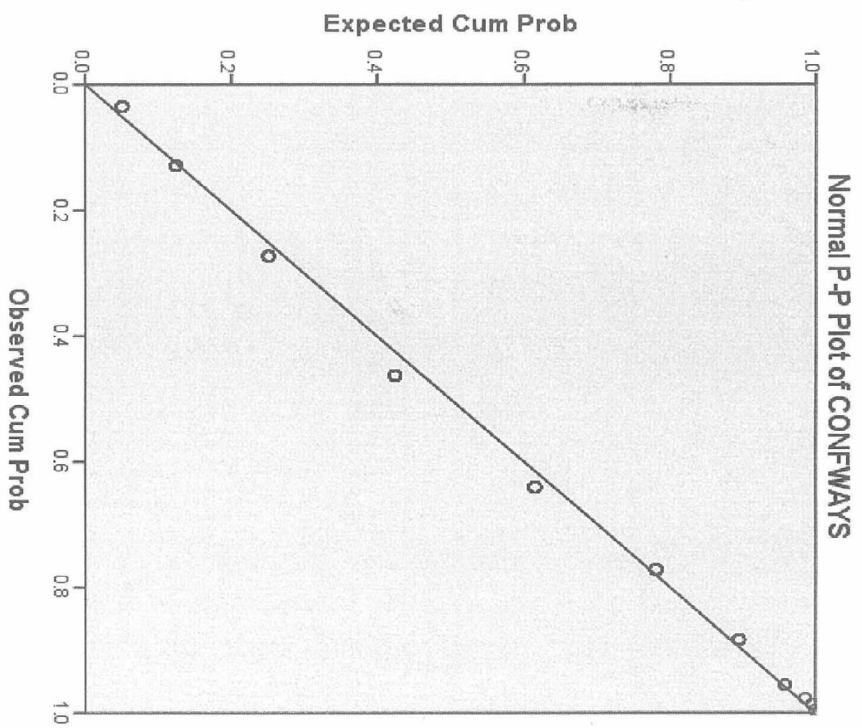


Figure A22: P-P plot of 'confrontive' coping total scores

Appendix 21: Diagnostic and assumption testing procedures of the multiple regression analysis

When the regression statistics were calculated, case wise diagnostics and generalisation statistics were completed to assess the models.

Diagnostics

Standard residuals were used to assess for outliers. A case was considered an outlier if its standard residual exceeded 3.29 (Field, 2009). The regression model was considered a poor representation of the data if more than 1% of the sample (>2 participants) had standard residuals greater than 2.58 or if more than 5% of the sample (>10 participants) had standard residuals greater than 1.96 (Field, 2009).

As well as assessing for outliers by looking at the error in the model, diagnostics statistics were calculated to ascertain whether certain cases exerted undue influence over the parameters of the model. Cook's distance values that exceeded 1 warranted further investigation (Cook & Weisberg, 1982). DFBeta statistics (the difference between a parameter estimated using all cases and estimated when one case is excluded) with absolute values above 2 were used to indicate cases with undue influence on the regression model (Stevens, 2002). Finally if the Covariance Ratio (CVR) was close to 1, the case was thought to be exerting very little influence on the variance of the model parameters (Belsey, Kuh, & Welsch, 1980). As noted by Belsey et al. (1980), the diagnostic statistics were only used to assess how good or bad the regression model fitted to the data. They were not used to justify the removal of data points to effect desirable change in the regression parameters.

Generalisation

For a regression model to generalise, it must have met the underlying assumptions and requires cross-validating. The assumptions and how these were assessed (Berry, 1993; Field, 2009) are as follows. Autocorrelation were assessed by the Durbin-Watson test to check whether the residuals in the model were independent. Values greater than 3 or less than 1 indicate a correlation (Durbin & Watson, 1950, 1951). Issues of multicollinearity were indicated when individual Variance Inflation Factors (VIF) were greater than 10, the mean VIF was greater than 1 or Tolerance statistics were below 0.2 (Field, 2009). Homoscedasticity (residuals at each level of the predictor should have the same variance) were assessed with graphs: (a) a scatter plot of ZRESID (standardised residuals) against ZPRED (standardised predicted values) where the resulting graph should be evenly dispersed around zero, and (b) a normal probability plot of the residuals which should be a straight line with most points lying on the line.

