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Associations between self-efficacy and secondary health conditions in people living with spinal cord injury: a systematic review and meta-analysis

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Associations between self-efficacy and secondary health conditions in people living with spinal cord injury: a systematic review and meta-analysis

Abstract

Objective: To describe the association between self-efficacy and secondary health conditions in people living with spinal cord injury.

Data sources: PubMed, Embase, the Cochrane library and CINAHL were systematically searched from database inception to September 2016.

Study selection: Studies describing patients living with spinal cord injury in which self-efficacy was measured by a standardized questionnaire and an association was made with somatic or psychological secondary health conditions.

Data extraction: An independent extraction by multiple observers was performed based on the STROBE statements checklist. A meta-analysis concerning the association between self-efficacy and secondary health conditions in people with spinal cord injury was performed if a minimum of 4 comparable studies were available.

Data synthesis: Out of 670 unique articles screened, 22 met the inclusion criteria. Seven out of these 22 studies investigated associations between self-efficacy and somatic secondary health conditions. Only a trend towards an association between higher self-efficacy with less pain, fatigue, number of secondary health conditions and limitations caused by secondary health conditions was found. Twenty-one studies described the association between self-efficacy and psychological secondary health conditions. All correlations of higher self-efficacy with fewer depressive (18) and anxiety symptoms (7) were significant and meta-analysis showed a strong negative correlation of -0.536 (-0.584 to -0.484) and -0.493 (-0.577

to -0.399) respectively. A small number of studies (2) showed a trend towards a positive correlation between self-efficacy and quality of life.

Conclusion: Self-efficacy is negatively associated with depressive and anxiety symptoms in spinal cord injury. Therefore self-efficacy seems an important target in the rehabilitation of patients living with spinal cord injury. More research is necessary to clarify the associations between self-efficacy and somatic secondary health conditions. Future research should also focus on different types of self-efficacy and their association with secondary health conditions.

Keywords: Spinal Cord Injuries, Self-Efficacy, Rehabilitation, Complications, Quality of Life, Mental Health.

Abbreviations:

SHCs: secondary health conditions

SCI: Spinal cord injury

Introduction

Spinal cord injury (SCI) is a highly disabling condition that affects many aspects of daily life.[1,2] A variety of secondary health conditions (SHCs) contribute to the disability people living with SCI may experience.[1,3] A secondary health condition is defined as: a condition that is causally related to a disabling condition (i.e., occurs as the result of SCI) and that can either be a pathology, an impairment, a functional limitation, or an additional disability.[4] SHCs can

be divided into somatic and psychological health problems. In a large Canadian survey of 1549 community based people living with a traumatic SCI, the following somatic SHCs were most commonly reported within 12 months after discharge from the hospital: neuropathic pain (65%), sexual dysfunction (62%), spasticity (60%), urinary tract infections (58%), joint contractures (57%), shoulder problems (53%), bowel incontinence (51%), weight problems (48%), urinary incontinence (46%), pressure ulcers (33%), neurological deterioration (33%) and fatigue (32%).[5] Psychological SHCs most commonly described in people living with SCI include depression, anxiety and poor quality of life.[6,7] Depression in people living with SCI has a prevalence of 22.2% (ranging from 7-48% in different studies).[6] This differs strongly from the prevalence in the general population of 3.2% and from the prevalence of depression in people with any chronic physical disease, ranging from 9.3 till 23%.[8] It is estimated that 27% (ranging from 15-32%) of people living with SCI develop an anxiety disorder.[9] In comparison, the prevalence of anxiety disorders in the general population is estimated at 7.3%.[10] In SCI research most studies, however, measured depression and anxiety using self-rating scales. These measurements reflect subjective mood rather than demonstrate the existence of a depressive or anxiety disorder.[11]

SCI itself can have an impact on the participation of a person[12] and SHCs may significantly enlarge this impact, including by effecting work.[1,2] Having SHCs is also related to high health care utilization, lower quality of life and increased health care costs.[13,14] This makes minimizing the occurrence and impact of SHCs an important target for the rehabilitation and the life-long care of people living with SCI.

A recent review shows that health promotion and self-care of people living with SCI are of great importance in preventing SHCs.[2] It has also been suggested that, in chronic disease, a person's self-efficacy is requisite to performing self-care.[15] Together this leads to the

assumption that better self-efficacy will lead to a better self-care which in turn may prevent SHCs. In the last decades, self-efficacy has gained interest in SCI research. Also in the theory of adjustment after SCI, as postulated in the Spinal Cord Injury Adjustment Model, self-efficacy has a central role. Within this model enhanced self-efficacy is associated with positive adjustment in the future.[16] Self-efficacy is described as: the belief that one can successfully execute the behavior required to produce the desired outcomes.[17] Self-efficacy can be operationalized at different levels: general self-efficacy is the general belief about one's ability to cope with a variety of difficult situations in life;[18] disease management self-efficacy is the ability to manage situations associated with one's problems that arise from their disease;[19] lastly, self-efficacy can be measured with respect to specific situations. Some examples of SCI-specific self-efficacy are: wheelchair-specific self-efficacy[20,21] and pressure sore prevention self-efficacy.[22] Most research regarding people living with SCI, focuses on the association between general self-efficacy or disease management self-efficacy with pain, depression and anxiety.[23–40]

Systematic reviews in people with chronic pain[41] and osteoarthritis[42] have shown that self-efficacy is an important factor in relation to SHCs. However, to our knowledge, no systematic review on the association between self-efficacy and SHCs in people living with SCI has been performed to date. Therefore the aim of this systematic review is to describe the evidence on the associations between self-efficacy and SHCs in people living with SCI. All types of self-efficacy and both somatic and psychological SHCs will be discussed. It is hypothesized that a higher self-efficacy leads to a lower incidence or less burden of both somatic and psychological SHCs.

