UNIVERSITY OF HULL

An exploration of working capacity and return to work after cerebrovascular accident

being a thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Clinical Psychology in the University of Hull

by

Kieran McCaffer, BSc (Hons) Psychology

May 2023

I dedicate this thesis to the memory of Peter Rouse, who would have been so proud.

Acknowledgements

I would firstly like to extend my appreciation to those people who gave up their free time to partake in this research. It has been a privilege to work alongside those affected by stroke and those who care for those whose lives have been changed because of it.

I would like to express gratitude to my research supervisor, Emma, for her continued support and advice. Also, Eric, for his guidance with the statistical analyses included in this research.

To my older brother, thank you for your continued support and encouragement during demanding times; and for reminding me of the importance of always following your passion.

Overview:

This portfolio contains three parts. Part one is a systematic literature review, in which the empirical literature concerning the psychological and neuropsychological comorbidities related to working capacity following stroke is reviewed. Part two is an empirical paper, which investigates the potential mediating effect of illness perceptions on the association between degree of comorbidities and post-stroke work status. Part three comprises the appendices.

Total word count (excluding appendices): 12,479.

Contents

List of Tables and Figures

Part One: Systematic Literature Review

This Paper is written in the format ready for submission to the

International Journal of Clinical Practice.

See Appendix B for submission guidelines.

Psychological and neuropsychological comorbidities related to working capacity following cerebrovascular accident: a systematic review

Running Title: Psychological and neuropsychological comorbidities and working capacity after stroke

Kieran McCaffer & Dr Emma Lewis

Faculty of Health Sciences, School of Psychology and Social Work,

University of Hull, Cottingham Road, Hull, HU6 7RX, United Kingdom

Word Count (excluding abstract, tables, figures, and references): 7,536.

Corresponding Author: Kieran McCaffer, Faculty of Health Sciences, School of Psychology and Social Work, University of Hull, Hull, United Kingdom, HU6 7RX. Tel: +44 (0) 1482 464106. Fax: +44 (0) 1482 464093. Email: K.McCaffer-2016@hull.ac.uk

No Conflicts of Interest to disclose.

Author Contributions

Kieran McCaffer contributed to the concept and design of the review; collection of data; synthesis of data; and drafting of the article.

Dr Emma Lewis contributed to the concept and design of the review, in addition to the critical revision of the article.

Acknowledgements

Funding: *None*

Acknowledgements: *None*

Abstract

Background: Psychological and neuropsychological concerns are commonly reported after stroke impacting a variety of life domains, including working capacity. Working capacity post-stroke has been linked to health status and quality of life. Yet, the psychological and neuropsychological sequelae of stroke are often overlooked within early stroke rehabilitation which focuses on optimising physical functioning. Moreover, a consensus on how such factors may predict capacity to work after stroke has not yet been determined. *Procedure:* A systematic literature search was undertaken, and the relevant data was extracted and presented utilising a narrative synthesis approach. *Participants:* 8431 individuals who were in employment preceding their stroke were included in this review. *Findings:* Consistent with prior literature, this review suggests that working capacity post-stroke is related to several negative psychological and neuropsychological outcomes. There were some discrepancies found in the literature pertaining to depression and cognition and capacity to work after stroke which may be explained by the high variation in study designs, instrumentation utilised, and definitions of working capacity and stroke across studies. However, most articles found that anxiety was associated with reduced capacity to work post-stroke. *Conclusions:* Despite some mixed findings regarding depression and cognition, evidence indicates that poorer psychological and neuropsychological outcomes are associated with reduced working capacity post-stroke. Therefore, it is vital that individuals at greater risk for poorer psychological and neuropsychological outcomes are identified early in the recovery process for judicious interventions to be initiated. Given the potential interrelatedness of psychological and neuropsychological variables and other psychosocial factors,

the standardisation of measurement tools and the consideration of clinical and demographic factors may be a direction for future research.

Review Criteria

A systematic search of databases relevant to stroke was conducted to collect literature in this review with search terms acquired by studying the applicable literature. On the basis of a set of pre-determined inclusion and exclusion criteria, the literature to be included in the review was selected. Data related to the review objectives was extracted from the literature and a narrative synthesis approach was used to present this.

Message for the Clinic

Prior reviews have determined that psychological and neuropsychological concerns are commonly reported after stroke impacting a variety of life domains, including working capacity. This review indicates that poorer psychological and neuropsychological outcomes are linked with declines in working capacity post-stroke. Consequently, it is vital that individuals at greater risk for poorer psychological and neuropsychological outcomes after stroke are identified early in the recovery process for judicious interventions to be initiated.

Introduction

Within the UK, stroke is a leading cause of morbidity with around 100,000 people suffering a stroke annually [1]. It is often assumed that those who have a stroke will experience weakness and paralysis [2]. However, an unknown number of individuals experience clinically silent stroke and 20% of individuals

experience no weakness at all [3]. Crucially, some degree of cognitive loss is evident in most survivors of stroke [4]. Around 75% of stroke survivors experience substantial impairment in their cognition, characterised by memory, language, attentional and perceptual difficulties [4]. It is also commonly reported that stroke survivors may experience mood disturbances [5]. Such psychological concerns have been linked to augmented rates of suicide, healthcare services usage, readmission, disability, and mortality in stroke survivors [6]. Yet, despite mood disturbances occurring in around 30% of patients post-stroke, a significant proportion of these persist undiagnosed and insufficiently treated [7]. This may have adverse consequences on a variety of life domains for the stroke survivor, including their working capacity.

Working capacity, the capability to efficiently return to the same or a similar job, is commonly seen as proof of recovery post-stroke and a rehabilitative goal to aspire to [8]. About one third of those who have a stroke are of working age [9]. Around 60% of stroke survivors are incapable of returning to employment [10]. The significance of resuming employment after stroke should not be underestimated as employment is one of the most prominent predictors of quality of life, health status, and health care usage [11, 12, 13, 14]. One review found that those exposed to sick leave are at greater risk of inactivity, decreased personal finances, and decreased career opportunities [15].

Despite numerous studies investigating which factors help to predict post-stroke return to work, much of this research has concentrated on demographic (i.e., gender, functional status, age, level of education, employment type) and stroke-related factors (i.e., lesion site and type of stroke)

only [16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29]. Yet, this research, particularly concerning motor functioning, may lack relevance for stroke survivors of working age as these individuals more frequently experience less visible stroke sequalae, including cognitive impairments and mood complaints [30, 31].

Moreover, it is often the focus within early stroke rehabilitation to optimise physical functioning [32]. This approach is based on the assumptions of motor learning and related concepts that providing task-specific interventions, which are progressive and intensive, will improve physical capacity and function [33]. In other words, this constitutes what the individual can do within a regulated, standardised post-stroke environment [34]. Yet, enhancement in the physical function and capacity domain may not automatically translate to improvement in reintegration into prior-stroke life roles or social participation [35]. Thus, to encourage more purposeful outcomes that better represent participation in the real-world, it has been suggested that the aim of rehabilitation after stroke should expand beyond the body structure domain [36].

Outcomes in rehabilitation are contingent on stroke survivors' self-beliefs, motivation, and attitudes [37,38]. Therefore, post-stroke outcomes, including returning to employment, are dependent on individuals having the capability to actively partake in the process of rehabilitation [39]. However, psychological and neuropsychological barriers to recovery after stroke, including anxiety and depression, have been shown to impede on survivors' motivation and self-efficacy thereby affecting participation and physical capacity, and subsequently lowering rehabilitation engagement [40, 41, 42, 43].

As stroke is considered a chronic disease with acute events [44], various theoretical models have attempted to explain how people psychologically adjust to its associated outcomes. Psychological adjustment describes the mental processes in reaction to continuing disease and related treatment [45]. Such models include the illness representation [46], the stress-coping model [47], the adjustment model [48], the adaptive tasks and coping model [55] and more recently the social cognitive transition model for stroke [49]. These models suggest that disease generates acute illness stressors (e.g., awareness of diagnosis of disease, undertaking burdensome treatment, suffering disease deterioration) and enduring illness-related stressors (e.g., threats to social relationships; insecurity concerning the future).

In line with the adjustment model [48], the adaptive tasks and coping model [49], and original the stress-coping model [47], behavioural and cognitive responses are important components in the process of adjustment. Illness stressors, both acute and enduring, produce behavioural and cognitive responses that influence outcomes of health [47]. For example, avoidance of physical activity is expected to lead to poor health whereas employing good health behaviours constitutes a behavioural response that may result in good health. Similarly, wishful thinking is a cognitive response that is thought to lead to poor health whereas self-efficacy (the person's belief in their own capacity to perform activities) is a cognitive response that promotes good health [49]. The illness representation model [46] introduced the emotional response to disease as a discrete pathway. Leventhal et al. (1984) proposed an independent pathway, corresponding with behavioural and cognitive responses, for an emotional response and managing an emotional response. This is in contrast

with the adjustment model [48], which posits that emotional responses lead to behavioural and cognitive responses, and from the stress-coping model [49] which places emphasis on the behavioural and cognitive responses. Hence, there are differences between how these different models conceptualise the sequential relationship between behavioural, emotional, and cognitive responses.

More recently, the social cognitive transition model for stroke (SCoTS) [50] has proposed that the trajectory of emotional adjustment after stroke is primarily regulated by the rigidity and content of an individual's 'assumptive world'. Upon these assumptions being confirmed or disconfirmed, the severity, duration, and quality of stress encountered is affected by other individual differences and social context [50]. The significance of inter- and intra-personal reactions, cognitive deficits and the dynamic interaction between these psychosocial variables is emphasised within the SCoTS model. Whether the 'assumptive world' is or is not adjusted to accommodate novel post-stroke experiences, is contingent on these aforementioned factors and thus this can have a significant influence on a person's working capacity following stroke [50, 51]. Yet, little research has been conducted so far which has investigated the predictive value of these psychological and neuropsychological variables, including self-efficacy, coping styles, cognition, and mood in relation to returning to work post-stroke. Moreover, there are inconsistent findings across the literature concerning these factors.

All things considered, in order for therapeutic goals to be realistic and achievable, it is necessary to thoroughly investigate the predictive factors of

return to work after stroke, and to foresee the necessity for psychological support from both employers and rehabilitative care services [52]. Still, the findings from studies investigating the proportion of stroke survivors returning to employment have been wide-ranging, and a consensus on the predictive factors for returning to employment following stroke has not been reached [53]. Literature pertaining to the psychological and neuropsychological factors post-stroke has produced inconsistent findings. In line with this, a stepped approach to psychological care is now a recommendation by the National Institute for Health and Care Excellence (NICE) guidelines for individuals bearing the psychological and neuropsychological consequences of stroke [54].

Therefore, the purpose of this literature review was to systematise evidence describing the relationship between return to work post-stroke and psychological and neuropsychological variables.

Review question:

- What psychological and neuropsychological outcomes are related to working capacity post-stroke?

Methods

Search Strategy

Between November 2021 and December 2022, a search of five databases which were relevant to stroke was conducted via the EBSCOhost service: MEDLINE, PsycInfo, PsycArticles, Cumulative Index to Nursing and Allied Health Literature (CINAHL Complete), Academic Search Premier. These databases were selected

to ensure the identification of relevant literature which has been published by professionals from an extensive assortment of medical, allied health, nursing and psychological backgrounds. Initially, a scoping search of the literature within these databases was carried out to establish relevant search terms.

The subsequent search terms were utilised: ("return to work" OR RTW OR reemployment OR "Job Re-Entry") AND Title (TI) ("cerebrovascular accident" OR CVA OR stroke OR "brain attack" OR "hemorrhagic stroke" OR "ischemic stroke") AND (depress* OR "mood disorder" OR anxiet* OR GAD OR "cognitive function" OR "post-traumatic stress disorder" OR PTSD). Specific diagnostic labels used as search terms were derived from previous literature relating to stroke which indicated that these are the most frequently reported mood disturbances after stroke [55, 56, 57, 58, 59]. Following trial database searches, which applied alternative descriptors, no further relevant articles were yielded and thus the selected search terms were considered suitably comprehensive. Additionally, reference lists of all yielded articles within the search were comprehensively examined to identify any further relevant articles.

Selection Strategy

Inclusion and exclusion criteria

The applied inclusion criteria involved: reporting of cerebrovascular accident subjects; published in English; included participants with a vocational age from 16 years and above; subjects were working prior to their stroke; included a quantitative rate of RTW or working capacity; and included at least one mental health or cognitive orientated outcome measure. Studies were excluded from the

analysis if: subjects were unemployed/retired prior to their stroke; the sample contained individuals with other neurological injuries; the publication was not in English language; the entire article text could not be accessed and if the article included participants under the vocational age of 16 years. In line with the pre-determined selection criteria, the chief reviewer conducted a database search and initial screening of titles and abstracts. In cases whereby it was uncertain from a screening of the title and abstract if the selection criteria had been satisfied, an evaluation of the complete text was conducted. Figure 1 illustrates the search procedure.

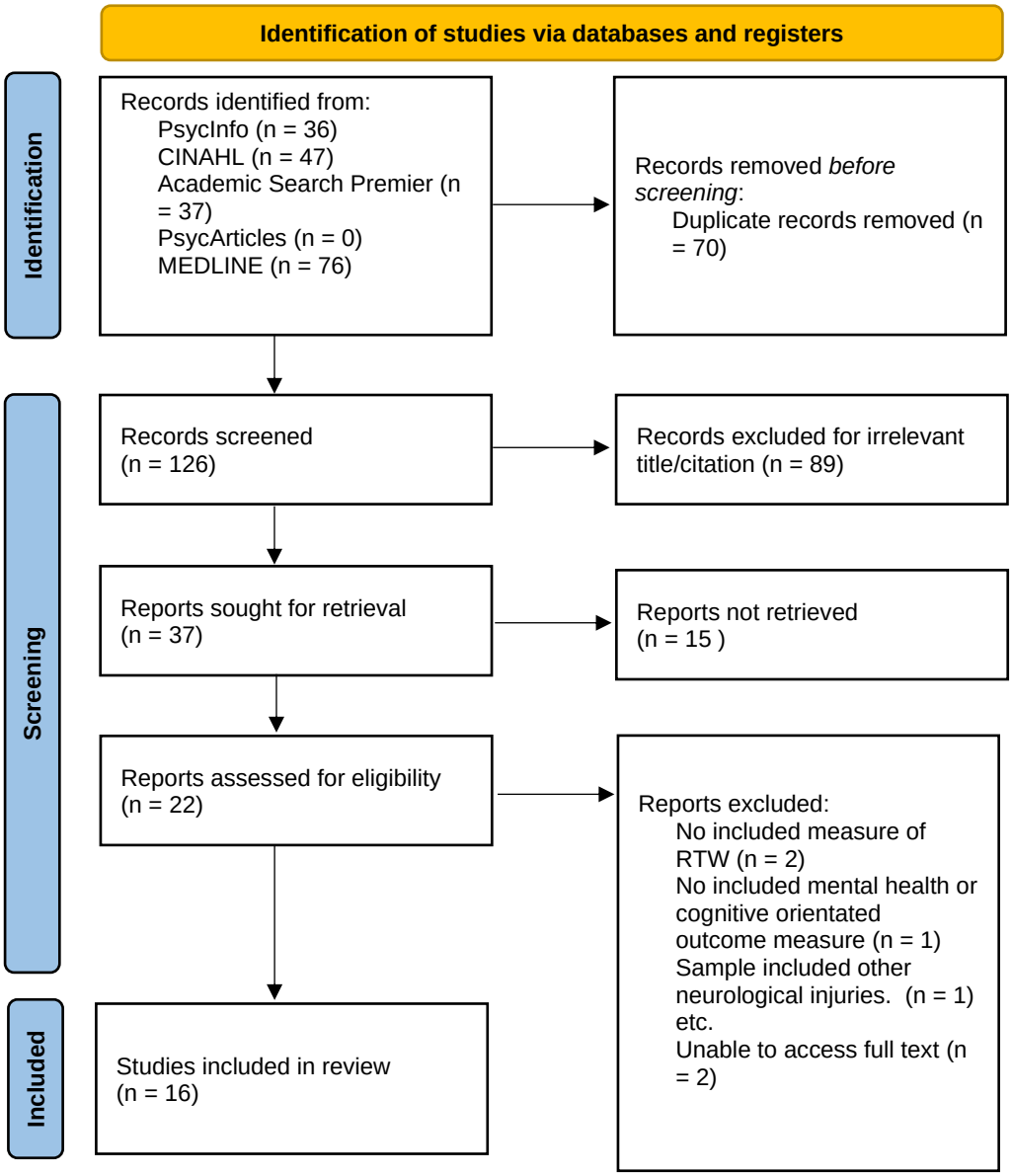

Figure 1. PRISMA flow diagram showing literature selection procedure.

Date Extraction and Quality Assessment

Information was obtained regarding studies' designs, participant characteristics, methods of sampling, methods of analysis, instrumentation used to examine psychological and neuropsychological variables and working capacity and the chief findings, study conclusions concerning the association between working capacity and limitations, and psychological and neuropsychological outcomes

post-stroke. In order to assess for methodological quality for all articles, the STrengthening the Reporting of OBservational studies in Epidemiology was utilised (STROBE) [60]. The STROBE checklist attempts to ensure that all articles are rigorously, accurately, and transparently reported. Likewise, in line with the positivist epistemological stance adopted in this research, this helps to clarify that the results from such studies are comparable and generalisable. If an article satisfied any of the 22 criteria items on the checklist, then a score of one was allocated. Total scores for each article ranged from 0 (weakest quality) to 22 (strongest quality. Though, articles which met selection inclusion and exclusion criteria were included in the review no matter what quality score was obtained due to their relevance to the main subject. Five randomly selected articles were assessed for quality by an independent rater using the selected checklist. Assessors agreed on 82% of the criteria across the five articles suggesting that there was high inter-rater reliability for quality assessment. Disagreements were present for eight items across the five articles, and these were discussed until an agreement was reached between the assessors.

Data Synthesis

Due to the heterogeneity in participant characteristics, instrumentation, and study designs, it was deemed that a meta-analysis would be unsuitable [61]. Therefore, a narrative synthesis approach was implemented as a means of summarising the outcomes from studies and examining themes and relationships within the reviewed literature. Firstly, this involved summarising the findings of each article and organising these findings to illustrate patterns in terms of the psychological and neuropsychological factors related to working capacity post-stroke. Groups

and clusters were then established from common and significant findings using spider diagrams. This technique enabled relationships and themes between research findings to develop. Over the course of time, it was discovered that several psychological and neuropsychological factors were consistently measured across articles, namely depression, anxiety, and cognition. Thus, it was deemed appropriate to present the findings from articles under these headings. Under these headings, findings were arranged according to whether they were in support or against the association between psychological and neuropsychological factors and working capacity post-stroke. In order to ensure that particular reporting standards were met, this review was presented in line with the PRISMA statement [62].

Study Selection Procedure

A preliminary search of the five databases generated 196 articles. Following the exclusion of articles in accordance with the aforementioned criteria (178), 16 articles were found to have met the criteria for selection (Figure 1). These articles were published from 2007-2022 as no other relevant articles were published prior to the year of 2007 A further 14 articles were classified as possibly relevant from the reference lists of eligible articles. However, upon exploration of full text none of these articles met the review's inclusion criteria.

Results

Methodological Quality Overview

The selected articles ranged in researcher rated quality levels, from 39-86%, with none of the studies acquiring a maximum score of 22 (100%). A single

study received a score below 40% however, this study was included in the review due to its relevance to the main subject. Twelve articles scored between 40-80% and three acquired a rating above 80%. The validity and reliability of reported findings within the reviewed articles were possibly impacted by the absence of several quality indicators. Most articles received high scores for their explanation of the rationale for the investigation and the scientific background, reporting demographic specifics of included participants, reporting an explicit explanation of the main outcomes of the study, and providing a tentative overall explanation of outcomes. Alternatively, scores were deducted from some articles which did not contain a representative sample, did not specify the specific type of stroke the participants had suffered, or did not provide justification for how the sample size was arrived at. Moreover, several studies did not account for potential sources of bias within data analysis procedures, possibly leading to misguided conclusions.

Overview of Included Studies

Sample characteristics

A concise overview of each article included in this review is given in Table 1. The majority of participants within the articles resided within Western countries and were of White Caucasian ethnicity. Still, there were a diversity of continents included within this review. Whilst all the articles included both female and male subjects, males were disproportionately represented in 81% of the studies. Only two studies contained a relatively equal representation of both of these genders and just one study included more females than males [63]. This may be inconsistent with the disproportionate burden of stroke mortality and disability

faced by women [64]. Study samples were made up of working age and older adults and mean ages varied from 40 to 86 years. Most participants had completed high school education as a minimum and among 61% and 92% had partners or were married, though several studies did not account for either of these factors [65, 66, 67, 68, 69].

Most articles included participants who had suffered ischemic strokes, though five studies contained hemorrhagic strokes within their samples. Seven studies did not specify the types of strokes within their samples. Nine studies recruited participants who had suffered first-ever strokes and seven studies did not report this information. Mean time from stroke occurrence to baseline assessment varied broadly between seven days to two years, though one study did not disclose this information [8]. Eleven of the studies reported on stroke severity which ranged from minor to severe, although five studies did not report this information [65, 63, 68, 70, 71]. Most of the articles omitted information regarding the physical comorbidities of participants however, six studies did disclose this information. However, evidence indicates that a clinical stroke may happen in the absence of concurrent physical conditions in less than 6% of instances, thus the findings from studies that fail to report these factors may lack generalisability [72].