Appendix 22: Data inspection for assumptions for multiple regression and mediation models

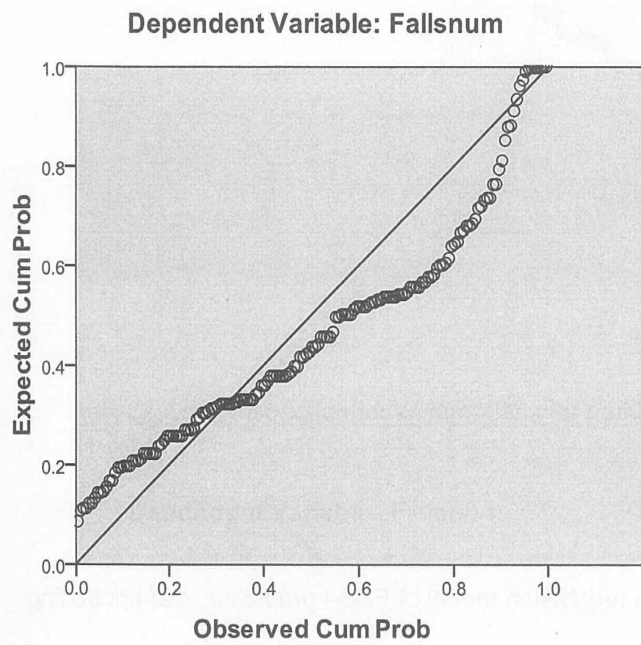


Figure A23: Normal probability plot for the regression model of FES-I predicting falls (*C pathway*)

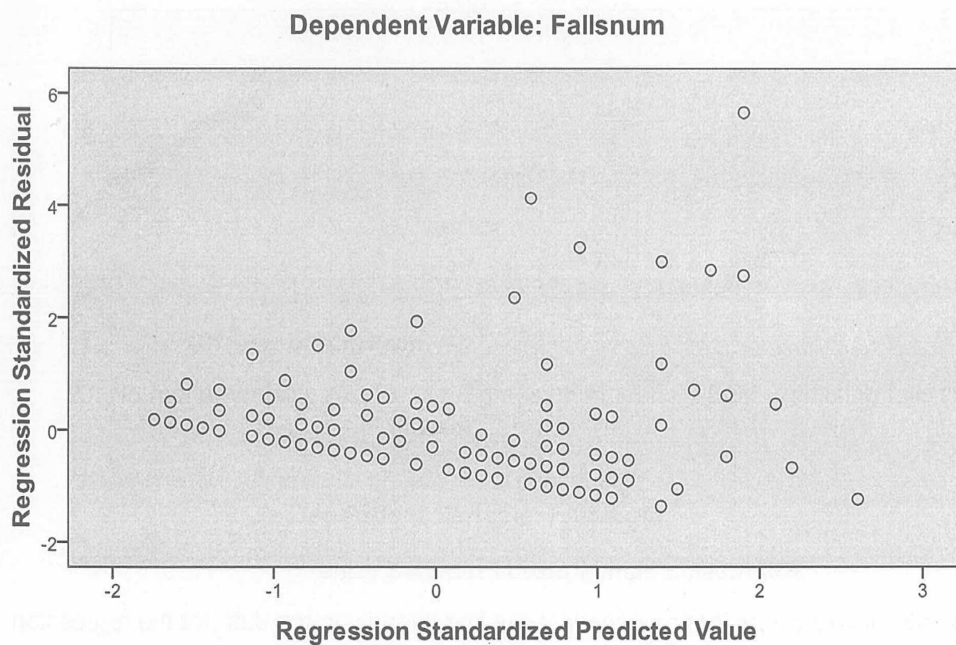


Figure A24: Scatterplot to check for homoscedasticity and linearity in the data for the regression model of FES-I predicting falls (*C pathway*)

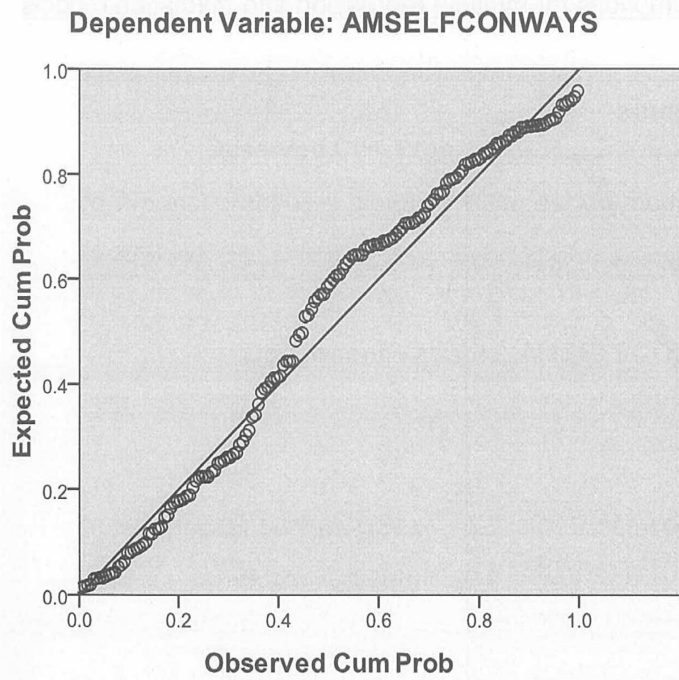


Figure A25: Normal probability plot for the regression model of FES-I predicting 'self-controlling' coping (*A pathway*)

