Pain, future possible selves and anticipated behavioural preferences

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ABSTRACT

Research has suggested that aspects of our self-concept can influence our decisions about behaviour. One way behaviour has been suggested to be influenced is through internal, value-laden goal states which are known as possible selves. These possible selves may have a role in motivating goal-oriented behaviours by inducing hopeful or fearful emotional states. Individuals who experience chronic pain often find their desired behavioural goals blocked, and yet not all of these individuals experience anxiety or depression. Therefore, it is clear that individual psychological factors play a part in determining behavioural responses and activity level in the face of ongoing pain. The purpose of this research was to investigate whether manipulating possible self-states could influence anticipated behaviours. It was predicted that individuals primed to imagine a more fearful pain-related possible future would report less activity.

159 participants were recruited from the University of Leeds student population. Participants were randomised to one of six experimental conditions, in a novel design developed for use in this study. Their anticipated activity levels were measured alongside an intervention designed to support them to generate either a feared-for pain future self, a hoped-for pain future self or a control future self.

Individuals undergoing the feared-for self intervention anticipated significantly less post-intervention activity than participants in the other two groups. Furthermore, they reported significantly less anticipated activity for their future selves then their current self.

This study has provided initial support for the viability of experimental manipulation of pain-related possible self-states on behaviours. However, future research in this area is necessary to support these findings. The implications of these findings are considered, alongside the study limitations and suggestions for future research.

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ABBREVIATIONS

ACT:	Acceptance and Commitment Therapy
ANOVA:	Analysis of Variance
BOS:	Bristol Online Survey
BPT	Behavioural Preferences Task
CFS:	Control future self
D:	Distribution
FFS:	Feared-for self
HADS:	Hospital Anxiety and Depression Questionnaire
HFS:	Hoped-for self
IAQ:	Imaging Ability Questionnaire
IASP:	International Association for the Study of Chronic Pain
M:	Mean
Mdn:	Median
N:	Number
PDT:	Preferences Distractor Task
SD:	Standard Deviation
SDT:	Self Discrepancy Theory
SPSS:	Statistical Package for the Social Sciences

CHAPTER 1: INTRODUCTION

People who experience pain often say they take it into account when thinking about whether to engage in activities. This consideration is often seen in clinical practice, where chronic pain patients typically behave in one of two ways. For some patients, fear of pain dominates their self and they might say things like, "I can't do that, because of my pain". A less common group are those who remain hopeful about their ability to live a full life in spite of pain. The reasons for this dichotomy are unclear, but individual psychological factors which influence the assessment of possible future consequences may play a part. The purpose of this research is to further understand the relationship between pain and possible future self-states and their subsequent influence on anticipated behaviours.

This thesis aims to test the prediction that priming people with a fearful pain-related future self results in less anticipated activity than those primed with a hopeful pain-related future. This chapter describes the current literature on the self, pain and their interaction.

1.2 The Self

When proposing a study involving the self, Brinthaupt and Lipka (1995) state it is crucial to think carefully about how the self is defined. Baumeister (1998) highlighted the various uses of the term in contemporary research, suggesting that "self is not really a single topic at all, but rather an aggregate of loosely related subtopics" (p.681). It is therefore unsurprising that there is no universally accepted definition of the self (Leary & Tangney, 2003).

Whilst an extensive study of semantics is beyond the scope of this research, it is important to consider that the definition of the self varies extensively depending on the

understanding of the concept used. This in turn has implications for a study's methodology and the measurement of the self (Brinthaupt & Lipka, 1995). This section will discuss the multidimensional nature of the self, before presenting the models and theories relating to self-perception which underlie the current study's approach.

1.2.1 The nature of the self in research

The term "self" (and its compounds) comprises multiple meanings which can relate to very different phenomena. To illustrate this, consider the meanings of the following phrases common in self-related research: self-reflection, self-evaluation, loss of self, the self and others, identity and identification of the self. The nature of the "self" relates to a distinct construct in each of these examples and the differences between definitions are not always easily quantifiable. Leary and Tangney (2003) state that the use of the term varies extensively between researchers and even within a single research paper, complicating the matter of presenting a single term further. Therefore, no single definition can be used to universally describe the self. When deciding a definition of "the self" it is useful to consider the five most common meanings of the self in research, put forward by Leary and Tangney (2003).

The most widely encountered use of the term "self" in research simply refers to that individual as a person. This is a reference to a person as a whole entity, so the "self" can simply relate to me (myself), him (himself) or her (herself) and is a means of identification. Although common in written and spoken language, using the "self" to describe the sum of a person excludes the psychological aspects and multiple processes which are of interest to researchers.

Other researchers have used the self interchangeably with "personality". This again is a common linguistic use of the term, which has filtered down into personality research (Elliott, 2010). One example is self-actualisation, which proposes that if basic needs are

met, an individual can then be motivated to achieve their full psychological potential (Maslow, 1997). When using the term "self-actualisation" Maslow was referring to the actualisation of an individual's personality, not the actualisation of the self (Leary & Tangney, 2003).

William James is credited with first introducing the concept of the self into psychological research in his book *The Principles of Psychology* (1890). In this text, James identifies two interlinked self-states, the self as knower and the self as known. The self as knower refers to the "I", the active internal process involved in the experience, whereas the self as known refers to the "me", which refers to the content of experiences, our beliefs about the self. One description of the self, taken from the self as "I" concept can be thought of as the "Self as experiencing subject" (Leary & Tangney, 2003, p. 7). Thus many researchers interpret this description of the self to refer to the internal psychological process at the core of our being, a part which consciously processes our experiences.

This understanding of self can be seen in contrast to the meaning researchers take from James' self as known, the "me" self. This is understood to operate alongside the "I" as two intertwined systems, but comprises a different understanding of self. This self relates to the knowledge and beliefs about oneself, which Leary and Tangney (2003) termed the "Self as Beliefs about Oneself". This self contains the beliefs, thoughts and associated feelings about oneself, also known as self-perceptions. In contrast to the previous self, this definition is associated with an individual's self-concept and the beliefs which influence these. James categorised this "me" self into three different, yet interrelated aspects; the material self, the social self and the spiritual self (James, 1890). Importantly, James suggested that "in each kind of self, material, social, and spiritual men distinguish between the immediate and actual, and the remote and potential..."

(James, 1890, p. 300), introducing the idea of different future possibilities of the self, an idea this thesis will return to later in this section.

The final way in which the phrase "self" is used in research is related to executive functions, motivation and regulation of behaviours (self-regulation). Baumeister (1998) proposes the self as an active decision maker and an agent of behaviour change. This self deliberately engages in processes aimed at improving or altering its contents (Baumeister & Vohs, 2003). These processes involve the consideration of incoming information, the generation of behavioural options and then selection and execution of the behaviour with the preferred outcome. Baumeister (1998)suggests that the part of the self which evaluates and implements behaviours is known as the executive function of the self. This understanding of the self can be combined with cybernetics, resulting in a systems theory understanding of how executive functions help to regulate the self (Richards & von Glasersfeld, 1979).

It is clear that there is a great deal of variation in the way that the term "self" is used in self-related research and a definition must be chosen with care. The first two approaches do not fully capture the essence of the self as thought of in psychological research. The other understandings discussed present a valid aspect of the self; however, no single one of these interpretations captures the essence of all three viewpoints. An appropriate definition must therefore bring all three stands of perspective together, combining conscious experience, a network of self-referential thoughts and executive functioning.

1.2.2 Defining the self

Oyserman and James (2011) define the self as:

 "…a mental concept, a working theory about oneself, stored in memory, and amended

   with use. It is a working theory about who one is, was, and will become." (p.117).

Previous work into possible selves, a focus of this thesis, has used this definition (e.g.,

(Oyserman, Destin, & Novin, 2015; Oyserman, Johnson, & James, 2010; Rocque,

Posick, & Paternoster, 2014). It is based on William James' ideas of self-concept,

combining this with a structured approach to the self. It integrates the conscious

experience of the self (the "I" self), is the foundation of self-perception and belief (the

"me" self) and facilitates the consideration of goal-oriented behaviour and actions (the

executive self).

This definition also allows for consideration of the self and its internally altering

processes (e.g., self-evaluation) as arising from a self-system. Mischel and Morf (2003)

suggest the self is an active and integrated system comprising an individual's

interrelated self-representations, beliefs, desires and motivations. They propose that the

self-system can be divided into levels of smaller systems called self-concepts. Self-

concepts are internal cognitive structures which hold multiple working theories about

oneself called identities. These identities comprise beliefs, values, attitudes, goals,

emotions and roles (Oyserman & James, 2011). Multiple identities can constitute a self-

concept and multiple self-concepts integrate into the self-system. This system impacts

on how an individual perceives and interacts with their social world and their selection

of behaviour (Carver & Scheier, 1998; Leary & Tangney, 2003; Mischel & Morf, 2003).

This results in a hierarchical, fluid and constantly changing model of who one was, is,

and can be.

The way in which the self-system develops and impacts on motivation and behaviours involves self-evaluation. Leary and Tangney (2003) proposed that this happens through three interconnected areas of the self: attentional processes, cognitive processes and executive processes which allow individuals to self-regulate behaviours. They suggested that individuals first turn their attention inwards, which allows them to use cognitive processes to think about themselves and self-reflect (Marcotte, 2013). This reflection may be related to present experiences, roles, qualities, memories and importantly, imagined constructions of the self in the future (Leary & Tangney, 2003). It is this cognitive ability which underpins the development of the self and self-identities, including the construction of assorted self-guides, which are selves we aim to become (Higgins, 1987). The ability to self-reflect results in the selection of goals and self-regulation, the process of selection and initiation of behaviours to achieve goals (Duval & Wicklund, 1972).

1.2.3 Future possible Selves

Two key models have emerged from the literature on the self, linking self-identity, self-guides, motivation and behaviours: possible selves (Markus & Nurius, 1986) and Self Discrepancy Theory (SDT; Higgins, 1987). These models are complementary and both put forward that the current self (who one is now) is influenced by the representations one holds about their future selves (who one might become).

Possible selves theory (Markus & Nurius, 1986) proposes the concept of future selves called the hoped-for self (what an individual would like to become) and the feared-for self (what an individual fears becoming) as cognitive incentives for future behaviours. These future possible selves are also known as self-guides, as they guide self-development by functioning as goals (Oyserman, Bybee, Terry, & Hart-Johnson, 2004). Perceptions of discrepancy between the current self and a desired future self (hoped-for

self) motivate individuals to implement behaviours that are consistent with the future self-identity they aspire to become, in order to reduce this discrepancy (Oyserman, 2007; 2009). Alternatively, a perception of proximity to an identity-incongruent future (feared-for self) may motivate individuals to execute behaviours to avoid becoming that undesired future possible self and increase discrepancy between this and their current self (Oyserman, 2007). However, there are conditions, such as the continued presence of pain, which block an individual's ability to reduce or increase a discrepancy for self-development, which results in emotional distress (Higgins, 1987).

Future possible selves are considered as an integral part of identity. They are dynamic, their content and centrality changing across life phases and in response to experience. For example, future possible selves adapt in response to transitions such as unexpected health circumstances and adulthood (Dunkel, 2000; Frazier, Hooker, Johnson, & Kaus, 2000). The existence of stable hoped for possible selves is linked to increased well-being (King & Raspin, 2004), however, at times these are unattainable and revising or relinquishing them can be emotionally distressing (Carroll, Shepperd, & Arkin, 2009). Interestingly, in field studies it is only when faced with an overwhelming likelihood of achieving a feared-for self that the pursuit of a hoped-for self ceases (Carroll et al., 2009). Therefore future possible selves are more than consistently changing goal states and have emotional and behavioural consequences. Markus and Ruvolo (1989) suggest the psychological appraisal of possible selves can result in a reaction almost identical to the genuine physical experience of these futures. Future possible selves enable the vivid enactment of psychological representations of the self in the future and can involve significant emotional investment. This model alongside Higgins's self discrepancy theory (1987) offers a way of understanding the possible internal motivational forces which influence the self.

1.2.4 Self discrepancy theory

Higgins's (1987) self-discrepancy theory (SDT) suggests that individuals use self-guides, to aid in judgement of proximity to goals during goal pursuit. SDT suggests motivating emotional responses are determined by an individual's perception of the magnitude of discrepancies between their current, or "actual self", and self-states relating to what they should be (the "ought self") or would ideally be ("ideal self"). Greater discrepancies result in greater emotional distress (Higgins, Bond, Klein, & Strauman, 1986). Thus this theory ultimately relates to one's ability to judge proximity between self-states and the resulting emotional impact of these.

1.2.5. Future possible selves and self-discrepancy theory

Oyserman and James (2011) suggest the selves in SDT are compatible with the future possible selves, in that the "ought-self" and the "ideal-self" can be understood as representing a single self-state, the "optimal self" (Tangney, Niedenthal, Covert, & Barlow, 1998). They suggest this can also be conceptualised as the "hoped-for self" of future possible selves. As SDT would suggest, one is motivated to move towards hoped-for selves, and away from feared-for selves. To approach a hoped for self, one must identify this self, assess proximity and be motivated by a positive emotional response to carry out behaviours selected to achieve closer proximity to this self. Conversely, to avoid the feared-for self, it is necessary for one to judge proximity, be motivated by a threatening emotional response (e.g. anxiety) and subsequently select and employ behaviours designed to avoid this self. It may be that at points, approaching a hoped-for self has the effect of also avoiding a feared-for self, but due to the multiple possible selves one holds at a time, this may not always be the case. For example, approaching a fitness hoped-for self may also bring one closer to an injured feared-for self.

Therefore considering future possible selves theory alongside SDT can explain the motivational forces of the self, through a perception of discrepancy between future goal self-states. The future selves then "provide the essential link between the self-concept and motivation" (Markus & Nurius, 1986, p. 954). Individuals are motivated to engage with behaviours which are consistent with moving toward and achieving their hoped-for selves, or moving away from and avoiding their feared-for selves, especially if these selves are seen as particularly significant (Markus & Ruvolo, 1989). The way in which future possible selves influence behaviour selection is said to be related to self-regulatory cognitive processes (Cross & Markus, 1991). Carver and Scheier (1998) bring the three stands of future possible selves, SDT and self-regulation together in their control theory of self-regulation.

1.2.6 Control theory of self-regulation

Self-regulation can be considered an internal process consisting of decision making and adjustment of behaviour designed to approach a goal (Hoyle, 2010). There is substantial support for the suggestion that goals promote purposeful behaviour through self-regulation (Carver & Scheier, 1981; Shah & Kruglanski, 2003; Wrosch, Scheier, Miller, Schulz, & Carver, 2003).