Most of the studies did not report on participants mental health history. Of the four studies that did report this information, only one study included participants with a history of mental health [63] and three studies included participants with no pre-stroke psychiatric history [68, 69, 70].

Recruitment methods

Just one study provided an explicit description of their sampling methods [63]. Most studies did not report on their chosen sampling procedures. Six studies utilised consecutive sampling procedures [63, 69, 70, 71, 73, 74] and one study used a convenience sampling procedure [65]. In several studies, participants who were deemed eligible were initially approached by the researchers or healthcare professionals within a range of healthcare settings that they would normally attend including emergency departments, rehabilitation clinics, stroke units and hospitals. Likewise, participants were also identified by their regular healthcare clinics in cases whereby the study information was posted to them. Some studies performed a secondary analysis of previously collected participants' data [65, 67, 75, 76, 77]. Only three articles reported on response rates of participants approached which ranged from 36%-95% [63, 68, 78]. In all included articles, researchers relied upon participants to volunteer however, individuals who partake in studies investigating psychological well-being more commonly have a history of emotional distress [79]. Similarly, individuals who volunteer for research tend to be younger, female, White race and with higher socioeconomic status and educational attainment [80]. Most samples within the articles contained in this review comprised of educated White individuals. Therefore, it is unlikely those samples are representative of the total target population which may limit the generalisability of any results obtained [81].

Design and analysis

The majority of studies adopted prospective methods in their design. Three studies were retrospective, two studies used cross-sectional methods, and one

study used a between-subjects design. Six studies completed two follow-up assessments, four studies completed three follow-ups, four studies completed one follow-up, one study conducted four follow-ups, and one study did not report on this information [82]. The period of time amid baseline measurement and final follow-up varied between studies from seven days and 10 years. The mean time since stroke occurrence at baseline ranged between seven days and two years, although a single study did not disclose this information [82]. Most studies examined a sole group of participants. One study by Schulz et al. (2017) described patterns of returning to employment for both stroke survivors and their spousal caregivers, however only data relating to the stroke survivors cohort was extracted from this review. Likewise, another article compared factors influencing employment between minor ischemic stroke versus myocardial infarction (MI) groups, but any data concerning MI individuals was not considered for the purposes of this review [70]. Most articles adopted regression analysis as their selected statistical method to explore the association relating to working capacity post-stroke and psychological and neuropsychological variables. Three studies applied correlation analysis [63, 82, 83].

Measurement of psychological and neuropsychological variables

Four articles measured only one psychological or neuropsychological variable [69, 71, 76, 77], while the others analysed multiple psychological and neuropsychological variables. Articles which measured several psychological and neuropsychological factors were not congruous in which variables were involved. Overall, eleven studies included a minimum of one validated measure

of emotional distress and fourteen included at least one validated measure of cognition. All articles that measured emotional distress asked subjects to record their answers via Likert scales to show the occurrence and intensity of psychological difficulties. Seven of the studies measuring cognition used self-report screening questionnaires, two studies used neuropsychological testing [70, 71], one study used a combination of both [68], and one study utilised a standardized telephone interview [63]. Only one study measured participants' self-perceived level of coping [78] despite many stroke survivors highlighting the importance of this factor in successfully remaining in work [84]. Notably, inconsistencies in the instruments used by researchers across the studies in this review may contribute to mixed findings and make comparison of the results of studies with other existing literature challenging.

Measurement, prevalence, and degree of stroke survivors' working capacity

Only two articles directly assessed work productivity utilising the Work and Social Adjustment Scale (WSAS) and the Work Productivity and Activity Impairment Questionnaire General Health (WPAI) [73, 78]. Both measures have been found to be reliable and valid [85, 86]. Most studies used self-report questionnaires to reduce return to work to a binary variable. Four studies adopted semi-structured interviews administered by researchers or healthcare professionals to obtain occupational data from participants [63, 74, 75, 77]. Definitions of return to employment varied throughout studies. Eight studies clarified returning to employment as either part time or full time paid work and provided quantitative definitions of these, whereas four studies did not disclose how they had defined return to work [67, 68, 74, 82]. One study defined return

to work as the individual not being registered with over 50% sickness compensation [76]. Only two studies included measurements of unpaid work [63] and only one of these studies classified formal study hours as time spent working [69].

All studies included rates of returning to work for participants which varied from 7.5% to 75.12%. Only one study reported on work satisfaction [83] using the previously validated Utrecht Scale for Evaluation of Rehabilitation-Participation (USER-P) [87] to gauge how satisfied those who had returned to work were in their employment. Half of the articles included details on the characteristics of participants' previous and current employment, including working hours, type of profession, and level of job demand, whilst the other half of studies did not account for this information. This may represent an important omission of information as stroke patients' job characteristics have been indicated as determinants of return to work [20]. As such, the lack of reporting on these factors within studies combined with the assessment of return to employment as a binary variable may not provide a comprehensive representation of a particular stroke survivor's capacity to work.

Relationships between stroke survivors' working capacity and demographic and clinical factors

Increased rates of return to work were established to be associated with clinical and demographic factors in several articles. Lower age was demonstrated to be related to returning to work in stroke survivors [67, 68, 70, 75, 76, 77, 82], although some studies did not replicate this finding [66, 71, 73, 74, 78]. Only two studies noted significant differences in gender between those who returned to

employment post-stroke versus those who were unable to [67, 75]. Having more years of education was related to greater rates of returning to employment post-stroke in three articles [63, 70, 74], however the majority of studies found no such differences. Only one study found significant differences in marital status between working and non-working groups post-stroke (p<.01) [75]. In three studies, being self-employed and having a non-manual job were related to returning to work post-stroke [63, 67, 82]. Only one study noted significant differences in ethnicity between working and non-working groups post-stroke (OR .88, 95% CI .77 to .99) [71].

While no significant differences between type of stroke and RTW were reported across all studies, there were significant differences for stroke severity with those who experienced less severe strokes being more probable to recommence employment [67, 66, 67, 68, 71, 76, 77, 82]. Only one study found increased length of stay in hospital to be related to attenuated rates of returning to employment in stroke survivors (OR .87, 95% CI .77 to .99) [78]. Two studies found that stroke survivors with less comorbidities were more probable to return to employment [66, 77]. It ought to be noted that it is difficult to draw strong inferences concerning the association among the prevalence and extent of stroke survivors' working capacity and clinical and demographic factors due to the variation in participant demographics' measured across all studies.

The relationship between stroke survivors' working capacity and psychological and neuropsychological comorbidities

Depression

Fourteen articles examined the relationship between depression and capacity to work following stroke. There were discrepancies in the literature regarding whether depression is associated with reduced capacity to work following stroke. Three studies used the Geriatric Depression Scale (GDS) [88] to assess for depressive symptoms in stroke survivors. A single study reported that in comparison to individuals who did not return to work three months following mild stroke those who did demonstrated significantly fewer signs of depressive mood (p<.02) [74]. Though, it is uncertain how representative of the entire population these findings are given that all participants (n=163) for this study were enrolled from a single medical centre in Israel. Besides, two other studies did not replicate this finding [65, 75]. One study reported non-significant differences in total mean depression scores between those individuals continuously employed compared to those unemployed between three months and two years following first-ever stroke [75]. Similarly, another study found that depression scores were not a predictor of capacity to return to work after stroke [65]. However, one of these studies was limited due to a high drop-out rate [75] and the other study had allocated participants to differing interventions over time thus it is difficult to approximate the influence of these confounding variables on outcomes [65].

Nine studies employed the Hospital Anxiety and Depression Scale (HADS) [89] to assess survivors of stroke for depression. A study by Bonner, Pillai, Sarma, Lipska, Pandian, and Sylaja (2016) investigated the proportionality of formerly employed patients (n=141) that resumed employment

following an acute first-ever stroke causing mild to moderate disability. They found that depression scores did not impact individuals' choice to return to employment. However, it is of note that this article was the lowest quality study in the review (39%). Another study aimed to clarify the early alterable factors related to younger stroke survivors' capacity to return to waged employment within one year [63]. Being free of depression at 28-days post-stroke demonstrated a relatively strong but not statistically significant effect on the possibility of resuming employment within one year. Contrary to the study by Bonner et al. (2016), this study was rated one of the highest quality studies in the review (84%).

Yet, another high-quality study (82%) by van der Kemp, Kruithof, Nijboer, van Bennekom, van Heugten and Visser-Meily (2019) reported that the total mean scores of symptoms of depression were inflated in those people who had an unsuccessful return to work after stroke in contrast to those who had returned. More severe depressive symptoms were noted in individuals who had not returned to employment following stroke versus those individuals who had. Symptoms of depression were also significantly correlated with return to employment one year after stroke. Similarly, individuals who returned to work two to five years following first-ever stroke scored lower in depression scores than individuals who had not returned to work [78]. However, studies with longer follow-up periods are susceptible to the influence of other factors such as comorbidity [90]. Still, another study observed similar patterns of depression scores in patients of first-ever minor ischemic stroke and transient ischemic attack (n=88) [66]. This study reported that patients who had returned to employment three months following stroke were significantly less depressed (p<.01). Similarly,

Slavin, McCune-Richardson, Moore, Ecklund-Johnson, Gronseth and Akinwuntan (2022) observed that normal HADS-depression scores (0-7) were significantly correlated with resumption of employment at three-month follow-up in a sample of mild ischemic stroke patients (n=36). It should be noted that there is a possibility of selection bias in both studies as they focused on mild stroke survivors only. This also limits generalisability and leads to lower power for analyses in both studies. Even so, another study by Morsund, Ellekjær, Gramstad, Reiestad, Midgard, Sando, Jonsbu and Næss (2020) replicated these findings observing a significant correlation between unemployment and depression scores at twelve months post-stroke (p<.04). However, this study was again relatively underpowered. Researchers also noted that the same relationship between depression scores and unemployment was not present at three months.

Nevertheless, another study by Hommel, Trabucco-Miguel, Joray, Naegele, Gonnet, and Jaillard (2009) found that scores on the Work and Social Adjustment Scale (WSAS), which contains five items (home management, work, private leisure, relationships, and social leisure) [91], were significantly correlated with depression scores on the HADS (p<.0001). This same study included the Beck Depression Inventory (BDI) [92] to evaluate depressive traits in stroke survivors. WSAS scores were observed to be significantly associated with BDI scores at one year (p<.0001). Moreover, irritability, which is a key symptom of depression [93], was significantly related to WSAS (p<.0001). It is worth noting that this sample consisted of people who were younger and less impaired regarding cognitive and physical aspects. Still, similar trends and outcomes in returning to work after stroke were identified within a multi-ethnic urban population

at discrete time-points [67]. The study noted significantly lower depression rates in stroke survivors employed at one and five years following stroke (p<.001; p<.002).

Only one study used the Irritability, Depression and Anxiety Scale (IDA) [94] but also found further support for the link among post-stroke depression and capacity to return to employment [77]. This study found that the odds of returning to paid work were inflated with less depressive traits at three months. However, this research was a sub-study of a large-scale randomised controlled trial. Therefore, the limitations of conducting secondary analysis of existing data from another study in which return to employment was not a principal focus should be noted [61]. Another study reported that those who had returned to employment within the first year following stroke experienced less self-perceived depression compared to those who did not, both at one and five years follow-up [76]. However, it should be noted that this association did not reach statistical significance. Furthermore, depression was assessed in this study only in a general subjective sense devoid of any objective or specific assessment tools.

Anxiety

Eight of the articles examined the association between anxiety and ability to work post-stroke. Anxiety was measured within studies using the HADS. The majority of the literature examining anxiety found that this was associated with reduced capacity to work post-stroke. In one study, anxiety at one year follow-up strongly predicted scores on the WSAS in people with mild to moderate stroke [73]. Such results were supported by another study by van der Kemp, Kruithof, Nijboer, van Bennekom, van Heugten and Visser-Meily (2019) who also found that people who

were unable to return to employment after stroke experienced a higher percentage of anxiety symptoms than those who did. Likewise, it has been noted that individuals who resume employment up to five years post-stroke obtain lower anxiety scores than those who do not [78]. Another study reported that those who return to employment following first-ever stroke are significantly less anxious at three months follow-up (p<.01) [66]. The same study also observed that greater anxiety scores were related to failing to return to employment at three months after stroke. Similarly, lower anxiety rates have been observed in survivors employed one year after stroke (p<.01) [67]. However, it should be noted that none of the aforementioned studies reported on work type which has previously been noted as a possible predictor of returning to employment after stroke [16]. Still, one study that did account for work type reported that normal HADS anxiety scores were correlated with return to employment at three and six months following stroke [68].

Only two articles in this review reported no association relating to anxiety and reduced capacity to work after stroke. One low quality study found no association between anxiety scores and capacity to work post-stroke [82]. Likewise, there was no association between HADS anxiety scores and unemployment at three or twelve months in a sample of minor ischemic stroke patients [70]. Both of these studies adopted self-report methods which may present issues with bias, particularly social desirability [95].

Cognition

Twelve articles measured cognition in relation to returning to employment following stroke. There were inconsistencies within the literature regarding

whether cognition is related with reduced working capacity after stroke. Included articles measured cognition using various neuropsychological tests. Two of the three studies which used the Mini-Mental State Examination (MMSE) [96] found an association concerning post-stroke working capacity and cognition. Research by Hommel et al., (2009) observed that MMSE scores were significantly associated with the WSAS (p<.001) and that MMSE scores significantly predicted WSAS outcome (p<.002). In another Korean study, which used a Korean version of the MMSE, cognitive impairment significantly differed between three months and two years for those employed-unemployed compared to those continuously-employed after stroke (p<.05) [75]. However, neither of the aforementioned studies considered intrinsic job and work environment factors. On the other hand, another study reported that MMSE scores at stroke onset were not observed to be a significant predictor of returning to employment following first-ever stroke [67]. It should be noted that this study lacked data on contextual facilitators and barriers to resuming employment following stroke and did not account for the precise time point of return to work for all participants.

Four studies utilised the Montreal Cognitive Assessment (MoCA) [97] to examine impairments in cognition. Only one of these four studies demonstrated no relationship between cognition and working capacity post-stroke. A study by Wicht, Chavan, Annoni, Balmer, Aellen, Humm and Medlin (2022) reported that there was no evidence found for discrepancies in MoCA scores among those who had resumed employment versus those who had not either at stroke onset or three-month follow up. However, the same study did report that people who had returned to employment following first-ever stroke reported less cognitive fatigue (p<.001). To counter this, a high-quality study by van der Kemp, Kruithof, Nijboer,

van Bennekom, van Heugten, & Visser-Meily (2019) reported that global functioning at two months after stroke was the only characteristic that was significantly different amid groups of survivors who had resumed employment within one year following stroke versus those who were unable to. Those individuals who failed to resume work within one year after stroke displayed higher levels of cognitive impairment than those who resumed employment (p<.048). In another study by Slavin, McCune-Richardson, Moore, Ecklund-Johnson, Gronseth and Akinwuntan (2022), MoCA scores were associated with resumption of work at six months post mild ischemic stroke (p<.032). This same study found that a one-point upsurge in the Clock Drawing Test (CDT) [98] score raised the odds of returning to employment at three months. Participants CDT scores were also observed to be significantly associated with resumed employment at twelve months (p<.05). Although, the low quality (55%) and limited sample size (n=39) of this study should be noted. Still, another study by Fride, Adamit, Maeir, Assayag, Bornstein, Korczyn and Katz (2015) reported that individuals who had resumed employment demonstrated significantly improved MoCA scores in comparison to individuals who had not (p<.009). This same study revealed that individuals' levels of executive functioning (p<.01) and dysexecutive function (p<.065) were variables that significantly differentiated between working and non-working groups. Stroke survivors who had resumed employment showed improved executive function profile, problem-solving abilities, and cognitive status. However, it should be noted that both working and non-working groups in this study exhibited MoCA scores lesser than the cut-off point of 26 indicating mild cognitive impairment (n=154).

Two other studies measured executive abilities directly by utilising the Delis–Kaplan Executive Function System (D-KEFS) [99] but did not find a similar pattern of results to Fride et al., (2015). Van Patten, Merz, Mulhauser and Fucetola (2016) reported that D-KEFS Trail Making Tests Part A and B time to completion scores did not predict resumption of employment. The same research reported this was the case for other neurocognitive tests employed. For instance, scores on either the Short Blessed Test [100] or Boston Naming Test [101] did not predict resumption of employment in this sample. Despite the high quality of this research (86%), it should be noted that return to employment status was examined at a singular time point. Static measurements of return to work such as this cannot quantify employment stability over time, such as maintaining previous level of functioning [102]. Even so, similar results were observed in a study by Morsund, Ellekjær, Gramstad, Reiestad, Midgard, Sando, Jonsbu and Næss (2020). This study applied the DKEFS Trail Making Tests Part A and B, Verbal Fluency, and Color-Word Interference test as measures of executive functioning and found no significant discrepancies in scores among unemployed and employed stroke survivors. The same study reported that there was no relationship involving employment at twelve months and the total number of impaired cognitive tests within the two groups of patients. Though this study did note unemployed participants presented with more errors in the Color-Word Interference test.

One study used the Functional Independence Measurement (FIM) [103], which includes a cognition functioning subscale, to measure cognition at baseline, three-, six- and 12-months follow-up after stroke [65]. They found that FIM cognitive scores at six months were a significant predictor of stroke survivors'

work status at six months (p<.034), indicating that for every unit increase in FIM cognitive scores, stroke survivors were over three times more probable to be employed. To counter this, another study which used the Barrow Neurological Institute Screen for Higher Cerebral Functions (BNIS) [104] reported that cognitive function was not found to reach a significant level for determining return to employment three years after stroke [69]. It ought to be noted that this study did find neurological deficit to be a statistically significant variable for determining resumption of work three years after discharge (p<.013). Still, another study, which used the Telephone Interview for Cognitive Status (TICS) [105] to examine which early modifiable factors are related to younger stroke survivors' capacity resume employment, reported no significant differences in cognitive impairment between those who returned to work versus those who did not [63]. However, both studies were limited to younger survivors' of less severe strokes [63, 73]. Therefore, the relevance of these findings for older survivors of more devastating strokes is questionable.

Discussion

This review aimed to examine the relationship between stroke survivors' working capacity and psychological and neuropsychological variables. Overall, as highlighted by previous researchers and models of psychological adjustment [16, 46, 47, 48, 49, 50, 63, 74, 106, 107, 108], the findings from this review indicate that working capacity and rates of returning to work post-stroke are related to negative psychological and neuropsychological outcomes. Still, there were some mixed findings amongst the literature pertaining to depression and cognition.

While the majority of the articles found that anxiety was associated with reduced capacity to work post-stroke.

It is possible that the variation in study designs (seen in Table 1) could account for some of the mixed evidence observed within the depression and cognition literature. Any conclusions regarding the association between post-stroke working capacity and psychological and neuropsychological variables are limited by the different time periods for assessment used within studies (varying from days to years' post-stroke). Similarly, instrumentation was not consistent across studies which may have contributed to the mixed findings in this review. For instance, an insignificant relationship was found between post-stroke working capacity and depression in the article by Westerlind et al. (2020), however instrumentation varied from that which would typically be implemented in this type of literature. They did not use any formal measure of depressive traits but rather asked participants how they self-perceived their symptoms of depression. Therefore, this lack of standardization makes comparison of results with other existing literature difficult [85].

An additional issue raised in the current review is specifically the manner in which work should be evaluated. Few studies in this review measured work productivity directly, while most studies reduced returning to work to a binary variable. Importantly, simply returning to employment may not correspond to returning to full capacity, nor may this account for the stroke survivors' level of satisfaction within their role [109]. Only one study accounted for work satisfaction within this review [83]. The more pertinent measure of working capacity from a patient-centred perspective may be a measurement of the individual's aptitude to perform at work in comparison to their prior capability [109]. Similarly, it is critical

to consider that returning to employment is not merely concerned with working capacity. Many individuals who are entitled to retire decide not to resume work despite having full working capacity. It is often the case that individuals revaluate and reorder priorities relating to family and work after surviving a life-threatening stroke [110]. Instead of working, these individuals may spend more time with their loved ones in line with their new hierarchy of priorities. None of the studies in this review invited participants to comment on their decision-making process in relation to returning to work. Thus, qualitative research in this area may provide clarification on the other reasons why fully functional individuals chose not to return to employment post-stroke.

Though most articles measured psychological and neuropsychological outcomes independently, it is likely that such outcomes are interrelated, in addition to being influenced by previous history. Only one study in this review included participants with premorbid conditions [63]. Although Hackett el. (2012) did not note a significant relationship between lifetime history of depression and return to employment, little research has explored the effect of premorbid psychiatric history, coupled with the effect of stroke, on returning to employment. Some research has indicated that having a history of depression and associated treatment preceding stroke may influence rates of return to work [111, 112]. Likewise, there are possible variations in the biology of diagnosed psychiatric conditions prior to stroke in comparison to post-stroke (i.e., premorbid depression versus depression after stroke) [113]. Thus, results may be confounded by combining these two factors together within studies.