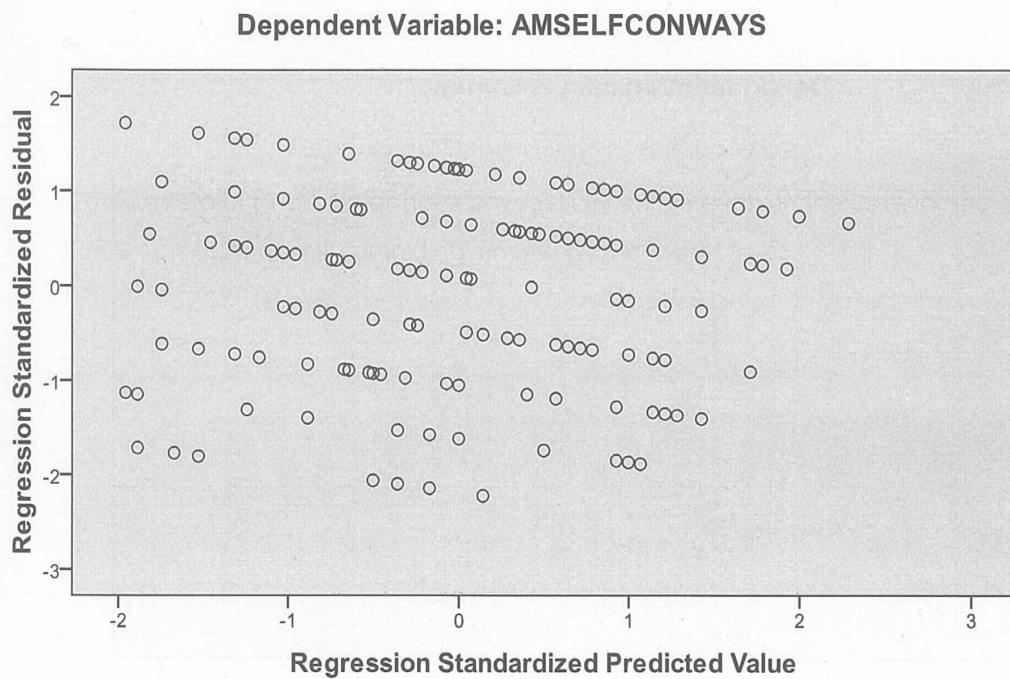


Figure A26: Scatterplot to check for homoscedasticity and linearity in the data for the regression model of FES-I predicting 'self-controlling' coping (*A pathway*)

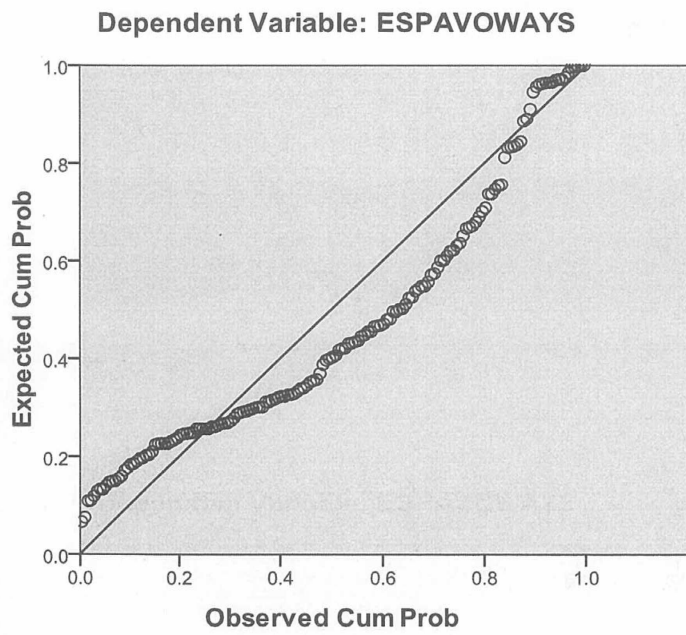


Figure A27: Normal probability plot for the regression model of FES-I predicting 'escape-avoidance' coping (*A pathway*)