Methods

Literature search and in- and exclusion criteria

Four relevant electronic medical databases (PubMed, The Cochrane Library, CINAHL and Embase) were comprehensively searched from database inception to September 2016. All electronically available, published research regarding self-efficacy in relation to SHCs of people with SCI were taken into account. Terms included: spinal cord injury and several synonyms, self-efficacy and related terms (e.g. self-concept, self-esteem, locus of control), and SHCs described in the SCI literature.[1–3,5,9,43–47] These terms were used to search in all available search fields. Search terms used are shown in the appendix.

After duplicates were removed, two investigators, one with a psychological (TvD) and one with a medical (TC) professional background, independently screened the titles and abstract for eligibility. Studies were included if they met the following criteria: 1) Journal article published in English. 2) The study describes people living with an acquired SCI, traumatic or non-traumatic. 3) The target population of the study is aged sixteen years or older. 4) Self-efficacy is measured using a standardized questionnaire. 5) A quantitative association with secondary health conditions is reported. The following exclusion criteria were used: 1) The study focused on people with cognitive disorders or malignant tumors. 2) The study is a systematic review or a case report. 3) The study does not separate the results of people living with SCI from people with other diagnoses (e.g. MS, cerebral palsy, chronic pain). Studies utilizing data from the same study groups are only included once into the systematic review. Cohen's kappa was calculated and used to assess inter-rater agreement on inclusion. To prevent selection bias, the differences were discussed until both investigators reached consensus. The remaining articles' full-texts were further checked for the in- and exclusion criteria as described above. In addition, the reference lists from the selected articles were screened for other potentially eligible studies.

Critical Appraisal

The completeness of the reported study's design, conduct and finding of each article was also

independently assessed by both investigators using the STROBE checklist for cohort, case control and cross-sectional studies.[48] The STROBE statements checklist consists of 22 items (with 12 additional sub items) which relate to the title, abstract, introduction, methods, results and discussion settings of an article.[49] One item: "13(c): Consider use of a flow diagram" was excluded, for this could not be verified by the investigators reading the article. Omitting this item left a total of 33 items. Twenty-one items were given a dichotomous rating, 1 (present) or 0 (absent). The other twelve items were given a three-point rating, 2 (present), 1 (partially present) or 0 (absent). If an item was not applicable for that study, the maximum score was given. This was applicable for four items. The range of the quality score was 0-45. The scores from both investigators were then compared, and differences were discussed to reach consensus.

Statistical analysis

Outcome data was extracted from the selected studies. Bivariate Pearson's correlation coefficients were the preferable statistics. A meta-analysis was performed if sufficient studies described a correlation between self-efficacy and a particular SHC or a measure of SHCs. No standards regarding the number of articles for a meta-analysis could be found and a minimum of four articles was deemed appropriate to perform a meta-analysis, if the used outcome measures were sufficiently similar (e.g., a validated screening measure for depression). Comprehensive Meta-Analysis Software (CMA)[a] was used.. Correlations were first transformed into Fisher's Z-scores, to calculate the mean. This mean Fisher's Z-score could then be transformed back into a correlation.[50] 95% Confidence Intervals and p-values were calculated by entering the correlations and its sample sizes into Comprehensive Meta-Analysis. Because of the differences in study design between the studies, a random-effects model was used to synthesize a mean correlation of the studies.[51,52] The random-effect model

was chosen based on interpretation of the selected studies, rather than on statistical heterogeneity.[51]

Results

Selection of articles

A total of 925 articles were found through searching the four electronic databases. After the removal of duplicates, a total of 665 articles were considered for inclusion. The intra- and interobserver agreement (Cohen's kappa) on in/exclusion of a study between the two investigators was 0.38. The investigator with a medical background selected more studies than the investigator with a psychological background, resulting in an only fair level of agreement.[53] All discrepancies were discussed, until consensus was reached. From the 665 articles found in the search, 70 were selected for full text analysis, resulting in the exclusion of another 49 articles. Screening of the references of all full-texts revealed five additional possibly relevant articles. Of these five articles, one was deemed eligible and added to the systematic review. The PRISMA Flow Diagram,[54] with reasons to exclude each full-text, is shown in Figure 1.

STROBE checklists

A total of 22 articles were included in the systematic review and were critically appraised using the STROBE checklist. Table 1 shows the scores awarded to each study. Scores varied from 27 to 41 points, with a mean score of 37. Individual item data of the STROBE checklist are summarized in figure 2. As this figure shows all the found articles in the review explained the scientific background (item 2), gave matching criteria (item 6), described subgroup analysis (if applicable) (item 12B), summarized follow-up time (if applicable) (item 14C), reported categorized variables (if applicable) (item 16B), gave risk estimates (if applicable)

Item 16C), reported other analysis (if applicable) (item 17), summarized key results (item 18) and gave overall interpretation of the results (item 20). Non however described any sensitivity analysis (item 12E). All but one study only gave incomplete information about the limitations of the study and the magnitude of the bias (item 19).

The self-efficacy scales used in the included studies, measure this concept on diverging levels; general self-efficacy (General Self Efficacy Scale); disease specific or disease management self-efficacy (Moorong Self Efficacy Scale, Chronic Disease Self-Efficacy Scale, Self-Efficacy for Managing Chronic Disease Scale and the Beliefs Scale); or a specific type of self-efficacy (Leisure Time Physical Activity Self-Efficacy Scale).

Somatic SHCs

A total of seven studies [25,27,29,34–36,55] described a correlation between self-efficacy and somatic SHCs. All significant and non-significant correlations between self-efficacy and somatic SHCs are depicted in Table 2. Somatic SHCs investigated in relation to self-efficacy were: pain, fatigue, amount of somatic SHCs and limitations caused by somatic SHCs. Pain was described in a variety of terms, including "pain"[25,29,34,35], "pain intensity"[25,27,34,35] and "pain interference"[27,36]. One study showed an association between self-efficacy and fatigue.[25] Finally, two articles showed a correlation between self-efficacy and a total somatic SHCs score.[27,55] One article used the Secondary Health Conditions Scale, which measures the experienced impact of SHCs,[27] the other used a list of 18 preselected SHCs in a questionnaire.[55] Pain and pain intensity did not meet the criteria set for a meta-analysis due to diverging outcome measures; questionnaires versus single numeric rating scales (see table 2). For pain interference, fatigue and number/impact of SHCs the number of studies did not meet the criteria set for a meta-analysis.