Another point to consider is that assessments of psychological and neuropsychological changes made by clinicians may differ from the stroke

survivor's perception. Particularly, this is the case for cognitive functioning whereby it has been observed that ratings of impairments made by patients are often greater predictors of capacity to work than assessments made by clinicians [114]. Stroke survivors may not have the cognitive capability to be efficient within the workplace despite appearing to be entirely functional within medical settings. Therefore, the focus of the clinicians assessment should be on which facet of cognition has the largest influence on working capacity. In this review, some studies demonstrated that the most important factors are the ability to make decisions and remember new information [71, 74]. Thus, patients at a greater risk of being unsuccessful in their return to employment may be identified through examining these aspects of cognition.

In addition, social characteristics and demographic variables that may be critical for working capacity post-stroke were omitted in some studies within this review. The significance of this missing information should not be overlooked as returning to employment can also be affected by education, level of social support, socioeconomic status, and age [115]. For the majority of articles, information on racial and ethnic backgrounds of participants was not included. Of the four studies that did account for this information, one study noted significant differences between ethnicity and racial background and working and non-working groups post-stroke [71]. Likewise, other studies have noted that those individuals of African descent demonstrate reduced rates of employment resumption after ischemic stroke [116], thus this may be a valuable topic for future research.

Another limitation of this review was the exclusive focus on psychological and neuropsychological factors with the exclusion of other psychosocial

variables. For instance, social support, social status, socioeconomic status, and work environment have all been shown to influence a person's ability to return to employment after illness [117]. Therefore, future research should aim to include these other factors when considering which psychosocial variables are most influential in determining an individual's ability to resume employment after stroke. Likewise, by using specific diagnostic labels as search terms it is possible that this review omitted other psychological factors related to working capacity post-stroke. Although a scope of the literature around mood disturbances post-stroke was undertaken prior to determining these search terms, it is possible that other atypical psychological complaints reported after stroke were missed by this review [118]. Finally, in most studies included in this review males formed a disproportionate percentage of the total sample. Given that it is females who generally face greater rates of disability and mortality following stroke [64], caution should be taken when generalising the results of this review to this segment of the population.

Still, regardless of the aforementioned limitations, most of the literature in this review does suggest that there is a link between poor psychological and neuropsychological outcomes, particularly anxiety, and reduced capacity to work following stroke. Hence, the prompt detection of individuals most at risk may be facilitated by providing nurses appropriate education on the prevalence of these outcomes. Upon admission to stroke units, patients who are at greater risk for developing psychological and neuropsychological impairments after stroke may be identified through the action of obtaining a comprehensive psychosocial history in line with a stepped approach to psychological care [119]. It is beyond the remit of this review to indicate an appropriate screening tool for use for this to

be carried out however, many such screening instruments are available, as well as the screening tools previously cited in this review. In addition, embedded forms that can guide such an assessment are included in most existing electronic medical records [26]. Equally, it is recommended that consultation between nurses, psychologists, social workers, and physicians should take place regarding the selection of appropriate tools for use in their facility [120]. Nursing and therapeutic interventions within occupational health settings may be guided by directed conversations around patients' employment history and future plans. Individuals who are at risk of being unable to return to employment, despite holding the desire to do so, may be streamlined for psychological support and additional services. The acute phase after stroke would be the optimal stage for implementing psychosocial interventions with the expectations of getting more survivors back to their level of prior work.

Conclusion

This literature review yields a summary of the research produced thus far regarding the association between working capacity and psychological and neuropsychological variables post-stroke. Even though findings were mixed amongst some studies relating to depression and cognition, the majority of evidence indicated that poorer psychological and neuropsychological outcomes were linked with declines in capacity to work post-stroke. As such, health care professionals should seek to identify early in the recovery process those individuals who are greater risk for poorer psychological and neuropsychological outcomes for judicious interventions to be commenced. Given the potential

interrelatedness of psychological and neuropsychological variables, the standardisation of measurement tools that could account for this should be considered. It may also be valuable to consider assessment of demographic and clinical variables and how these may be related to capacity to work post-stroke.

Table 1. *Characteristics of reviewed studies*

First Author (Year)	Sample Size and Location	Participant Characteristics (DNR; Did not report)	Methodology	Working Capacity Measure [1]	Psychological and/or Neuropsychological Variable Measure [2]	Main Findings	QS[3]
Arwert et al. (2017)	46 Netherlands Hospital	**Diagnosis:** First-ever, Ischemic, Hemorrhagic **Stroke Severity:** Barthel Index *M*=13.5 **Ethnicity:** DNR **Gender:** 29 Males (63%) **Mean Age:** 47.7 years **Education:** High level of education (35%) **Relationship:** DNR	Cross sectional **Follow-up**: two- and five-years Regression analysis	Self-report: WPAI Work Status: (Yes/No) **Return to Work Rate:** 18 (39.13%)	Self-report: HADS; COPE	Lower HADS depression score (0.76; 0.63–0.92), a less avoidant coping style (1.99; 0.80–5.00) were associated with the chance of RTW.	64%

Bonner et al.(2016)	141 India Medical Centre	**Diagnosis:** Ischemic, Hemorrhagic **Stroke Severity:** 3.1 (NIHSS Scale Score) **Ethnicity:** DNR **Gender:** Male (98%) **Mean Age:** 48 years **Education:** High school or above (70%) **Relationship:** Married (89%)	Cross sectional **Follow-up**: DNR Correlation analysis	Self-report: Binary = RTW, No-RTW **Return to Work Rate:** 74 (52.48%)	Self-report: HADS	No association between anxiety/depression and reduced capacity to work post-stroke (p<.17; p<.61).	39%
Cain et al. (2022)	376 Australia, New Zealand, UK, Malaysia and Singapore Acute Stroke Unit	**Diagnosis:** Ischemic, Hemorrhagic **Stroke Severity:** 6 (NIHSS Scale Score) **Ethnicity:** Asian (21%)	Retrospective cohort **Follow-up**: 12-months Regression analysis	Self-report: Binary = Yes, No	Self-report: IDA	The odds of returning to paid employment were increased with less depressive traits at three-months (OR per IDA point 0.87, 0.80–0.93).	48%

		Gender: Male (78%) **Mean Age:** 56 Years **Education:** University level (20%) **Relationship:** DNR		**Return to Work Rate:** 221 (59%)			
Fride et al. (2015)	163 Israel Medical centre	**Diagnosis**: First-ever, Ischemic **Stroke Severity:** 2.7 (NIHSS Scale Score) **Ethnicity:** DNR **Gender:** 117 males (71.8%) **Mean Age:** 63.75 years **Education:** 13.2 years **Relationship:** DNR	Prospective cohort **Follow-up**: three-months post-stroke Regression analysis	Self-report: Binary = working, not working **Return to Work Rate:** 73 (69.9%)	Self-report: MoCA; EFPT; DEX; GDS-SF	RTW after three-months individuals demonstrated significantly better MoCA scores (t= -2.71, p<.009, d=.52) than non-RTW individuals. The most significantly differentiated variables between RTW and non-RTW groups were RNLI scores (p<.01), QoL	80%

						(SIS; p<.05), executive functioning (p<.01) and DEX (p<.065). RTW demonstrated significantly fewer signs of depressive mood (t= -2.37, p<.02).	
Hackett et al. (2012)	441 Australia Hospital	**Diagnosis:** Ischemic, Hemorrhagic **Stroke Severity:** DNR **Ethnicity:** DNR **Gender:** 196 males **Mean Age:** 50.7 years **Education:** Diploma/ degree in RTW group (44%)	Prospective cohort **Follow-up**: 28 days, six and 12-post-stroke Correlation analysis	Binary = Yes, No **Return to Work Rate**: 75% RTW within one-year post-stroke	Self-report: HADS; TICSm	Being free of depression at 28-days showed a reasonably strong but not statistically significant effect on the likelihood of returning to work within a year (OR 2·31, 95% CI 0·87 to 6·12). No significant differences were	84%

		Relationship: Married in RTW Group (67%)				found between those who RTW versus those who did not in cognitive impairment (OR 1.60, 95% CI 0.74-3.48, *p*<.24).	
Han et al. (2019)	193 Korea Rehabilitation Clinic	**Diagnosis:** First-ever, non-specific **Ethnicity:** DNR **Stroke Severity:** 157 (0-2), 35 (3-15), 1 (16-42) (NIHSS Scale Score) **Gender:** 163 males (84.5%) **Mean Age:** <65 years 118 (61.1%) **Education:** 60 (31.1) University educated **Relationship:** Married (92.2%)	Prospective cohort **Follow-up:** three-months and two years post-stroke Regression analysis	Self-report: Binary = Continuously-employed, employed-unemployed **Return to Work Rate:** 145 (75.1%)	Self-report: K-MMSE; GDS-SF; PWI-SF	Although not statistically significant, total mean depression scores were lower in individuals continuously employed versus those unemployed between three months and two years. Significant differences in cognitive impairment and	70%

						subjective psychological well-being between three months and two years for those employed-unemployed compared to those continuously-unemployed (p<.05).	
Hofgren et al. (2007)	58 Sweden Rehabilitation Clinic	**Diagnosis:** First-ever, non-specific **Stroke severity:** 4.2 (NIHSS Scale Score) **Ethnicity:** DNR **Gender:** Male (76%) **Mean Age:** 52 Years **Education:** DNR **Relationship:** DNR	Prospective cohort **Follow-up:** one-year and three-years Regression analysis	Binary = Yes, No **Return to Work Rate:** 11% (three years)	Self-report: BNIS	Cognitive function was not found to reach a significant level for determining RTW three years after discharge.	70%

Hommel et al. (2009)	84 France Stroke Unit	**Diagnosis:** First-ever, non-specific **Stroke Severity:** 5.8 (NIHSS Scale Score) **Ethnicity:** DNR **Gender:** 43 males (51.2%) **Mean Age:** 43.5 years **Education:** University level 41 (48.8%) **Relationship:** DNR	Prospective cohort **Follow-up:** one-year post-stroke Regression analysis	Self-report: WSAS **Return to Work Rate:** 37 at one year post-stroke 44.05%	Self-report: HADS; BDI; MMSE	WSAS scores were significantly associated with HADS depression scores (p<.0001). WSAS scores were significantly associated with BDI scores at one year (p<.0001). Irritability was significantly related to WSAS (p<.0001). MMSE scores were significantly associated with the WSAS (p<.001).	61%

						MMSE score was a predictive variable of WSAS (OR 0.60, 95% CI 0.44–0.83, *p*<.002).	
Morsund et al. (2020)	217 Norway Hospital	**Diagnosis:** Ischemic **Stroke Severity**: DNR **Ethnicity:** DNR **Gender:** 67 females **Mean Age:** 55 years **Education:** University level (45%) **Relationship:** Partner (79%)	Between-Subjects **Follow-up**: three- and 12-months Regression analysis	Self-report: Binary = Employed, unemployed **Return to Work Rate:** 163 (12-months) 75.12%	Self-report: HADS; DKEFS Trail Making Tests Part A and B, Color-Word Interference test and Verbal Fluency	No association between HADS-depression and unemployment at three months. Significant association between HADS-depression and unemployment at 12 months (*p*<.04). No association between the total number of impaired cognitive tests and employment at 12	70%

						months in the two patient groups.	
Schulz et al. (2017)	159 USA Hospital	**Diagnosis:** Non-specific **Stroke Severity:** DNR **Ethnicity:** Caucasian (59.1%) **Gender**: Male (74.8%) **Mean Age:** DNR **Education:** DNR **Relationship:** DNR	Retrospective cohort **Follow-up**: three-, six-, nine- and 12 months Regression analysis	Self-report: Binary = Yes, No **Return to Work Rate:** 7.5% (12-months)	FIM; GDS	Depression was not a predictor of ability to RTW. FIM cognitive scores at six months were a significant predictor of work status at six months (OR 3.27, *p*<.034).	73%
Sen et al. (2019)	5609 United Kingdom Stroke Register	**Diagnosis:** First-ever, non-specific **Stroke Severity:** BI(<19)= 38.6% **Ethnicity:** White (54.1%) **Gender:** Male (68.2%)	Prospective cohort **Follow-up**: one-, five- and 10-years follow-up	Self-report: Binary = RTW, No-RTW **Return to Work Rate:**	Self-report: HADS; MMSE	Significantly lower rates of depression in patients working at one- and five-years post-stroke (*p*<.001; *p*<.002).	73%

		Mean Age: 53.35 years **Education:** DNR **Relationship:** DNR	Regression analysis	19% at three-months		MMSE at stroke onset was not a significant predictor of RTW (OR 0.77, 95% CI 0.27–2.22, *p*<.63).	
Slavin et al. (2022)	39 USA Stroke Unit	**Diagnosis:** First-ever, Ischemic **Stroke severity:** DNR **Ethnicity:** DNR **Gender:** Males (77.5%) **Mean Age:** 55 Years **Education**: DNR **Relationship:** DNR	Prospective cohort **Follow-up:** three-, six- and 12-Months Regression analysis	Self-report: Binary = RTW, No-RTW **Return to Work Rate:** 58% (three months)	Self-report: HADS; MoCA; CDT, DKEFS Trail Making Tests Part A and B	Normal HADS scores (0-7) were significantly associated with return to work at three- and six-months. A single point increase in the CDT score increased the odds of RTW by 3.79 (95% CI, 1.10-14.14) at three months. MOCA was associated with RTW at six months	55%

						(95%CI, OR=1.35 (1.03-1.77) *p*<.032) and CDT was associated with RTW at 12 months (95%CI, OR=8.67 (1.00-75.02) *p*= .050).	
van der Kemp et al. (2019)	121 Netherlands Hospital	**Diagnosis:** Ischemic, Hemorrhagic **Stroke Severity:** 2.3 (NIHSS scale score) **Ethnicity:** DNR **Gender:** Female 27.3% **Mean Age:** 56.3 years **Education**: Higher level of education 33.3% **Relationship:** 82.6 (Yes)	Prospective cohort **Follow-up**: seven-days, two-months, one-year Correlation analysis	Self-report: USER-P Binary = RTW, No-RTW **Return to Work Rate**: 87 (71.90%)	Self-report: HADS; MoCA	Depressive symptoms were significantly associated with return to work one-year post-stroke (*r*= -.16, *p*<.092). Global functioning at two months post-stroke was significantly different between groups of individuals who RTW within one	82%

						year versus those who did not (*r*=.19). No-RTW within one-year presented with more cognitive impairment than RTW (*Z*= -2.0; *p*<.048).	
Van Patten et al. (2016)	298 USA Medical Centre	**Diagnosis:** Non-specific **Stroke severity:** DNR **Ethnicity:** White in RTW group (76.6%) **Gender:** Male in RTW group (56.6%) **Mean Age:** In RTW group (55 Years) **Education:** 14.6 years in RTW group **Relationship:** Married in RTW group (61.4%)	Retrospective cohort **Follow-up:** Six-Month Regression analysis	Self-report: Binary = Yes, No **Return to Work Rate:** 145 (48.66%)	Self-report: DKEFS Trail Making Tests Part A and B; BNT; SBT	D-KEFS scores did not predict return to work (*B*= -.006, *SE*=.008, *p*< .503, OR 0.994, 95% CI .978- 1.011; *B*= -.003, *SE*=.004, *p*<.407, OR .997, 95% CI .989-1.005). SBT (*B*=.013, *SE*=.043, *p*<.762, OR 1.013 95% CI 0.931-1.103) and BNT (*B*= -.015, *SE*=.088,	86%

						p<.867, OR 0.985 95% CI 0.826-1.175) scores did not predict RTW.	
Westerlind et al. (2020)	398 Sweden Stroke Register	**Diagnosis:** First-ever, Ischemic, Hemorrhagic **Stroke Severity:** 358 92.0% (RLS-Alert) **Ethnicity:** Ethnic Swedes (86.8%) **Gender:** 263 males (66.1) **Mean Age:** 50.4 years **Education:** Long university education 93 (23.4%) **Relationship:** DNR	Prospective cohort **Follow-up:** one- and five-years post-stroke Regression analysis	Self-report: Binary = RTW, No-RTW **Return to Work Rate:** 298 (74.87%)	Self-report: Self-perceived Depression	RTW individuals experienced less self-perceived depression at one- and five-years follow-up compared to No-RTW group. However, such differences did not reach statistical significance (OR 0.685, 95% CI 0.389 to 1.207, *p*<.190).	57%

Wicht et al. (2022)	88 Switzerland Stroke Unit	**Diagnosis:** First-ever, non-specific **Stroke Severity:** 0.57 (NIHSS Scale Score) **Ethnicity:** DNR **Gender:** 62 males **Mean Age:** 54 years **Education:** DNR **Relationship:** DNR	Prospective cohort **Follow-up**: seven days and three-months Regression analysis	Self-report: Binary = RTW, No-RTW **Return to Work Rate:** 56.8%	Self-report: HADS; MoCA	At three-months follow-up, higher anxiety/depression were associated with noRTpW (p<.01). RTpW individuals reported less cognitive fatigue (p<.001), but no evidence found for differences in MoCA scores between those who RTpW versus noRTWpW either at onset or three-month.	70%

Note. [1] WSAS (The Work and Social Adjustment Scale; Mundt, Marks, Shear, & Greist, 2002); USER-P (The Utrecht Scale for Evaluation of Rehabilitation Participation; Post, van der Zee, Hennink, Schafrat, Visser-Meily, & van Berlekom, 2012); WPAI (The Work Productivity and Activity Impairment questionnaire; Reilly, 2008); [2] MoCA (The Montreal Cognitive Assessment; Nasreddine, Phillips, Bédirian, Charbonneau., Whitehead, Collin, & Chertkow, 2005); EFPT (Executive Function Performance Test; Baum, & Wolf, 2013); DEX (The Dysexecutive Questionnaire; Chan, 2001); GDS-SF (The Geriatric Depression Scale-Short Form; Ferraro, & Chelminski, 1996); FIM (The Functional Independence Measure; Ravaud,

Delcey, & Yelnik, 1999); PWI-SF (Psychosocial Well-being Index-Short Form; Kim., Kwon, Koh, Leem., Park., Shin, & Kim, 2006); IDA (The Irritability, Depression and Anxiety Scale; Snaith & Taylor, 1985); HADS (The Hospital Anxiety and Depression Scale; Crawford, Henry, Crombie, & Taylor, 2001); BDI (The Beck Depression Inventory; Richter, Werner, Heerlein, Kraus, & Sauer, 1998) ; MMSE (Mini-Mental State Examination; Kurlowicz, & Wallace, 1999); TICSm (The telephone interview for cognitive status; Seo, Lee, Kim, Kim, Kim, Kim, & Woo, 2011). COPE (The Coping with Problems Experienced inventory; Greer, 2007); DKEFS (The Delis-Kaplan Executive Function System; Delis, Kaplan, & Kramer, 2001) CDT (The Clock Drawing Test; Agrell, & Dehlin, 1998) ; BNIS (BNI Screen for Higher Cerebral Functions; Borgaro & Prigatano, 2002); BNT(The Boston Naming Test; Kaplan, Goodglass, & Weintraub, 2001); SBT (The Short Blessed Test; Ball, Bisher, & Birge, 1999); [3] Quality assessment score.

References

1. Patel, A., Berdunov, V., Quayyum, Z., King, D., Knapp, M., & Wittenberg, R. Estimated societal costs of stroke in the UK based on a discrete event simulation. *Age and Ageing* 2020; **49:** 270-276.
2. Stone, J., & Aybek, S. Functional limb weakness and paralysis. *Handbook of Clinical Neurology* 2016; **139:** 213-228.
3. Masuda, J., Nabika, T., & Notsu, Y. Silent stroke: pathogenesis, genetic factors and clinical implications as a risk factor. *Current Opinion in Neurology* 2001; **14:** 77-82.
4. Gorelick, P. B., & Nyenhuis, D. Stroke and cognitive decline. *Jama* 2015; **314:** 29-30.
5. Kim, J. S. Post-stroke mood and emotional disturbances: pharmacological therapy based on mechanisms. *Journal of Stroke* 2016; **18:** 244.
6. Ayerbe, L., Ayis, S. A., Crichton, S., Wolfe, C. D., & Rudd, A. G. Natural history, predictors and associated outcomes of anxiety up to 10 years after stroke: the South London Stroke Register. *Age and Ageing*, 2014; **43:** 542-547.
7. Paolucci, S. Epidemiology and treatment of post-stroke depression. *Neuropsychiatric Disease and Treatment* 2008; **4:** 145-154.
8. Alaszewski, A., Alaszewski, H., Potter, J., & Penhale, B. Working after a stroke: survivors' experiences and perceptions of barriers to and facilitators of the return to paid employment. *Disability and Rehabilitation* 2007; **29:** 1858-1869.

9. Powers, W. J., Rabinstein, A. A., Ackerson, T., Adeoye, O. M., Bambakidis, N. C., Becker, K., ... & Tirschwell, D. L. 2018 guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* 2018; **49:** e46-e99.
10. Saeki, S., & Toyonaga, T. Determinants of early return to work after first stroke in Japan. *Journal of Rehabilitation Medicine* 2010; **42:** 254-258.
11. Van Velzen, M. J. A., Sluiter, J. K., & Frings-Dresen, M. H. Predictors of return to work after acquired brain injury: a systematic review. *Brain Injury* 2009; **11:** 78-102.
12. Passier, P. E., Visser-Meily, J. M., Rinkel, G. J., Lindeman, E., & Post, M. W. Life satisfaction and return to work after aneurysmal subarachnoid hemorrhage. *Journal of Stroke and Cerebrovascular Diseases* 2011; **20:** 324-329.
13. Hoffman, B. M., Papas, R. K., Chatkoff, D. K., & Kerns, R. D. Meta-analysis of psychological interventions for chronic low back pain. *Health Psychology* 2007; **26:** 1.
14. Iles, R. A., Davidson, M., & Taylor, N. F. Psychosocial predictors of failure to return to work in non-chronic non-specific low back pain: a systematic review. *Occupational and Environmental Medicine* 2008; **65:** 507-517.
15. Kent, P. M., & Keating, J. L. Can we predict poor recovery from recent-onset nonspecific low back pain? A systematic review. *Manual Therapy* 2008; **13:** 12-28.