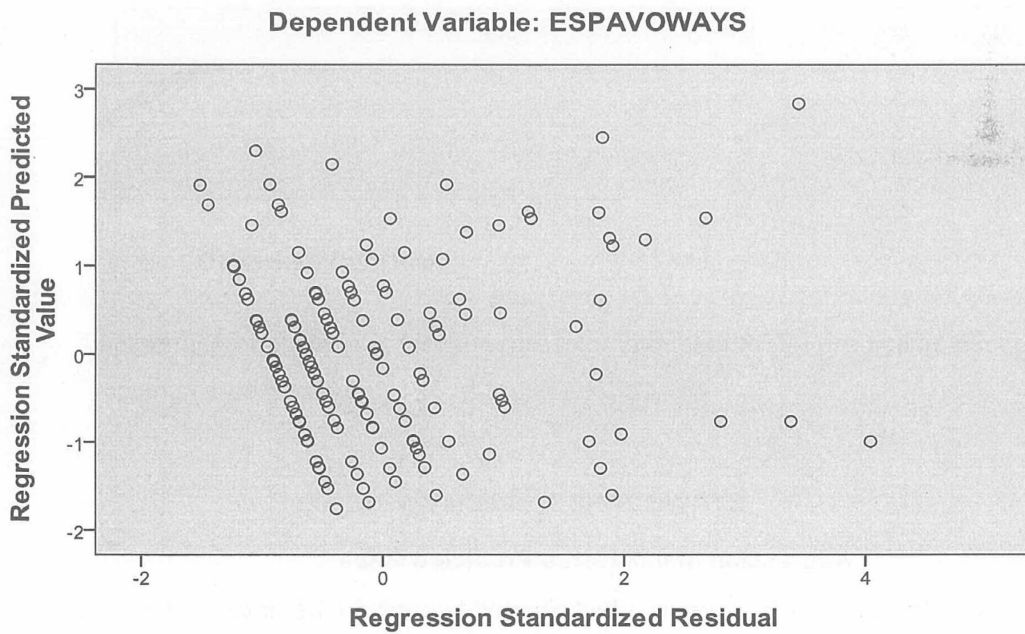


Figure A28: Scatterplot to check for homoscedasticity and linearity in the data for the regression model of FES-I predicting 'escape-avoidance' coping (*A pathway*)

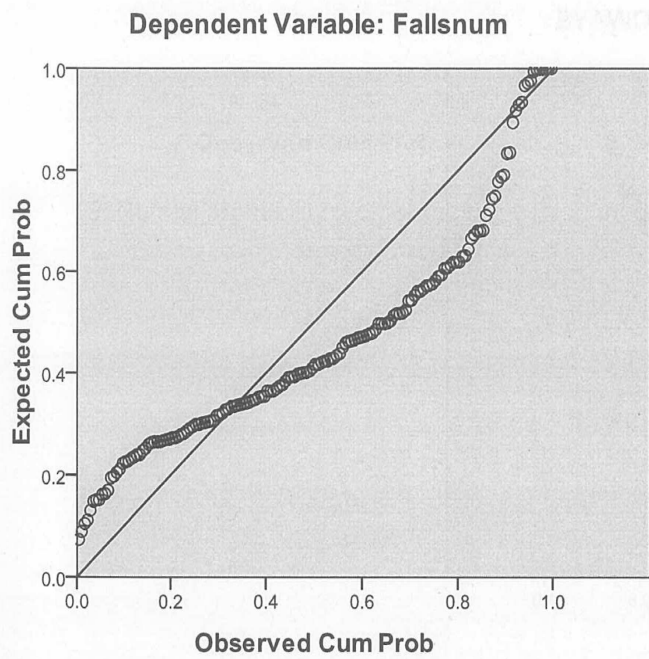


Figure A29: Normal probability plot for the regression model of coping predicting falls (*B pathway*)

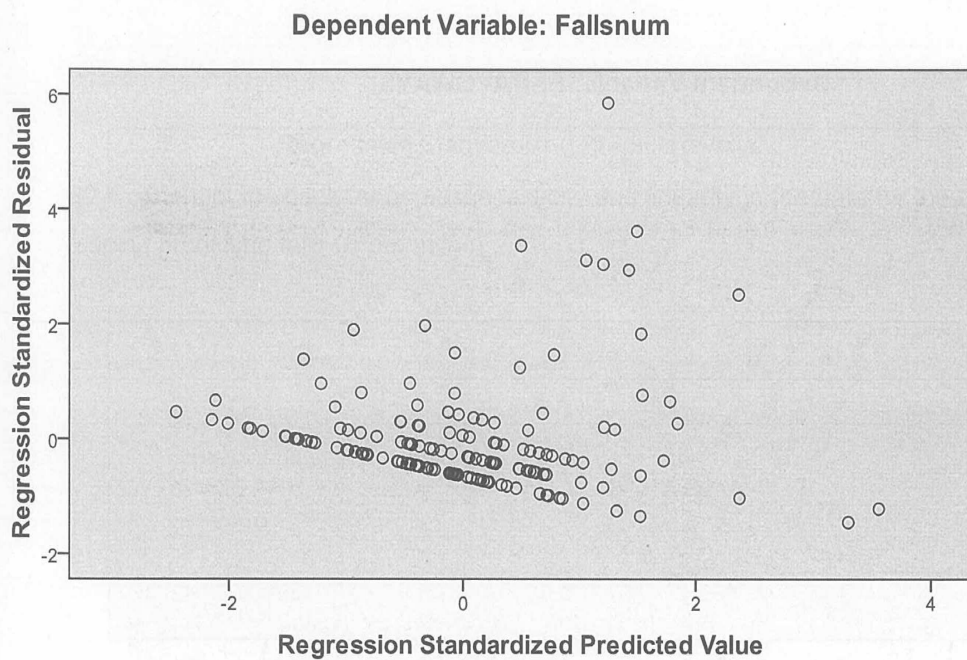


Figure A30: Scatterplot to check for homoscedasticity and linearity in the data for the regression model of coping predicting falls (*B pathway*)