Psychological SHCs

A total of 21 studies described an association between self-efficacy and one or more psychological SHCs.[23–40,56–58] Eighteen studies showed significant correlations between self-efficacy and depression, varying from -0.32 to -0.74 (Table 3).[23–40] One study gave correlations between self-efficacy and depression during initial rehabilitation and 3 months after discharge, on behalf of the homogeneity the latest is used in the meta-analysis.[26] All studies used validated scales to measure self-efficacy and depression. Assuming that these scales measure the same underlying construct, a meta-analysis was performed. The mean correlation and the forest plot of this meta-analysis are shown in Figure 3. The 4 studies using a general self-efficacy scale had a mean correlation of -0.52. The 13 studies using a disease specific or disease management self-efficacy scale had a mean correlation of -0.57. The one study using a specific type of self-efficacy scale showed a correlation of -0.32.[39]

The most studies in this review are cross-sectional of nature and used community dwelling patient with SCI. One study however investigated the correlation between self-efficacy and depression on different time intervals.[26] That study showed a nonsignificant correlation during rehabilitation, and the largest correlation found in this review three months post-discharge (-0.74).[26] Another study used the same scale in a larger population of community dwelling people with SCI (60% > 4 years post injury). The correlation found in that study was more similar to that of the mean correlation (-0.58).[23] The only other longitudinal study in this review, investigated the correlation between self-efficacy and quality of life.[57] That study showed a change from 3 to 15 months of r=0.62 to r=0.47 respectively.

Seven studies showed a correlation between self-efficacy and anxiety.[27–30,33–35] The scales used to describe self-efficacy varied, but anxiety was measured using only two scales: the Hospital Anxiety and Depression Scale (HADS, six articles) and the Depression Anxiety and

Stress Scale 21 (DASS-21, one article). The correlations found varied from -0.32 to -0.61 and were all significant. The mean correlation and the forest plot are shown in Figure 4.

One final study showed an association between self-efficacy and psychological disorders, determined using the Mini International Neuropsychiatric Interview-Plus.[56] These psychological disorders included: major depressive disorder, bipolar disorder, suicidality, post-traumatic stress disorder, generalized anxiety disorder, alcohol dependence and abuse disorder, drug dependence and abuse disorder and psychosis. The only association with self-efficacy shown in that article was a non-significant Odds Ratio of 1.05 for the total number of psychological disorders. Due to the different outcomes and the low number of articles describing quality of life, affective/subjective disorder and psychological disorders, no meta-analyses were performed.

Correlations between self-efficacy and quality of life were described in two studies.[40,57] One study used the Life Satisfaction Questions (2LS) (a 2-item scale with one question regarding the quality of life at this moment, and one about the quality of life now compared to life before SCI) to measure life satisfaction,[40] where the other used the Quality of Life Index.[57] Another study reported no correlations, but a significant regression coefficient of self-efficacy with psychological well-being.[58]

Discussion

A systematic review was performed, resulting in 22 studies describing an association between self-efficacy and SHCs. Seven studies described somatic SHCs, including different pain

variables, fatigue, amount of SHCs and impact of SHCs. These studies did not provide solid evidence of an association between self-efficacy and somatic SHCs. Only a trend towards a small negative correlation was found. Based on 21 studies describing an association between self-efficacy and psychological SHCs, a meta-analysis produced strong mean negative correlations between self-efficacy and both depression and anxiety.

The strong mean negative correlations between self-efficacy with depression and anxiety are in accordance with those found in a systematic review in people with osteoarthritis and somewhat stronger than found in a review of people with chronic pain.[41,42] While the study on people with osteoarthritis did not find evidence of a relation between self-efficacy and pain,[42] the study of people with chronic pain, did find a relation between self-efficacy and pain intensity.[41]

In this review only few studies were found examining self-efficacy and somatic SHCs. Most of these studies focused on pain. Frequently reported somatic SHCs in the SCI literature, like pressure ulcers and urinary tract infections, are to our knowledge, never examined in relation with self-efficacy other than being part of a total SHCs score. The occurrence of somatic SHCs may increase with the aging of the SCI population,[59] and with the shortening of initial rehabilitation programs for financial reasons.[60,61] Such an increase of somatic SHCs will lead to a higher rate of physician and specialist utilization, emergency department visits and hospital readmissions. This underscores the importance of research into prevention of somatic SHCs and the possible role of enhancing self-efficacy in self-care of persons with SCI.

This review showed limited indication that time since injury might moderate the association between self-efficacy and psychological SHCs.[26,57] One study found that at inpatient stay, disease-management self-efficacy was not significantly correlated to depression. However, 3 months post-discharge the correlation was the strongest found in this review. In another study

using the same scale in community dwelling patients with SCIthe correlation is somewhat weaker.[23] A longitudinal study using a general self-efficacy scale to investigate the association with quality of life, found a decrease in the correlation from 3 to 15 months.[57] This might suggest that the influence of self-efficacy on psychological SHCs changes over time.[23,26,57] It might be expected that disease management self-efficacy will increase during inpatient rehabilitation, being a major target of the rehabilitation team. How it changes, and its impact over time on the association with depression, must be clarified in future research. General self-efficacy on the other hand is a trait variable that will not change much over time, its alteration on the impact of the association with psychological SHCs must also be subject for further research.