A frequently cited model is Carver and Scheier's (1998) control theory of self-regulation. This explains how the possible self-states drive behaviours and how one can have a sense of control over the speed of approach to a goal. This model considers goals to form a self-regulation system and connects concrete behavioural goals of self-development to the more abstract goals of the self. There are multiple paths to the highest level of goal (see Figure 1) and goals are ordered hierarchically through sense of importance to the self. Multiple lines to a single goal demonstrate that several of the goals from the lower level combine to result in achievement of the higher goal.

Therefore these higher goals ultimately guide behaviour by providing goals to the next lowest level (Powers, 1973a).
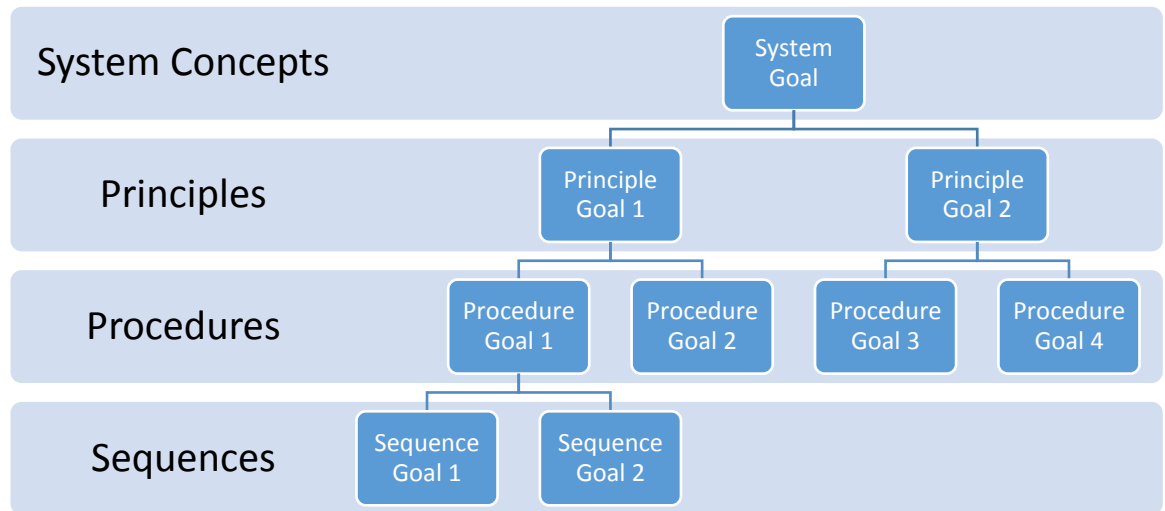
Figure 1: Self-regulation hierarchy (Redrawn from Carver and Scheier, 1998, p.72)

This model suggests that there is an overall system concept which can be understood to represent the self. Underneath this are principles which are characteristics one would have to "be" to achieve a system goal for example, to achieve a system goal of being a good student one might have to be "dedicated" and "hard working". These system and principle goals are not concrete enough to result in behaviours and instead function as abstract qualities we aim to be to guide to self-development. In order to influence behaviour, we "manifest such qualities in behaviour by doing specific activities" (Carver & Scheier, 1998, p. 71). In this model, the specific activities relate to the procedures which are behaviours one would have to "do" to meet the principle goals, which in the given example might be "study for an exam". To implement these procedures, sets of sequences are used. These are the individual motor sequences which make up a behaviour, for example, "picking up a pencil", "opening a textbook". Many sequences make up a procedure and many procedures might contribute to meeting a principle goal, which ultimately come together to achieve a system goal guided by a process of feedback loops.

Carver and Scheier (1998) relate this model to possible selves theory, as future possible selves can be system or principle goals and interestingly, anti-goals. SDT then allows a perception of proximity to these goals which then initiates feedback in a top down process, approaching or avoiding these possible future self goals. As noted in previous discussion, the self can consist of positive and negative qualities (Markus & Nurius, 1986). The hoped-for self represents a positive self-development goal and is therefore something one might approach through complimentary sequence, procedure and principle goals. Therefore, individuals execute observable behaviours consistent with achieving a hoped-for self. In contrast, the feared-for self represents the desire "not to be" and therefore is considered an anti-goal and avoided. In this case, individuals can implement behaviour to avoid the feared-for self. Many different hoped-for and feared-for goals operate concurrently, therefore the self-regulation hierarchy is "a complex web of positive goals with some anti-goals within its fabric" (Carver & Scheier, 1998, p. 92).

This model suggests the self is influenced through many different routes – our goals and anti-goals, judgements about whether we approach or avoid these goals and the behaviours we use to do so. This leads to observed behaviours, but since this model accounts for planning in order to meet long term goals (Lawrence, Carver, & Scheier, 2002) it is also possible to anticipate the future behaviours necessary to attain a hoped-for self or avoid a feared-for self. Conversely, it is also possible to create imagined scenarios of the self and consider anticipated behaviours associated with these imagined self-states (Carver & Scheier, 1998).

1.2.7 Blocked goals

There are times in this model when achievement of certain selves is not possible or blocked. This is because successful self-development depends on a person's ability to participate in certain goal-oriented behaviours (Wells, 2010). However, if there are

circumstances which prevent a self-goal from being pursued, this can impact negatively on the self. Perceived lack of progress towards a goal or a goal becoming unattainable can lead to negative affect and impact on self-concept (Carver, Lawrence, & Scheier, 1999). Goals may become unattainable due to an individual's action or inaction. They can also be blocked by "outside disturbances" (Carver & Scheier, 1998, p. 140), which are changes in life circumstances affecting the sequences available, such as the ongoing presence of pain. Avoidance of pain can be a powerful anti-goal and can lead to either modification of or withdrawal from certain behaviour sequences (Vlaeyen, Morley, Linton, Boersma, & Jong, 2012). This not only reduces a behavioural repertoire, but can block higher level goals of importance to self-development, leading to emotional distress (Carver & Scheier, 1998). Therefore the behaviours (i.e., sequences) of people experiencing ongoing pain may prevent their achievement of their hoped-for self, or bring them closer to their feared for-self. If these self-goals are not adapted, they may lead to inappropriate persistence in goal achievement.

1.2.8 Possible selves and Self-regulation

The types of possible selves prioritised by individuals have been noted to impact on their behaviour. Hoped-for selves are associated with the performance of more daily goal-oriented activities (Anderman, Anderman, & Griesinger, 1999; Hoppmann, Gerstorf, Smith, & Klumb, 2007; Marcotte, 2013; Oyserman et al., 2004; Oyserman & Markus, 1990b; Oyserman & Markus, 1990a). They were also found to be associated with positive affect. However, there is no such association reported between the feared-for self and activity (Hooker, 1992; Hoppmann et al., 2007; Murru & Martin Ginis, 2010; Oyserman et al., 2004). These differences in patterns of behaviour are consistent with the wider literature in possible selves and self-regulatory activities (Cross & Markus, 1991; Hooker, 1992; Hooker & Kaus, 1992; Markus & Ruvolo, 1989; Whaley, 2003). Consistent with control theory, the vivid mental representations of a hoped-for

self generates includes strategies for activities which will reduce discrepancy and move them closer towards their future hoped-for self. As these strategies are included when the hoped-for self is thought about, the probability they will be implemented in the service of the desired future self is increased, helping to support the performance of behaviour (Hoppmann et al., 2007). Conversely, the feared-for self is observed to contain fewer actions, but more negative emotion (Kindermans, 2012). The mental representation of this self may therefore lack a range of successful behavioural strategies contained within it, resulting in less adaptive behaviour and more emotive experience (Hooker, 1992). Thus the literature supports the assertion that the possible selves differentially affect self-regulation, with hoped-for selves resulting in more goal oriented behaviours than the feared-for self. This has been found to be particularly relevant in the domain of physical health.

1.2.9 Health-related possible selves and behaviour

There is a longstanding association between health-related possible selves and behaviours (Oyserman & James, 2011). Health-related possible selves are future selves related to health, which have been shown to be stable and of increasing importance with age (Frazier et al., 2000). They have been shown to influence an individual's perceptions of their health, independent of their actual health status (Hooker, 1992). This is suggested to be a two way process, as the experience of a long term health condition influences the self-concept and possible selves (Frazier, Cotrell, & Hooker, 2003), which in turn influence the perceptions of health and possibilities for behaviours (Hooker & Kaus, 1992). Therefore, these possible selves not only represent goal states but also influence the possible cognitive input to the self and the resulting self-regulatory processes.

Hooker and Kaus (1992) investigated the mechanisms by which the selves influence behaviour. They used open-ended questionnaires to assess the saliency of selves and their relationship to self-regulatory processes (e.g., self-efficacy). They found that health related possible selves were better predictors of health behaviours than health values (Hooker & Kaus, 1992). Other significant predictors of health behaviours related to the possible selves were self-efficacy and number of goal oriented activities, suggesting a clear link between health-related possible selves, self-regulation internal processes and goal oriented activities.

1.2.10 Summary

In summary, our selves not only guide self-development but this process also impacts on self-regulation and therefore our behaviours. However, certain life experiences can lead to self-development goals being blocked, by changing the behavioural repertoires available to us. One such experience is pain, which can significantly reduce the motor sequences and behaviours we might normally use to reach goals. How one reacts to this experience will result in either adjustment of goals at the level of one's system concept or persistence with unachievable goals which results in emotional distress. However, adjustment is unpredictable and likely related to an individual's unique experience of pain. Therefore patterns of behavioural engagement observed in those with pain might be explained by the impact that pain has on self-identity and thus self-regulation.

1.3 Pain

Pain is a multifaceted, complex construct, defined by the International Association for the Study of Pain (IASP) as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage" (IASP, 1986, p. 210). There are three broad categories of pain, nociceptive, neuropathic and idiopathic. These categories refer to the underlying cause of the pain, nociceptive pain is a result of physical damage

to tissue, neuropathic pain describes pain arising from damage or disease of the somatosensory system and idiopathic pain is where there is no known cause (Carver & Foley, 2003). Although individuals with idiopathic pain are differentiated from the first two categories, it is important to note that their subjective experiences of pain do not differ (Keefe, Beaupre, Weiner, & Siegler, 1996).

Despite the integrative definition of pain above, it is clear that these divisions promote a medical conceptualisation of pain, with physical causes. Although it can be useful to taxonomise pain, this reduces an individual's experience of pain to a medical pathology. This overlooks individual differences in the complex experience of pain, which varies extensively, even between those with apparently similar pain aetiologies (Coghill, 2010). Turk and Flor (1999) suggest a biomedical perspective of pain excludes important psychological and socio-cultural variables which shape the way we experience it.

The function of pain is to signal the possibility of tissue damage, encouraging automatic withdrawal to avoid further damage and allow for healing. This suggests an expectation that avoidance of the pain stimulus inevitably leads to the tissues healing and complete removal of pain. Indeed, acute pain management treatment involves two medically focused strategies: analgesic medication to relieve pain and physical interventions to repair or strengthen tissue. However, pain is unpredictable, does not necessarily conform to expectations of healing and can undergo a transition from acute to chronic presentation.

1.3.1 Chronic Pain

The term chronic pain refers to the continuation of pain "beyond the normal time of healing" (IASP, 1986, p. 217). There are no firm indications of what time period is considered abnormal, but clinical definitions range between three and six months (Verhaak, Kerssens, Dekker, Sorbi, & Bensing, 1998). Determining the prevalence of

chronic pain is challenging as different studies refer to different definitions. Breivik, Collett, Ventafridda, Cohen, and Gallacher (2006) investigated chronic pain prevalence in a large European sample, proposing an average prevalence of 19%. Whilst acute pain has purpose and is often conceptualised as a physical reaction to actual tissue damage, chronic pain may not link to nociception and involves additional psychological and behavioural influences (Verhaak et al., 1998).

Despite the biomedical focus of pain management, physical characteristics of pain, such as intensity and duration, have been shown to only account for a small amount of the variance in the impact of pain (Ilowite, Walco, & Pochaczevsky, 1992; Turk, 1999). This suggests there are other factors, such as individual psychological factors, which both influence, and are influenced by, the continued presence of pain.

1.3.2 Psychological factors and pain

There is substantial evidence suggesting that individual psychological factors affect the experience of pain (Turk & Okifuji, 2002). No single factor has been found to be consistently associated with pain intensity (Jensen, Turner, Romano, & Karoly, 1991). Therefore the true picture is likely very complex and most likely varies between individuals (Malleson, Connell, Bennett, & Eccleston, 2001).

The precise mechanism of how pain influences personal psychological factors is not known. However, Morley (2008) identified three main consequences of ongoing pain which impact on an individual's functioning: interruption, interference and identity. Eccleston and Crombez (1999) put forward a cognitive-affective model of pain as a mechanism for understanding how pain influences aspects of one's self and behavioural choices. This suggests pain is a stimulus which demands attention and as a result individuals experiencing pain have frequent attentional shifts towards it. Pain prompts

an escape response and the individual's priority becomes pain management. These regular interruptions and prioritisation of pain interfere with an individual's daily goal-orientated behaviours (Eccleston & Crombez, 1999; Korula, 2008). Persistent interruption and interference can hinder an individual's achievement of valued self-development goals and subsequently impact on their overall self-concept, resulting in psychological distress (Sutherland & Morley, 2008).

One way of understanding this influence is using the schema-enmeshment model of pain (Pincus & Morley, 2001). This model was originally proposed to explain the attentional biases towards pain-related stimuli that pain patients often demonstrate. Pincus and Morley (2001) suggested this bias can be explained by the extent of enmeshment between a pain patient's self-concept and their pain. The term schema refers to "a stored body of knowledge that interacts with task demands" (Pincus & Morley, 2001, p. 607). They can be understood as parts of the self-identity, with an individual being able to hold several schemas and activate and relate these to each other. When schemas are activated concurrently and consistently, parts of them begin to overlap and information from one is integrated into the other (Pincus & Morley, 2001). Therefore, when multiple schemas are activated together this is known as enmeshment.

Schema-enmeshment theory has been related to possible selves and pain. Possible selves, including those related to pain, can be understood as self-schema (Morley, Davies, & Barton, 2005). Therefore, if an individual's self is enmeshed with pain, when a self-schema is activated, the pain schema also activates. In pain, a person's self-schema might overlap with their pain and illness schema, and the activation of one might activate the others. The extent to which the self-schema overlaps with pain can lead to the perception of blocked self-development goals and cause significant distress.