16. Van Velzen, J. M., Van Bennekom, C. A. M., Edelaar, M. J. A., Sluiter, J. K., & Frings-Dresen, M. H. How many people return to work after acquired brain injury?: a systematic review. *Brain Injury* 2009; **23:** 473-488.
17. Donker-Cools, B. H., Daams, J. G., Wind, H., & Frings-Dresen, M. H. Effective return-to-work interventions after acquired brain injury: a systematic review. *Brain Injury* 2016; **30:** 113-131.
18. Black-Schaffer, R. M., & Osberg, J. S. Return to work after stroke: development of a predictive model. *Archives of Physical Medicine and Rehabilitation* 1990; **71:** 285-290.
19. Howard, G., Till, J. S., Toole, J. F., Matthews, C., & Truscott, B. L. Factors influencing return to work following cerebral infarction. *Jama* 1985; **253:** 226-232.
20. Wozniak, M. A., Kittner, S. J., Price, T. R., Hebel, J. R., Sloan, M. A., & Gardner, J. F. Stroke location is not associated with return to work after first ischemic stroke. *Stroke* 1999; **30:** 2568-2573.
21. Gabriele, W., & Renate, S. Work loss following stroke. *Disability and Rehabilitation* 2009; **31:** 1487-1493.
22. McLean, R. Incidence of complications in stroke patients in an acute rehabilitation unit in Singapore. *Cerebrovascular Diseases* 2007; **24:** 129.
23. Trygged, S., Ahacic, K., & Kåreholt, I. Income and education as predictors of return to working life among younger stroke patients. *BMC Public Health* 2011; **11:** 1-9.
24. Saeki, S., & Hachisuka, K. The association between stroke location and return to work after first stroke. *Journal of Stroke and Cerebrovascular Diseases* 2004; **13:** 160-163.

25. Saeki, S., Ogata, H., Okubo, T., Takahashi, K., & Hoshuyama, T. Factors influencing return to work after stroke in Japan. *Stroke* 1993; **24:** 1182-1185.
26. Vestling, M., Tufvesson, B., & Iwarsson, S. Indicators for return to work after stroke and the importance of work for subjective well-being and life satisfaction. *Journal of Rehabilitation Medicine* 2003; **35:** 127-131.
27. Glozier, N., Hackett, M. L., Parag, V., & Anderson, C. S. The influence of psychiatric morbidity on return to paid work after stroke in younger adults: the Auckland Regional Community Stroke (ARCOS) Study, 2002 to 2003. *Stroke* 2008; **39:** 1526-1532.
28. Tanaka, H., Toyonaga, T., & Hashimoto, H. Functional and occupational characteristics associated with very early return to work after stroke in Japan. *Archives of Physical Medicine and Rehabilitation* 2011; **92:** 743-748.
29. Hsieh, C. L., & Lee, M. H. Factors influencing vocational outcomes following stroke in Taiwan: a medical centre-based study. *Scandinavian Journal of Rehabilitation Medicine* 1997; **29:** 113-120.
30. Ferro, J. M., Caeiro, L., & Figueira, M. L. Neuropsychiatric sequelae of stroke. *Nature Reviews Neurology* 2016; **12:** 269-280.
31. Tellier, M., & Rochette, A. Falling through the cracks: a literature review to understand the reality of mild stroke survivors. *Topics in Stroke Rehabilitation* 2009; **16:** 454-462.
32. Gelaw, A. Y., Janakiraman, B., Gebremeskel, B. F., & Ravichandran, H. Effectiveness of Home-based rehabilitation in improving physical function of persons with Stroke and other physical disability: A systematic review of randomized controlled trials. *Journal of Stroke and Cerebrovascular Diseases* 2020; **29:** 104-800.

33. Winstein, C., Lewthwaite, R., Blanton, S. R., Wolf, L. B., & Wishart, L. Infusing motor learning research into neurorehabilitation practice: a historical perspective with case exemplar from the accelerated skill acquisition program. *Journal of Neurologic Physical Therapy: JNPT* 2014; **38:** 190.
34. Levin, M. F., & Demers, M. Motor learning in neurological rehabilitation. *Disability and Rehabilitation* 2021; **43:** 3445-3453.
35. Waddell, K. J., Strube, M. J., Bailey, R. R., Klaesner, J. W., Birkenmeier, R. L., Dromerick, A. W., & Lang, C. E. Does task-specific training improve upper limb performance in daily life poststroke?. *Neurorehabilitation and Neural Repair* 2017; **31:** 290-300.
36. Peterson, D. B., & Rosenthal, D. A. The International Classification of Functioning, Disability and Health (ICF): A Primer for Rehabilitation Educators. *Rehabilitation Education* 2005; **19**.
37. Bandura, A. Self-efficacy mechanism in human agency. *American Psychologist* 1982; **37:** 122.
38. Brouwer-Goossensen, D., van Genugten, L., Lingsma, H. F., Dippel, D. W., Koudstaal, P. J., & den Hertog, H. M. Self-efficacy for health-related behaviour change in patients with TIA or minor ischemic stroke. *Psychology & Health* 2018; **33:** 1490-1501.
39. Kobylańska, M., Kowalska, J., Neustein, J., Mazurek, J., Wójcik, B., Bełza, M., ... & Szczepańska-Gieracha, J. The role of biopsychosocial factors in the rehabilitation process of individuals with a stroke. *Work* 2018; **61:** 523-535.
40. Gupta, A., Deepika, S., Taly, A. B., Srivastava, A., Surender, V., & Thyloth, M. Quality of life and psychological problems in patients undergoing

neurological rehabilitation. *Annals of Indian Academy of Neurology* 2008; **11:** 225.

41. Ahn, D. H., Lee, Y. J., Jeong, J. H., Kim, Y. R., & Park, J. B. The effect of post-stroke depression on rehabilitation outcome and the impact of caregiver type as a factor of post-stroke depression. *Annals of Rehabilitation Medicine* 2015; **39**: 74-80.
42. French, M. A., Miller, A., Pohlig, R. T., & Reisman, D. S. Depressive symptoms moderate the relationship among physical capacity, balance self-efficacy, and participation in people after stroke. *Physical Therapy* 2021; **101:** pzab224.
43. Forgea, M. C., Lyons, A. G., & Lorenz, R. A. Barriers and facilitators to engagement in rehabilitation among stroke survivors: an integrative review. *Rehabilitation Nursing Journal* 2021; **46:** 340-347.
44. O'Neill, D., Horgan, F., Hickey, A., & McGee, H. Stroke is a chronic disease with acute events. *Bmj* 2008; **336:** 461-461.
45. De Ridder, D., Geenen, R., Kuijer, R., & van Middendorp, H. Psychological adjustment to chronic disease. *The Lancet* 2008; **372:** 246-255.
46. Leventhal, H., Nerenz, D. R., & Steele, D. J. Illness representations and coping with health threats. In A. Baum, S. E. Taylor, & D. J. Singer (Eds.), Handbook of psychology and health: *Social Psychological Aspects of Health* 1984; **4:** 219–252.
47. Lazarus, R. S., & Folkman, S. *Stress, appraisal, and coping*. Springer publishing company 1984.
48. Moss-Morris, R. Adjusting to chronic illness: time for a unified theory 2013.

49. Moos, R. H., & Holahan, C. J. Adaptive tasks and methods of coping with illness and disability. *Coping with chronic illness and disability: Theoretical, Empirical, and Clinical Aspects* 2007; 107-126.
50. Taylor, G. H., Todman, J., & Broomfield, N. M. Post-stroke emotional adjustment: A modified social cognitive transition model. *Neuropsychological Rehabilitation* 2011; **21:** 808-824.
51. Mukherjee, D., Levin, R. L., & Heller, W. The cognitive, emotional, and social sequelae of stroke: psychological and ethical concerns in post-stroke adaptation. *Topics in Stroke Rehabilitation* 2006; **13:** 26-35.
52. Hartke, R. J., & Trierweiler, R. Survey of survivors' perspective on return to work after stroke. *Topics in Stroke Rehabilitation* 2015; **22**: 326-334.
53. Palstam, A., Westerlind, E., Persson, H. C., & Sunnerhagen, K. S. Work-related predictors for return to work after stroke. *Acta Neurologica Scandinavica* 2019; **139:** 382-388.
54. Kneebone, I. I. Stepped psychological care after stroke. *Disability and Rehabilitation* 2016; **38:** 1836-1843.
55. Teasdale TW, Engberg AW. Psychosocial consequences of stroke: A long-term population-based follow-up. *Brain injury* 2005; **12**: 1049-58.
56. Broomfield NM, Kneebone II, Laidlaw K. Neuropsychological (mood and cognition) consequences of stroke. *InClinical Psychology Forum* 2014; **11**: 20-22.
57. Robinson, MD RG. Neuropsychiatric consequences of stroke. *Annual review of medicine* 1997; **48:** 217-29.
58. Ross S, Barton J, Reading J. Post-stroke psychological and communication issues. *British Journal of Healthcare Assistants* 2009; **6:** 302-7.

59. Wijenberg ML, Van Heugten CM, Van Mierlo ML, Visser-Meily JM, Post MW. Psychological factors after stroke: Are they stable over time?. *Journal of rehabilitation medicine* 2019; **51:** 18-25.
60. Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., & Gøtzsche, P. C. Vandenbroucke JP; for the STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for reporting observational studies. *Int J Surg* 2014; **12:** 1495-9.
61. Snilstveit, B., Oliver, S., & Vojtkova, M. Narrative approaches to systematic review and synthesis of evidence for international development policy and practice. *Journal of Development Effectiveness* 2012; **4:** 409-429.
62. Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group*, T. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of Internal Medicine* 2009; **151:** 264-269.
63. Hackett, M. L., Glozier, N., Jan, S., & Lindley, R. Returning to paid employment after stroke: the Psychosocial Outcomes In StrokE (POISE) cohort study. *PloS One* 2012; **7:** e41795.
64. Heron, M. P. Deaths: leading causes for 2018. 2021
65. Schulz, C. H., Godwin, K. M., Hersch, G. I., Hyde, L. K., Irabor, J. J., & Ostwald, S. K. Return to work predictors of stroke survivors and their spousal caregivers. *Work* 2017; **57:** 111-124.
66. Wicht, C. A., Chavan, C. F., Annoni, J. M., Balmer, P., Aellen, J., Humm, A. M., ... & Medlin, F. Predictors for Returning to Paid Work after Transient Ischemic Attack and Minor Ischemic Stroke. *Journal of Personalized Medicine* 2022; **12:** 1109.

67. Sen, A., Bisquera, A., Wang, Y., McKevitt, C. J., Rudd, A. G., Wolfe, C. D., & Bhalla, A. Factors, trends, and long-term outcomes for stroke patients returning to work: the South London stroke register. *International Journal of Stroke* 2019; **14:** 696-705.
68. Slavin, S. J., McCune-Richardson, L., Moore, J., Ecklund-Johnson, E., Gronseth, G. S., & Akinwuntan, A. Cognitive testing during mild acute ischemic stroke predicts long-term return to work. *Journal of Stroke and Cerebrovascular Diseases* 2022; **31:** 106-132.
69. Hofgren, C., Björkdahl, A., Esbjörnsson, E., & Stibrant-Sunnerhagen, K. Recovery after stroke: cognition, ADL function and return to work. *Acta Neurologica Scandinavica* 2007; **115:** 73-80.
70. Morsund, Å. H., Ellekjær, H., Gramstad, A., Reiestad, M. T., Midgard, R., Sando, S. B., ... & Næss, H. Factors influencing employment after minor stroke and NSTEMI. *Journal of Stroke and Cerebrovascular Diseases* 2020; **29:** 105-036.
71. Van Patten, R., Merz, Z. C., Mulhauser, K., & Fucetola, R. Multivariable prediction of return to work at 6-month follow-up in patients with mild to moderate acute stroke. *Archives of Physical Medicine and Rehabilitation* 2016; **97:** 2061-2067.
72. Nelson, M. L., McKellar, K. A., Yi, J., Kelloway, L., Munce, S., Cott, C., ... & Lyons, R. Stroke rehabilitation evidence and comorbidity: a systematic scoping review of randomized controlled trials. *Topics in Stroke Rehabilitation* 2017; **24:** 374-380.
73. Hommel, M., Trabucco-Miguel, S., Joray, S., Naegele, B., Gonnet, N., & Jaillard, A. Social dysfunctioning after mild to moderate first-ever stroke at

vocational age. *Journal of Neurology, Neurosurgery & Psychiatry* 2009; **80:** 371-375.

74. Fride, Y., Adamit, T., Maeir, A., Ben Assayag, E., Bornstein, N. M., Korczyn, A. D., & Katz, N. What are the correlates of cognition and participation to return to work after first ever mild stroke?. *Topics in Stroke Rehabilitation* 2015; **22:** 317-325.
75. Han, J., Lee, H. I., Shin, Y. I., Son, J. H., Kim, S. Y., Kim, D. Y., ... & Kim, Y. H. Factors influencing return to work after stroke: the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) Study. *BMJ open* 2019; **9:** e028673.
76. Westerlind, E., Persson, H. C., Palstam, A., Eriksson, M., Norrving, B., & Sunnerhagen, K. S. Differences in self-perceived general health, pain, and depression 1 to 5 years post-stroke related to work status at 1 year. *Scientific Reports* 2020; **10:** 1-8.
77. Cain, S., Churilov, L., Collier, J. M., Carvalho, L. B., Borschmann, K., Moodie, M., ... & AVERT Trialist Collaboration. Factors associated with paid employment 12 months after stroke in A Very Early Rehabilitation Trial (AVERT). *Annals of Physical and Rehabilitation Medicine* 2022; **65:** 101-565.
78. Arwert, H. J., Schults, M., Meesters, J. J. L., Wolterbeek, R., Boiten, J., & Vliet Vlieland, T. Return to work 2–5 years after stroke: a cross sectional study in a hospital-based population. *Journal of Occupational Rehabilitation* 2017; **27:** 239-246.

79. Donkin, L., Hickie, I. B., Christensen, H., Naismith, S. L., Neal, B., Cockayne, N. L., & Glozier, N. Sampling bias in an internet treatment trial for depression. *Translational Psychiatry* 2012; **2:** e174-e174.
80. Patel, M. X., Doku, V., & Tennakoon, L. Challenges in recruitment of research participants. *Advances in Psychiatric Treatment* 2003; **9:** 229-238.
81. Olsen, T. S. Stroke recurrence and prognosis after stroke. *Handbook of Clinical Neurology* 2008; **92:** 407-421.
82. Bonner, B., Pillai, R., Sarma, P. S., Lipska, K. J., Pandian, J., & Sylaja, P. N. Factors predictive of return to work after stroke in patients with mild−moderate disability in India. *European Journal of Neurology* 2016; **23:** 548-553.
83. van der Kemp, J., Kruithof, W. J., Nijboer, T. C., van Bennekom, C. A., van Heugten, C., & Visser-Meily, J. M. Return to work after mild-to-moderate stroke: work satisfaction and predictive factors. *Neuropsychological Rehabilitation* 2019; **29:** 638-653.
84. Balasooriya-Smeekens, C., Bateman, A., Mant, J., & De Simoni, A. Barriers and facilitators to staying in work after stroke: insight from an online forum. *BMJ open* 2016; **6:** e009974.
85. Reilly, M. C., Gerlier, L., Brabant, Y., & Brown, M. Validity, reliability, and responsiveness of the work productivity and activity impairment questionnaire in Crohn's disease. *Clinical Therapeutics* 2008; **30;** 393-404.
86. Zahra, D., Qureshi, A., Henley, W., Taylor, R., Quinn, C., Pooler, J., ... & Byng, R. The work and social adjustment scale: reliability, sensitivity and value. *International Journal of Psychiatry in Clinical Practice* 2014; **18:** 131-138.

87. Post MW, van der Zee CH, Hennink J, Schafrat CG, Visser-Meily JM, van Berlekom SB. Validity of the 70mpairm scale for evaluation of rehabilitation-participation. *Disability and rehabilitation* 2012; **34:** 478-85.
88. Ferraro FR, Chelminski I. Preliminary normative data on the Geriatric Depression Scale-Short Form (GDS-SF) in a young adult sample. *Journal of clinical psychology* 1996; **52:** 443-7.
89. Crawford JR, Henry JD, Crombie C, Taylor EP. Normative data for the HADS from a large non-clinical sample. *British Journal of Clinical Psychology* 2001; **40:** 429-34.
90. Hill, K. G., Woodward, D., Woelfel, T., Hawkins, J. D., & Green, S. Planning for long-term follow-up: Strategies learned from longitudinal studies. *Prevention Science* 2016; **17:** 806-818.
91. Mundt, J. C., Marks, I. M., Shear, M. K., & Greist, J. M. The Work and Social Adjustment Scale: a simple measure of impairment in functioning. *The British Journal of Psychiatry* 2002; **180:** 461-464.
92. Richter P, Werner J, Heerlein A, Kraus A, Sauer H. On the validity of the Beck Depression Inventory: A review. *Psychopathology* 1998; **31:** 160-8.
93. Jackson-Koku, G. Beck depression inventory. *Occupational Medicine* 2016; **66:** 174-175.
94. Snaith RP, Taylor CM. Rating scales for depression and anxiety: a current perspective. *British Journal of Clinical Pharmacology* 1985; **19:** 17-20.
95. Paulhus, D. L., & Vazire, S. The self-report method. *Handbook of Research Methods in Personality Psychology* 2007; **1:** 224-239.
96. Kurlowicz L, Wallace M. The mini-mental state examination (MMSE). *Journal of gerontological nursing* 1999; **1:** 8-9.

97. Nasreddine ZS, Phillips NA, Bédirian V, Charbonneau S, Whitehead V, Collin I, Cummings JL, Chertkow H. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society* 2005; **53:** 695-9.
98. Agrell B, Dehlin O. The clock-drawing test. *Age and ageing* 1998; **27:** 399-404.
99. Delis DC, Kaplan E, Kramer JH. Delis-Kaplan executive function system. *Assessment* 2001; **26:** 19-30.
100. Ball LJ, Bisher GB, Birge SJ. A simple test of central processing speed: an extension of the Short Blessed Test. *Journal of the American Geriatrics Society* 1999; **47:** 1359-63.
101. Kaplan E, Goodglass H, Weintraub S. Boston naming test. *Journal of the American Geriatrics Society 2001*; **12;** 12-13.
102. Treger, I., Shames, J., Giaquinto, S., & Ring, H. Return to work in stroke patients. *Disability and Rehabilitation* 2007; **29:** 1397-1403.
103. Ravaud JF, Delcey M, Yelnik A. Construct validity of the functional independence measure (FIM): Questioning the unidimensionality of the scale and the" value" of FIM scores. *Scandinavian journal of rehabilitation medicine* 1999; **31:** 31-42.
104. Borgaro SR, Prigatano GP. Early cognitive and affective sequelae of traumatic brain injury: A study using the BNI screen for higher cerebral functions. *The Journal of head trauma rehabilitation* 2002; **17:** 526-34.
105. Seo EH, Lee DY, Kim SG, Kim KW, Kim DH, jo Kim B, Kim MD, Kim SY, Kim YH, Kim JL, Kim JW. Validity of the telephone interview for cognitive status (TICS) and modified TICS (TICSm) for mild cognitive impairment

(MCI) and dementia screening. *Archives of gerontology and geriatrics* 2011; **52:** 26-30.

106. Waje-Andreassen, U., Thomassen, L., Jusufovic, M., Power, K. N., Eide, G. E., Vedeler, C. A., & Naess, H. Ischaemic stroke at a young age is a serious event–final results of a population-based long-term follow-up in Western Norway. *European Journal of Neurology* 2013; **20:** 818-823.

107. Culler, K. H., Wang, Y. C., Byers, K., & Trierweiler, R. Barriers and facilitators of return to work for individuals with strokes: perspectives of the stroke survivor, vocational specialist, and employer. *Topics in Stroke Rehabilitation* 2011; **18:** 325-340.

108. Kauranen, T., Turunen, K., Laari, S., Mustanoja, S., Baumann, P., & Poutiainen, E. The severity of cognitive deficits predicts return to work after a first-ever ischaemic stroke. *Journal of Neurology, Neurosurgery & Psychiatry* 2013; **84:** 316-321.

109. Hartke, R. J., Trierweiler, R., & Bode, R. Critical factors related to return to work after stroke: a qualitative study. *Topics in Stroke Rehabilitation* 2011; **18:** 341-351.

110. Western, H. Altered living: coping, hope and quality of life after stroke. *British Journal of Nursing* 2007; **16:** 1266-1270.

111. Fertl, E., Killer, M., Eder, H., Linzmayer, L., Richling, B., & Auff, E. Long-term functional effects of aneurysmal subarachnoid haemorrhage with special emphasis on the patient's view. *Acta Neurochirurgica* 1999; **141:** 571-577.