The forest plot on the meta-analysis of self-efficacy and depression shows that one study deviates the furthest from the mean.[39] Its negative correlation (-0.32) was smaller than any other study, of which the correlations did not get above -0.40. An explanation for this difference might be the Leisure Time Physical Activity self-efficacy scale, which no other study used. Leisure time physical activity is an aspect of importance for people living with SCI functioning in society. The Leisure Time Physical Activity self-efficacy scale mostly focuses on the barriers to performing leisure time physical activities. This may be the reason that the association with psychological SHCs is less strong.[39]

To date it is unclear if the type of self-efficacy scale used influences the associations found with SHCs. The studies included in this review used different self-efficacy scales, measuring diverging levels of self-efficacy. The mean correlation of general self-efficacy scales with depression was somewhat weaker than the mean correlation of a SCI specific - or disease management self-efficacy scales with depression. The scale most commonly used is the

Moorong Self-Efficacy Scale (10 out of 17).[24,25,29–33,35,39] The studies in our review all used the Moorong Self-Efficacy Scale total score. The scale was developed with a two factor structure, although some discrepant findings have been reported.[30,32,62,63] In a recently published study, however, the factor structure of the Moorong scale was reexamined, showing three factors: social function self-efficacy (e.g.: I can maintain contact with people who are important to me), personal function self-efficacy (e.g.: I can maintain my personal hygiene with or without help) and general self-efficacy (e.g.: When I see someone I would like to meet, I am able to make the first contact).[64] The authors consider the first two to be SCI-specific variables, whereas the latter is considered to be a general self-efficacy. The reexamining study of the Moorong Self-efficacy Scale showed that the different subscales all had strong correlations with physical health (including pain and vitality) and mental health (the positive equivalent of depression). The most distinct differences are found between the social functioning self-efficacy (r=0.59) and personal functioning self-efficacy (r=0.42) on the one hand and mental health on the other. The total Moorong score showed the strongest correlation (r=0.63) with mental health.[64] In a systematic review concerning people with chronic pain the heterogeneity in the found relationships across studies was, among other things, based on the self-efficacy scale content.[41] Future research is needed to differentiate between the different levels of self-efficacy and their relations to SHCs and whether these different levels of self-efficacy have a different effect on somatic versus psychological SHCs.

The strong mean correlations found for self-efficacy with depression and anxiety trigger interest in the causal pathway of this effect. Peter et al.[37] tested the Spinal Cord Injury Adjustment Model,[16] proposing a multifactorial adjustment process in which biological, environmental and psychological factors interact and influence the way people with SCI

appraise their situation. In this model appraisal refers to the way a person perceives and interprets a stressful situation, like their disability. Peter et al.[37] found that self-efficacy influences depressive symptoms indirectly via appraisals; self-efficacy relates to the way people appraise their disability, which in turn leads to more or less depressive symptoms. Sweet et al.[39] proposed another mechanism, based on their study of Leisure Time Physical Activity self-efficacy. Their hypothesis is that Leisure Time Physical Activity self-efficacy is directly correlated to Leisure Time Physical Activity, which in turn is negatively correlated to depression. Finally van Leeuwen et al.[40] found that self-efficacy has a direct pathway to mental health, as well as a mediated pathway through appraisals. These studies describe both a direct and an indirect effect of self-efficacy on SHCs. It is likely that the indirect effect is mediated through appraisals. Future research is needed to clarify the direct and indirect effect, through appraisals, of self-efficacy on SHCs.

The relatively high scores on the STROBE can be explained by the fact that 20 out of the 22 articles are published in the last ten years. In this last decade, many publishers use the STROBE or similar checklists.

Strengths and limitations

This is the first systematic review in people with SCI with respect to self-efficacy in relation to SHCs. The search used was extensive, and terms related to self-efficacy were included to avoid missing relevant studies. Also the reference lists of included studies were screened for additional articles, which accounted for one extra study included in the systematic review. The results of this review are representative for people living with SCI in the community. Therefore the information extracted on psychological SHCs can be generalized for this population.

Unfortunately, in case of somatic SHCs not enough data was found to come to a grounded conclusion. Although associations between self-efficacy and pain were examined in six studies, due to the use of significantly different pain scales no meta-analysis could be performed. It was further impossible to include the non-significant correlations that were mentioned but not stated in one article.[27]

As in every systematic review, there is the risk of publication bias. Non-significant results are less likely to be to publish, so there is a possibility this data is missed despite of our extensive literature search. This may result in an inflation of the effect size estimates.

Clinical implications

Enhancing self-efficacy has been described as a target in the rehabilitation of SCI. This can for instance be done by exercise, through improving physical condition and functional abilities,[65] or by improving the self-management abilities through a creative way of thinking.[66] Often the outcome discussed in studies focusing on self-efficacy relate to a person's participation.[67] Our study suggests that increasing self-efficacy can have a positive effect on depressive and anxious symptoms and probably on somatic SHCs. A widely used therapy for both depression and anxiety is Cognitive Behavioral Therapy.[68] Within this tradition, explicitly adjusting the self-efficacy cognitions of people with SCI may be, based on this review, a very promising approach that should be the subject of further research.

Conclusion

Self-efficacy is negatively associated with depressive and anxiety symptoms in spinal cord injury in accordance with the hypothesis. Therefore self-efficacy seems an important target in the rehabilitation of patients living with spinal cord injury to prevent SHCs.

More research is necessary to clarify the associations between self-efficacy and somatic SHCs. Future research should also focus on different types of self-efficacy and their association with secondary health conditions and the changes in self-efficacy over time.

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Legend Figure 2

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology.

Legend Figure 3

Abbreviations: LCL, Lower Confidence Limit; UCL, Upper Confidence Limit.

Q-value 39,610; df(Q) 17,000; P-value: 0,001; I-squared: 57,082.

Legend Figure 4

Abbreviations: LCL, Lower Confidence Limit; UCL, Upper Confidence Limit.

Q-value 8,224; df(Q) 6,000; P-value: 0,222; I-squared: 27,043.