Therefore pain can have a powerful impact on one's identity, interfering with valued life goals and causing distress.

There is a growing body of evidence that suggests the extent of interference caused by this process is mediated by variables related to the self. Assessments of pain and coping, individual beliefs and understandings about the presence of chronic pain are thought to influence interference, suggesting the involvement of self-related variables in this process. As previously discussed, pain is a powerful motivator and both cognitive and behavioural factors have been found to be important in explaining varying levels of distress and adjustment in people with chronic pain. The role of fear and avoidance (Crombez, Vlaeyen, Heuts, & Lysens, 1999) and catastrophising (Vowles, McCracken, & Eccleston, 2008) can lead to withdrawal or avoidance of usual goal oriented behaviours (Turk & Okifuji, 2002). This is thought to impede one's ability to pursue goals related to developing the overall self-concept which results in emotional distress (Carver & Scheier, 1998). Unsurprisingly then, mood disorders are frequently reported as present in both acute (Carr, Thomas, & Wilson-Barnet, 2005; Mok & Lee, 2008) and chronic pain patients (McWilliams, Goodwin, & Cox, 2004; Tsang et al., 2008). A study by Means-Christensen, Roy-Byrne, Sherbourne, Craske, and Stein (2008) found that those with pain are up to ten times more likely to also present with a mood disorder. In addition, a review found that 52% of chronic pain patients also had depression (Bair, Wu, Damush, Sutherland, & Kroenke, 2008) and this is suggested to be a higher prevalence than the general population (McWilliams, Cox, & Enns, 2003). Fishbain, Cutler, Rosomoff, and Rosomoff (1997) conducted an extensive review of the literature and were unable to determine whether depression is an antecedent or consequence of chronic pain. Clearly the relationship between depression and pain is complex and no

one model is able to integrate all the variables which may be involved (Fishbain et al., 1997).

Anxiety has also been identified as important in chronic pain populations. One study found 45% of chronic pain patients experienced co-morbidity with depression or anxiety (Bair et al., 2008). Interestingly, this study also found greater pain-related interference with daily activities for those with combined chronic pain and mood difficulties than those with pain only. This suggests that affect may influence self-regulation. Additionally, a large scale study by McWilliams and colleagues (2003) found that associations between chronic pain and anxiety were stronger than those between pain and depression. This makes sense in the context of the continual threat that pain poses (Vlaeyen et al., 2012) but also that those with higher anxiety tend to perceive pain as more of a problem and seek diagnosis and treatment earlier (McCracken & Turk, 2002)

In summary, the literature suggests that individual psychological factors not only play a significant role in chronic pain but that these aspects combine to impact on emotional distress. In addition, pain, distress and individual perceptions may impact on self-regulation activities. Therefore it is likely that adjustment to pain is an important consideration (Keefe, Rumble, Scipio, Giordano, & Perri, 2004) and this may involve adjusting the goals which are interrupted or interfered with by the presence of pain. Therefore the relationship between these constructs is likely to be complex and reciprocal (Bair et al., 2008).

1.4 The self and pain

The experience of pain is clearly a potential threat to an individual's self and their goal-oriented behaviours (Pincus & Morley, 2001). Despite this, there is limited research focusing on pain and the self. The presence of pain leads to reduced physical function (Vlaeyen & Morley, 2005) and forces a review of an individual's sense of self, their possible selves and their behaviours (Brandtstädter & Renner, 1990). However, individual differences also play a part in the meaning an individual gives to their pain experiences and pain perception, which in turn impacts on goal adjustment, distress and coping (Huijnen et al., 2011; Morley & Eccleston, 2004; Wall, 2000; Weiner, 2001). This is likely to be a complex, interdependent relationship. Therefore this section will review the literature relating to the self-concepts previously introduced and pain, before considering the rationale and hypotheses for the present study.

1.4.1 Pain and Possible Selves

Several authors have suggested that pain leads to the loss of aspects of the self (Asbring, 2001; Johansson, Hamberg, Westman, & Lindgren, 1999; Morley & Eccleston, 2004; Smith & Osborn, 2007). Specifically, the loss of valued roles and attributes has been found as a consequence of experiencing ongoing pain, and these losses predict emotional distress (Harris, Morley, & Barton, 2003). Since possible selves can represent both roles and attributes, they are potentially as risk of loss due to pain. The literature supports this idea (Harris et al., 2003; Hellström, 2001). There are very few studies which solely discuss possible selves and pain, as they are most often considered alongside SDT and self-regulation, as below. Nonetheless, it is clear pain has the potential to obstruct certain possible selves and so poses a significant threat to a person's identity.

1.4.2 Pain and SDT

The impact of self-discrepancies has also been investigated in individuals experiencing pain. As noted, people are motivated to reduce discrepancies and do this by choosing the most appropriate behavioural strategies (Carver & Scheier, 1998; Higgins, 1987). Self goals, and proximity to these, vary between individuals and result in different emotional and behavioural consequences. In those with pain, this suggests that people will perceive different challenges to their self than those without pain, which may result in them experiencing different emotional states and behaving differently.

Waters, Keefe, and Strauman (2004) were the first to find that self-discrepancies were reliably measurable, distinct and contributed to distress in chronic pain patients. They used semi-structured interviews to assess self-discrepancies, alongside standardised measures for pain and psychological distress. Interestingly, they found that those with larger discrepancies between their actual self and their ideal selves also reported a higher pain severity and more distress and depression. Additionally, the analyses were all correlational which does not allow attribution of causality. Nonetheless, the study provided a foundation for other studies in the area.

Further research by Goossens et al. (2010) investigated self-discrepancies, emotion, daily functioning and flexible goal adjustment in people with persistent pain. Consistent with Waters et al. (2004) they found larger actual self-ought self and smaller "actual self-feared self" discrepancies were related to higher reported depression and anxiety. However, they did not find any relationship between the magnitude of these discrepancies and pain perception or daily functioning. This latter finding may be an artefact of the measure used to assess daily functioning. Alternatively, it may be related to the study's finding of an interaction between self-discrepancies and flexible goal

adjustment. The authors concluded that flexible goal adjustment as a response to continued pain might reduce discrepancies thereby improving daily functioning.

Links between SDT and sub-acute pain have also been found Vangronsveld, Morley, Peters, Vlaeyen, and Goossens (2011). They examined psychological changes with pain resolution after whiplash injury. Interestingly, they found enmeshment and distress decreased as pain resolved, but self-discrepancies remained stable. However, diary examinations revealed that during this time, there was a significant increase in the amount of "actual behaviour" which matched to reported "ideal behaviour". This suggests that the emotional impact of discrepancies may be influenced by the value one attaches to the self-goal and the ability to carry out behaviours consistent with the hoped-for goal. This is consistent with other studies in the area (Goossens et al., 2010; Richardson & Morley, 2015; Sutherland & Morley, 2008).

It seems there is evidence for a link between pain and self-discrepancies, however, the mechanisms of this relationship are not clear. The connection between these constructs may be mediated by self-processes, such as enmeshment or flexible goal adjustment in self-regulation. It may be that studies which include the possible selves as goal states can elucidate this relationship further.

1.4.3 Pain, possible selves and SDT

As mentioned, the experience of the loss of aspects of the self in pain patients is not uncommon (Morley & Eccleston, 2004; Smith & Osborn, 2007). Literature linking pain and the self has largely focused on describing the content of pain related selves or the hypothesising about the process of integrating pain selves into the self.

Explorations of the impact of pain on the self have found that pain results in "radical disruption" to self-identity (Asbring, 2001, p. 312; Hellström, 2001; Kindermans et al., 2009; Osborn & Smith, 2008). These qualitative studies describe an initial rejection of

integration pain into the self (e.g., "[pain's] not part of me", Osborn & Smith, 2008, p. 219). However, the experience of pain over time led to a significant reorganisation of the self-system and pain and pain-related possible future selves were integrated into the self. Refusal to accept and integrate pain into the self can amplify perceptions of self-discrepancies, causing further distress (Osborn & Smith, 2008), consistent with the findings reported in the section above. Furthermore, Hellström (2001) found that this linked to participant behaviour: "But now I am fully aware that I can't [do this activity] and don't. What am I able to do now?" (Hellström, 2001, p. 118).

Interestingly, the loss of the possible selves that had existed prior to the onset of pain was reported as the most distressing part of the experience in both studies, consistent with Carver and Scheier (1998). It seems that pain forces a review of the entire self-concept, imposing both pain related aspects and limits to possible selves and behaviours. These must be adjusted to at all levels of the self or result in distress. However, the above studies were qualitative and as such had small sample sizes and no formal assessment of possible future selves, which may limit the validity of the findings (Packard & Conway, 2006).

Other studies using bigger samples and formal selves assessment have found associations between pain, SDT and possible selves (Morley et al., 2005; Sutherland & Morley, 2008). These studies considered the impact of self-pain enmeshment on identity and distress. They found the magnitude of discrepancies between the actual and possible selves and self-pain enmeshment predicted depression and acceptance. In addition, they found links between distress and perceptions of pain as blocking movement towards self-regulatory goals.

To conclude, the blocking of self-regulation towards important development goals by the continued presence of pain may also block successful adaptation. Thus self-

regulation for those in pain is an important factor in understanding their behaviours and distress (Solberg Nes, Roach, & Segerstrom, 2009).

1.4.4 Pain, self-regulation and behaviour

The research provides some interesting insight into factors which contribute to the challenge of self-regulating effectively whilst experiencing pain. The experience of pain, acute and chronic, involves a complex interplay of biological, psychological, physiological and social challenges. The findings of the previous section suggest that successful adaptation to these challenges involves an individual's ability to self-regulate. Self-regulatory capacity "varies across people and situations, and self-regulatory strength appears to be both an individual difference and a limited resource that can be fatigued" (Solberg Nes, Carlson, Crofford, De Leeuw, & Segerstrom, 2010, p. 37). In wider research, self-regulatory fatigue has been experimentally observed in a range of tasks, including impulse control, decision making and regulating the self, thoughts and emotions, which all decrease a participant's subsequent ability to engage in self-regulatory tasks (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Muraven, Tice, & Baumeister, 1998; Segerstrom & Nes, 2007).

Also as previously suggested, identity and adjustment may depend on an individual's capacity to self-regulate. This suggests that not only are all the previously noted tasks operationalised under the same resource, but that that resource is also limited (Vohs, Baumeister, & Ciarocco, 2005). Pain experience introduces a new set of demands to an individual, which they must adapt to or experience further distress (Osborn & Smith, 2008; Solberg Nes et al., 2009). However, this attempt to adapt to so many concurrent challenges has been suggested to deplete the self-regulatory resource (Solberg Nes et al., 2010). Furthermore, those experiencing pain may be more susceptible to continual self-regulatory fatigue due to the high self-regulatory demand of pain. Unsurprisingly,

fatigue is consistently related to pain, with many patients describing it as a key part of their pain experience (Aaron, Burke, & Buchwald, 2000; de Leeuw, Studts, & Carlson, 2005).

Differences have been found between pain patients and healthy controls in experimental studies of self-regulation (Solberg Nes et al, 2009; 2010). Solberg Nes et al. (2010) manipulated self-regulation demand by splitting participants into groups and giving one group a task demanding a high level of self-regulation and another a low level task. They then assessed fatigue using an anagram solving persistence task. They not only demonstrated that high self-regulatory effort resulted in faster fatigue, but that there were individual differences which influenced self-regulation. Pain patients generally performed poorly in both groups, suggesting that they experience more self-regulatory fatigue than healthy controls. Furthermore, the amount of fatigue was mediated by patient's perceptions of pain intensity. Therefore there is evidence that pain may interfere with self-regulation by fatiguing the limited resource.

1.4.5 Pain, possible selves, SDT and self-regulation

The relationships between pain, possible selves, SDT, self-regulation and behaviour are complex. One area that has been influential in the literature is fear-avoidance models (Van Damme & Kindermans, 2015; Vlaeyen, Kole-Snijders, Boeren, & Van Eek, 1995; Vlaeyen & Linton, 2000). These models focus on the development of acute to chronic pain hypothesised to be caused by an avoidant behavioural style which emerges from fear of pain (Van Damme & Kindermans, 2015). Furthermore, this fear encompasses a fear of movement and further injury due to movement. Therefore, individuals with pain develop avoidance and safety behaviours which result in them being less active, which leads to pain related fear. This in turn leads to the disuse of the affected body area and increased distress, which results in further pain (see Figure 2).

INJURY

DISUSE
DEPRESSION
DISABILITY

RECOVERY

AVOIDANCE
HYPERVIGILANCE

PAIN-RELATED FEAR

PAIN EXPERIENCE

CONFRONTATION

PAIN CATASTROPHIZING

NO FEAR

NEGATIVE AFFECTIVITY
THREATENING ILLNESS INFORMATION
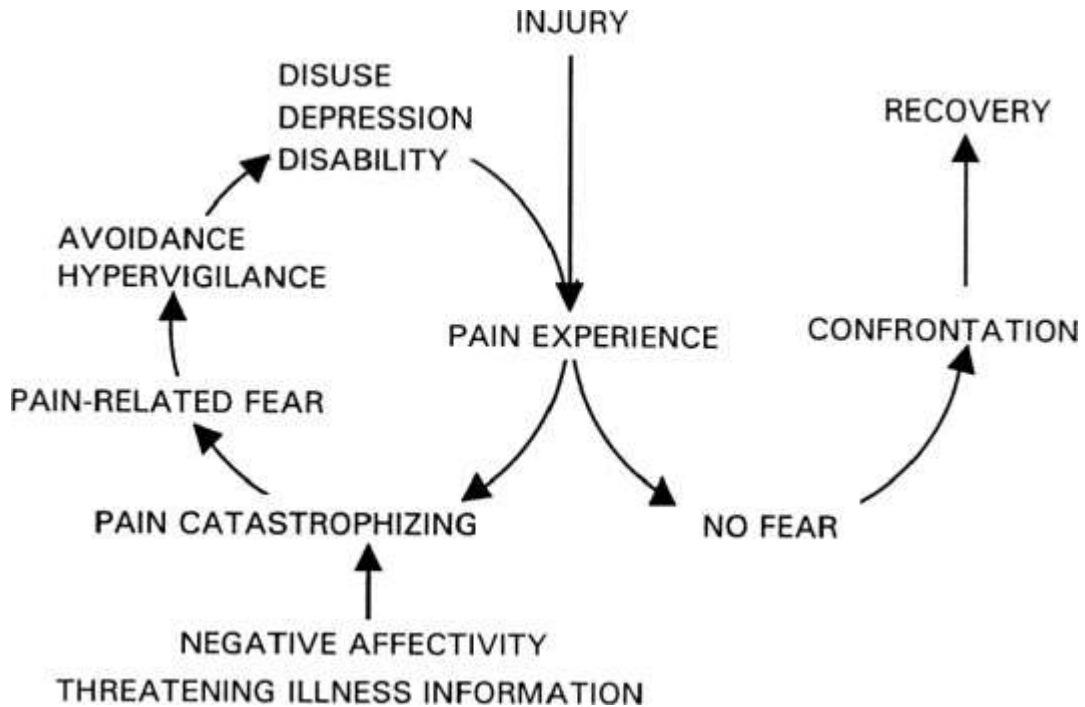
Figure 2: The fear-avoidance model reproduced from Vlaeyen and Linton (2000, p. 329)

Thus people in pain cease to be as behaviourally active as an attempt to protect

themselves. It can also be noted in this model that normal, daily self-regulatory

activities are blocked by the threatening interpretation of pain, consistent with the self-

regulation literature. Fear avoidance models have been well validated in research

(Asmundson, Noel, Petter, & Parkerson, 2012; de Leeuw, Studts & Carlson, 2005).