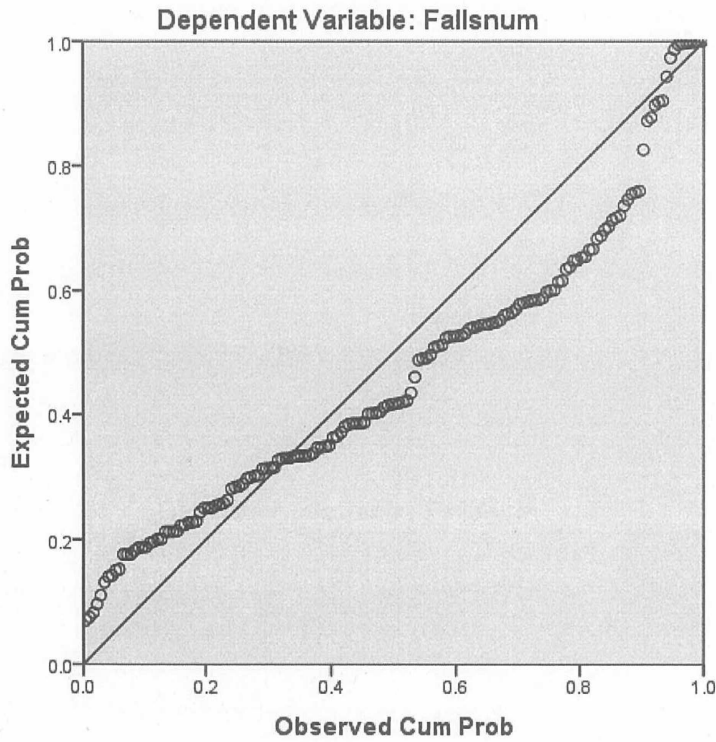


Figure A31: Normal probability plot for the mediation model with falls as the dependent variable

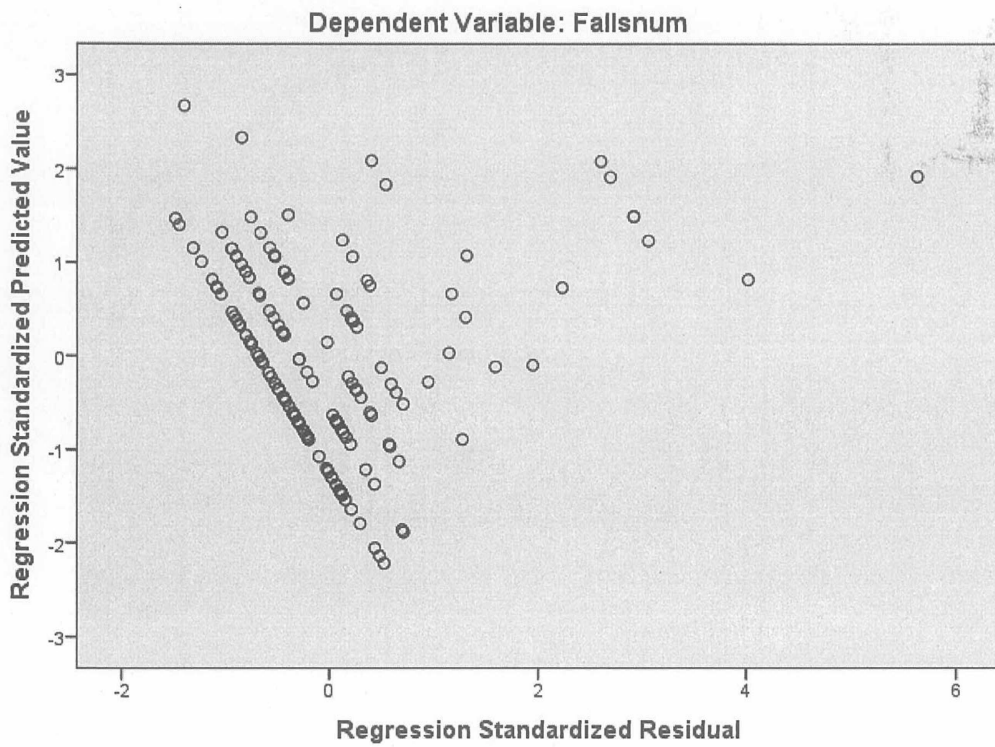


Figure A32: Scatterplot to check for homoscedasticity and linearity in the data for the mediation model with falls as the dependent variable

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Please also include 3-5 Key Points in your manuscript. These should be short bullet points which summarise the main message of your paper.