112. Vilkki, J., Juvela, S., Malmivaara, K., Siironen, J., & Hernesniemi, J. Predictors of work status and quality of life 9–13 years after aneurysmal subarachnoid hemorrahage. *Acta Neurochirurgica* 2012; **154:** 1437-1446.

113. Whyte, E. M., & Mulsant, B. H. Post stroke depression: epidemiology, pathophysiology, and biological treatment. *Biological Psychiatry* 2002; **52:** 253-264.

114. Vilkki, J. S., Juvela, S., Siironen, J., Ilvonen, T., Varis, J., & Porras, M. Relationship of local infarctions to cognitive and psychosocial impairments after aneurysmal subarachnoid hemorrhage. *Neurosurgery* 2004; **55:** 790-803.

115. Nascimento, L. R., Scianni, A. A., Ada, L., Fantauzzi, M. O., Hirochi, T. L., & Teixeira-Salmela, L. F. Predictors of return to work after stroke: a prospective, observational cohort study with 6 months follow-up. *Disability and Rehabilitation* 2021; **43:** 525-529.

116. Busch, M. A., Coshall, C., Heuschmann, P. U., McKevitt, C., & Wolfe, C. D. Sociodemographic differences in return to work after stroke: the South London Stroke Register (SLSR). *Journal of Neurology, Neurosurgery & Psychiatry* 2009; **80:** 888-893.

117. Cancelliere C, Donovan J, Stochkendahl MJ, Biscardi M, Ammendolia C, Myburgh C, Cassidy JD. Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews. *Chiropractic & manual therapies* 2016; **24**: 1-23.

118. Bielawski M, Bondurant H. Psychosis following a stroke to the cerebellum and midbrain: a case report. *Cerebellum & ataxias* 2015; **2:** 1-4.

119. Bowen, A., James, M., & Young, G. Royal College of Physicians. *National Clinical Guideline for Stroke RCP* 2016.

120. Richards, C. L., Malouin, F., & Nadeau, S. Stroke rehabilitation: clinical picture, assessment, and therapeutic challenge. *Progress in Brain Research* 2015; **218:** 253-280.

Part Two: Empirical Paper

This Paper is written in the format ready for submission to the

International Journal of Clinical Practice.

See Appendix B for submission guidelines.

Return to Work after Cerebrovascular Accident: A Mediation Study of Illness Perception

Running Title: Illness Perceptions and Returning to Work After Stroke

Kieran McCaffer, Dr Emma Lewis

Faculty of Health Sciences, School of Psychology and Social Work,

University of Hull, Cottingham Road, Hull, HU6 7RX, United Kingdom

Word Count (excluding tables and references): 4,943.

Corresponding Author: Kieran McCaffer, Faculty of Health Sciences, School of Psychology and Social Work, University of Hull, Hull, United Kingdom, HU6 7RX. Tel: +44 (0) 1482 464106. Fax: +44 (0) 1482 464093. Email: K.McCaffer-2016@hull.ac.uk

No Conflicts of Interest to disclose.

Author Contributions

Kieran McCaffer contributed to the concept and design of the study; data collection; data analyses; and drafting of the article.

Dr Emma Lewis contributed to the concept and design of the study, in addition to the critical revision of the article.

Acknowledgements

Funding: *None*

Acknowledgements: *None*

Abstract

Background: Research consistently demonstrates that survivors of stroke struggle to return to work (RTW). So far, it is largely unknown why some survivors of stroke RTW whilst others do not. No one or combination of variables to date seems to adequately account for the high variance in rates of RTW which may indicate that an additional mediating variable could be accountable for such widespread disparities. Furthermore, there is scarce research into illness perceptions. Illness perceptions may be predictors of recovery and are indicated to mediate the relationship among illness and outcomes. The current study examined the possible mediating influences of illness perceptions on the association among degree of comorbidities and RTW following stroke. *Methods*: Participants who were in employment preceding their stroke were recruited both locally and nationally. Quantitative measures included the Brief Illness Perception Questionnaire (BIPQ), the Charlson Comorbidities Index (CCI), and the Functional Status Questionnaire (FSQ). A Mediation analysis was carried out to establish the mediating effect of illness perceptions on the association among degree of comorbidities and RTW following stroke. *Results:* The illness perception domain of Emotional Representations had a mediating influence on the association between degree of comorbidities and post-stroke work status. There was an association between illness perceptions and degree of comorbidities. Illness perceptions were also shown to predict work status in individuals after stroke. *Conclusions:* It is indicated that illness perceptions, as represented within the Common-Sense

Model (CSM), may be utilised to plan appropriate intervention approaches in survivors of stroke.

What is already known about this topic

Research consistently demonstrates that survivors of stroke struggle to return to work. Studies have found associations between RTW post-stroke and various factors including comorbidities, age, sex, stroke severity and job role.

What does this article add

This article indicates that there is a mediating effect of illness perceptions on the association between degree of comorbidities and post-stroke work status and thus may be targeted to aid intervention strategies in patients after stroke.

Introduction

Cerebrovascular accident (CVA), also known as stroke, is defined by Franck (2020) as “the rapid loss of brain functions due to either ischemic blocked arteries or hemorrhages in the blood vessels of the brain” [pp. 43,1]. Stroke is the second leading cause of mortality worldwide, resulting in approximately five and a half million deaths each year [2, 3]. Although incidence rates have declined in recent years, likely due to improved medical management and surgical techniques [4], chronic disability occurs in up to 50% of stroke survivors [5]. Moreover, data from Public Health England suggests that the risk of stroke in younger people is increasing, with over a third of strokes in adults between 40 and 69 years [6]. Moreover, these rates of stroke amongst working age adults are set to double within the next 15 years [7]. Despite advances in stroke care

and treatment, patients report an abundance of psychological difficulties in the aftermath of stroke, coupled with an unsatisfactory quality of survival [8]. Such complaints are speculated to hinder recovery and negatively influence outcomes including return to work (RTW). Within the UK alone, the psychological, social, physical, and socioeconomic burden associated with loss of productivity post-stroke is staggering, including an estimated aggregate societal cost of £26 billion per year [9, 10]. Given the growing incidence of stroke in working aged people, the capacity to RTW has become an important area for research.

The average percentage of those RTW after stroke is around 50% [11]. In addition, RTW occurs on average three to six months post-stroke [12] and many survivors do not RTW even years after injury [11, 13]. Following recovery from illness, failing to RTW is linked with negative health outcomes including elevated rates of mortality, cardiac disease, and depression [12]. It is also associated with social consequences including poor coping ability and isolation [14, 15, 16]. Meanwhile, those in employment report improved health-status and quality of life, along with reduced usage of health services [17]. Individuals who can RTW post-stroke report greater levels of subjective life satisfaction and well-being than those who are incapable [18, 19, 20]. Hence, RTW is considered as one of the most valuable predictors of quality of survival following stroke [17].

Factors influencing RTW after Stroke

So far, it is largely unknown why some survivors of stroke RTW whilst others do not. Elsewhere, comorbidities have been widely studied for their impact on

outcomes within various disease states, including RTW. Comorbidities is defined by Valderas et al. (2009) as “the presence of one or more additional conditions often co-occurring with a primary condition” [pp.181, 21]. Increased comorbidities are associated with decreased quality of life and elevated levels of physical disability [22]. A negative association has also been reported between comorbidity and RTW in workers following bouts of nonspecific, work-disabling lower back pain [23]. In another study, comorbidity was noted as a substantial determinant of RTW after major trauma [24]. In ischemic stroke patients, higher comorbidity has been shown to predict decreased function in the community [25]. It has also been found that ischemic stroke patients with higher Charlson Comorbidity Indexes (CCI) [26], one of the most widely used comorbidity indices, have increased odds of poorer outcomes at discharge and mortality at one-year [27]. Other studies have found an association between psychiatric comorbidities, such as anxiety and depression, and RTW post-stroke [11, 17, 28].

Other research has speculated that age [29, 30, 31], sex [32, 33, 34], stroke severity [18, 31, 32, 35, 36, 37, 38], and job role [18, 39], may all contribute to failing to RTW after stroke. Nevertheless, the findings from these aforementioned studies have been conflicting and there is widespread variation in the rates of RTW, which varies between seven percent to 84%, among stroke survivors within these studies [40]. As such, no one variable or combination of variables to date seems to adequately account for the high variance in rates of RTW which may indicate that an additional mediating variable could be accountable for such widespread disparities [40]. Each individual may be impacted differently following stroke, which increases uncertainty around

predicting RTW. Furthermore, the environmental, social, and personal circumstances surrounding each case of stroke are unique and impact differently on a variety of outcomes.

Illness Perceptions

It has recently emerged that illness perceptions, which according to Jang et al. (2007) is “a person’s identification of the attributes of illness reflecting the understanding, perspective, and interpretation of one’s personal health conditions” [pp.77, 41], may be a predictor of recovery and is hypothesised to mediate the association amongst illness and outcomes [42]. The perceptions an individual holds about their illness can impact outcomes and may be critical to recovery [43]. For instance, one study observed that baseline illness perceptions predicted pain outcome three years later in patients with musculoskeletal pain [44]. Another study by Scharloo et al. (2000) found that negative illness perception was associated with more outpatient clinic visits, and poorer outcomes in physical and mental health, in patients with psoriasis. Poor illness perceptions at baseline have even been shown to predict levels of social support, depression, and anxiety twelve years later in myocardial infarction patients [45]. Negative illness perception is associated with increased comorbidities in headache patients [46]. Likewise, negative perception of health predicted higher comorbidities in patients with shoulder injuries [47]. Another study found a decrease in rates of RTW in patients with musculoskeletal disorders was predicted by negative illness perception [48]. Whereas positive illness perception has been indicated to improve the likelihood of RTW after disease onset [49, 50].

The Common-Sense Model (CSM) by Leventhal, Nerenz and Steele (1984) is a commonly applied theoretical framework on illness perceptions. Illness perceptions based on this concept incorporate the individual labelling the illness and recognising its accompanying symptoms; creating ideas around how the illness arose; developing beliefs about short-term and long-term effects of the illness involving the emotional, social, and economic costs; ascertaining illness duration, whether it is enduring, acute or will have recurring effects; and assessing how much control he/she has or health-care providers can offer to impact illness course [51]. Variations in the dimensions of an illness perception have been shown to predict a variety of outcomes including quality of life and RTW [52]. Furthermore, illness perceptions have shown considerable potential in explaining variability in outcomes within various illnesses. Yet, the potential mediating effect of illness perceptions in stroke related outcomes, particularly RTW, continues to be an entirely uncultivated area of research.

Rationale for Study

Healthcare professionals working within stroke care can fulfil a vital role in supporting stroke patients to RTW through screening and interventions [32]. Still, there must be a robust understanding of why some individuals successfully manage RTW after stroke whist others do not before such programs can be developed and implemented. Given the limited research to date, it is essential to examine the potential mediating factors in the relationship between stroke and RTW. An investigation into the illness perceptions of stroke survivors may contribute to explaining the large variability in rates of RTW. Gaining an insight into illness perception may be a compelling approach to capturing the stroke

survivor's idiosyncratic perspective of the burden of stroke sequalae eliminating the need to guess which factors are the most crucial for RTW. Nevertheless, illness perceptions have not been amply examined within stroke research. It has been suggested that this is due to a lack of awareness amongst health care professionals working within stroke care regarding the importance of illness perceptions coupled with an emphasis on physical recovery within early stroke rehabilitation [53, 54]. Furthermore, despite the potential influence on patient outcomes, illness perceptions have not been evaluated in relation to RTW. It is important that this gap within the literature is amended.

Prior to the construction, testing, or implementation of any intervention, it would be important to firstly explore the relationship between illness perceptions and RTW [55]. Developing our knowledge of how some individuals make a successful RTW post-stroke will aid the improvement of intervention strategies to support others who may otherwise be struggling to RTW [17]. Such research will also address the key public health issue concerning post-illness workplace productivity loss [9, 10]. Otherwise valuable members of the workforce may fail to RTW if we lack an understanding of the problems and the resources needed to support patients in transitioning from significant illness back into the workplace. If legislators and healthcare providers are aware of the numerous barriers to RTW then there is potential for these issues to be resolved. The current study describes illness perceptions as a potential barrier to explain variance in RTW. Furthermore, the study offers data concerning work outcomes in stroke population which has not so far been adequately assessed.

Aims

The main purpose of the current research was to examine the potential mediating effects of illness perceptions on the association between degree of comorbidities and RTW post-stroke. By way of this, the aim was also to establish whether in survivors of stroke: there is a relationship among degree of comorbidities and illness perceptions; there is a relationship between degree of comorbidities and RTW after stroke; and there a relationship among illness perceptions and RTW after stroke.

Hypotheses

It was hypothesised that there would be a mediating effect of illness perceptions on the association between degree of comorbidities and RTW after stroke. Additionally, it was assumed that degree of comorbidities would be related to illness perceptions and degree of comorbidities would be associated with RTW post-stroke. It was hypothesised that there would be an association between illness perceptions and RTW post-stroke.

Methods

Design

The current study was cross-sectional in nature and employed a quantitative approach that incorporated closed-response questions; multiple-choice questions including single word answers (e.g., ‘yes’ or ‘no’), or a 10-point Likert scale (e.g., not at all affected emotionally to extremely affected emotionally).

Participants and Procedure

In order to be eligible to partake in this research, participants must have previously suffered a stroke, be 18 years old or above, must have been employed at the time of their stroke, must have had capacity to consent to take part in line with the Mental Capacity Act (2005), and have the ability to read English. Individuals were excluded from the study if they were below 18 years old, were unable to read English, lacked mental capacity to consent to take part, or were unemployed/retired at the time of their stroke.

Participants were recruited locally via community stroke services and nationally via online advertisement by stroke charities and organisations. Participants completed either an online or postal version of the study questionnaire, according to personal preference. The questionnaire had an estimated completion time of 20 minutes. It was not possible to do a sample size calculation for mediation of an ordinal outcome with three categories, as planned for the RTW outcome. As an estimation, a sample size calculation was instead performed for a mediation model with a binary outcome measure using the power mediation package within R version 4.1.2. The regression coefficient was standardised to one and thus, to achieve 80% power for testing for mediation using a two-sided five percent significance level, 120 participants were required for a mediator standard deviation of .59.

Measures

Participants completed a questionnaire containing questions abstracted from various validated measures (listed below). These self-report measures collected data on work status, comorbidities, illness perceptions, and individual characteristics:

The Brief Illness Perception Questionnaire (BIPQ) [56] was utilised as a measure of illness perception. This contains nine items that quantitatively measure five domains of illness representations based on the CSM model (Broadbent et al., 2006). BIPQ has been developed from the Illness Perception Questionnaire-Revised (IPQ-R), which contains 80 items, has stable correlations (α = .79-.89), and has excellent internal consistency for each subscale [57]. Eight of the nine questions contained within the BIPQ have been derived by creating a single question that most sufficiently abridged the items covered within each subscale of the IPQ-R. Items are rated by means of zero to 10 scales. The ninth item invites respondents to answer an open-ended question in which they must rank in order the three most critical factors that they consider having caused their illness. These responses can be analysed separately or with the questionnaire according to researcher preference [56]. The BIPQ produces a total score which exemplifies the extent to which individuals view their illness as benign or threatening, with elevated scores indicating a more threatening view of one's disease.

The BIPQ has been selected for this study due to its stable test-retest reliability, which has been demonstrated in patients of kidney failure, with correlations varying from .42-.75, p<.01 [56]. Likewise, predictive validity has been established in a study used to evaluate the capability of the BIPQ to predict various important outcomes in patients of myocardial infarction. Quality of life, cardiac anxiety, mental states, and vitality three months after myocardial infarction were all predicted using the BIPQ [56].

The Charlson Comorbidities Index (CCI) [8] was used as a measure of comorbidities. It was developed as a measure of one-year mortality risk and

burden of disease. The scoring system used by this measure has previously been validated by researchers to assess the effect of comorbid conditions on other illnesses, including ischemic stroke [27]. CCI measures the existence of nineteen medical conditions and offers a weighted score of one, two, three, or six in accordance with the burden of the individual illness. The weighted scores are added up to provide an overall score to represent the burden of illness. The CCI was chosen for this study due to its established predictive validity with a variety of outcomes such as disability, hospital length of stay, readmission rates, and with functional outcomes after ischemic stroke [25, 27, 58, 59, 60]. This measure also has high test-retest reliability (ρ=.94) [61].

The Functional Status Questionnaire (FSQ) [62] was utilised as a means of assessing work status. It is a brief, standardized, self-administered questionnaire which provides a comprehensive assessment of social, psychological, physical, and role function in ambulatory patients [62]. The FSQ has been shown to produce reliable sub-scales with construct validity [62]. In addition to change in employment and working hours from pre-injury levels, Work Status after stroke in this study was established based on questions that were partly adapted from the FSQ [62]. This allowed participants to be categorized into three possible classifications based on a similar method used by Nishino et al. (1999): Group one: working at the same/ different place of employment with an increase/ no change in work hours; Group two: working at the same/ different place of employment with a decrease in work hours; Group three: unemployed or early retirement. In the present study, Group one indicated individuals who were able to resume productive activities at the equivalent level or above, Group two indicated individuals who were able to

resume productive activities, only at a diminished level. Group three reflected individuals who were unable to resume any productive activities. Work status was measured as an ordinal variable.

It was also important to control for other covariates that may have predicted work status including gender and age [63]. Age was documented as a continuous variable and gender was documented as a categorical variable either male, female, or non-binary.

Data Analysis

Statistical Analysis

Physical and demographic variables were calculated using descriptive statistics. PROCESS Macro version 4.2 [64] was adopted to run the mediation analysis in order to establish the mediating effects of illness perceptions on the association among degree of comorbidities and work status post-stroke. It is hypothesised that mediation is a causal chain whereby the independent variable influences the mediator (second variable) which, in succession, influences the outcome variable. The independent variable was ‘degree of comorbidities’ which was conceptualised as the burden of illness (CCI score) [26]. The outcome variable was ‘work status’ which was classified as the recommencement of productive activities [65] which the participant subjectively viewed as work. Illness perceptions domains, namely Emotional Representations, Cognitive Representations, and Illness Comprehensibility were the mediator variables. Hence, five mediation analyses were conducted in total.

The Statistical Package for Social Sciences IOS version 23.0 was adopted for all statistical analyses. Pearson's correlation coefficient was utilised

as a means of calculating the strength of a linear relationship between degree of comorbidities and illness perception [66]. An ordinal logistic regression was completed to further investigate the potential predictive effects of degree of comorbidities and illness perceptions on post-stroke work status [67].

Results

Participants

As can be seen in Table 1, a total of 123 participants who were recruited from across the United Kingdom completed the questionnaire. Five participants were further excluded from the analyses due to incomplete questionnaire responses.

Table 1. Demographics of participants (*n*= 123).

	Frequency % (n)
Total	100 (123)
Gender	
Male	59.3 (73)
Female	40.7 (50)
Age	Mean= 56.89 (SD= 8.69), Range: 29-76
Ethnic Group	
White/Caucasian	75.6 (93)
Asian/Pacific Islander	1.6 (2)
Black/African/Caribbean	4.1 (5)
Not disclosed	18.7 (23)
Type of Stroke	

Ischemic	21.1 (26)
Hemorrhagic	17.1 (21)
Cryptogenic	1.6 (2)
Transient Ischemic Attack	4.9 (6)
Brain Stem	0.8 (1)
Not disclosed	67 (54.5)
Years spent in education	Mean= 12.7 (SD= 2.21), Range: 7-17

Degree of Comorbidities

Participants' ratings of burden of illness ranged from zero to 10, with a mean of 1.98 (*SD*= 2.05). Greater scores imply the perception of a higher burden of illness. Table 2 highlights the frequencies of various comorbidities reported by participants.

Table 2. Comorbidities reported by participants.

(*n*=123).

Comorbidity	**Frequency % (n)**
Heart attack	8.9 (11)
Heart failure	4.9 (6)
Blood circulation disorder	11.4 (14)

Asthma, chronic lung disease, chronic bronchitis, or emphysema	18.7 (23)
Diabetes	8.9 (11)
Chronic kidney disease	1.6 (2)
Liver disease	2.4 (3)
Stomach ulcers	4.1 (5)
Cancer	10.6 (13)
Cognitive difficulties	29.3 (36)
Arthritis	22 (27)
Hypertension	38.2 (47)
Skin infection	7.3 (9)
Depression	17.1 (21)

Illness Perceptions

Participants had very variable perceptions of their stroke as indicated by the range of scores from the B-IPQ. Participants perceived their stroke as causing them high concern as indicated by their mean scores (*M*=7.51; *Range*= 1-10; *SD*= 2.69). Participants mean scores also indicated that they perceived their stroke as severely impacting their emotional well-being (Emotional Representations, *M*=6.76; *Range*= 1-10; *SD*= 2.78) and affecting their life (Consequence, *M*=7.26; *Range*= 2-10; *SD*= 2.73). Mean scores from participants also suggested that they were worried that their illness would progress (Timeline, *M*=8.11; *Range*= 1-10; *SD*= 2.52). Largely, this sample of participants possessed

strong beliefs in Treatment Control (*M*=4.41; *Range*= 1-10; *SD*= 2.51). In contrast, participants possessed lower levels of perceived personal control (*M*=3.72; *Range*= 1-10; *SD*= 2.39). However, participants' scores suggested that they had developed an understanding of their stroke, but that this was not markedly robust (Coherence, *M*=5.72, *Range*= 1-10; *SD*= 3.04). Concerning Identity (illness symptoms), individuals did not demonstrate markedly strong illness identities; with mean scores of 6.59 (*Range*= 1-10; *SD*= 2.65) for how symptomatic they perceived themselves to be.