However, they are contentious in the literature and a review by Vlaeyen and Linton

(2012) found not all of the relationships in Figure 2 have been adequately demonstrated.

For example, some studies find no association between pain and observed behaviours

(e.g., Goossens et al., 2010). Furthermore, these models fail to explain the subset of

individuals described in the introduction to this thesis: those who experience pain, yet

persist in their usual activities (e.g., Vlaeyen & Morley, 2004). In response to this, the

avoidance-endurance model was proposed, which is based on the fear-avoidance models

(Hasenbring & Verbunt, 2010). This model comprises a similar fear avoidance model

as depicted in Figure 2, but additionally suggests that chronic pain can also develop through a second pathway: inappropriate persistence. This involves persisting until exhaustion in spite of severe pain, and supressing pain-related cognitions and emotions (Huijnen et al., 2011). Initial support for this model has been found (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, 2012; Huijnen et al., 2011). However, neither of these models can explain the underlying motivational forces which drive pain behaviours. Self-regulation, possible selves and SDT might provide the motivational theory to underpin these models (Van Damme & Kindermans, 2015). As previously mentioned, future possible selves provide individual goal states one wishes to attain or avoid. People in pain may be motivated to reduce discrepancies between their actual self and hoped-for possible selves and increase discrepancies between their actual and feared-for possible selves. They can achieve this through self-regulation, implementing behaviours which contribute towards the achievement of their goal. Pain presents a challenge to individuals, blocking the pursuit of valued self-development goals and draining self-regulatory capacity. Thus pain behaviours "are no longer viewed as the direct consequence of how pain is perceived or interpreted, but rather as a result of self-regulation of current goals in the context of pain" (Van Damme & Kindermans, 2015, p. 116).

Recent research has provided some support to the suggestion that possible selves, self-discrepancies and enmeshment with pain are related to problem solving behaviours. Persistence with pain removal was associated with proximity to, and identity enmeshment with, the feared-for self (Wells, 2010). As participants moved closer to their feared selves, the more enmeshed with pain they became and the more persistence behaviours they reported. Interestingly, the opposite has been found for the hoped-for self. Proximity to the hoped-for self was associated with less persistence behaviour and less identity enmeshment with pain (Donaldson, 2012). Thus, as individuals moved

away from their hoped-for self they became more enmeshed and more likely to use unhelpful persistence behaviours. Problem solving behaviours, such as persistence, can be seen as a part of self-regulatory functioning (Solberg Nes et al., 2009). Therefore these studies represent initial support for links between possible selves as goal states and perceptions of proximity resulting in the self-regulation of behaviours in those experiencing pain.

These ideas fit with the previous theory presented and suggests that the avoidance and persistence pain behaviours are both influenced by pain and individual differences in the self. There is also evidence that possible selves, self-discrepancies and self-regulation are associated with observable behaviours in those with chronic pain. This suggests that it is possible to manipulate pain-related possible selves and thereby influence people's anticipated behaviours.

1.5 Methodological choice in possible self and pain research

There is a wide range methods and measures used in self and pain research (Packard & Conway, 2006). This is due to the differences in definition of the self and the differing focus of individual studies.

Although it is challenging to measure specific aspects of the selves, many studies have tried. A thorough review of the possible selves literature into revealed it is plagued with methodological flaws (Packard & Conway, 2006). The review found three consistent weaknesses: a lack of robust assessment of possible selves, correlational data analysis and small sample size (Packard & Conway, 2006). Further research has to carefully consider these challenges to provide a valuable contribution.

The literature which examines possible selves use two distinct ways of assessing the content of people's possible selves: endorsement or generation. Endorsement of selves

involves the presentation of statements (e.g., "at peak fitness") that participants rate according to whether it represents their current self and whether they would like it as a future self. This method often uses pre-defined statements from the possible selves questionnaire (Markus & Nurius, 1986). The advantages to using this method is that the selves presented are validated in prior research, can be easily compared in analysis and ensures participation is quick. However, this also means that the research is biased towards those items, and the researcher does not have the opportunity to investigate possible selves not originally included in the questionnaire by Markus and Nurius (1986). An alternative method is spontaneous generation of possible selves, which has been used to encourage individuals to verbally describe their own current, hoped-for and feared-for future selves. The main benefit of this method is the meaning and validity of the possible selves produced due to the greater participant input and potential for dialogue (Packard & Conway, 2006). Unfortunately, this also means that there is likely to be little consistency in the possible selves and analysis and this leaves the data open to bias from researcher interpretation. Furthermore, both methods limit measurement of the impact of possible selves on people's behaviour as there is no experimental manipulation of the selves and thus no causation can be attributed.

The pain literature includes many qualitative studies which explore people's existing pain related future possible selves (Toye et al., 2014). There are also studies which have investigated pain-related avoidance and persistence behaviours, but few studies have considered all of these concepts together. If we are to understand pain-related behaviours further it is necessary to research these concepts in a single, quantitative study.

1.5.1 Study rationale

This study is predicated on the view that the self as a dynamic and changing self-system, which uses self-regulatory activities to reduce discrepancies between the actual self and the goal states, the possible selves. These self-regulatory activities can be observed through participant's behaviours, or stated anticipated behaviours. The literature reviewed, particularly the fear-avoidance model (Vlaeyen & Linton, 2000) suggests that pain-related hoped-for selves will result in more activity (observed behaviours) than pain-related feared-for selves. The avoidance-endurance model (Hasenbring & Verbunt, 2010) adds that some people will persist in spite of continued presence of pain. Both of these behaviours (avoidance-persistence) can be seen as arising from motivation towards self-regulatory goals. This indicates that future possible selves, as goal selves, potentially play a significant role in determining whether an individual avoids or persists.

Van Damme and Kindermans (2015) state that "we should not only ask the question *if* [pain] patients are displaying avoidance or persistence behaviour, but, perhaps even more importantly, *why* they behave in such ways" (p. 120). Thus, the next stage of research in this area is to use experimental designs to investigate causation. This thesis proposes that different pain-related possible selves can explain variation in pain behaviours. In order to test this, we need to activate these possible selves in people and investigate their anticipated behaviours. This research is vital if we are to begin to understand the underlying function of these behaviours in order to inform effective intervention.

To the author's knowledge there are no existing studies which have experimentally manipulated pain-related possible selves and measured the influence of these on behaviour, with pain or non-pain patients. However, there are studies in the area of

possible selves and exercise that have used possible selves priming scripts to manipulate exercise-related possible selves. These studies have resulted in successful manipulation and measurement of the impact of possible selves on exercise behaviours (Marcotte, 2013; Murru & Martin Ginis, 2010). If manipulation of pain-related possible selves can be achieved then researchers can begin to investigate the impact of these on pain behaviours.

Initially, the design of a priming experiment should be developed and tested among a large group of non-pain patients, which would minimise ethical and recruitment considerations of implementing this in a clinical group. This study will involve three groups of participants based on the possible selves: a hoped-for pain related possible selves group, a feared-for pain related possible selves group and a control future selves group. The different groups will undergo different priming scripts, and then asked how they would behave if that possible self situation was real. This will allow us to contrast post-priming behavioural scores, measured by anticipated activity levels (see methodology for further details). In addition, this study will assess and contrast pre- and post-priming activity levels which would further our understanding of the individual and overall impact of the possible selves on pain. This leads to the hypotheses stated below.

1.5.2 Research Hypotheses

It was hypothesised that anticipated activity levels would differ depending on the possible selves priming an individual underwent. Those in the feared-for pain selves group were anticipated to be more likely to avoid movement and were therefore expected to report less anticipated activity than the other two groups. In addition, they were expected to report less activity in comparison to their pre-priming selves. This led to the hypotheses stated below.

1. Individuals primed with a *feared-for pain possible self* will be more likely to indicate less post-test anticipated activity than the other two groups.

2. Individuals primed with a *feared-for pain possible self* will be more likely to indicate higher pre-test anticipated activity scores in comparison to their post-test anticipated activity scores.

It is more challenging to propose a hypothesis for individuals primed with the hoped-for self group, as there is less research from which to make a prediction. However, consistent with the avoidance-persistence model and clinical observation, individuals in the HFS group may anticipate persisting with their usual activities as much as is possible with ongoing pain. This would mean that instead of avoiding activity, as the FFS group is expected to do, they would continue to engage with activity at a similar level to that which they would anticipate for their current selves. Therefore, it is likely their post-intervention scores would be higher than the FFS group, but less than the control group. This idea led to the hypothesis stated below.

3. Individuals primed with a *hoped-for pain possible self* will indicate more post-intervention anticipated activity scores than those in the feared-for self group, and less anticipated activity scores than those in the control group.

CHAPTER 2: METHODOLOGY

2.1 Overview

This chapter describes the methodological approach and choice of methods used in this study in detail. First it presents the overall approach of this thesis, and then discusses the decisions made in relation to the development of the experimental design. The chapter concludes with an examination of the practical environment of the study and the implications of this choice.

2.2 Methodology and Design

As discussed in Chapter 1, the aim of this research was to prime pain-related future possible selves and investigate the impact of these on anticipated future behaviours. A qualitative approach was considered, as this would have produced rich data to explore individual's perspectives on future selves and activities. However, there already exists an extensive literature base of qualitative research in this area. In addition, the aim of this study was to investigate whether different future pain-related possible selves would influence an individual's choice of activities. The use of a quantitative methodology allowed for the manipulation of future possible selves and for an assessment of causality between this manipulation and activity responses (Babbie, 2010).

To meet the above aims this study used an experimental design. Originally this was envisaged as a simple three group pre-test, post-test design. Each group would have been given questions about their activities both before and after the treatment condition, a future possible selves manipulation. The type of manipulation given would have grouped the participants into three: hoped-for self group, feared-for self group and control group. This design would have achieved the research aims, but would also have been vulnerable to pre-test sensitization generally associated with this type of design (Willson & Putnam, 1982). Participants in this original design may have been

influenced, or sensitised, by the pre-test to the purpose of the study. They might have responded by altering their post-test responses to experimental demand, biasing the study results. The use of a between group design or within group design respectively in this study would result in an inability to separate the effect of the possible selves manipulation from the possible influence of the exposure to the pre-test. Therefore an experimental design that controlled for the possible effect of a pre-test as well as allowing for these manipulations was the most appropriate for use in this study. The most robust of these designs is the Solomon's four-group design (Solomon, 1949).

2.2.1 Solomon's Four-Group Design & Development

In 1949, Solomon presented a research design which addresses the challenge of pre-test sensitisation, whilst allowing for between and within participant measurements. This consists of four groups, two experimental and two control groups, and is summarised in Table 1. The treatment can be suggested to have an effect if $O_2 > O_1$, with $O_2 > O_4$, $O_5 > O_3$ and $O_5 > O_6$. This would suggest that the treatment is effective, even with groups 3 and 4 controlling for the possible effect of pre-test sensitization. This design effectively controls for threats to internal validity (Braver & Braver, 1988) and can assess interactions between the pre-test and treatment condition due to the presence of pre-test control groups (Huck & Sandler, 1973).

Table 1: Solomon four-group design

Group	Randomised to group	Pre-test	Treatment	Post-test
1	Yes	O_1	Yes	O_2
2	Yes	O_3		O_4
3	Yes		Yes	O_5
4	Yes			O_6

The experimental design used in this study was a development of the traditional

Solomon's design. There were two main adaptations made to this design, the first was

to increase the number of groups to accommodate the aims of the study, the second was

to make all group tasks equivalent.

The Solomon four group design is only intended to be used to study the influence of one

independent variable. The aim of this study was to manipulate two independent

variables, the hoped-for future self and the feared-for future self. In order to do this and

maintain the benefits of the design, two Solomon four-group designs were used. This

would have resulted in 8 groups, 4 experimental groups and 4 control groups. Of these

four control groups, two would have been identical pre-test, post-test groups and two

identical post-test only groups. For this study, these duplicate groups were condensed

into two single groups. This resulted in 6 experimental groups presented in Table 2.

Table 2: Adapted Solomon four-group design

Group	Pre-test	Treatment	Post-test
1	O_1	Hoped-for future self manipulation	O_2
2	O_3	Feared-for future self manipulation	O_4
3		Hoped-for future self manipulation	O_5
4		Feared-for future self manipulation	O_6
5	O_7		O_8
6			O_9

Using this design for the study ensured the benefit of controlling for threats to the

validity of the results, whilst enabling the comparisons necessary to meet the study aims.

The design facilitated hypothesis testing to determine whether activity choices can be

influenced by future possible selves and whether feared-for future selves might impact

activities more than hoped-for future selves. In addition, it permitted investigation of the impact of individual differences on future possible selves and activities, through questionnaires completed after the experiment. Controlling for the pre-test meant the effect of this and any interaction between the pre-test and hoped-for selves manipulation could be measured.

The second alteration to the modified Solomon design was to make all the groups as equivalent as possible. In the original design, the groups are different in terms of the tasks completed and therefore the time required of participants between groups varies. This difference in demand may leave the design vulnerable to participant fatigue effects. Therefore, to ensure all groups were equivalent in terms of demand, a distractor task was developed and presented to the pre-test control groups (3, 4 & 6) in place of the experimental pre-test. In addition, an experimental control condition was developed, and called the control future self condition (CFS). The development of the tasks and control condition are discussed fully later in this chapter. The final experimental design is presented in Table 3. This design required the development of three treatment conditions, each corresponding to one of the future possible selves manipulations and a control. In addition, two tasks, an experimental task and an appropriate distractor task needed to be created. The next sections of this chapter describe the processes of constructing these components of the design.