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- Multiple grant numbers should be separated by a comma as follows: '[grant numbers xxxx, yyyy]'
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01 July 2012

To Salomons Ethics Committee

Please find below a brief summary of the following research project which is now completed.

Study title: Coping responses to falls-related psychological concerns (FrPC) in community-dwelling older people: Do the mediate between falls-related psychological concerns and falls incidence?

British Psychological Society and Salomons Ethics Committee Ethical code was adhered to throughout the study and no ethical issues arose over the course of this study. None of the participants reported being distressed and there were no complaints made. No participants contact to request their data be deleted or removed from the study. All participants consented to participate in the study, and for their data to be used in the report.

Brief summary

Risk of falling for community-dwelling older people (CDOP) is significant; 30% of over 65's fall at least one annually (Tinetti, Speechley & Ginter, 1988). Falls reduction is a key UK government target, with falls identified as a major cause of disability (Department of Health, 2001). Research suggests up to 83% of CDOP experience falls-related psychological concerns (FrPC; Zijlstra et al, 2007). FrPC are associated with reduced quality of life, social isolation, activity restriction (Cummings, Salkeld, Thomas, Szonyi, 2000).

FrPC have been associated with increased falls risk (Lachman, Howland & Tennstedt, 1998; Delbaere, Crombez, Vanderstraeten, Willems & Cambier, 2004). However, some researchers have failed to find significant associations between FrPC and falls (Arnold, Busch, Schachter, Harrison & Olszynski, 2005).

Understanding why some CDOP with FrPC experience falls and other do not may identify protective and risk factors which could be addressed in interventions to reduce falls and FrPC.

A model of factors associated with FrPC that lead to increased falls risk has been proposed by Lincoln, Kneebone, Macniven and Morris (2012). Within this model, the area of 'maladaptive coping' has received limited empirical support to date. Coping with FrPC is not clearly understood and further research is required to develop understanding of the role that coping plays in the relationship between FrPC and falls (Drozdzick & Edelstein, 2001; Filitatrault & Desrosiers, 2011). Understanding which coping responses are helpful and unhelpful could help to inform interventions aimed at reducing FrPC and falls incidence.

A cross-sectional survey was used to collect data using measures of falls-related psychological concerns, coping and a falls incidence questionnaire. These were completed with 160 community-dwelling older people who were attending day-centres across the Kent region.

Below I have summarised the main findings from the multiple regression and mediation analysis conducted.

Summary of the findings

Concerns about falling and coping

This study explored how participants coped with their concerns about falling using a questionnaire that listed lots of coping strategies, and participants needed to say how much they thought they used that strategy to cope with their concerns. We found that the coping responses significantly associated with being concerned about falling were using escape/avoidance and self-controlling. Escape-avoidance describes wishful thinking and efforts to escape or avoid the problem. Self-controlling strategies were trying not to let other people know how bad things were, and trying to keep feeling to oneself. No other coping responses were significantly associated with concerns about falling.

Coping and reporting having had a fall in the last 12 months

From the same coping questionnaire, the responses were explored to see if any were significantly associated with participants reporting having had a fall in the last 12 months. We found that the only coping response significantly associated with reporting of having had a fall in the last 12 months was using self-controlling strategies. No other coping responses were significantly associated with reporting having had a fall in the last 12 months.

The effect coping has on the relationship between concerns about falling and reporting having had a fall in the last 12 months

The study found that having concerns about falling and reporting having had a fall in the last 12 months were significantly associated. We wanted to see if the way people coped with their concerns about falling could explain why these were related. To look at this we carried out a mediation analysis. A mediation analysis aims to identify and explain how or why falls and having concerns about having a fall may be related. We found that the coping response self-controlling explained part of this relationship. This means there was evidence that self-controlling significantly contributed to the variance in falls incidence in the preceding 12 months.

Summary

Overall, the study suggests that the most highly associated factors were being concerned about falling and reporting having had a fall in the preceding 12 months. We need to do more research to find directionality of this relationship (i.e. does concerns about falling cause falls to happen, or do falls make people concerned?).

The study found that self-controlling was significantly associated with concerns about having a fall and reporting having had a fall in the last 12 months, and explained some of the association between concerns about falling and falls. Research in the future might seek to identify the direction of this relationship (i.e. what causes what, which comes first), and seek to identify other things which may explain the remaining association between having reported a fall in the last 12 months and having concerns about falling, including behavioural ways of coping with these concerns.

If you have any questions or would like to feedback or comment on any of these results, please do not hesitate to contact me.