Appendix: Search Strategy

	AND →	AND →	OR →	
"Spinal Cord Injury" "Spinal Cord Trauma" "Cord Trauma, Spinal" "Cord Traumas, Spinal" "Spinal Cord Traumas" "Trauma, Spinal Cord" "Traumas, Spinal Cord" "Injuries, Spinal Cord" "Cord Injuries, Spinal" "Cord Injury, Spinal" "Injury, Spinal Cord" "Spinal Cord Injury" "Myelopathy, Traumatic" "Myelopathies, Traumatic" "Traumatic Myelopathies" "Traumatic Myelopathy" "Spinal Cord Transection" "Cord Transection, Spinal" "Cord Transections, Spinal" "Spinal Cord Transections" "Transection, Spinal Cord" "Transections, Spinal Cord" "Spinal Cord Laceration" "Cord Laceration, Spinal" "Cord Lacerations, Spinal" "Laceration, Spinal Cord" "Lacerations, Spinal Cord" "Spinal Cord Lacerations" "Post-Traumatic Myelopathy" "Myelopathies, Post-Traumatic" "Myelopathy, Post-Traumatic" "Post Traumatic Myelopathy" "Post-Traumatic Myelopathies" "Spinal Cord Contusion" "Contusion, Spinal Cord" "Contusions, Spinal Cord" "Cord Contusion, Spinal" "Cord Contusions, Spinal" "Spinal Cord Contusions" "Spinal Cord Diseases" Paraplegia Paraplegias Quadriplegia Quadriplegias Tetraplegia Tetraplegias	"Self-efficacy" "Efficacy, self" Mastery "Internal-External control" "Control, Internal-External" "Controls, Internal-External" "Internal External Control" "Internal-External Controls" "Locus of Control" "Control Locus" "Self-concepts" "Concept, Self" "Concepts, Self" "Self Concepts" "Self-Perception" "Self-Perceptions" "Self Perception" "Perception, Self" "Perceptions, Self" "Self Perceptions" "Self Esteem" "Esteem, Self" "Esteems, Self" "Self Esteems" "Self-assessment" "Self-Assessments" "Self Assessment" "Assessment, Self" "Assessments, Self" "Self Assessments" "Self-Criticism" "Self Criticism" "Self-Criticisms"	Depression Depressions Depressive Dysthymic Dysthymia Anxiety Anxieties Hypervigilance Nervousness Affective Affection Affections Alexithymia Alexithymias Emotional "Anxiety disorders" "Anxiety Disorder" "Disorder, Anxiety" "Disorders, Anxiety" "Neuroses, Anxiety" "Anxiety Neuroses" "Anxiety States, Neurotic" "Anxiety State, Neurotic" "Neurotic Anxiety State" "Neurotic Anxiety States" "State, Neurotic Anxiety" "States, Neurotic Anxiety" "Quality of Life" "Life Qualities" "Life Quality" QoL	Comorbidity Comorbidities Multimorbidity Multimorbidities "Secondary Health" SHC SHCs "Pressure Ulcers" "Ulcer, Pressure" "Ulcers, Pressure" Bedsore Bedsores "Pressure Sore" "Pressure Sores" "Sore, Pressure" "Sores, Pressure" "Bed Sores" "Bed Sore" "Sore, Bed" "Sores, Bed" "Decubitus Ulcer" "Decubitus Ulcers" "Ulcer, Decubitus" "Ulcers, Decubitus" "Autonomic dysreflexia" "Autonomic Dysreflexias" "Dysreflexias, Autonomic" "Hyperreflexia, Autonomic" "Spinal Autonomic Dysreflexia" "Autonomic Dysreflexia, Spinal" "Autonomic Dysreflexias, Spinal" "Dysreflexia, Spinal Autonomic" "Dysreflexias, Spinal Autonomic" "Spinal Autonomic Dysreflexias" "Autonomic Hyperreflexia" "Autonomic Hyperreflexias" "Hyperreflexias, Autonomic" "Dysreflexia, Autonomic" Cardiovascular Circulation Circulatory Bladder Bowel Fecal Incontinence Incontinences "urinary tract" Infection Sexual Sex Joint Joints Muscle Muscles Contracture Contractures Respiratory Pain Diabetes Spasm Spasms Sleep Nocturnal apnea	OR →

Table 1 – Characteristics of included studies

Article	Country	Study design	Population	N=	STROBE
Munce (2016)[31]	Canada	Cross-sectional	Community-dwelling individuals	99	40
Driver (2016)[24]	USA	Cross-sectional	Inpatient and community-dwelling individuals	44	39
Peter (2015)[35]	Switzerland	Cross-sectional	Community-dwelling individuals	516	39
Craig (2015)[54]	Australia	Cohort	Inpatient and community dwelling individuals	88	38
Craig (2014)[22]	Australia	Cross-sectional	Inpatient, outpatient and community-dwelling individuals	107	35
Sweet (2013)[37]	Canada	Cohort	Community-dwelling individuals	395	40
Kilic (2013)[27]	Australia	Cross-sectional	Community-dwelling individuals	60	39
Craig (2013)[23]	Australia	Cross-sectional	Community-dwelling individuals	70	34
van Leeuwen (2012)[38]	The Netherlands	Cohort	Community-dwelling individuals	143	38
Geyh (2012)[25]	Switzerland	Cross-sectional	Community-dwelling individuals	102	39
Bombardier (2012)[21]	USA	Cross-sectional	Community-dwelling individuals	244	35
Mortenson (2010)[55]	Canada	Cohort	Inpatient and community dwelling individuals	93	40
Pang (2009)[34]	Taipei	Cross-sectional	Community dwelling individuals	49	34
Nicholson-Perry (2009/I)[32]	Australia	Cross-sectional	Inpatient	47	41
Nicholson-Perry (2009/II)[33]	Australia	Cohort	Outpatient	45	40
Miller (2009)[30]	USA	Cross-sectional	Community dwelling individuals	162	27
Hampton (2008)[56]	China	Cross-sectional	Outpatient	119	35
Suzuki (2007)[53]	USA	Cross-sectional	Community dwelling individuals	270	38
Middleton (2007)[29]	Australia	Cross-sectional	Community dwelling individuals	106	38
Kennedy (2006)[26]	United Kingdom	Cohort	Community dwelling individuals	35	37
Middleton (2003)[28]	Australia	Cohort	Community dwelling individuals	36	33
Shnek (1997)[36]	USA	Cross-sectional	Community dwelling individuals	80	31