The Relationship Between Degree of Comorbidities and Illness Perceptions

Among illness perceptions, Emotional Representations were weakly positively correlated with degree of comorbidities, $r(121) = .29$, $p < .001$. This suggests that individuals' illness burden increases concurrently with their levels of emotional distress relating to their stroke.

The Cognitive Representations and Illness Comprehensibility aspects of illness perceptions were not significantly related to degree of comorbidities.

Work status

Alike the variation in illness perceptions, participants also had large degree of variation in their work statuses. Overall, 39% (n=48) of the sample were able to resume employment. Of this, 65% (n=31) were in part-time employment with mean working hours of 16.55 hours per week (*Range*= 5-30; *SD*= 7.38). Mean working hours per week varied less amongst full-time employees (*M*=38.41;

Range= 35-42; *SD*= 2.29). Only 18.7% (n=23) of the sample were able to maintain the same number of working hours from before their stroke and a single participant was able to work more hours than before their stroke. Regarding job role, 69.9% (n=86) of the sample had switched to work in a different job from before their stroke.

The Effects of Degree of Comorbidities and Illness Perceptions on Work Status

A cumulative odds ordinal logistic regression with proportional odds was conducted to establish the effect of degree of comorbidities, illness perceptions domains, that is Emotional Representations, Illness Comprehensibility, and Cognitive Representation, on post-stroke work status. An increase in Emotional Representations scores was associated with an increase in the odds of failing to return to work, with an odds ratio of 1.178, 95% CI [1.066 to 1.302], $\chi^2(1) = 10.309$, $p < .001$. An increase in Cognitive Representations scores were associated with an increase in the odds of failing to return to work, with an odds ratio of 1.101, 95% CI [1.026 to 1.181], $\chi^2(1) = 7.231$, $p < .007$. This indicates that the stronger participants' perceptions of Emotional and Cognitive Representations of their stroke were the lower the likelihood of them returning to work. Both Illness Comprehensibility and degree of comorbidities were not found to predict post-stroke work status.

The Mediation Effects of Illness Perceptions on The Relationship Between Degree of Comorbidities and Work Status

In mediation analysis, when two variables are associated independent of the mechanism represented by the mediator variable (i.e., illness perceptions) then this would indicate a direct effect. Contrary to this, when two variables are associated through the mediator variable then an indirect effect is observed. In such cases, it can be assumed that M acts to mediate the effect of X on Y (i.e., X→M→Y) [63].

As can be seen in Figure 1, Emotional Representations demonstrated a mediating effect on the association between degree of comorbidities and work status. Degree of comorbidities indirectly influenced work status through its effect on Emotional Representations. Participants who perceived themselves as having a greater degree of comorbidities (*a*=.679, *p*=.001), had stronger perception of Emotional Representations, which further resulted in higher impairment in work status (*b*=.059, *p*=.001). A bias-corrected bootstrap confidence interval for the indirect effect (*ab*=.040) based on 5000 bootstrap samples was entirely above zero (.013 to .077). There was no indication that degree of comorbidities impacted work status independent of its effect on Emotional Representations (c'= .013, *p*=.664).

There was no evidence to suggest Cognitive Representations or Illness Comprehensibility had an indirect effect on the association among degree of comorbidities and work status.

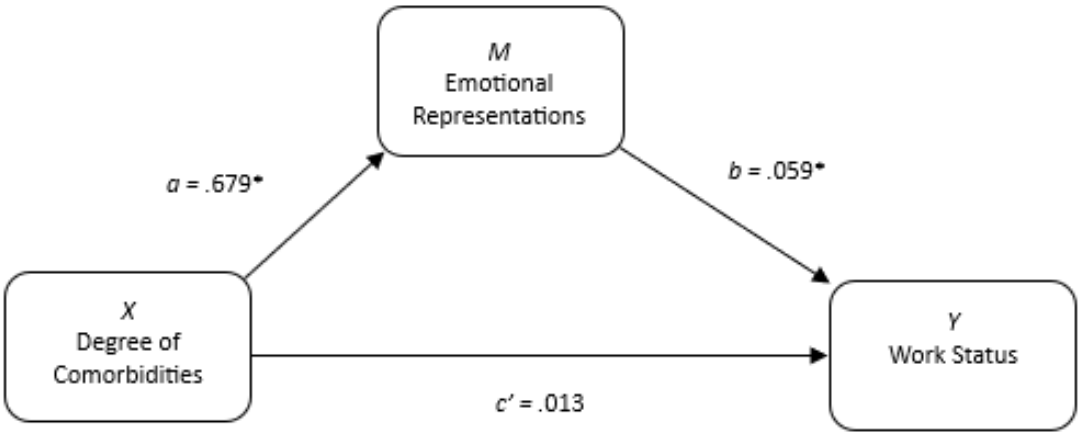

Figure 1. The indirect effect of degree of comorbidities on work status mediated by Emotional Representations.

* p<.05

Discussion

The current study sought to investigate the possible mediating effect of illness perceptions on the association between degree of comorbidities and return to work following stroke. As such, just the illness perception domain of Emotional Representations was observed to mediate the association among degree of comorbidities and return to work post-stroke. This highlights an important link between the degree to which the individual's stroke makes them experience symptoms of anxiety or depression and their degree of concurrent illness comorbidities, and their subsequent ability to work. Individuals who rated their perception of illness burden higher, in turn, were more highly emotionally affected

by their stroke which subsequently impaired their capability to resume employment.

Following observations of an indirect (mediating) relationship, where no direct relationship has been observed, and the mechanism of the mediator is accounted for, it may be assumed that an association involving the independent variable and the outcome variable does not exist [63]. Moreover, this demonstrates that the mediator variable demonstrates a mediating effect on the relationship among the independent variable and the outcome variable [63]. Thus, this would indicate that degree of comorbidities does not influence post-stroke work status independent of the influence of illness perceptions on post-stroke employment status; but that there is an indirect relationship between degree of comorbidities and post-stroke work status which may be clarified owing to the mechanism of illness perceptions, namely Emotional Representations.

Prior to examining illness perceptions and post-stroke work status, the potential association between illness perceptions and degree of comorbidities was explored. In line with previous literature [38, 45, 46, 47], an association among illness perceptions and degree of comorbidities, albeit weak, was observed. This suggests that an individual's perception of the impact of their stroke upon their lives is closely related to their concurrent comorbidities and illness burden.

Another objective of this research was to establish if illness perceptions predict work status in individuals after stroke; these results were able to verify this. The finding that the stronger participants' illness perceptions, namely Emotional and Cognitive Representations, the lower the likelihood of them returning to employment corroborated previous research which has found varying rates of RTW in those harbouring different illness perceptions [48, 49,

50]. However, it should be noted that this analysis evaluated components of illness perception for individual effects. In such cases, researchers suggest that caution is required when utilising illness perception subcategories in isolation [68], as they were originally intended as a whole or in subsets [69]. Additionally, the illness perception domain of Illness Comprehensibility was not observed to predict work status suggesting that the degree of understanding of illness from the individual does not influence their ability to resume employment after stroke.

Still, these results indicate that there are several cognitive and emotional illness-representations which may predict the probability of an individual resuming employment following stroke including an individual's beliefs about how their condition is identified, beliefs about their illness duration, beliefs concerning the effect of their stroke on their lives, thoughts about the perceived reasons for the development of their illness, beliefs about how much control they possess over their stroke, and how emotionally affected the individual feels as a result of their stroke [29, 68]. Within stroke population, illness perceptions continue to be under researched as a result of both a lack of awareness amongst health care professionals and a historic focus on optimising physical functioning within stroke rehabilitation [79, 80]. As has been highlighted within the existing literature, it is important to develop greater insight into illness perceptions' of stroke survivors in order to develop more appropriate services [70, 71].

Future research could be focused on targeting and possibly altering negative illness perceptions, which may be acting as obstacles to returning to employment after stroke, through the development of specific psychological interventions. As Emotional Representations were the most significant subcategories of the BIPQ in this study, further clarification of their functions may grant additional information on how to reduce a negative illness perception [70].

Through teaching and increased understanding of concerns and consequences, negative illness perceptions may be altered subsequently encouraging RTW after stroke. Lastly, it is frequently the case that individuals revaluate and reorder priorities relating to family and work after surviving a life-threatening stroke [72]. In line with their new hierarchy of priorities, such individuals, though physically capable, may opt to spend more time with their loved ones over employment. No research thus far has explored the decision-making process in relation to resuming employment and the potential role of illness perceptions within this area. Such future research may provide clarification on the other reasons why fully functional individuals chose not to return to employment post-stroke.

Strengths and Limitations

This study demonstrated several strengths. Firstly, there was a minimal lack of missing data and no loss to follow up owing to the cross-sectional design of this research. This research included nationwide charity organisations and thus included participants covering a wide geographical area. Finally, the questionnaire had a relatively short completion time as to minimise issues of fatigability which are often prevalent amongst this client population [73].

In terms of limitations, the cross-sectional and retrospective nature of this study does not enable causal inferences to be drawn. The static measurements of each of the variables does not enable a time series analysis. Further elaboration of the time factor, particularly with regards to work status, may have provided more insight into employment stability over time, including whether the individual could maintain their previous level of functioning [74]. It is also important to mention that in order to assess participants' work status, this study

used questions that were abstracted from the FSQ. In other words, this constitutes the modification or adaptation of an existing measure. In such circumstances, researchers suggest that caution should be taken and that there is a delicate balance between attempting to retain the strength of an existing measure, which has undergone extensive development and testing, and making modifications which may or may not work [75]. In this study, it was not possible for the researcher to conduct a full-scale psychometric assessment of the modified measure given the time and cost involved in this process however, they did attempt to ensure that only minor modifications were made to this measure.

This study did not elucidate on individual stroke survivors' rehabilitation journeys after hospitalisation. Therefore, it is difficult to discern the potential impact of additional resources and vocational training on participants RTW outcomes. Another issue pertains to the lack of information regarding nonresponders to the study. As a result, nonresponders could not be compared to those who did respond and thus the sample may not be fully representative of the number of people who were able or unable to RTW. Moreover, the study sample included individuals who were able to speak English, working before their stroke and were cognitively able post-injury, thus the outcomes may lack generalisability to the wider stroke populace, particularly those who are more cognitively impaired following stroke. Similarly, it is possible that the online dissemination of this research may have excluded a subset of stroke population who were physically or cognitively incapable of accessing the online questionnaire, or experiencing digital poverty to an extent that prevented them from having the digital equipment to do so. For future researchers, it may be imperative for them to ensure that these individuals are assisted by health care professionals in their participation and completion of study material. It is noted

that this sample contained a high prevalence of White middle-aged males which may not represent the typical stoke populace who tend to be older, female, and belonging to Black, Asian and other ethnic minorities [6]. It is worth mentioning that this study found that individuals did not demonstrate markedly strong illness identities. Younger stroke survivors are reported to be less likely to recognise and report stroke related symptoms [76]. Therefore, it is possible that the younger demographic observed within this study may have simply inadvertently underreported their symptoms and such weak perceptions of stroke symptoms would not be observed within an older sample of the stroke populace who have been shown to be far more likely to utilise prehospital systems for stroke-like symptoms [53]. Finally, this study reduced work status to an ordinal variable. Importantly, measuring return to work in this way does not reveal the stroke survivors' level of satisfaction within their post-stroke role [54]. It is possible that this omits important qualitative data that captures stroke survivors' RTW experiences more fully and better translates to real-world participation. It is also noteworthy that RTW is frequently defined within the stroke literature as the success or failure of an individual to return to employment. This type of language may be reductionist and emblematic of a capitalist agenda aimed to endlessly increase profits [42]. This may also wrongly assume that the responsibility for RTW begins and ends with the individual at the expense of other important societal factors such as employment opportunities and population density [42].

Implications for Practice

It is indicated that illness perceptions, as represented in the CSM, may be utilised to target intervention approaches in individuals after stroke. The

outcomes of this study imply that it is sensible for healthcare professionals within occupational health settings to pay more attention to illness perceptions. However, many healthcare professionals are oblivious to the importance of reflecting on illness representations with patients or the strategies patients embrace to manage their stroke [77]. Concurrently, anecdotal evidence suggests that many stroke survivors do not often communicate these issues spontaneously if they are not prompted to do so [77]. Yet, the discussion of illness perceptions with patients is often well-received and increases feelings of support [78]. Such conversations may enable the discovery of patients at risk of developing maladaptive illness representations and subsequently preventive steps could be implemented by occupational professionals for these workers who may be at greater risk of resigning from employment or failing to return altogether. This could include providing individuals with the ability to vent their emotions concerning their stroke and offering more positive views about their illness.

Current vocational rehabilitation strategies used in stroke care may be strengthened by the inclusion of the theory of illness perceptions. Similarly, applying illness perception measures (e.g., BIPQ) may be an economical alternative to offering a one-size fits all approach allowing healthcare professionals to target specific interventions to those stroke survivors who require most assistance.

Conclusion

Despite illness perceptions having been shown to influence outcomes, including RTW, in various disease states many health care professionals fail to prompt

conversations around this topic with stroke survivors. This may have important implications for a stroke survivors capacity to RTW, particularly in those harbouring a negative illness perception. The results from this study indicate that illness perceptions, as represented within the CSM, may be utilised to plan appropriate intervention approaches in survivors of stroke to aid their journey in RTW.

References

1. Franck, J. A. Rehabilitation of patients with a moderately to severely affected arm-hand in the sub-acute phase after stroke. *ProefschriftMaken Maastricht* 2020; **34:** 75-87.
2. Rothwell, P. M., Coull, A. J., Giles, M. F., Howard, S. C., Silver, L. E., Bull, L. M., ... & Anslow, P. Change in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire, UK from 1981 to 2004 (Oxford Vascular Study). *The Lancet* 2004; **363:** 1925-1933.
3. Virani, S. S., Alonso, A., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., … & American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2020 update: a report from the American Heart Association. *Circulation* 2020; **141:** e139-e596.
4. Feigin, V. L., Forouzanfar, M. H., Krishnamurthi, R., Mensah, G. A., Connor, M., Bennett, D. A., ... & Murray, C. Global and regional burden of stroke during 1990–2010: findings from the Global Burden of Disease Study 2010. *The Lancet* 2014; **383:** 245-255.
5. El-Saed, A., Kuller, L. H., Newman, A. B., Lopez, O., Costantino, J., McTigue, K., … & Kronmal, R. Geographic variations in stroke incidence and mortality among older populations in four US communities. *Stroke* 2006; **37:** 1975-1979.
6. Thornton, J. Stroke:“striking reductions” are seen in number of people with symptoms seeking help 2020..

7. Ekker, M. S., Boot, E. M., Singhal, A. B., Tan, K. S., Debette, S., Tuladhar, A. M., & de Leeuw, F. E. Epidemiology, aetiology, and management of ischaemic stroke in young adults. *The Lancet Neurology* 2018; **17:** 790-801.
8. Hackett, M. L., Glozier, N., Jan, S., & Lindley, R. Returning to paid employment after stroke: the Psychosocial Outcomes In StrokE (POISE) cohort study. *PloS One* 2012; **7:** e41795.
9. Patel, A., Berdunov, V., Quayyum, Z., King, D., Knapp, M., & Wittenberg, R. Estimated societal costs of stroke in the UK based on a discrete event simulation. *Age and Ageing* 2020; **49:** 270-276.
10. Saka, Ö., McGuire, A., & Wolfe, C. Cost of stroke in the United Kingdom. *Age and Ageing* 2009; **38:** 27-32.
11. Arwert, H. J., Schults, M., Meesters, J. J. L., Wolterbeek, R., Boiten, J., & Vliet Vlieland, T. Return to work 2–5 years after stroke: a cross sectional study in a hospital-based population. *Journal of Occupational Rehabilitation* 2017; **27:** 239-246.
12. Culler, K. H., Wang, Y. C., Byers, K., & Trierweiler, R. Barriers and facilitators of return to work for individuals with strokes: perspectives of the stroke survivor, vocational specialist, and employer. *Topics in Stroke Rehabilitation* 2011; **18:** 325-340.
13. Westerlind, E., Persson, H. C., & Sunnerhagen, K. S. Return to work after a stroke in working age persons; a six-year follow up. *PloS One* 2017; **12:** e0169759.

14. Werner, C., & Engelhard, K. Pathophysiology of traumatic brain injury. *BJA: British Journal of Anaesthesia* 2007; **99:** 4-9.
15. Leidner, R. Work identity without steady work: Lessons from stage actors. In *Research in the Sociology of Work* 2016; **29:** 3-35.
16. Brown, J., Gilmour, W. H., & Macdonald, E. B. Ill health retirement in Scottish teachers: process, outcomes and re-employment. *International Archives of Occupational and Environmental Health* 2006; **79:** 433-440.
17. van der Kemp, J., Kruithof, W. J., Nijboer, T. C., van Bennekom, C. A., van Heugten, C., & Visser-Meily, J. M. Return to work after mild-to-moderate stroke: work satisfaction and predictive factors. *Neuropsychological Rehabilitation* 2019; **29:** 638-653.
18. Vestling, M., Tufvesson, B., & Iwarsson, S. Indicators for return to work after stroke and the importance of work for subjective well-being and life satisfaction. *Journal of Rehabilitation Medicine* 2003; **35:** 127-131.
19. Gilworth, G., Phil, M., Cert, A. D., Sansam, K. A. J., & Kent, R. M. Personal experiences of returning to work following stroke: an exploratory study. *Work* 2009; **34:** 95-103.
20. Hillman, A., & Chapparo, C. J. The role of work in the lives of retired men following stroke. *Work* 2002; **19:** 303-313.
21. Valderas, J. M., Starfield, B., Sibbald, B., Salisbury, C., & Roland, M. Defining comorbidity: implications for understanding health and health services. *The Annals of Family Medicine* 2009; **7:** 357-363.

22. Ekici, A., Ekici, M., Kurtipek, E., Keles, H., Kara, T., Tunckol, M., & Kocyigit, P. Association of asthma-related symptoms with snoring and apnea and effect on health-related quality of life. *Chest* 2005; **128:** 3358-3363.
23. Nordin, K., Påhlman, L., Larsson, K., Sundberg-Hjelm, M., & Lööf, L. Health-related quality of life and psychological distress in a population-based sample of Swedish patients with inflammatory bowel disease. *Scandinavian Journal of Gastroenterology* 2002; **37:** 450-457.
24. Holtslag, H. R., Post, M. W., Lindeman, E., & Van der Werken, C. Long-term functional health status of severely injured patients. *Injury* 2007; **38:** 280-289.
25. Tessier, A., Finch, L., Daskalopoulou, S. S., & Mayo, N. E. Validation of the Charlson Comorbidity Index for predicting functional outcome of stroke. *Archives of Physical Medicine and Rehabilitation* 2008; **89:** 1276-1283.
26. Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of Chronic Diseases* 1987; **40:** 373-383.
27. Goldstein, L. B., Samsa, G. P., Matchar, D. B., & Horner, R. D. Charlson Index comorbidity adjustment for ischemic stroke outcome studies. *Stroke* 2004; **35:** 1941-1945.
28. Glader, E. L., Jonsson, B., Norrving, B., & Eriksson, M. Socioeconomic factors' effect on return to work after first stroke. *Acta Neurologica Scandinavica* 2017; **135:** 608-613.

29. Black-Schaffer, R. M., & Osberg, J. S. Return to work after stroke: development of a predictive model. *Archives of Physical Medicine and Rehabilitation* 1990; **71:** 285-290.
30. Howard, D., Patterson, K., Franklin, S., Orchard-Lisle, V., & Morton, J. The facilitation of picture naming in aphasia. *Cognitive Neuropsychology* 1985; **2:** 49-80.
31. Wozniak, M. A., Kittner, S. J., Price, T. R., Hebel, J. R., Sloan, M. A., & Gardner, J. F. Stroke location is not associated with return to work after first ischemic stroke. *Stroke* 1999; **30:** 2568-2573.
32. Gabriele, W., & Renate, S. Work loss following stroke. *Disability and Rehabilitation* 2009; **31:** 1487-1493.
33. McLean, R. Incidence of complications in stroke patients in an acute rehabilitation unit in Singapore. *Cerebrovascular Diseases* 2007; **24:** 129.
34. Trygged, S., Ahacic, K., & Kåreholt, I. Income and education as predictors of return to working life among younger stroke patients. *BMC Public Health* 2011; **11:** 1-9.
35. Saeki, S., & Hachisuka, K. The association between stroke location and return to work after first stroke. *Journal of Stroke and Cerebrovascular Diseases* 2004;**13:** 160-163.
36. Saeki, S., Ogata, H., Okubo, T., Takahashi, K., & Hoshuyama, T. Factors influencing return to work after stroke in Japan. *Stroke* 1993; **24:** 1182-1185.
37. Glozier, N., Hackett, M. L., Parag, V., & Anderson, C. S. The influence of psychiatric morbidity on return to paid work after stroke in younger adults: the

Auckland Regional Community Stroke (ARCOS) Study, 2002 to 2003. *Stroke* 2008; **39:** 1526-1532.