Yours sincerely

Christine Hughes

Trainee Clinical Psychologist

Email: ch303@canterbury.ac.uk

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Appendix 25: Research diary

Date	
January 2010	Had the research fair. I'm left with lots of ideas and areas to consider. It feels exciting but also slightly overwhelming. I've got three projects I would like to follow up. I've emailed the main supervisors who are involved in the proposed ideas. Also had some good conversations with my peers about research ideas, people seem to be very knowledgeable. Need to brush off my research skills!
February 2010	Have met with two of the supervisors who proposed ideas at the research fair. I'm not sure how I feel about those projects, and I wanted to feel more interested than I did when I met them. However, had a really interesting conversation with [external supervisor]. I think this could be interesting. We discussed a model of falls-related psychological concerns. Ignited some of my interests from my undergraduate days. He's emailed me some literature on the model. I must find time to sit and read it.
March 2010	The information from [external supervisor] was interesting, I found myself generating some questions about untested areas of the model (outcome expectancy, secondary gain, coping). I have spoken with [external supervisor] and he is happy to supervise my project (yey!). Also managed to get [internal supervisor]. Feeling pretty pleased!
April 2010	I have completed my supervisor selection form and both have signed it. Submitted it to the research team.
May 2010	Met with [external supervisor]. We really began to discuss the model in-depth and generated ideas and questions. I'm getting married in a month and need to make sure I get through all this research planning. I think it would be best to consider doing a brief literature search and getting a sense of the state of the evidence base at the current time. Then consider measures. [External supervisor] has kindly given me contact details of his previous trainees who he has supervised. I'll contact them to discuss my ideas.
June 2010	Spoke to [external supervisors] previous trainees. Very helpful. Discussed recruitment and areas for potential participants. Settled on contacting [day centres] in [south east region] to see if they would be potentially willing to allow me in to recruit. This will allow me to go through Salomon's Ethics Panel. Also considered measures. The FES-I is the best measure of FrPC. Nice to have my ideas confirmed.
July 2010	Back from wedding and honeymoon and very aware of how quickly time is moving! I've engrossed myself in literature. Coping is definitely where I would like to consider the model moving forward. I've begun completing my MRP proposal. Feels exciting! Some struggles with which coping measure to use. They all have their pro's and con's. A couple I'm trying to track down more information on which is proving difficult and a little frustrating. Emailed [internal supervisor] who suggested using two coping measures to balance the pro's and con's.

	Thinking how this might affect my sample size required and statistical power. Will keep researching!
August 2010	Still heard nothing from one of the authors of the coping measure. The phone calls to America and emails are proving no worth! Think it's best to consider other coping measure options. After reading review it leaves me with the COPE and the WAYS.
September 2010	Finalising my MRP proposal. Have been struggling with the analysis section of it and agreed to meet with [internal and external] together when we are all at same conference. We discuss the nature of the IV and DV's in the research I am conducting. We consider the mediation model and agree on multiple regression with Baron and Kenny's mediation model. This conversation has helped things to become a little clearer and I feel a bit more confident. Finalised my proposal form and we all sign. Phew!
October 2010	Submitted my proposal form to the review panel. Had my review panel. They were positive about the research and approved it. Very relieved as I was nervous! It was really exciting to discuss the research. They discussed the importance of applying to ethics early and gave me contact details to book at slot with the Salomons Ethics Panel. Things move quickly in the research field!
November 2010	I contact the Salomons Ethics Panel and book a slot. Only two weeks away. I must get on with my proposal. I arranged to meet with [service user group] to discuss advertising posters, measures and the overall project in more detail. They were really helpful, and made some changes to my poster with regards colours and fonts. Also reworded some of my information sheet to be clearer.
December 2010	Completed my ethics forms. Submitted to the panel. It's approved. What a relief, another hurdle over. Very aware that I now need to get a move on carrying out this research!
January 2011	Contacted all the day centres in my region. Had some really quick and positive responses. I'm beginning to feel hopeful about this! Also order the WAYS measure through the research office. Sat making up questionnaire packs for hours. Suddenly aware of the huge number of participants I need. Need to get a move on with this data collection.
February 2011	Started data collection and it's picking up. I set up my data file in SPSS and begin inputting data. This takes a while to enter all the data and I note to myself the importance of entering the data as I go along. Don't leave it all until the end!
March 2011	Data collection getting moving. I've been to seven centres so far and I'm enjoying being out and about. But it takes up a lot of time, all my study days. And I'm beginning to feel the pressure because of my other academic assignments being due. Think I need to scale back in