Table 2 – Correlations between self-efficacy and somatic SHCs

Type of SHC	Article	N=	SE-scale	Outcome scale	Value
Pain	Kilic (2013)[27]	60	MSES	NRS (0-10)	-0.27
	Craig (2013)[23]	70	MSES	SFMPQ	-0.54*
	Nicholson-Perry (2009/I)[32]	47	MSES	PRSS	-0.28
	Nicholson-Perry (2009/II)[33]	45	MSES	PRSS	-0.46*
Pain intensity	Craig (2013)[23]	70	MSES	PPI	-0.45*
	Geyh (2012)[25]	102	GSES	BPI	NS
	Nicholson-Perry (2009/I)[32]	47	MSES	NRS (0-10)	-0.47*
	Nicholson-Perry (2009/II)[33]	45	MSES	NRS (0-10)	-0.36
Pain interference	Geyh (2012)[25]	102	GSES	BPI	-0.24*
	Pang (2009)[34]	49	SEMCD	PIS	-0.59*
Fatigue	Craig (2013)[23]	70	MSES	CFS	-0.54*
General SHCs	Geyh (2012)[25]	102	GSES	SHCS-L	-0.25*
				SHCS-N	NS
	Suzuki (2007)[53]	270	BRFSS	18 selected SHCs	-0.13*

All Studies showed a correlation between self-efficacy and the outcome.
Abbreviations: MSES, Moorong Self-Efficacy Scale; NRS, Numeric Rating Scale; SFMPQ, Short-Form McGill Pain Questionnaire; PRSS, Pain Response Self-Statements Scale; PPI, Present Pain Intensity; GSES, General Self-Efficacy Scale; BPI, Brief Pain Inventory; PIS, Pain Interference Score; SEMCD, Self-Efficacy for Managing Chronic Diseases; CFS, Chaulder Fatigue Scale; SHCS-L, Secondary Health Conditions Scale Limitations; SHCS-N, Secondary Health Conditions Scale Number; BRFSS, Behaviour Risk Factor Surveillance System.
The 18 selected SHCs from Suzuki (2007)[53] include: high or too low blood pressure, poor circulation (such as swollen or cold feet or hands, blood clots), contractures, diabetes, fatigue, injuries, osteoporosis, pressure sores, alcohol or other drug overuse/abuse, muscle spasms, urinary tract infection/bladder problems, yeast infections/vaginal infections, pneumonia, repetitive motion pain (carpal tunnel syndrome, shoulder pain), weight management/weight gain, chronic pain, stomach problems, and constipation or bowel problems.
* $P < 0.05$
NS: Non-significant correlational value not shown in study

Table 3 – Correlations between self-efficacy and psychological SHCs

Type of SHC	Article	N=	SE-scale	Outcome scale	Value
Depression	Munce (2016)[31]	99	MSES	HADS-D	-0.56*
	Driver (2016)[24]	44	CDSES	PHQ-9	-0.74*
	Peter (2015)[35]	516	GSES	HADS-D	-0.54*
	Craig (2014)[22]	107	MSES	SF-36[a]	0.48*
	Sweet (2013)[37]	395	LTPA-SE	PHQ-9	-0.32*
	Kilic (2013)[27]	60	MSES	DASS-21	-0.63*
	Craig (2013)[23]	70	MSES	POMS	-0.64*
	van Leeuwen (2012)[38]	143	GSES	SF-36[a]	0.52*
	Geyh (2012)[25]	102	GSES	HADS-D	-0.57*
	Bombardier (2012)[21]	244	CDSES	PHQ-9	-0.58*
	Pang (2009)[34]	49	SEMCD	CESD-10	-0.46*
	Nicholson-Perry (2009/I)[32]	47	MSES	HADS-D	-0.61*
	Nicholson-Perry (2009/II)[33]	45	MSES	HADS-D	-0.59*
	Miller (2009)[30]	162	MSES	CESD-10	-0.54*
	Middleton (2007)[29]	106	MSES	SF-36[a]	0.41*
	Kennedy (2006)[26]	35	GSES	HADS-D	-0.43*
	Middleton (2003)[28]	36	MSES	HADS-D	-0.61*
	Shnek (1997)[36]	80	BS	CESD-10	-0.58*
Anxiety	Munce (2016)[31]	99	MSES	HADS-A	-0.32*
	Kilic (2013)[27]	60	MSES	DASS-21	-0.54*
	Geyh (2012)[25]	102	GSES	HADS-A	-0.61*
	Nicholson-Perry (2009/I)[32]	47	MSES	HADS-A	-0.52*
	Nicholson-Perry (2009/II)[33]	45	MSES	HADS-A	-0.43*
	Kennedy (2006)[26]	35	GSES	HADS-A	-0.45*
	Middleton (2003)[28]	36	MSES	HADS-A	-0.58*
Quality of Life	van Leeuwen (2012)[38]	143	GSES	Two life satisfaction questions	0.33*
	Mortenson (2010)[55]	93	GSES	QLI (3 months)	0.62*
				QLI (15 months)	0.47*
Affective/subjective disorder	Hampton (2008)[56]	119	GSES	IPWB	-0.09[b]
Psychological disorders	Craig (2015)[54]	88	MSES	MINI-plus	1.05[c]