38. Tanaka, H., Toyonaga, T., & Hashimoto, H. Functional and occupational characteristics associated with very early return to work after stroke in Japan. *Archives of Physical Medicine and Rehabilitation* 2011; **92:** 743-748.
39. Hsieh, C. L., & Lee, M. H. Factors influencing vocational outcomes following stroke in Taiwan: a medical centre-based study. *Scandinavian Journal of Rehabilitation Medicine* 1997; **29:** 113-120.
40. Saeki, S. Disability management after stroke: its medical aspects for workplace accommodation. *Disability and Rehabilitation* 2000; **22:** 578-582.
41. Jang, Y., Bergman, E., Schonfeld, L., & Molinari, V. The mediating role of health perceptions in the relation between physical and mental health: a study of older residents in assisted living facilities. *Journal of Aging and Health* 2007; **19:** 439-452.
42. Pinquart, M. Correlates of subjective health in older adults: a meta-analysis. *Psychology and Aging* 2001; **16:** 414.
43. Evangelista, L. S., Kagawa-Singer, M., & Dracup, K. Gender differences in health perceptions and meaning in persons living with heart failure. *Heart & Lung* 2001; **30:** 167-176.
44. Bergman, S., Jacobsson, L. T., Herrström, P., & Petersson, I. F. Health status as measured by SF-36 reflects changes and predicts outcome in chronic musculoskeletal pain: a 3-year follow up study in the general population. *Pain* 2004; **108:** 115-123.

45. Gerber, Y., Benyamini, Y., Goldbourt, U., Drory, Y., & Israel Study Group on First Acute Myocardial Infarction. Prognostic importance and long-term determinants of self-rated health after initial acute myocardial infarction. *Medical Care* 2009; **52**: 342-349.
46. Kalaydjian, A., & Merikangas, K. Physical and mental comorbidity of headache in a nationally representative sample of US adults. *Psychosomatic Medicine* 2008; **70:** 773.
47. Rozencwaig, R., van Noort, A., Moskal, M. J., Smith, K. L., Sidles, J. A., & Matsen 3rd, F. A. The correlation of comorbidity with function of the shoulder and health status of patients who have glenohumeral degenerative joint disease. *The Journal of Bone and Joint Surgery. American Volume* 1998; **80:** 1146-1153.
48. Reiso, H., Nygård, J. F., Jørgensen, G. S., Holanger, R., Soldal, D., & Bruusgaard, D. Back to work: predictors of return to work among patients with back disorders certified as sick: a two-year follow-up study. *Spine* 2003; **28:** 1468-1473.
49. Van Der Giezen, A. M., Bouter, L. M., & Nijhuis, F. J. Prediction of return-to-work of low back pain patients sicklisted for 3–4 months. *Pain* 2000; **87:** 285-294.
50. Post, M., Krol, B., & Groothoff, J. W. Self-rated health as a predictor of return to work among employees on long-term sickness absence. *Disability and Rehabilitation* 2006; **28:** 289-297.
51. Leventhal, H., Nerenz, D. R., & Steele, D. J. Illness representations and coping with health threats. In *Handbook of Psychology and Health* 1984; **5:** 219-252.

52. Miglioretti, M., Mazzini, L., Oggioni, G. D., Testa, L., & Monaco, F. Illness perceptions, mood and health-related quality of life in patients with amyotrophic lateral sclerosis. *Journal of Psychosomatic Research* 2008; **65:** 603-609.
53. Gelaw, A. Y., Janakiraman, B., Gebremeskel, B. F., & Ravichandran, H. Effectiveness of Home-based rehabilitation in improving physical function of persons with Stroke and other physical disability: A systematic review of randomized controlled trials. *Journal of Stroke and Cerebrovascular Diseases* 2020; **29:** 104-800.
54. Hartke, R. J., Trierweiler, R., & Bode, R. Critical factors related to return to work after stroke: a qualitative study. *Topics in Stroke Rehabilitation* 2011; **18:** 341-351.
55. Groeneveld, I. F., Van der Pas, S. L., Meesters, J. J. L., Schuurman, J. M., van Meijeren-Pont, W., Jagersma, E., ... & SCORE-Study Group. Illness perceptions of stroke survivors: Predictors and changes over time–A 1 year follow-up study. *Journal of Psychosomatic Research* 2019; **116:** 54-61.
56. Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. The brief illness perception questionnaire. *Journal of Psychosomatic Research* 2006; **60:** 631-637.
57. Moss-Morris, R., Weinman, J., Petrie, K., Horne, R., Cameron, L., & Buick, D. The revised illness perception questionnaire (IPQ-R). *Psychology and Health* 2002; **17:** 1-16.
58. Ghali, W. A., Hall, R. E., Rosen, A. K., Ash, A. S., & Moskowitz, M. A. Searching for an improved clinical comorbidity index for use with ICD-9-CM administrative data. *Journal of Clinical Epidemiology* 1996; **49:** 273-278.

59. D'Hoore, W., Bouckaert, A., & Tilquin, C. Practical considerations on the use of the Charlson comorbidity index with administrative data bases. *Journal of Clinical Epidemiology* 1996; **49:** 1429-1433.
60. Newschaffer, C. J., Bush, T. L., & Penberthy, L. T. Comorbidity measurement in elderly female breast cancer patients with administrative and medical records data. *Journal of Clinical Epidemiology* 1997; **50:** 725-733.
61. Katz, J. N., Chang, L. C., Sangha, O., Fossel, A. H., & Bates, D. W. Can comorbidity be measured by questionnaire rather than medical record review?. *Medical Care* 1996; **12:** 73-84.
62. Jette, A. M., Davies, A. R., Cleary, P. D., Calkins, D. R., Rubenstein, L. V., Fink, A., ... & Delbanco, T. L. The Functional Status Questionnaire: reliability and validity when used in primary care. *Journal of General Internal Medicine* 1986; **1:** 143-149.
63. MacKinnon, D. P., & Luecken, L. J. How and for whom? Mediation and moderation in health psychology. *Health Psychology* 2008; **27:** 99.
64. Hayes, A. F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford publications 2022.
65. Alaszewski, A., Alaszewski, H., Potter, J., & Penhale, B. Working after a stroke: survivors' experiences and perceptions of barriers to and facilitators of the return to paid employment. *Disability and Rehabilitation* 2007; **29:** 1858-1869.
66. Cohen, I., Huang, Y., Chen, J., Benesty, J., Benesty, J., Chen, J., ... & Cohen, I. Pearson correlation coefficient. *Noise Reduction in Speech Processing* 2009; **1**: 4.

67. Koletsi, D., & Pandis, N. Ordinal logistic regression. *American Journal of Orthodontics and Dentofacial Orthopedics* 2018; **153:** 157-158.
68. Leventhal, H., Phillips, L. A., & Burns, E. The Common-Sense Model of Self-Regulation (CSM): a dynamic framework for understanding illness self-management. *Journal of Behavioral Medicine* 2016; **39:** 935-946.
69. French, D. P., Cooper, A., & Weinman, J. Illness perceptions predict attendance at cardiac rehabilitation following acute myocardial infarction: a systematic review with meta-analysis. *Journal of Psychosomatic Research* 2006; **61:** 757-767.
70. Hagger, M. S., & Orbell, S. A meta-analytic review of the common-sense model of illness representations. *Psychology and Health* 2003; **18:** 141-184.
71. Della Vecchia, C., Préau, M., Carpentier, C., Viprey, M., Haesebaert, J., Termoz, A., … & Schott, A. M. Illness beliefs and emotional responses in mildly disabled stroke survivors: A qualitative study. *PloS One* 2019; **14:** e0223681.
72. Western, H. Altered living: coping, hope and quality of life after stroke. *British Journal of Nursing* 2007; **16:** 1266-1270.
73. Acciarresi, M., Bogousslavsky, J., & Paciaroni, M. Post-stroke fatigue: epidemiology, clinical characteristics and treatment. *European Neurology* 2014; **6:** 255-261.
74. Treger, I., Shames, J., Giaquinto, S., & Ring, H. Return to work in stroke patients. *Disability and Rehabilitation* 2007; **29:** 1397-1403.
75. Coons SJ, Gwaltney CJ, Hays RD, Lundy JJ, Sloan JA, Revicki DA, Lenderking WR, Cella D, Basch E. Recommendations on evidence needed to support

measurement equivalence between electronic and paper-based patient-reported outcome (PRO) measures: ISPOR ePRO Good Research Practices Task Force report. *Value in Health* 2009; **4:** 419-29.

76. Singhal AB, Biller J, Elkind MS, Fullerton HJ, Jauch EC, Kittner SJ, Levine DA, Levine SR. Recognition and management of stroke in young adults and adolescents. *Neurology* 2013; **12:** 1089-97.
77. Hoving, J. L., Van der Meer, M., Volkova, A. Y., & Frings-Dresen, M. H. W. Illness perceptions and work participation: a systematic review. *International Archives of Occupational and Environmental Health* 2010; **83:** 595-605.
78. Theunissen, N. C., de Ridder, D. T., Bensing, J. M., & Rutten, G. E. Manipulation of patient–provider interaction: discussing illness representations or action plans concerning adherence. *Patient Education and Counseling* 2003; **51:** 247-258.

Part Three: Appendices

Appendix A: Epistemological Statement

The following statement aims to consider and make explicit the epistemological and ontological stance underlying the chosen methodology in this research thesis.

Epistemological assumptions concern the creation, acquisition, and communication of the social world whereas ontological assumptions refer to what there is to understand about the world and what represents reality (Scotland, 2012; Al-Saadi, 2014).

A positivist epistemology and ontological stance of realism is most likely to be linked with the utilisation of quantitative research methodology. Positivists perceive the world as external and objective emphasising the independency of the observer (Snape & Spencer, 2003).

On the other hand, the ontological stance of relativism and interpretive epistemology is most likely to be associated with qualitative research methodology. This stance encompasses the notion that reality is subjective, involving as many realities as there are individuals, and that the researcher and social world will inevitably influence each other. Thus, interpretivists argue that objective 'value-free' research is not feasible (Snape & Spencer, 2003; Al-Saadi, 2014).

Purists argue that quantitative and qualitative methodologies should not be combined due to the quantitative-qualitative paradigmatic distinctions (Al-Saadi, 2014). On the other hand, pragmatists assure that both methods can be combined to aid the course of social inquiry more effectively by utilising strengths from both

methodologies, and that the claim by purists that there is a dichotomy between the two is false (Onwuegbuzi & Leech, 2005).

I, myself, believe that I am a purist, ascribing to a positivist epistemological stance and viewpoint within this thesis. Adopting a quantitative deductive approach in testing theory around illness perceptions, the main objective of my empirical research was to explore whether illness perceptions mediate the relationship between degree of comorbidities and post-stroke work status.

I favour quantitative methodologies as a researcher and adopt the positivist practice of aspiring to understand large quantities of individuals (Al-Saadi, 2014). However, being fully affiliated with the positivist stance did present a few drawbacks in my research. For instance, theory and hypotheses testing in quantitative research may neglect some key variables and may not reflect the local social understanding (Al-Saadi, 2014). Although I believe quantitative questionnaires can be objectively interpreted, it is likely that participants interpreted questions and concepts being measured in their own subjective and idiosyncratic way.

Still, reflecting on time constraints for this research, a quantitative approach enabled me to collect large quantities of data relatively quickly. Obtained results were precise and thus data analysis was fairly straightforward. The knowledge produced from this research may also be generalised to other contexts. Thus, for these reasons I choose to adopt quantitative methods.

In summary, whilst a pragmatic perspective may offer the opportunity to examine a limited number of cases in depth, I believe that the positivist epistemological position and associated quantitative measures I adopted in this

thesis enabled me to obtain precise and generalisable findings within a time constrained period.

References

Al-Saadi, H. (2014). Demystifying Ontology and Epistemology in research methods. *Research Gate*, *1*(1), 1-10.

Onwuegbuzie, A.J. & Leech, N.L. (2005) On becoming a pragmatic researcher: The importance of combining quantitative and qualitative research methodologies. International Journal of Social Research Methodology, 8 (5), 375-387.

Snape, D. & Spencer, L. (2003) The Foundations of Qualitative Research. In J. Ritchie & J. Lewis (Eds.), Qualitative Research Practice: A guide for social science students and researchers (pp. 1-23). London: Sage Publications Ltd.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. English Language Teaching, 5(9), p9.

Appendix B: Submission Guidelines for the *International Journal of Clinical Practice*

CONTENTS

Pre-submission guide

Want an informal opinion before you submit? For informal and rapid pre-submission guidance, send your abstract and brief letter explaining why your manuscript is suitable by email to the IJCP Editorial Office and we'll be in touch.

GUIDELINES AND CHECKLIST

Read IJCP Editorial Policy for manuscript types considered and IJCP peer review process.

Checklist. Use our submission checklist to help prepare your submission.

Note to NIH grantees. Pursuant to NIH mandate, Wiley-Blackwell will post the accepted version of contributions authored by NIH grant-holders to PubMed Central upon acceptance. This accepted version will be made publicly available 12 months after publication. For further information, see www.wiley.com/go/nihmandate.

Note on the PEER Project. This journal is participating in the PEER Project, an EU-funded initiative to examine the impact on scholarly journals of depositing accepted manuscripts in web-based repositories. If the corresponding author is

based in an EU country, we will deposit the accepted manuscript into the central project repository (DRIVER). The article's availability will be subject to a post-publication embargo. This project has no effect on your rights or obligations under the terms of the copyright agreement pertaining to this journal.

Standards. Materials should comply with the ICMJE Uniform Requirements. EQUATOR reporting guidelines and checklists (e.g. CONSORT, STROBE, STARD, QUOROM, MOOSE) should be used when appropriate.

Suitability. Your cover letter should explain why your manuscript is suitable for publication in IJCP.

Title. Concise and informative title (read Optimizing for Search Engines).

Authors. Names department(s) and institution(s) of all authors. (In online submission system, confirm that all listed authors meet ICMJE authorship criteria and that nobody who qualifies for authorship has been excluded. Credit for authorship should be based on: [1] substantial contributions to research design, or the acquisition, analysis or interpretation of data; [2] drafting the paper or revising it critically; [3] approval of the submitted and final versions. Authors should meet all three criteria.) Corresponding author. Name, address, email address, telephone and fax numbers. (*Corresponding author should take responsibility for communicating with all other authors and getting their approval for the final version to be published. During online submission corresponding authors can nominate an individual, who may or may not be an author, to assist them with administration of*

the publication process.)

Author contributions. Recommendation: Include a short description of each authors' contribution immediately before your references. (*Examples of categories for authors' contributions: Concept/design, Data analysis/interpretation, Drafting article, Critical revision of article, Approval of article, Statistics, Funding secured by, Data collection, Other*.)

Access to data. You will be asked during online submission to confirm that authors had access to the study data that support the publication.

Research papers: 'What's known?' and 'What's new?'. After your abstract please answer these questions: 'What is already known about this topic?' (2 or 3 short sentences; 70 words) and 'What does this article add?' (2 or 3 short sentences; 70 words).

Review papers: 'Review Criteria' and 'Message for the clinic'. After your abstract please answer these questions: 'How did you gather, select and analyze the info you considered in your review?' (2 or 3 short sentences; 70 words) and 'What is the take-home message for the clinician?' (2 or 3 short sentences; 70 words).

Review papers: Non-systematic/narrative reviews. Reviews that are not systematic will be considered only if they include a discrete Methods section that

must explicitly describe the authors' approach. Special priority will be given to systematic reviews.

Disclosures (title page under heading 'Disclosures'). For each author, disclose potential conflicts of interest, including all relevant financial interests (e.g. employment, significant share ownership, patent rights, consultancy, research funding) in any company or institution that might benefit from the publication (or state 'none'). Authors might consider, as a guide for financial disclosures, reporting interests where the sums concerned are above USD10,000 or the equivalent of >5% of an author's gross income. Authors do not need to report the sums concerned.

Funding and Acknowledgements (under heading 'Acknowledgements' before references). State sources of funding for the research and its publication, or for the publication (or state 'none'), including a short description of involvement of the funder in study design, data collection, data analysis, manuscript preparation and/or publication decisions. Acknowledge individuals who do not qualify as authors but who contributed to the study or manuscript (or state 'none'). Contributions that should be acknowledged include administrative, technical, or material forms of support like writing assistance, literature searching, data analysis, administrative support, supply of materials. (*Authors should secure approval from anyone listed in acknowledgements*.)

Research ethics. You will be asked during online submission to confirm that your

study has been approved by relevant bodies (e.g. institutional review boards, research ethics committees) and that appropriate consent was obtained for studies involving human participants.

Publication ethics. IJCP's author guidelines were prepared with reference to Best Practice Guidelines on Publication Ethics: a Publisher's Perspective (Graf C, Wager, E, Bowman A et al. Int J Clin Pract 2007;61[s152]:1-26). IJCP is a member of the Committee on Publication Ethics.

Clinical trials - registration. Recommendation: Provide clinical trial registration number and registry name at the end of your abstract.

Clinical trials - data posting. Recommendation: If trial data are posted online before submission and peer reviewed publication, provide clinical trial results database number and database name at the end of your abstract.

Prior Publication. You will be asked during online submission to confirm that the submitted work is not published, in press or currently being considered for publication elsewhere. (*Abstracts, presentations at scientific meetings and clinical trial data posting should be indicated in your cover letter. Publication of abstracts, presentations at scientific meetings and subsequent press coverage will not jeopardise full publication in IJCP. Posting of clinical trials results in databases [data without interpretation, discussion, context or full conclusions in the form of tables and text to describe data/information where this is not easily presented in*

tabular form] prior to submission to IJCP will not jeopardize full peer reviewed publication in IJCP.)

Appendix (e.g. list of participating physicians). Optional. Will appear in print and online. Use an appendix immediately following references to list further details related to clinical studies like participating physicians, clinical and coordinating centers (which should be presented in the most concise form possible, i.e. not tabulated).

Supplementary material (e.g. OnlineExtra slideshows). Optional. Will only appear online. Should be submitted online during manuscript submission as 'Supplementary Files'. Supplementary material is additional material to accompany your printed article online. Supplementary material, slideshows or supporting data, should draw exclusively from or support material presented in your manuscript.

Tables. All tables should be mentioned in the text and individually numbered. Tables should be presented together and separated from the main text. They should be numbered in the order in which they are mentioned in the text, and each should have a short explanatory caption. Each table column should have a short heading. Any tables previously published should be submitted with the written consent of the copyright holder, an acknowledgement should be included in the caption, and the full reference included in the reference list.

Illustrations. For detailed information about preparing and submitting digital images, please register at the Wiley-Blackwell Author Services website and refer to the 'Author Resources' pages.

Illustrations will only be accepted if provided electronically (TIFF preferred; JPEG, GIF, EPS, PNG Microsoft PowerPoint, Microsoft Excel also acceptable); they should be professionally drawn, labelled and photographed; freehand lettering is not acceptable. Staining techniques and the magnification of micrographs should be stated, and arrows/abbreviations explained in the captions. If the subjects of photographs are identifiable, either their eyes should be masked or their written permission to use the photograph be submitted with the manuscript. Any information (including personal data) that could enable a patient to be identified should be removed.

All illustrations and figures should be mentioned in the text and individually numbered. Only those essential to the paper should be included. Illustrations and figures should be presented together and separated from the main text. They should be numbered in the order in which they are mentioned in the text, and each should have a short explanatory caption. Any illustrations and figures previously published should be submitted with the written consent of the copyright holder, an acknowledgement should be included in the caption, and the full reference included in the list.

Illustrations may be reproduced in colour if essential to the article. A charge will be made for colour reproduction (see below). If colour is required, a Colourwork Agreement Form must be completed and returned to the Editorial Office. Any article received with colour work will not be published until this form has been returned.

Measurements, abbreviations, drug names. Measurements should be given in the units in which they were made, but non-metric units must be accompanied by metric (SI) equivalents (exceptions: blood pressure in mmHg; haemoglobin in g/dl). Generic drug names should be used (drug brand names must not be used). If an acronym is used, the term for which it stands should be given in full at its first mention in the text, for example, anti-diuretic hormone (ADH).

References. Original textual matter quoted from other authors must have formal citation and be appropriately attributed and referenced. Authors should verify references against the original documents. References should be identified in the text using square brackets, and numbered and listed consecutively at the end of the paper in the order in which they are first cited in the text. The Vancouver style is used.

We recommend the use of a tool such as EndNote for reference management and formatting. Click here to download the most up to date EndNote reference style for *International Journal of Clinical Practice*.

For more guidance about how to reference and cite, please refer to the Uniform

Requirements for Manuscripts Submitted to Biomedical Journals, prepared by the International Committee of Medical Journal Editors.

Copyright. Authors are required to license copyright in their paper to Wiley-Wiley-Blackwell. Copyright licensing is a condition of publication. On acceptance, you must submit a completed Copyright Transfer Agreement. If you require OnlineOpen publication, you must also complete an OnlineOpen Form.

Proofs. Proofs will be sent to the designated corresponding author. (During online submission corresponding authors can nominate an individual, who may or may not be an author, to assist them with administration of the publication process.)