Table 3: Final experiment design

Group	Pre-test	Pre-test task	Treatment	Post-test
1	O_1	Experimental	Hoped-for future self manipulation	O_2
2	O_3	Experimental	Feared-for future self manipulation	O_4
3		Distractor	Hoped-for future self manipulation	O_5
4		Distractor	Feared-for future self manipulation	O_6
5	O_7	Experimental	Control future self condition	O_8
6		Distractor	Control future self condition	O_9

2.3 Development of the future possible selves manipulation

The three conditions comprised of scripts designed to manipulate participants into imagining different future possible selves. The concept of using scripts came from the literature on exercise-related possible selves. Research in this area has moved towards the empirical testing of hypotheses through experimental manipulation, as in the present study. Murru and Martin Ginis (2010) were the first researchers in this area to use scripts of physical activity possible selves to manipulate participant conditions. They created two scripts, termed "interventions": one related to a hoped-for self and another a feared-for self. These scripts contained short descriptions which encouraged participants to first imagine their future possible selves as fit and healthy (HFS) or unfit and unable (FFS). Questions were then used to support the description of these selves, to help participants in engaging with these imagined futures. They subsequently found that both of these future possible selves conditions contributed to an increase in exercise behaviours compared to a control condition. A replication of this study was carried out by Marcotte (2013), with similar findings. This suggests that the use of scripts with

questions to help focus and engagement is a viable way of experimentally manipulating future possible selves.

The scripts used in this study were based on those used by Murru and Martin Ginis (2010) and Marcotte (2013) and these are given in full in the method section (3.4.3). Three scripts were made, a hoped-for pain related future self script, a feared-for pain related future self script and a control future self script.

It is important to note that in this study, the term "hoped-for self" (HFS) is employed differently to the way it is generally described and used in the literature. Instead of referring to a hope for oneself in the future, it specifically relates to a hopeful self created in the context of someone experiencing ongoing pain (i.e., what is the best one could hope for if one experienced chronic pain?). Thus the HFS groups read a script which describes a hopeful future in spite of the presence of pain. This change is necessary to ensure the feared-for and hoped-for groups are as equivalent as possible and can be contrasted fairly.

The adaptation of the scripts needed some development. As in the above studies, all of the scripts consisted of a short introduction to the task, and a request to read the paragraph that followed carefully and answer the questions presented underneath. This next paragraph began by requesting that the participant imagine themselves 20 years in the future. This timeframe of 20 years was chosen as chronic pain prevalence increases with age (Keefe et al., 2004), and thus it was hoped that a long timeframe would help the script to seem realistic with our chosen participant group of students (see 2.6 and 2.7 below for more details on why this group was chosen).

The description that followed this introduction was to help guide the possible selves imagery and was therefore different depending on which of the conditions the participant was allocated to. They were again based on the scripts in Murru and Martin-

Ginis (2010) and Marcotte, which consisted of using a single sentence to introduce the possible self needed in the condition. However, these scripts focused on exercise possible selves and so two new sentences needed to be constructed for this study to induce a hoped-for and feared-for self. The control condition did not need a further priming sentence making as participants had already been asked to create a future self.

Careful consideration went into the wording of these sentences. This was to establish each sentence induced the appropriate possible self (HFS and FFS), whilst ensuring that the two sentences, when contrasted, did not differ significantly enough to bias the study. Furthermore, sentences which did not mention activities or engagement could not be used as this may have influenced the study findings.

To construct these sentences, the author reviewed the work of Kindermans (2012). Two of the studies in her thesis examined the words used by pain patients to describe their pain-related hoped-for and feared–for selves. It was hoped that using some of these words would make the scripts representative of the hoped and feared-for experiences of having ongoing pain. The author made two lists of these words, one relating to the HFS and one to the FFS and then discussed these words with her thesis supervisors (Professor S Morley and Dr Julia Hackett). This was to gain different perspectives into how representative these words were of the concepts, whether the words would induce difference concepts and to agree on the sentences. The words that were decided upon were "predictable"/"unpredictable" and "manageable"/"unmanageable", which were two commonly cited themes in the Kindermans study (2012). Thus, the hoped-for script described daily pain which was sometimes predictable and sometimes manageable, whereas the feared-for script described a pain which was sometimes unpredictable and sometimes unmanageable (see section 3.4.3 for full script wording). It can be noted that the only difference between the hoped-for and feared-for words, and sentences, is the

prefix: "un". Therefore these sentences were considered to be similar enough to not cause significant bias, yet different enough to induce differing future selves.

The four questions asked after participants read their paragraphs were adapted from the "Possible Selves Reflection Questions" created by Marcotte (2013). These questions were used as both of the studies above found they were useful to ensure participants had read the paragraph and help them to engage with the image. Three of the questions requiring elaboration of the participant's imagined future possible selves were adapted from Marcotte (2013). A further question relating to the impact of pain was introduced to encourage participants to think about how its presence may affect them.

The CFS condition simply asked the participants to imagine and describe a future possible self and the impact this would have on them. However, there was no mention of pain. It was identical to the HFS and FFS scripts, but without the additional sentence priming the specific future self.

The scripts and questions for each condition constituted the "treatment" phase of the Solomon's design. Thus a participant's future possible self was manipulated by being presented with the possible self script corresponding to the condition they were assigned to. The impact of these future possible selves on behavioural preferences was measured through a post-test task which measured behavioural activity preferences. Participants were asked to respond to this task as if they were the future possible self they had generated during the manipulation. In addition, three of the groups completed this task at pre-test stage, from the point of view of their current self. This allowed for both within group and between group comparisons. A task, termed the behavioural preferences task, was developed due to the lack of suitable existing exercises.

2.4 Development of the behavioural preferences task

The behavioural preferences task aimed to measure the extent to which a participant would choose to engage in a particular activity. As can be seen in Table 3, the three experimental groups (1, 2 and 5) completed two sets of this task, both before and after the future possible selves manipulation. The pre-test sensitisation control groups (groups 3, 4 and 6) completed one presentation of this task, after the future possible selves induction. The function of this task was to present activities that a participant could choose to engage with, that is, indicate activities they would exhibit a behavioural preference for. This was a forced choice task, where one would have to indicate (to varying degrees) that they would, or would not, engage with an activity.

The activities asked about in this task required careful consideration. They had to be representative of usual day to day activities, so that those groups undergoing the pre-test presentation could relate to them. Additionally, they also needed to comprise a mixture of the contextual factors implicit when asking about preferences for behaviours: the environment and social interaction. This aimed to control for individual differences in inclination for staying at home versus going out and for social interaction as opposed to individual activities. Therefore there were four categories of activities used in the forced choice questions which developed from these two factors: social and going out, social and staying in, individual and going out and finally, individual and staying in. Furthermore, these activities had to be things those experiencing pain would potentially be able to engage with. Existing lists of activities used in pain scales, based on a study by Richardson and Morley (2015), provided an ideal beginning for an item pool from which to select the activities. These needed to be categorised by their contextual factors, so that these factors could be equally represented in the experiment. To ensure the impartial categorisation of these activities, a small survey was conducted.

2.4.1 Design and Materials

A list of activities was constructed by taking items from an existing survey about pain and activity and adding to this with results from a literature search. The existing questionnaire was the Action Identification for Pain questionnaire (AIP) compiled by Richardson and Morley (2015). They conducted a thorough literature search of all general pain measures mentioning activities in English language and integrated 40 items to make the AIP from the following measures: "Chronic Illness Problem 38 Inventory (Kames, Naliboff, Heinrich, & Schag, 1985), Groningen Activity Restriction Scale (Kempen & Suurmeijer, 1990), Pain Disability Index (Pollard, 1984), Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gilson, 1981) and West Haven-Yale Multidimensional Pain Inventory (Kerns, Turk, & Rudy, 1985)" (p. 37-38). The current study replicated Richardson and Morley's literature search in 2014 and an additional 7 items were added; 3 from the Quality of Life Scale (Cowan & Kelly, 2003) and 4 from the Quebec Back Pain Scale (Kopec et al., 1995). This resulted in a 47 item survey for participants to categorise (see appendix 1).

For each activity, participants were asked forced choice questions about whether an activity involved going out or staying home, and whether they considered it a social activity. This allowed the researcher to create categorised lists of items based on the responses e.g., "social, going out", "not social, staying home".

2.4.2 Sample

A sample of the researcher's friends and family (n=14) completed the survey. This comprised 7 males and 7 females, with an age range between 18 and 57 years. None reported having experienced chronic pain.

2.4.3 Procedure

Participants were given a short information sheet and the activity list questionnaire and asked to complete all questions. These were returned to the researcher and feedback on any difficult or ambiguous items was sought. In response to feedback, one item was removed from this list due to ambiguity.

2.4.4 Analysis

Items were investigated for the level of agreement relating to the categories they fell into. Items with agreement of both factors comprising of over 80% were accepted into the corresponding category. The four categories and examples are shown in Table 4.

Table 4: Categories and example items

	Social Activity	Individual Activity
Staying in	A social activity staying in, e.g. Joking with family members	A non-social activity staying in, e.g. Reading
Going out	A social activity going out, e.g. Going out for entertainment	A non- social activity going out, e.g. Doing the shopping

2.4.5 Results

Of the 47 items, 32 items reached 100% agreement on both factors and 42 items reached over 80% agreement on both factors. Since this experiment required a small number of activities, only items with 100% agreement were selected as suitable for use in this research. These were then categorised on Microsoft Excel spreadsheets according to the responses using the categories specified in Table 4. The Excel function

"=RANDBETWEEN(first number,last number)" was used to select one activity from each category and also select a further random activity from all four categories to produce the five items necessary for the task (see method chapter section 3.4.1 for further task details).

Due to the possible impact that pre-test sensitisation could have on biasing participant responses, it was necessary to include control groups for each experimental condition in the design. To ensure the experimental and control groups were as equivalent as possible; a task with demands similar to the activities choices task was constructed. This was called the preferences distractor task, which was completed by control groups instead of the activity choices pre-test task.

2.5 Development of the preferences distractor task

The preferences distractor task aimed to present a task which was similar to the behavioural preferences task. As can be noted from Table 3, there were three groups that were to function as pre-test sensitisation control groups. To aim to make the groups as equivalent as possible, it was necessary to design a task which was similar to the behavioural preferences task yet focused on a different topic, to avoid sensitising participants to the topic of study. The topic chosen was general preferences, which came from the idea that participants could indicate general preferences for things other than behaviours (e.g. cake). This was to be an almost identical forced choice task to the behavioural preferences task, using different questions and slightly modified responses. To ensure an impartial list of preferences, a survey was conducted.

2.5.1 Design

This survey used a questionnaire, comprised of free response sections where participants were asked to generate items for which a like or dislike could be stated. One example was given, which was "the taste of bananas".

2.5.2 Sample

A sample of the researcher's friends, family and colleagues from the doctorate of clinical psychology completed the questionnaire (n=21). This comprised 9 males and 12 females, with an age range between 22 and 53 years. None of this sample reported they had experienced chronic pain. This was assessed through a question on the questionnaire: "Do you, or have you ever suffered with pain lasting longer than 3 months?".

2.5.3 Procedure and Materials

Participants were given a short information sheet and the questionnaire and asked to complete all questions. The questionnaire asked participants to list 3 pairs of items where they would have a preference for one thing over another, with an example being "Coca Cola vs Pepsi". They were asked specifically not to list activities. If activities were listed, these were excluded as the purpose of the task was to assess for pre-test sensitisation.

2.5.4 Results

Participants suggested 57 items that did not relate to an activity choice. These items were eliminated if repeated. These items ranged in themes around sport, the weather, mood, food, drinks, and entertainment. Of these 46 were unique items which were then added to the item preferences pool (see appendix 2) on a Microsoft Excel spreadsheet. The Excel function "=RANDBETWEEN(1,46)" was used to select five activities from this pool to produce the five items for the task.

2.5.5 Summary

Both the behavioural preferences task and preferences distractor task generated pools of activities and items individuals could express a preference for. These tasks were then

used in the experiment. For more details of how these items were used in the study and the questions and responses available, see the method chapter (section 3.4.2).

2.6 Challenges of using this design

Although the Solomon's four-group design is very robust, Whitman, Van Rooy, Viswesvaran, and Alonso (2008) suggest that it is underused because of both the complexity of statistical analysis and the number of participants required to reach an appropriate power. The analyses involved in a traditional Solomon's four-group design are complex, but thorough guidance exists given by Braver and Braver (1988). In this study, the complexity of analyses was further complicated by the modified design. A full discussion of the series of analyses can be found in the results in chapter 4.

The problem in recruiting enough participants for the design to achieve sufficient power in the present study was also a difficulty. Originally, this study planned to investigate hoped and feared- for future selves and behavioural activity with chronic pain patients. However, previous thesis studies with this patient group found that recruitment was a significant challenge (e.g., Donaldson, 2012; Wells, 2010). Therefore, a more readily available participant group of University of Leeds students was used.

2.7 Student Research

Using students in this study enabled the collection of a large sample through an internet based experiment. Although it is often suggested student research is limited in terms of generalisability, considering a future possible self is a universal ability, and is not influenced by education or job role (Markus & Nurius, 1986). Young adults are at a point in their lives where they are considering their future in depth, perhaps more so than older adults (Frazier et al., 2003; Hooker, 1992; Oyserman & Fryberg, 2006).

However, the question of whether students can successfully imagine the experience of persistent pain remains.

Markus and Nurius (1986, p. 959) conducted their initial possible selves study on students and stated that "these students imagine an extremely heterogeneous set of possibilities for themselves, and these possibilities do not appear to be particularly constrained by their current or now selves, even in domains such as personality, others' feelings toward them, and physical characteristics". Further research has demonstrated that students can be guided to successfully generate and engage with a wide range of possible selves, relating to delinquency, careers, and health (Burack et al., 1997; Cross & Markus, 1991; Inglehart, 1987; Ouellette, Hessling, Gibbons, Reis-Bergan, & Gerrard, 2005). Furthermore, students have been demonstrated to participate well in similar studies using possible selves scripts (Marcotte, 2013; Murru & Martin Ginis, 2010).