	data collection for a few weeks to make sure I'm not forgetting other academic work. The balance is tricky.
April 2011	My other academic assignments are submitted and I can begin really focusing on my data collection. Really getting into it now and beginning to notice some of the same conversations happening between me and participants whilst they complete their questionnaires. Thinking how it may have been a helpful project to run this as a qualitative research project. Several participants have talked to me about the influence their adult children or neighbours have on their worries about falling. They talk about their family being concerned about them and telling them not to do things. One lady said to me today 'well I trust them, so they must be right. I'm a silly old woman, and they tell me I'd fall, so I'm sure I would. So I don't go out on my own.' This got me thinking about the influence of others in CDOP concerns about falling. Future research perhaps??
May 2011	Data collection is becoming the routine study-day activity now. It's very sociable and rewarding. Enjoying this research. But need to begin to dig into the literature.....
June 2011	Started my literature search. Wow. There is so much. Met with [librarian] to review my search strategy. Really helpful, and helped me to focus in on my searching required for my section A. Read a few previous reviews in the area of FrPC. A real sense of a lack of psychological thinking which is surprising given the term actually refers to psychological factors!
July 2011	Decided on the area for my section A and have begun collating the literature from my searches. I have hundreds of papers to begin to unpick and narrow down to make manageable. Feeling slightly overwhelmed but also very interested. Emailed my plan of section A to my internal and external supervisors who feel it is a good structure.
August 2011	Begun writing my section A. Written up my summary table of studies for my appendices, which has helped me really distil the essence of the vast amount of literature. I have emailed my supervisors with a schedule of deadlines. We have agreed on a deadline of November for first draft of section A to my external and January to my internal. This feels manageable. Just need to balance this with my ongoing data collection and other academic assignments.
September 2011	Other assignments submitted and feel like I have a bit of clear time to focus wholly on my research. Section A is developing (albeit massively over the word limit!), and data collection is well over 100 now. Feeling positive!
October 2011	Struggling to draw section A back into focus. It feels like the amount of literature to fit in the word limit is impossible. Send a small excerpt to

	my internal supervisor, who provides some really helpful advice about consolidating and summarising information. I've been trying to write it in as much detail as a critical review which only has 8-12 papers and now I have 50! Read a couple of previous trainee examples which has been helpful in shifting my Section A.
November 2011	Still plodding along with section A. Will this ever be under the word limit?! Just keeping chipping away. Contact stats consultant to begin thinking about data analysis. She agrees to meet next month.
December 2011	Meet with the statistics consultant who is helpful, but I realise that I have to go through and recode some variables and collapse some categories in order to proceed with the analysis. Frustrating but helpful to know now! Section A is developing and I am managing to address the word limit.
January 2012	Email my section A draft to my internal supervisor. We meet to discuss areas to develop or change, suggesting more clarity around the FrPC concepts and more summarising of the literature due to the complexity of the area. Very helpful feedback and I feel clearer on what I need to do to improve it. Agree to send a draft of section B in April 2012 to my internal. Email my external supervisor to discuss the results and arrange a deadline for a draft of section B.
February 2012	Meet with my external supervisor. We review the data and what the preliminary analysis shows. Discussed ways to manage the difficulties with the data violating assumptions of multiple regression. Given some useful information about bootstrapping and will need to teach myself how to use this to ensure my analysis is robust. Order a couple of useful books and download the Macro's required to begin practicing how to use it. Agreed to email him section B in June as he is away for 2 months.
March 2012	Conducted the bootstrapping. Macro's felt like a really difficult program to get my head around! But when I got used to it, it was really easy to use! And reassuring that my analysis is now robust. Section A is now written integrating the feedback from my supervisors and under the word count. I've sent it to one of my peers to read and awaiting their feedback. Section B is underway, and I feel more confident writing this section than I did section A. Planned out my section C and begun writing it when I need a break from section B!
April 2012	Emailed my section B to my internal supervisor. Gave me some very positive feedback, and felt that the comments he made were manageable. He was unable to read my discussion before we met, but has agreed to email me with his comments.
May 2012	Received an email from my internal supervisor regarding my discussion. Some bigger changes to make to this section, which is slightly disheartening, but also nice that I have the time to address them. Agreed to respond to the comments with a redraft in June.

June 2012	Emailed my section B to my internal and external supervisor. Also emailed my section C to my internal who provided comments which I addressed. Section C is complete and sent to a peer for feedback prior to submission. I begin collating my section D as an electronic file. Got feedback on my last assignments with conditions, so I break to address these whilst awaiting feedback on my section B. Feeling very tired with my research, and struggling with motivation at times. I read back over my research diary again and realise what a long journey it's been. Beginning to feel the end is in sight. I write my summary report to my participants and ethics. I'm hoping to finish this a bit ahead of the deadline so I have time to check through everything, get it bound and have some space from thinking about it.
July 2012	Integrating final feedback into my sections, and I'm glad I was as organised previously to manage last minute changes. I guess prior planning may well improve performance! Will have to wait and see! Checking through keeps throwing up minor changes which are becoming a little wearing, but will be glad to have this handed in. When reading back over my final drafts, I find myself really interested in my research again, a feeling I thought I'd lost along the way at times. Feels strangely...rewarding!