All studies except for [a] and [b] showed a correlation between self-efficacy and the outcome.
Abbreviations: MSES, Moorong Self-Efficacy Scale; HADS-D, Hospital Anxiety and Depression Scale - Depression; CDSES, Chronic Disease Self-Efficacy Scale; PHQ-9, Personal Health Questionaire 9; GSES, General Self-Efficacy Scale; SF-36, Short Form 36; LTPA-SE, Leisure Time Physical Activity Self-Efficacy; DASS-21, Depression Anxiety and Stress Scale 21; POMS, Profile of Mood States; SEMCD, Self-Efficacy for Managing Chronic Diseases; CESD-10 Centre of Epidemiologic Studies Depression Scale; BS, Beliefs Scale; HADS-A, Hospital Anxiety and Depression Scale - Anxiety; QLI, Quality of Life Index; IPWB, Index of Personal Well-Being; MINI-plus, MINI International Neuropsychiatric Interview.
* P < 0,05
[a] the SF-36 describes mental health instead of depression. Therefore outcomes are positive instead of negative. For the meta-analysis, the effect direction was changed to negative.
[b] hierarchical regression instead of correlation was used as outcome measure
[c] Odds ratio instead of correlation was used as outcome measure

Figure 1 – PRISMA Flow Diagram

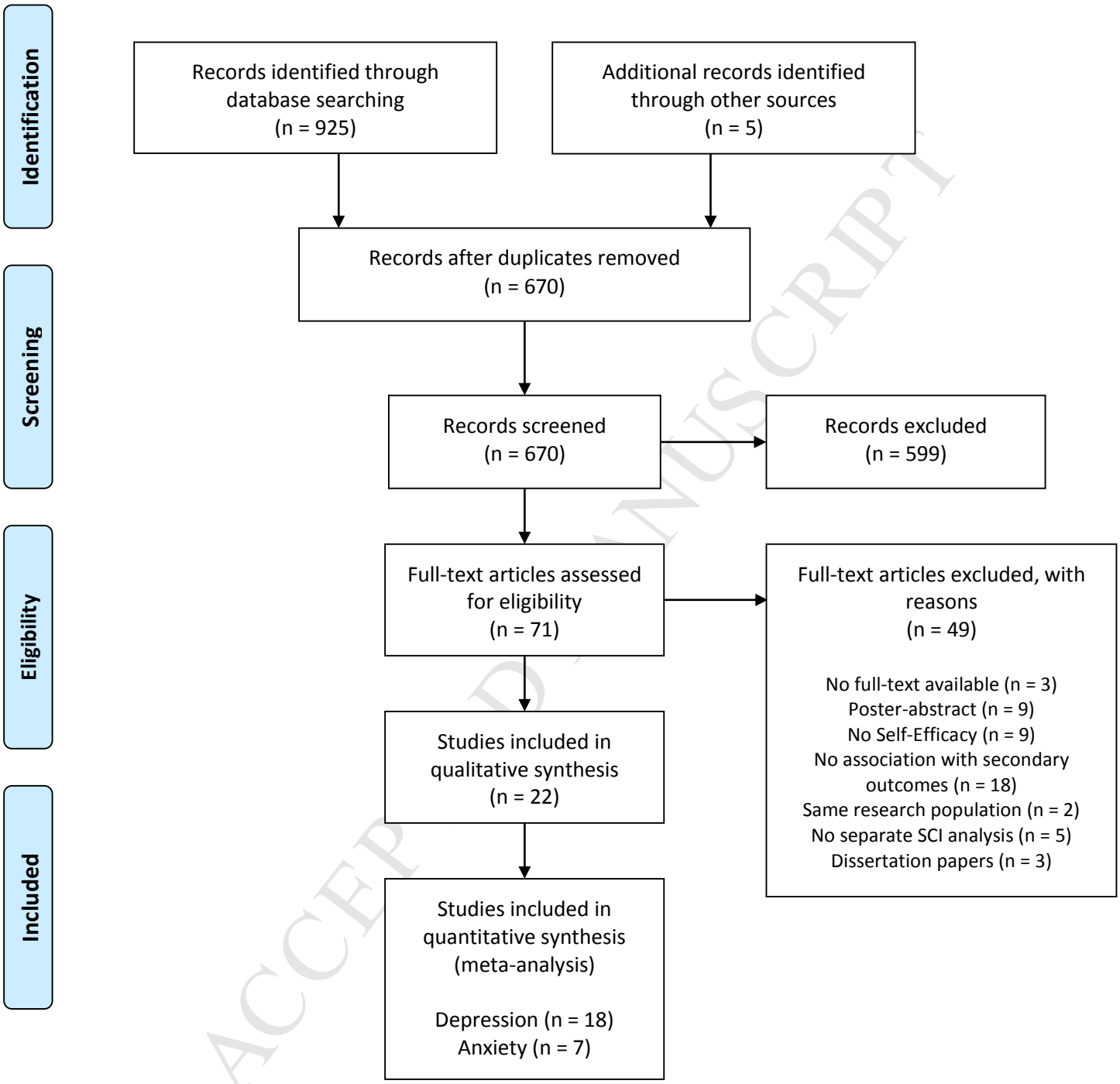

Figure 2. Reporting quality assessment with STROBE (N=22)