This suggests that, with guidance, students are capable of creating a realistic persistent pain-related possible self. There is no literature which suggests that students, or the wider population would find creating a pain-related possible self difficult, however, this may be due to a publication bias. Interestingly, if we consider how possible selves are constructed, it becomes clear that students probably would be able to produce these selves. Markus and Nurius (1986) state that the range of possible selves one holds is related to self knowledge and sociocultural context. This suggests that if a student has experienced any ongoing pain at any point in their life, or knew of someone who had, they would hold self knowledge which would aid them in creating this pain-related possible self.

Thus, using only students in this study should not impact on the validity or generalisability of the results. However, since this is the first research of its kind in the

area, it may be pertinent to consider it as an initial foundation on which further research can be based.

2.8 Internet Based Studies

With the introduction of the internet in the early 1990s, a new method of recruitment and data collection became available - internet based research studies (Wright, 2005). The Office of National Statistics (ONS, 2013) found 36 million adults in the UK, including 90% of students, use the internet regularly (Eurostat, 2005). Richards and Tangney (2008) investigated the feasibility of using students in online research and suggest they are a suitable and accessible population for this type of research.

In addition, Couper, Tourangeau, and Steiger (2001) found that interacting with a computer interface significantly reduces the influence of social desirability effects, which is particularly important in this research. When considering literature comparing internet and paper based questionnaires, it is suggested they are equivalent (e.g., Dillman, 2011).

There are disadvantages with implementing an online study. A common critique is the nonresponse bias, which suggests that individual characteristics of those who respond to online surveys may be different to non-responders (Nulty, 2008). Foremost, the ability to use the internet is paramount for participation. However, since most courses at the University of Leeds require students to have basic skill in using the internet, this factor was not considered significant enough to bias the results of this study.

Kays, Gathercoal, and Buhrow (2012) suggest gender can be considered an important factor in response rates to online surveys. They found that around 65% of their online respondents were female and proposed this could influence the representativeness of internet based studies. However, this figure is representative of the published Leeds

University student gender ratio of approximately 60% female population (University of Leeds, 2014). Therefore this study anticipated a gender split proportional to this population.

Achieving high response rates in online surveys can be problematic, however, similar internet studies and previous thesis projects have achieved good numbers of participants and representativeness (e.g., Miller, 2010). One way of maximising response rates is through providing an incentive to participants. Erlen, Sauder, and Mellors (1999) caution that this must be carefully considered to achieve thoughtful participation as participants may rush responses to gain the incentive. The current study provided printer credits to students, with a printer credit, valued at £3.00, assigned to the participant's university account on completion of the survey.

Reviews were consulted which set out guidelines for increasing response rates in internet based surveys (Nulty, 2008; Patton, 2005; Umbach, 2004). These suggest that having an accessible website and allowing for the participant to save progress and return to complete at their convenience boosts response rates significantly. For these reasons, the present research selected the Bristol Online Survey system as the online platform for presenting the questionnaires. This program enabled easy access to the questionnaires and allowed survey progress to be saved.

2.9 The Bristol Online Survey

Questionnaires were hosted online using a system known as the Bristol Online Survey website (BOS, 2007). This online system has been used in previous studies (e.g., Miller, 2010). Each of the conditions in the experimental design was constructed as a different survey on the BOS website. When the experiment and subsequent questionnaires were completed, responses were stored online by the BOS system until the data was extracted

for analysis. However, the BOS system was unable to employ randomisation procedures; therefore a splash page was developed.

2.10 Splash page development

A splash page is the introduction page of a web site. The purpose of the splash page in this study was to randomise the participants to the experimental conditions. This page contained the information from the participant information sheet and then two buttons so that a participant could click on their gender and proceed to an experimental condition. Computer code then randomised the participants to one of the six experimental conditions hosted on the BOS website.

The hosting, construction and coding of the splash screen was created by members of the Yorkshire Centre for Health Informatics team. Several meetings were held to support the development of this page, clarify the purpose and shape the functioning of this page. After initial development the page was tested and the coding did not perform the expected randomisation. However, after discussing this with the Informatics team and supporting a change of code, testing of the splash page demonstrated it randomised to one of the six experimental conditions hosted on BOS.

CHAPTER 3: METHOD

3.1 Design

This study was an internet-based experiment, which used a 2 x 3 design. The factors were pre-test group (2 levels; pre-test or no pre-test) and possible selves group (3 levels; hoped for self, feared for self and control future self). Figure 3 presents the design and processes for each group.

The top three groups shown in Figure 3 are the experimental pre-test post-test groups. The bottom three groups are the post-test only control groups. To control for pre-test sensitisation, these groups completed a distractor task (termed the preferences distractor task) instead of the activity choices task, but were otherwise identical to the experimental groups.

Factors demonstrated to impact on perceptions of pain or participants ability to engage with future possible selves induction were assessed after test completion. This design allowed for the minimisation of confounding variables such as individual differences in mood and activity as well as extraneous factors such as testing environment.
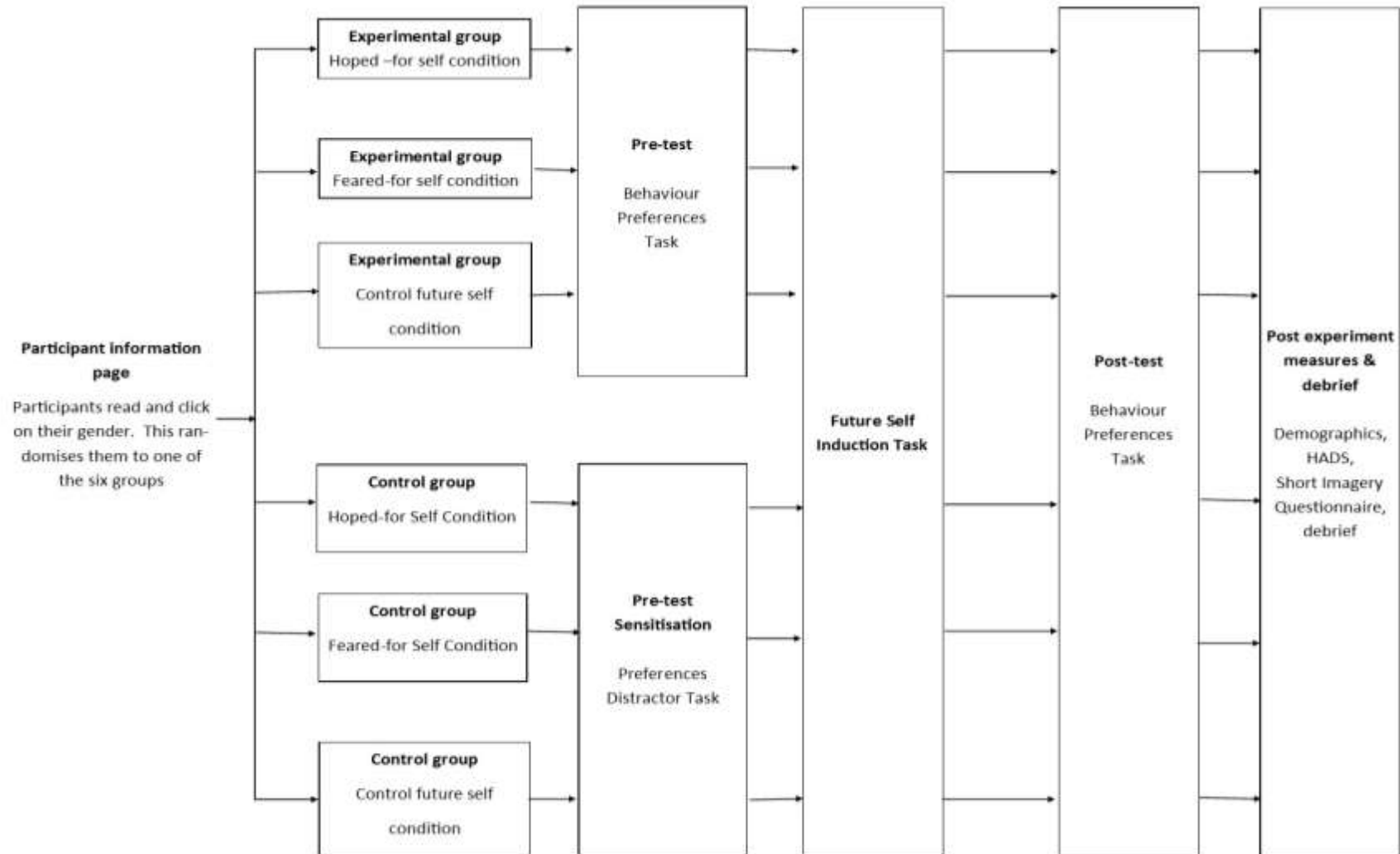
Figure 3: Overview of design

3.2 Ethical Considerations

Ethical concerns were considered during the development of this project and the need for care around these issues was recognised. Concerns about asking participants to imagine their future selves in pain were raised. Since possible selves theory would suggest that individuals are capable of, and do, consider their possible feared for selves on a regular basis, it was therefore decided that this experiment would be a brief variation to an everyday occurrence.

In addition, the researcher considered the impact of asking participants who may be in pain to complete the questionnaires. It was decided that if participants were in pain and considered the future possible selves induction to be unmanageable, they would choose to disengage from the study.

These can be sensitive issues and thus contact details for appropriate support organisations were included in the study debrief information. Leeds University Nightline, Leeds University Student Counselling Centre and The Samaritans were contacted to request permission to include their details and all consented.

3.2.1 Ethical Approval

Ethical approval for this study was granted by the University of Leeds, School of Medicine Research Ethics Committee (SoMREC). A copy of the approval letter is presented in appendix 3.

3.3 Participants

Participants were recruited through posters displayed around the university, study participant pools, and emails cascaded through university departments containing a link to the participant information webpage (appendix 4). All participants were offered an incentive of £3.00 of printer credits.

3.3.1 Inclusion and Exclusion criteria

Inclusion criteria were that participants were undergraduate or postgraduate students registered with the University of Leeds and needed to be adequately fluent in English to complete the measures. Since all of the participants were students studying at the University, it was assumed that they would all have a good understanding of English, which would have been necessary to complete their courses. The exclusion of potential participants experiencing chronic pain and individuals with low mood was considered, as these factors could have influenced their responses (Gable, Reis, & Elliot, 2000). However, during the development phase of this research it was decided to include these participants, and consider these factors in additional analyses.

3.4 Tasks

3.4.1 Behaviour Preferences Task

The behavioural preferences survey produced a pool of items divided into categories of activities based on whether these involved staying in, going out, were social activities or were individual activities. These categories combined created four categories of activities: "staying in-social", "going out- social", "staying in-individual" and "going out-individual". These were kept on four separate Microsoft Excel worksheets, and arranged so that each activity occupied a numbered row. An Excel formula was then used to select an activity from that sheet, and then another formula to select a random activity from all four worksheets. This resulted in a total of five activities randomly selected per task.

To create a behavioural preferences task, these five activities were integrated into the following question: "How likely would you be to [insert activity]?". Responses were measured using a six point Likert scale. Although two option forced choice responses

were considered (e.g., Yes/No), Toner (1987) suggested that they are not sensitive enough when researching abstract concepts and posits balanced Likert scales as a viable alternative. A mid-point response was not included to avoid acquiescence responding.

Possible responses ranged from the negative to positive: "Definitely Would Not", "Probably Would Not", "Would Not Consider", "Would Consider", "Probably Would" and "Definitely Would". To score these scales a 1 to 6 scoring system was used, where 1 indicated a response of "Definitely would not" and a score of 6 indicated "Definitely Would". The scores for the five questions were then summed to give a total "activity engagement" score, where 5 was the lowest possible score and 30 the highest. These total scores were then used in analyses. Five questions relating to anticipated engagement with activities were included in each task, these are presented in Table 5. The first five questions were presented to individuals in the pre-test groups as their first task, whereas the other group received the five preferences distractor task questions. All groups completed questions 6 to 10 after undergoing the possible selves intervention.

Table 5: Questions used in the Behavioural Preferences Tasks

Question Number	Task	Question
1	1	How likely would you be to spend time with family?
2	1	How likely would you be to clean the house?
3	1	How likely would you be to eat out at a restaurant with friends?
4	1	How likely would you be to do the food shopping?
5	1	How likely would you be to stay in and read a book?
6	2	How likely would you be to visit friends?
7	2	How likely would you be to stay in and sleep during the day?
8	2	How likely would you be to go to a party?
9	2	How likely would you be to go out walking on your own?
10	2	How likely would you be to go on holiday with friends or family?

Task 1 = Pre-test behavioural preferences, Task 2 = Post-test behavioural preferences

3.4.2 Preferences Distractor Task

The preferences distractor task was designed to produce items where an individual could respond with their preference. These items were not related to activities to avoid any sensitization effects on the post-test responses. These pairs were kept on a Microsoft Excel worksheet, with each item occupying a single numbered row. A randomisation formula was then used to select five items from this worksheet.

Similarly to the activity choices task, these five preference items were incorporated into the question: "How much do you like [preference item]?". To make this task as similar as possible to the behavioural preferences task, a comparable set of response choices were used. This wording supported a response that indicated a degree of choice rather

than a simple forced choice response. The five questions used in the preferences distractor task can be seen in Table 6.

Responses to this question were measured on a six point Likert scale and the range of possible responses reflected various degrees of preference. These were "Definitely Dislike", "Often Dislike", "Dislike Somewhat", "Like Somewhat", "Often Like" and "Definitely Like". The scoring was identical to the behavioural preferences task. Since this was a control task the scores were not used in the main analyses, but were analysed for responding biases.

Table 6: Questions used in the Preferences Distractor Task

Question Number	Question
1	How much do you like rugby?
2	How much do you like cake?
3	How much do you like pop music?
4	How much do you like the colour blue?
5	How much do you like watching the news?

3.4.3 Possible Selves Induction

This experiment combined the scripts used by Murru and Martin Ginis (2010) and Marcotte (2013) and adapted them to focus on pain-related future possible selves, instead of physical activity possible selves. Three scripts were produced, which correspond to the three manipulation groups in this experiment, the "hoped-for", "feared-for", and "control" future possible self scripts. These scripts asked participants to imagine themselves 20 years in the future and describes a future with sometimes

predictable and manageable pain (hoped-for), a future where pain is unpredictable and

unmanageable (feared-for) and a script with no mention of the presence of pain

(control). The inductions presented to each group are shown in Table 7.