Appendix C: Data Extraction Form for Systematic Literature Review

Data Extraction Form

Author

Year

Journal

Country

Sample

N

Stroke type

Psychosocial variable(s) measured

Setting

Method

Results

Rates of RTW

Appendix D: Quality Checklist for Systematic Literature Review

Quality Assessment Checklist (STROBE; Von Elm, Altman, Egger, Pocock, Gøtzsche, Vandenbroucke, & Strobe Initiative, 2014):

Article Section	Item No	Criteria	Score: Yes 2	Partly 1	No 0
Title and abstract					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found			
Introduction					
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported			
Objectives	3	State specific objectives, including any prespecified hypotheses			
Methods					
Study design	4	Present key elements of study design early in the paper			

Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection			
Participants	6	(a) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants (b) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed			
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable			
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group			

Bias	9	Describe any efforts to address potential sources of bias			
Study size	10	Explain how the study size was arrived at			
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why			
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses			
Results					

Participants	13*	a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed b) Give reasons for non-participation at each stage c) Consider use of a flow diagram			
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) *Cohort study*—Summarise follow-up time (eg, average and total amount)			
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time *Cross-sectional study*—Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95%			

		confidence interval). Make clear which confounders were adjusted for and why they were include (b) Report category boundaries when continuous variables were categorize (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period			
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses			
Discussion					
Key results	18	Summarise key results with reference to study objectives			
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results			
Other information					

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based			
Totals					

Other Notes:

$$Percent\ STROBE\ adherence = \frac{\text{Total STROBE adherence score}}{\text{Applicable maximum possible STROBE score}}\ x\ 100$$

Publication quality grades.

STROBE Quality grade for adherence score (%)

≥ 85 (Excellent)

70 to < 85 (Good)

50 to < 70 (Fair)

< 50 (Poor)

Appendix E: Ethical approval

UNIVERSITY OF HULL

University of Hull
Hull, HU6 7RX
United Kingdom
T: +44 (0)1482 463336 | **E:** e.walker@hull.ac.uk
w: www.hull.ac.uk

PRIVATE AND CONFIDENTIAL
Kieran McCaffer
Faculty of Health Sciences
University of Hull
Via email

6th June 2022

Dear Kieran

REF FHS422 - Return to Work after Cerebrovascular Accident: A Mediation Study of Illness Perception

Thank you for your responses to the points raised by the Faculty of Health Sciences Research Ethics Committee.

Given the information you have provided I confirm approval by Chair's action.

Please refer to the Research Ethics Committee web page for reporting requirements in the event of any amendments to your study.

Should an Adverse Event need to be reported, please complete the Adverse Event Form and send it to the Research Ethics Committee FHS-ethicssubmissions@hull.ac.uk within 15 days of the Chief Investigator becoming aware of the event.

I wish you every success with your study.

Yours sincerely

Professor Liz Walker
Chair, FHS Research Ethics Committee

UNIVERSITY OF HULL

Liz Walker | Professor of Health and Social Work Research | Faculty of Health Sciences
University of Hull
Hull, HU6 7RX, UK
www.hull.ac.uk
e.walker@hull.ac.uk | 01482 463336
@UniOfHull /UniversityOfHull universityofhull

Appendix F: Information sheet, Consent Form, and Empirical Questionnaire

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

0% complete

Information Sheet

We would like to invite you to take part in a research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. Please read the information below. If you have any questions please ring the number at the end of this form.

Background

Stroke is a medical condition in which poor blood flow to the brain causes cells to die. Despite improvements in stroke care, people report a wide variety of emotional problems after stroke, coupled with a reduced quality of life. This can have a huge impact on a person's ability to return to work after stroke. There are huge differences in the rates of people returning to work after stroke and no one factor or combination of factors has been able to explain these differences so far.

What is the purpose of the study?

This research is looking at illness perceptions. These are a set of beliefs that people develop to make sense of their symptoms and condition. Research has suggested that people's perceptions of their illness vary, even between those with similar illnesses. Numerous previous studies have shown a link between people's illness perceptions and their ability to return to work after illness.

This research is interested in whether people's illness perceptions will impact their ability to return to work after stroke. This research may help to remove barriers to returning to work after stroke by looking at one of those potential barriers, illness perception. The findings may also help to improve stroke recovery and interventions.

Why have I been invited?

You have been invited to take part because the details of this research have been sent to stroke support charities across the UK. The study is open to anyone who was employed at the time of having their stroke, are at least 18 years old, and can read English.

Do I have to take part?

No, participation is completely voluntary. If you decide to take part, you will be asked to give your consent by ticking a few boxes on the online survey tool or paper questionnaire to indicate that you agree to take part. You are free to withdraw from the study at any point while completing the questionnaire, your answers will not be saved, and you do not have to give a reason for this. However, if you just click off the survey window your answers will not be saved. If you are completing the paper version of the questionnaire and no longer wish to take part in the study, simply do not return the study pack. Once you have completed the survey or returned the paper version via the freepost envelope, you will not be able to withdraw your data, as this is all anonymous so your answers cannot be identified. Participation will not affect your medical care or your legal rights.

What will happen if I decide to take part?

If you wish to take part, this will involve completing an online questionnaire or paper questionnaire, depending on your preference. You will also be asked to provide some basic information about yourself, such as age and gender etc. As this will all be done online or by free post return envelope, you can complete this wherever, and whenever convenient to you. The whole process should take between 20-30 minutes to complete.

What are the possible disadvantages and risks of taking part?

Participating in the study will require up to thirty minutes of your time; this may be inconvenient for you. The questions require you think about getting your diagnosis and also about your current feelings towards your stroke, and your life in general since your diagnosis. It is possible that this may cause you some emotional distress. The names and contact details of helpful support organisations will be provided to all participants at the end of the study. This information will be given at the end of the questionnaire, or if you decide to finish sooner.

What Are The Possible Benefits Of Taking Part?

We cannot promise that you will have any direct benefits from participating in this research. We hoped that this research will help us understand more about living with a stroke, and whether the way people view their illness can have an impact on their ability to return to work.

What Are The Possible Benefits Of Taking Part?

We cannot promise that you will have any direct benefits from participating in this research. We hoped that this research will help us understand more about living with a stroke, and whether the way people view their illness can have an impact on their ability to return to work.

What if There Is A Problem?

If you have any concerns about any part of this study, you can contact the researcher or their research supervisors, who will do their best to answer your questions. Contact information is at the end of this information sheet

How will we use information about you?

We will need to use information from you for this research project.

This information will include your initials, name, and contact details. People will use this information to do the research or to check your records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.
We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

Where can you find out more about how your information is used?

You can find out more about how we use your information

at www.hra.nhs.uk/information-about-patients/
by asking one of the research team
by sending an email to dataprotection@hull.ac.uk

What Will Happen To The Results Of The Study?

After the study is completed the results from all participants will be analysed and presented in a report written for a scientific journal and as part of a thesis project. Results will also be presented at conferences and professional development events. A summary of the findings will be given to the organisations which have helped recruit for this study.

Who is Organising And Funding The Research?

This research is being undertaken as part of a Doctoral thesis in Clinical Psychology. The research is funded and regulated through the University of Hull, UK. Some sections of data collected during the study that are relevant to participation may be assessed by responsible individuals from the University of Hull or from regulatory authorities to ensure that appropriate guidance was followed by the researcher

Who Has Reviewed the Research?

This research has been reviewed by the University of Hull Research Ethics Committee and received a favourable review. This protects the interests of research participants.

Who will sponsor this research?

This research will be sponsored by the University of Hull.

Next >

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

16% complete

Consent form

I confirm that I have read the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. By answering yes to this question, it will be assumed that I have mental capacity. * *Required*

- ○ Yes
- ○ No

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. I understand that once I have returned my questionnaires I cannot withdraw my anonymised data. I understand that the data I have provided up to the point of withdrawal will be retained. * *Required*

- ○ Yes
- ○ No

‹ Previous Next ›

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

33% complete

Demographics

What is your gender?

- ○ Male
- ○ Female
- ○ Non-Binary

What is your age?

How would you describe your ethnic group?

- ○ White
- ○ Asian/Pacific Islander
- ○ Black/African/Caribbean
- ○ Hispanic/Latino
- ○ Mixed/Multiple ethnic groups
- ○ Other

How many years have you spent in education?

Type of stroke?

‹ Previous Next ›

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

50% complete

For the following questions, please indicate the number which best corresponds to your views in relation to your stroke:

This part of the survey uses a table of questions, view as separate questions instead?

How much does your illness affect your life? * Required

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- no affect at all	2	3	4	5- somewhat affects my life	6	7	8	9	10- severley affects my life
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This part of the survey uses a table of questions, view as separate questions instead?

How long do you think your illness will continue? * Required

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- a very short time	2	3	4	5- moderate amount of time	6	7	8	9	10- forever
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This part of the survey uses a table of questions, view as separate questions instead?

How much control do you feel you have over your illness? *
Required

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- absolutely no control	2	3	4	5- somewhat in control	6	7	8	9	10- extreme amount of control
Please selelct one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

How much do you think your treatment can help your illness?

* *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- not at all	2	3	4	5- somewhat helpful	6	7	8	9	10- extremely helpful
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This part of the survey uses a table of questions. view as separate questions instead?

How much do you experience symptoms from your illness? *

Required

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- no symptoms at all	2	3	4	5- some symptoms	6	7	8	9	10- many severe symptoms
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This part of the survey uses a table of questions. view as separate questions instead?

How concerned are you about your illness? * *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- not at all concerned	2	3	4	5- somewhat concerned	6	7	8	9	10- extremely concerned
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This part of the survey uses a table of questions. view as separate questions instead?

How well do you feel you understand your illness? * *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- don't understand at all	2	3	4	5- somewhat understand	6	7	8	9	10- understand very clearly
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This part of the survey uses a table of questions. view as separate questions instead?

How much does your illness affect you emotionally (e.g. does it make you feel angry, scared, upset or depressed? * *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	1- not at all affected emotionally	2	3	4	5- somewhat affected emotionally	6	7	8	9	10- extremely affected emotionally
Please select one of the following:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

< Previous Next >

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

66% complete

For the following questions, please select the statement that best matches to your current work situation:

Which of the following statements best describes your work situation now? * Required

- ○ Full time
- ○ Part time
- ○ Unemployed or early retirement

Are you working in the same or different job from before your stroke? * Required

- ○ Same
- ○ Different

Are you working more hours, less hours, or the same number of hours from before your stroke? * Required

- ○ More
- ○ Less
- ○ Same

Current number of hours working per week?

< Previous Next >

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

83% complete

For the following questions, please answer either yes or no:

Have you ever had a heart attack? * Required

- Yes
- No

Have you been hospitalised or treated for heart failure? * Required

- Yes
- No

Do you have a blood circulation disorder (affecting either the heart, arteries, veins or vessels)? * Required

- Yes
- No

Do you have asthma, chronic lung disease, chronic bronchitis, or emphysema? * Required

- Yes
- No

Do you have diabetes that requires treatment? * Required

- Yes
- No

Do you have chronic kidney disease? * Required

- Yes
- No

Do you have liver disease? * Required

- Yes
- No

Have you had any stomach ulcers? * Required

- ○ Yes
- ○ No

Have you had cancer? * Required

- ○ Yes
- ○ No

Do you have any cognitive difficulties (including Alzheimer's or any other form of Dementia)? * Required

- ○ Yes
- ○ No

Do you have any form of arthritis? * Required

- ○ Yes
- ○ No

Do you have HIV or AIDS? * Required

- ○ Yes
- ○ No

Do you have hypertension? * Required

- ○ Yes
- ○ No

Do you have a skin infection? * Required

- ○ Yes
- ○ No

Do you have depression? * Required

- ○ Yes
- ○ No

‹ Previous Finish ✔

UNIVERSITY OF HULL

Return to Work after Stroke: A Mediation Study of Illness Perception

100% complete

Survey complete. Thank you for your participation.

Further information

Sources of support and information regarding Stroke

The Stroke Association offers information and advice regarding Stroke on its website:

www.stroke.org.uk

Stroke Helpline: 0303 3033 100 or email helpline@stroke.org.uk.

The Brain and Spine Helpline is staffed by neuroscience nurses and other health professionals. It covers all neurological conditions, from the fairly common to the very rare, and can offer information and support on any medical or related social and emotional issues of concern. The service answers queries by telephone, letter or email as well as providing an opportunity for people to share their experiences of having a neurological condition on the discussion forum http://www.cobfoundation.org/

Helpline: 0808 808 1000

Should you have any specific issues regarding your treatment that taking part in this study has raised then you can call the Researcher on:

E-mail: K.McCaffer-2016@hull.ac.uk

If you still have concerns having spoken to the Researcher you may also wish to seek advice from your GP

Further information and contact details

Kieran McCaffer, Trainee Clinical Psychologist

The Department of Psychological Health and Wellbeing,

Aire Building,

The University of Hull,

Cottingham Road,

Hull,

HU6 7RX

E-mail: K.McCaffer-2016@hull.ac.uk

Dr Emma Lewis, Clinical Psychologist

The Department of Psychological Health and Wellbeing,

Aire Building,

The University of Hull,

Cottingham Road,

Hull,

HU6 7RX

E-mail: E.Lewis@hull.ac.uk

Telephone: 01482 464617

Dr David Richards

PVC Research & Enterprise, University of Hull

Hull

HU6 7RX

Telephone: 01482 466800

E-mail: pvc-re@hull.ac.uk

Appendix G: Statistical Output

Example of Mediation Analysis:

Testing for the mediation effect of illness perceptions on the relationship between degree of comorbidities and works status post-stroke (controlling for covariates: age and gender).

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Version 4.2 beta ***************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : WORKSTA
    X  : CCI
   M1  : illcom
   M2  : cogrep
   M3  : emotrep

Covariates:
 GENDER   age

Sample
Size:  123

**************************************************************************
OUTCOME VARIABLE:
 illcom

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2382      .0567    10.3102     2.3851     3.0000   119.0000      .0726

Model
             coeff         se          t          p       LLCI       ULCI
constant      .2291     2.2700      .1009      .9198    -4.2657     4.7240
CCI          -.1025      .1446     -.7085      .4800     -.3889      .1839
GENDER       1.1423      .6017     1.8986      .0600     -.0491     2.3337
age           .0725      .0345     2.1018      .0377      .0042      .1408

**************************************************************************
OUTCOME VARIABLE:
 cogrep

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4026      .1621    36.7721     7.6731     3.0000   119.0000      .0001

Model
             coeff         se          t          p       LLCI       ULCI
constant    14.0609     4.2870     3.2799      .0014     5.5722    22.5496
```

```
CCI           .5273      .2732     1.9306      .0559     -.0135     1.0682
GENDER       4.6413     1.1363     4.0847      .0001     2.3914     6.8913
age           .1483      .0651     2.2774      .0245      .0194      .2773

**************************************************************************
OUTCOME VARIABLE:
 emotrep

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3317      .1101    20.0662     4.9054     3.0000   119.0000      .0030

Model
             coeff         se          t          p       LLCI       ULCI
constant     8.9489     3.1668     2.8258      .0055     2.6782    15.2196
CCI           .6797      .2018     3.3686      .0010      .2802     1.0792
GENDER       1.5713      .8394     1.8720      .0637     -.0908     3.2333
age           .0284      .0481      .5899      .5563     -.0669      .1237

**************************************************************************
OUTCOME VARIABLE:
 WORKSTA

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5791      .3354      .4461     9.7561     6.0000   116.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
constant     -.4067      .4973     -.8178      .4152    -1.3917      .5783
CCI          -.0137      .0315     -.4345      .6647     -.0761      .0487
illcom       -.0084      .0194     -.4316      .6668     -.0467      .0300
cogrep        .0305      .0114     2.6659      .0088      .0078      .0532
emotrep       .0594      .0156     3.8063      .0002      .0285      .0904
GENDER        .0203      .1351      .1499      .8811     -.2474      .2879
age           .0195      .0074     2.6234      .0099      .0048      .0343


****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
     -.0137      .0315     -.4345      .6647     -.0761      .0487

Indirect effect(s) of X on Y:
            Effect     BootSE   BootLLCI   BootULCI
TOTAL        .0573      .0205      .0218      .1021
illcom       .0009      .0041     -.0050      .0122
cogrep       .0161      .0106      .0003      .0408
emotrep      .0404      .0161      .0136      .0771

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```

Correlations

		CCI	cogrep	illcom	emotrep
CCI	Pearson Correlation	1	.163	-.048	.289**
	Sig. (2-tailed)		.072	.595	.001
	N	123	123	123	123
cogrep	Pearson Correlation	.163	1	.109	.502**
	Sig. (2-tailed)	.072		.232	<.001
	N	123	123	123	123
illcom	Pearson Correlation	-.048	.109	1	-.104
	Sig. (2-tailed)	.595	.232		.252
	N	123	123	123	123
emotrep	Pearson Correlation	.289**	.502**	-.104	1
	Sig. (2-tailed)	.001	<.001	.252	
	N	123	123	123	123

**. Correlation is significant at the 0.01 level (2-tailed).

Warnings

There are 242 (66.7%) cells (i.e., dependent variable levels by observed combinations of predictor variable values) with zero frequencies.

Case Processing Summary

		N	Marginal Percentage
WORKST	Working	24	19.5%
	Working diminished level	24	19.5%
	Non-working	75	61.0%
Valid		123	100.0%
Missing		4	
Total		127	

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	231.081			
Final	193.441	37.640	4	<.001

Link function: Logit.

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	237.315	236	.464
Deviance	193.441	236	.980

Link function: Logit.

Pseudo R-Square

Cox and Snell	.264
Nagelkerke	.311
McFadden	.163

Link function: Logit.

Parameter Estimates

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[WORKST = 1]	3.405	1.014	11.279	1	<.001	1.418	5.392
	[WORKST = 2]	4.695	1.063	19.494	1	<.001	2.611	6.780
Location	cci	.005	.105	.003	1	.959	-.201	.212
	cogrep	.096	.036	7.231	1	.007	.026	.167
	emotrep	.164	.051	10.309	1	.001	.064	.264
	illcom	-.004	.061	.005	1	.943	-.124	.115

Link function: Logit.

Test of Parallel Lines[a]

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	193.441			
General	191.210	2.231	4	.693

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.

a. Link function: Logit.

Odds ratios

11.279	1	.001	1.418	5.392	30.116	4.128	219.700
19.494	1	.000	2.611	6.780	109.44	13.614	879.856
.003	1	.959	-.201	.212	1.005	.818	1.236
7.231	1	.007	.026	.167	1.101	1.026	1.181
10.309	1	.001	.064	.264	1.178	1.066	1.302
.005	1	.943	-.124	.115	.996	.883	1.122

Appendix H: Reflective Statement

In retrospect, my desire to conduct research into stroke manifested during my first clinical placement on the doctorate. I recall witnessing amazing feats of strength from stroke survivors whose lives had been quite literally changed overnight. Yet, these individuals continued to demonstrate bravery and determination in the face of adversity. I was astonished by how many survivors were determined to return to work after their stroke. Unfortunately, many were unable to make this step to recovery due to various physical and psychological barriers. Witnessing all of this, I felt compelled to share stroke survivors' experiences of returning to work through my own research thesis.

Upon exploring the existing literature, I discovered that much of this was qualitative in nature. Whilst I felt that this was a good thing, affording many individuals the opportunity to recount their stroke journeys in considerable detail, I did also reflect that these findings were often not generalisable to the wider population. Thus, there was a palpable need for quantitative data to contribute to the development of existing stroke-related vocational rehabilitation strategies and services. However, I was aware that this type of analysis would require a significant sample of participants and thus doubt regarding the feasibility of this project within the allotted timeframe began to manifest. In addition, the COVID-19 pandemic had given rise to numerous challenges for stroke teams and services. Such difficulties had disrupted the quality and deliverability of stroke care at the time of collecting my data.

There had been grave reductions in staffing levels across the whole stroke pathway and many stroke related support services, which were operating pre

pandemic, were no longer in operation. Therefore, conducting my research within the confines of strict infection control measures was very challenging. I had to make a concerted effort to have all planned face-to-face visits to participating services approved in advance. Coupled with this, I had to balance the need to collect data with the challenges faced by staff relating to increased patient caseloads post-pandemic. Thus, wherever feasible, my research procedures and tools had to be adapted to minimise disruption to service delivery. Again, this led to self-doubts about not being able to complete my thesis within the allotted time. However, it was here that I learnt the importance of contingency planning. Between myself and my supervisor, setting a guide timeline of events and adhering to this as best as possible, allowed me to remain on track.

To potential researchers, I would highly recommend the online dissemination of your research to possible participants. Although, I did reflect that this may have excluded stroke survivors less cognitively able to operate technology or those experiencing digital poverty, my research was able to reach a much wider pool of participants through using digital means. It allowed me to connect with stroke survivors nationwide whom I would have otherwise not been able to connect with due to geographical and logistical difficulties.

Perhaps naively, I did not anticipate just how emotionally impacted I would be through reading third hand accounts of surviving stroke throughout the literature. This was certainly something that I took to research supervision and through supportive discussions with my supervisor was able to contain. I would advise

future researchers in this area to remain conscious of how their research is impacting them personally and uptake supervision as appropriate.

Finally, I found the writing up process of this thesis challenging at times. There were occasions that I felt overwhelmed and out of my depth. However, during such instances, it was helpful to think back to the incredible stroke survivors that I had met along my research journey. I do believe that this is what inspired me to continue my pursuit despite numerous obstacles.