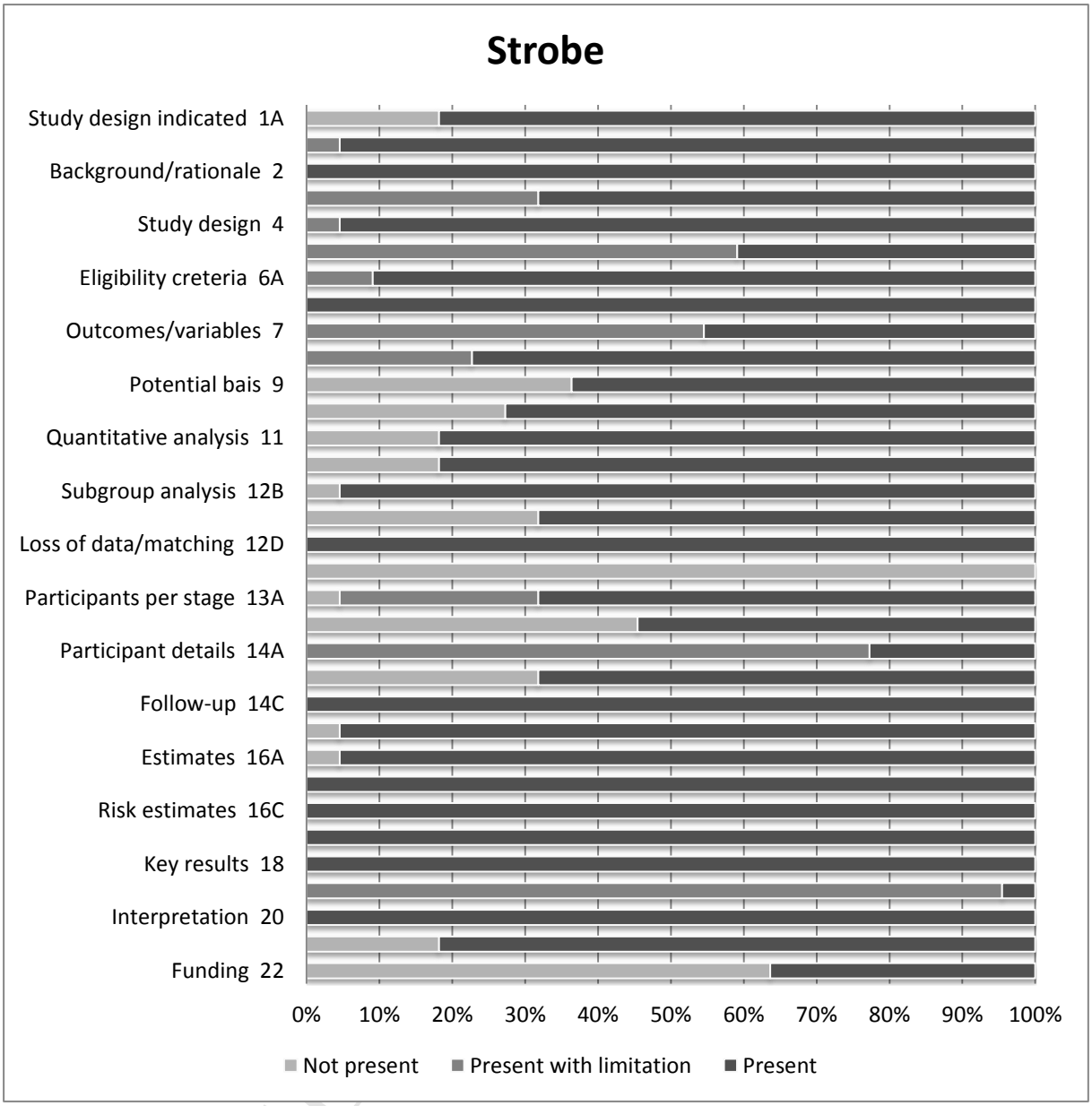

Figure 3 – Self-efficacy and Depression: forest plot

Study	Correlation	LCL	UCL
Munce (2016)	-0,560	-0,682	-0,408
Driver (2016)	-0,740	-0,867	-0,523
Peter (2015)	-0,540	-0,600	-0,474
Craig (2014)	-0,480	-0,614	-0,319
Sweet (2013)	-0,320	-0,406	-0,229
Kilic (2013)	-0,630	-0,762	-0,448
Craig (2013)	-0,640	-0,761	-0,477
van Leeuwen (2012)	-0,520	-0,630	-0,389
Geyh (2012)	-0,570	-0,691	-0,417
Bombardier (2012)	-0,582	-0,659	-0,492
Pang (2009)	-0,463	-0,658	-0,209
Nicholson Perry (2009/I)	-0,611	-0,766	-0,390
Nicholson Perry (2009/II)	-0,592	-0,754	-0,361
Miller (2009)	-0,540	-0,641	-0,421
Middleton (2007)	-0,410	-0,557	-0,238
Kennedy (2006)	-0,430	-0,668	-0,113
Middleton (2003)	-0,610	-0,782	-0,352
Shnek (1997)	-0,580	-0,709	-0,413
Total	-0,536	-0,584	-0,484

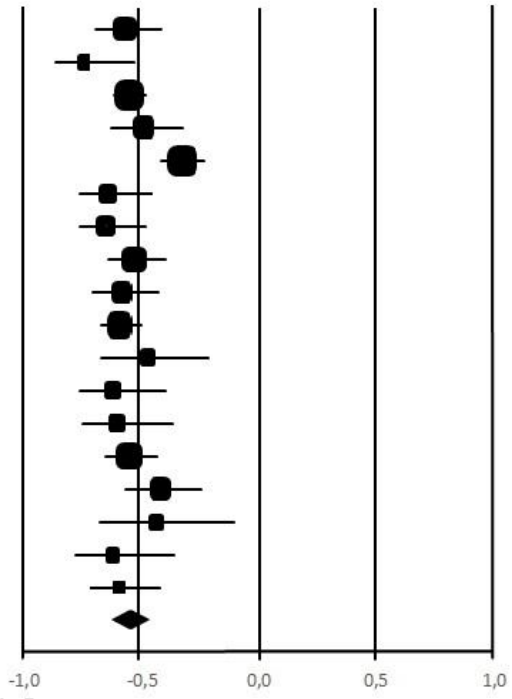

Figure 4 – Self-efficacy and Anxiety: forest plot

Study	Correlation	LCL	UCL
Munce (2016)	-0,315	-0,482	-0,125
Kilic (2013)	-0,540	-0,698	-0,332
Geyh (2012)	-0,610	-0,722	-0,467
Nicholson Perry (2009/I)	-0,515	-0,701	-0,264
Nicholson Perry (2009/II)	-0,428	-0,641	-0,154
Kennedy (2006)	-0,450	-0,681	-0,137
Middleton (2003)	-0,580	-0,763	-0,311
Total	-0,493	-0,577	-0,399