Table 7: Possible selves scripts by group

Group	Script
HFS	We are interested in your ability to imagine yourself 20 years from now. More specifically, we would like you to think about yourself in the future as a person who experiences chronic pain, which is sometimes predictable and sometimes manageable. When you think about this future self who experiences chronic pain (we will call this your pain possible self), what images come to mind? **Please take a few minutes to imagine and think about this image.** Now that you have imagined a pain possible self, please take a minute to reflect upon and to answer the following questions. Please remember that while it is not imperative that you write a lot for each question, it is important that you try to answer each one.
FFS	We are interested in your ability to imagine yourself 20 years from now. More specifically, we would like you to think about yourself in the future as a person who experiences chronic pain, which is sometimes unpredictable and sometimes unmanageable. When you think about this future self who experiences chronic pain (we will call this your pain possible self), what images come to mind? **Please take a few minutes to imagine and think about this image.** Now that you have imagined a pain possible self, please take a minute to reflect upon and to answer the following questions. Please remember that while it is not imperative that you write a lot for each question, it is important that you try to answer each one.
CFS	We are interested in your ability to imagine yourself 20 years from now. When you think about this future self (we will call this your possible self), what images come to mind? **Please take a few minutes to imagine and think about this image.** Now that you have imagined a possible self, please take a minute to reflect upon and to answer the following questions. Please remember that while it is not imperative that you write a lot for each question, it is important that you try to answer each one.

HFS = Hoped for self group, FFS = Feared for self group, CFS = Control future self group

To ensure the participants were fully engaged with the induction, this study also incorporated Marcotte's (2013) method of using questions with free text responses relating to the imagined future possible selves. Four questions put forward by Marcotte were selected as relevant to this aim and were presented underneath the scripts to facilitate engagement with the induction. These focused on describing the future self in detail and indicating what they felt life might look like for that future possible self. These are shown in Table 8.

Table 8: Questions used to enhance possible selves induction for all groups

Question Number	Question
1	What was the first thing that came to mind when you imagined yourself as someone with chronic pain? Please describe this with as much detail as possible.
2	What does this image look like? Can you describe your appearance?
3	Can you imagine anything you might find easy or difficult as this future self?
4	How realistic does this image feel?

3.5 Measures

3.5.1 Demographic Measures

The following demographic data were collected: gender, date of birth, university faculty and course, any current pain, or family members with pain. If participants indicated that they, or a close family member experienced pain, then whether the pain had continued for more than 6 months was recorded. These pain factors were recorded as having some experience of ongoing pain may influence the activity scores (e.g., Asmundson et al., 2012; Vlaeyen & Linton, 2000).

3.5.2 The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)

The HADS was used as a measure of current affect, presented in appendix 5. It was selected for use in this study as it is simple to administer. It is also a well validated and reliable measure of anxiety (mean α=.83) and depression (mean α=.82) as found in a large review by Bjelland, Dahl, Haug, and Neckelmann (2002). When administered online it has also been demonstrated to produce meaningful data which is consistent with pen and paper administration (Andersson, Kaldo-Sandström, Ström, & Strömgren, 2003). This study found that reliability was moderately high for both the anxiety (α=.75) and depression scales (α=.67). The HADS consists of two separate subscales for anxiety and depression. Responses to the seven questions comprising each scale are summed to produce a total score for the subscales.

3.5.3 The Imaging Ability Questionnaire (IAQ; Kwekkeboom, 2000)

The imaging ability questionnaire was used as a measure of imagery ability. Ability to create and engage with an imagined image was essential for the future possible selves induction to work effectively, however, this ability varies between individuals. The IAQ is a 32 item questionnaire consisting of a 21 item subscale investigating the ability to produce a mental image. The following 11 item subscale investigates a participant's ability to become engrossed in the image. The IAQ was chosen as it has been recommended for studies requiring imagery engagement (Andersson & Moss, 2011) and has been previously used to measure imagery ability as a possible confound in a previous study which also induced possible selves (Marcotte, 2013). Kwekkeboom (2000) found the IAQ had high reliability (0.93) and internal consistency (0.92).

During development of this study it was decided to shorten the IAQ to avoid fatigue effects from the length of the experiment. The acceptable test length was calculated using the Spearman-Brown prophecy formula, which indicated that if 0.8 were set as the

lowest desirable reliability the test could be shortened to 10 items. To ensure that the subscales were proportionately represented, 6 questions were presented from the "imagery production" subscale, and 4 from the "imagery engagement" subscale. The 10-item IAQ used in this study can be found in appendix 6. In this study, the reliability of this 10-item scale was found to be high ($\alpha = .89$).

3.6 Schedule of Administration

The tasks and measures were administered using the following schedule presented in Figure 4. These schedules were constructed in this order to avoid potential methodological biases. Participants were first presented with the experiment, before other potentially influencing factors of imaging ability and mood were assessed. Demographics, including presence of pain or chronic pain were collected last, as this may have drawn participant's attention to the true purpose of the experiment and influenced their answers.

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┌─────────────────────────────────────────────────────────┐
│         Task 1: Behavioural or Distractor Task           │
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┌─────────────────────────────────────────────────────────┐
│             Future Possible Selves Induction             │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│           Task 2: Behavioural Preferences Task           │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│          Imaging Ability Questionnaire (IAQ)             │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│  Hospital Anxiety and Depression Questionnaire (HADS)    │
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┌─────────────────────────────────────────────────────────┐
│                      Demographics                        │
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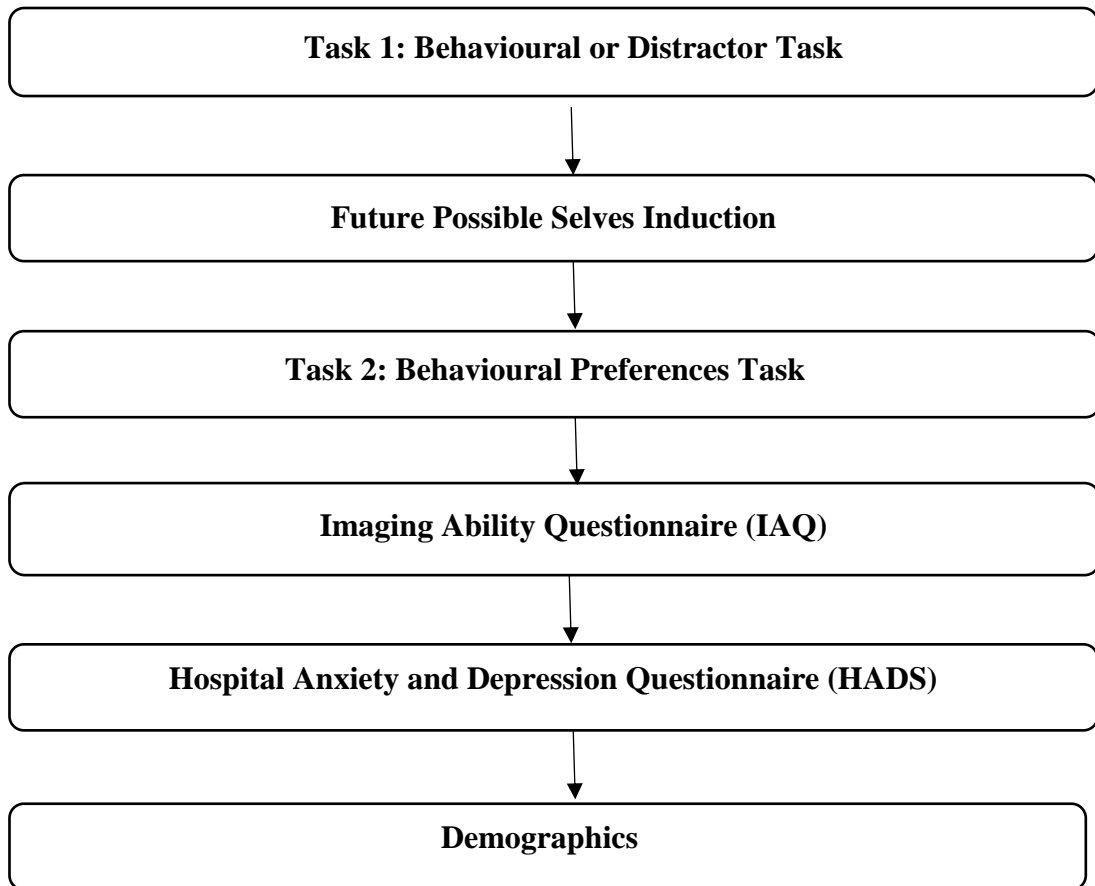
Figure 4: Schedule of administration

3.7 Procedure

Participants were invited to take part through email and posters around the university containing the website address of a participant information page (appendix 4). This page briefly described the research and included details regarding confidentiality of responses, anonymity of data and voluntary nature of participation.

If individuals consented to take part, they selected their gender and were randomised to one of the six conditions. They then completed the experiment, consisting of the experiment, HADS, IAQ and demographic information. At this point they recorded their email addresses which were credited with the printer credits and were presented with a page containing debrief information (appendix 7). This included a statement

reminding participants they could withdraw from the experiment at any point and contained links to information about sources of support, in the case that they were emotionally affected by the research.

The process of the experiment and questionnaires took around 15 minutes to complete. Participants were able to save their responses mid-completion and return back to this later to allow for breaks. Due to the nature of the study any partial completers would be automatically withdrawn prior to analysis. During data analysis, any identifying information (e.g., email addresses) were removed from the data set and participants were assigned identification numbers to preserve anonymity.

CHAPTER 4: RESULTS

The data were analysed to check whether they met the assumptions of normality and homoscedasticity for parametric testing. The distribution of data was examined using histograms, values of skewness and kurtosis, stem and leaf plots and the Kolmogorov-Smirnov test. This allowed for violations of assumptions and outliers to be determined. In a few of the experimental groups, some of the scale variables (HADS anxiety and depression scores and activity scores for two of the six groups) were found to be not normally distributed. Activity scores were not an established scale, but rather a measurement of anticipated activity created for this study and were therefore not necessarily expected to produce normal data. However, transformation of all variables, using Log10 and Log10+1 and square root values were considered, however, these did not improve normality.

A matrix scatter plot was conducted on SPSS to investigate relationships between these variables. It was used as a tool to investigate whether violations of normality were confined to a single variable or whether there were consistent patterns throughout the data set and relationships between these non-normal groups. If the former is the case, then it is likely that outliers in the data set are causing the normality and there is no challenge to parametric analysis. However, if the lack of normality is related to other variables, then more complex parametric analysis which considers covariance must be used. The groups and therefore distributions were found to be independent of one another and thus individual data outliers were considered as the cause of the violations of normality.

Groups were then individually examined to investigate outliers and variance, using Q-Q plots and descriptive information. It was observed that the standard deviations of the groups did not vary significantly from one another and the lack of normality appeared to

be due to the presence of a small number univariate outliers in those data sets. None of these values were indicated to be significant outliers and were therefore included in the analysis. Both parametric and non-parametric methods were considered for the main analysis. Both hypotheses were testing using both methods to consider any difference in outcome. This showed the results obtained from conducting ANOVAs (factorial and repeated measures ANOVAs) were similar to those that would have been obtained from non-parametric methods (Kruskal-Wallis test, followed by a Dunn's test and a Friedman's ANOVA), but that the latter method involved the implementation of more tests, increasing the chances of a type I error. In circumstances where either method can be used, Tomkins (2006) suggests a researcher should employ the tests which results in the least error as long as these are appropriate statistical tests for the data. Therefore the decision was made to proceed with parametric main analysis, as due to the sample size the ANOVAs used were considered robust enough to maintain validity despite small deviations from normality. However, any supplementary analyses which considered the non-normal data used non-parametric analyses.

4.1 Sample Characteristics

A total of 159 participants completed the online study on BOS over a 4 month period. They were recruited through email lists, posters displayed around the university and leaflets. This number of participants is similar to that obtained by a previous study using a large scale BOS survey (Miller, 2010). Participants were asked to indicate the faculty that their university course of study belonged to. Table 9 shows the frequency of university faculty. It can be noted that participants were from a wide range of faculties. A request was made to the University of Leeds for statistics showing the overall numbers of students in each faculty for 2014-2015 so our sample could be

compared for representativeness. However, a response stated that this data was not readily available.

Table 9: Frequency and percentage of university faculty

University Faculty	Frequency	Percentage
Arts	22	13.8
Biological Sciences	16	10.1
Business	18	11.3
Education, Social Sciences and Law	15	9.4
Engineering	11	6.9
Environment	13	8.2
Mathematics and Physical Sciences	14	8.8
Medicine and Health	45	28.3
Performance and Visual Arts	5	3.1

Participants were randomised to one of 6 groups. A further 12 potential participants began the study but disengaged part way through. As these individuals did not reach the final page of the study (demographics and email) there is no information available on those who did not complete the study. Only completed data sets were submitted for analysis. Table 10 shows summary demographic statistics for the sample by group.

Table 10: Summary demographics for the sample by group

		Group					
		Pre-test			No pre-test		
Variables		HFS	FFS	CFS	HFS	FFS	CFS
		n=25	n=25	n=24	n=30	n=26	n=29
Age	M	20.84	20.16	20.41	20.70	19.35	19.62
	SD	4.52	4.29	4.15	4.10	2.15	1.99
Gender m/f		12/13	12/13	9/15	16/14	10/16	14/15
(% of group)		(48/52)	(48/52)	(37.5/62.5)	(53.3/46.7)	(38.5/61.5)	(48.3/51.7)
Pain		7	8	8	9	10	9
experience		28	32	33	30	39	31
(% of group)							
HADS	M	3.16	4.44	3.25	3.90	3.03	3.62
Anxiety	SD	2.36	3.81	3.17	3.42	2.34	2.64
HADS	M	5.08	4.36	5.13	4.97	4.85	4.28
Depression	SD	2.25	2.07	1.80	2.19	1.87	2.27
IAQ	M	31.76	34.00	29.42	34.10	31.04	32.28
	SD	8.07	8.41	6.45	8.67	8.52	5.74

HFS = Hoped for self group, FFS = Feared for self group, CFS = Control future self group

The overall sample mean age of respondents was 20.18 years (sd = 3.63). Age was not normally distributed, $D(159)$ = .29, $p < .001$. This was expected due to the target population of university students. A Log10 transformation was conducted as data were positively skewed, however, this did not improve the normality statistic. As can be noted from Table 10, the differences in age between each group were minimal and a Kruskall-Wallis test, adjusted for ties in the data, found there were no significant differences in age between groups, χ^2 (5, N=159) = 2.19, p>.84.

As part of the randomisation, participants were asked to indicate their gender. In total, 73 males (45.9%) and 86 (54.1%) females participated in the study. This was generally representative of the University of Leeds overall gender ratio of 60% female, 40% male. The number of male and female participants varied by experimental group. A chi-square analysis was performed to investigate whether gender was equally represented throughout the six groups. This found no significant differences between the groups in terms of gender, χ^2 (5, N=159) = 2.08, p>.05.

Participants also indicated whether they or a relative had any experience of ongoing pain, or were in pain at the time of testing. The purpose of recording this was to examine whether these participants responded differently to the activity questions than others without pain experience. An independent samples Mann-Whitney U test found no significant differences between pre-intervention anticipated activity responses for participants with pain experience (Mdn = 23.00) and those reporting no pain (Mdn = 23.00), $U(72)$ = 569, z = -.205, p = .84. In terms of post-intervention anticipated activity responses, an independent samples Mann-Whitney U test also found no significant differences in these for participants with pain experience (Mdn = 20.00) and those reporting no pain (Mdn = 23.00), $U(157)$ = 3149, z = 1.46, p = .144.

Data from the HADS was divided into the anxiety and depression subscales for analysis.

Descriptive data for the HADS anxiety and depression subscale scores, for the entire

sample, are given in Table 10. The highest level of anxiety was reported by participants

undergoing the pre-test feared-for self condition. However, those individuals who

completed the feared-for self condition without the pre-test reported the lowest anxiety

levels. In terms of the HADS depression subscale, participants in the control condition,

without the pre-test, reported the lowest levels of depression (M= 4.28). The highest

levels of depression were reported by individuals in the control condition undergoing

the pre-test (M= 5.13). Kendall's Tau was used to examine any correlations between the

HADS subscale scores and post-intervention anticipated activity scores. No significant

relationships were found between either HADS subscale score and the post-intervention

anticipated activity scores, however, the HADS depression score was significantly

positively correlated with the HADS anxiety scores, $r\tau = -.179$, $p= .003$.

The mean overall reported HADS scores for anxiety (M = 3.58) and depression (M=

4.77) were within the normal, non-clinical, range as indicated in Zigmond and Snaith

(1983). These findings are similar to those reported by Crawford, Crombie & Taylor

(2001) who found higher HADS anxiety scores (M= 6.14) and slightly lower depression

scores (M= 3.68). However, the HADS total score in that study (M= 9.82) was similar

to the finding of this study (M= 8.35).

Measures of participants imaging ability were assessed using the imaging ability

questionnaire (IAQ). Scores can be seen for each group in Table 10. IAQ scores were

high, indicating that participants' ability to produce and engage with mental images was

generally good (Kwekkeboom, 2000). Kendall's Tau was used to examine any

relationships between IAQ scores and pre- and post-intervention anticipated activity

scores, as activity scores were not normally distributed. There was a single significant

correlation found between IAQ scores and post-intervention anticipated activity scores for the feared-for selves group undergoing the pre-test, $r\tau = -.471$, $p= .001$.

4.2 Main analyses

The effect of the pre-test and the main analyses are reported here. The two main hypotheses predicted that the feared for self would result in reduced anticipated activity, both between and within participant groups. All effects are reported as significant at $p < .05$.

4.2.1 Effect of pre-test

A mixed factorial ANOVA was conducted to investigate the effect of the pre-test on both post-intervention anticipated activity scores. This analysis considered between-participants factors of pre-test group, with two levels, pre-test and distractor task (i.e., the pre-test sensitisation control group) and possible selves, with three levels, hoped-for self intervention, feared for self intervention and control future self group. The within-participants factor was time of measurement of activity levels, with two levels, pre and post intervention. This found no significant differences on post-test activity scores between the pre-test and no pre-test groups, $F(1,153) = .234$, $p = .947$. Furthermore, Bonferroni post hoc comparison tests revealed that there were no significant differences between any of the individual group pre-test scores. Therefore responses were similar in the pre-test and no pre-test groups and thus the pre-test did not sensitise participants to the experiment's purpose.

4.2.2 Between participant contrasts

To examine the between groups differences in anticipated activity scores, a factorial ANOVA was conducted. This had two fixed factors, pre-test group with two levels, pre-test and distractor test (pre-test sensitisation control) and possible selves, with three

levels, hoped-for self intervention, feared for self intervention and control future self group.

There was a non-significant main effect of the pre-test on post-intervention anticipated activity scores, $F(1, 153) = 1.49$, $p = .224$, $\eta^2 = .010$. The lack of main effect can also be seen in Figure 5. There was a significant main effect of a participant's possible selves group, on their post-intervention anticipated activity scores, $F(2, 153) = 41.74$, $p < .001$, $\eta^2 = .353$. Figure 5 illustrates the mean post-intervention anticipated activity scores by possible selves and pre-test group.
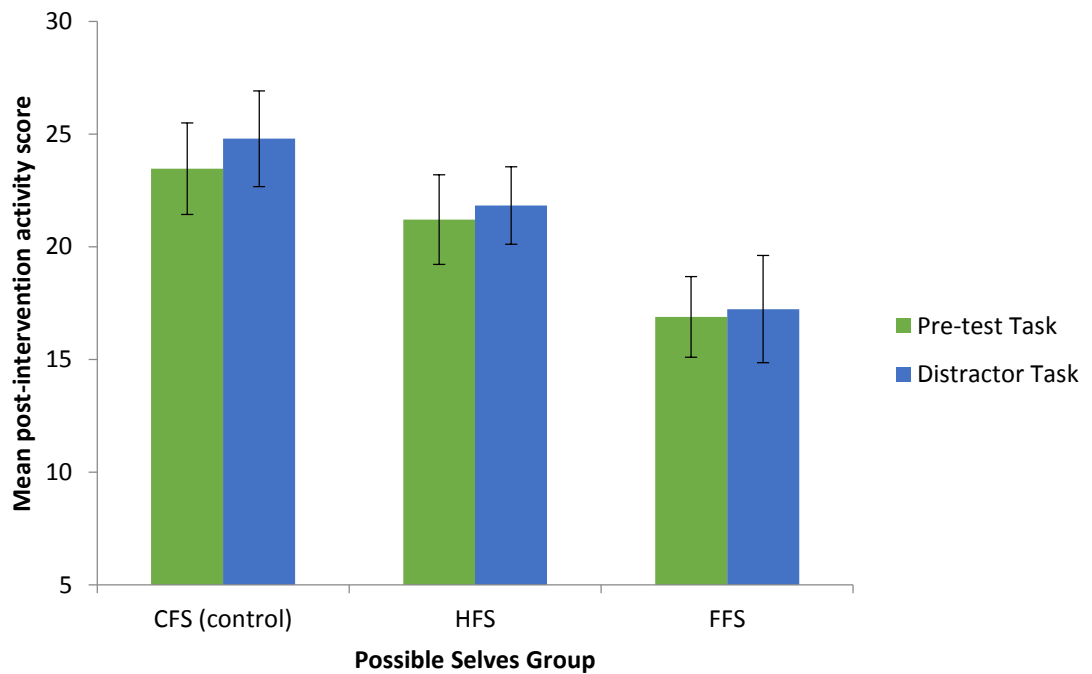

Figure 5: A bar graph showing the mean post-intervention anticipated activity scores for each group

HFS = Hoped for self group, FFS = Feared for self group, CFS = Control future self group

A Bonferroni post hoc comparison test revealed that post-intervention anticipated activity scores were significantly higher in the control group than the hoped-for and feared-for selves groups. Furthermore, anticipated activity scores for the hoped-for self group were significantly higher than the feared for selves group. Table 11 presents the multiple comparison data.

Table 11: Comparisons for the possible selves group and post-intervention scores

					95% Confidence interval	
Condition	**Comparison**	**Mean difference**	**Standard error**	**Significance**	**Lower bound**	**Upper bound**
CFS	HFS	2.64*	.766	.002	.79	4.50
	FFS	7.13*	.780	.000	5.24	9.02
HFS	FFS	4.49*	.773	.000	2.62	6.36

*Significant at the 0.5 level

HFS = Hoped for self group, FFS = Feared for self group, CFS = Control future self group

4.2.3 Within participant contrasts

The number of participant datasets that were used in this analysis was 74, which was the number of participants who did not undergo the pre-test sensitisation control condition. To examine within group differences on anticipated activity scores pre- and post-intervention, a repeated measures ANOVA was carried out. This had one fixed factor, possible selves group of a participant, which had three levels: hoped-for self intervention, feared for self intervention and control future self group.

There was a significant difference overall between participants' pre- and post-intervention anticipated activity scores, $F(1, 71) = 16.07$, $p < .001$, $\eta^2 = .185$. Furthermore, there was a significant interaction between the possible selves group and the pre- and post- anticipated activity scores, $F(2, 71) = 10.85$, $p < .001$, $\eta^2 = .234$. This indicates that anticipated activity scores were different depending on the possible selves group a participant was in. Post-hoc contrasts revealed that post intervention scores

were significantly lower for the feared for self than the control group ($p < .001$) and

hoped-for self ($p < .05$). The difference between the hoped-for and control group was

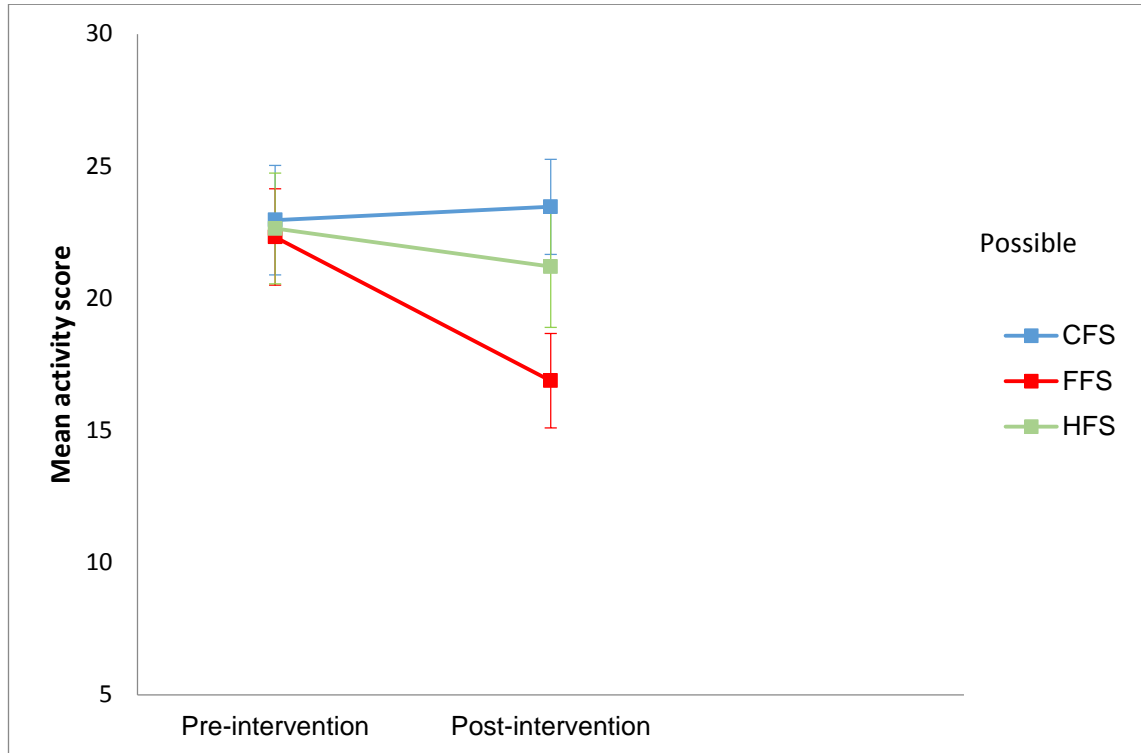non significant. These contrasts are illustrated in Figure 6.

Figure 6: Mean anticipated activity scores by possible selves group

HFS = Hoped for self group, FFS = Feared for self group, CFS = Control future self group

4.2.4 Additional Questions

As part of the possible selves intervention, participants were asked how realistic they

found the possible self they generated. Table 12 shows their responses and shows

participants varied in how realistic they felt the possible self was. The modal category

in the experimental condition was "Fairly realistic", whereas in the control condition it

was "A little realistic".

Table 12: How realistic participants thought their imagined image was

	Condition		
	Hoped-for pain self	Feared-for pain self	Control self (n=53)
Very Realistic	12.7% (n=7)	17.6 (n=9)	11.3% (n=6)
Fairly Realistic	49.1% (n=27)	58.8% (n=30)	28.3% (n=32)
A little realistic	38.2% (n=21)	21.6% (n=11)	60.4% (n=15)
Not realistic at all	0% (n=0)	2% (n=1)	0 % (n=0)

A chi-square analysis found no significant differences between the hoped-for, feared-for and control future self in terms of realism, χ^2 (6, $N=159$) = 2.61, $p>.05$.

CHAPTER 5: DISCUSSION

5.1 Introduction

The aims of this research were to investigate the impact of priming pain-related future possible selves on anticipated behaviour. A comprehensive review of existing literature indicated that a study of this type had not previously been undertaken in the area of pain. However, research in related areas led to the development of two hypotheses. First, it was predicted that individuals who were primed with a feared-for pain possible self (FFS group) would indicate significantly lower anticipated activity after this priming than those in the hoped-for (HFS group) or control groups (CFS group). Second, it was hypothesised that individuals in the FFS group would indicate higher anticipated activity before the priming than afterwards.

A cross sectional design based on the Solomon 4-group design was used to investigate these hypotheses. The novel design of the study was developed specifically to meet the research aims and resulted in a 6 group multiple measures design. However, aspects of the design had been used in related research to manipulate similar self-phenomena (e.g., in Marcotte, 2013; Murru & Martin Ginis, 2010). One hundred and fifty nine student participants were recruited from the University of Leeds. A task was developed to measure anticipated behavioural activity preferences and this was used to test the two hypotheses in this study, pre and post priming. In addition, data was collected for possible covariate factors using the Imaging Ability Questionnaire (IAQ), the HADS scale, age and questions relating to a participant's previous experience of pain. Then two Analysis of Variance (ANOVA) analyses were used to investigate significant differences both between and within groups.

This chapter first presents an examination of the results of the main hypotheses and their place in the context of the wider literature base. Following this, relevant findings

from the additional analyses in this study are considered. Next, limitations of the research and clinical implications are discussed. Finally, directions for future research are examined.

5.2 Summary of main findings

5.2.1 Pre-test and randomisation

In this study, the nature of the design meant there was a possibility of pre-test sensitisation biasing the results. A pre-test sensitisation group (no pre-test) was therefore created to control for and measure this possible influence. The presence of the pre-test had no significant effect on post-intervention anticipated activity levels for each possible self group. Individuals in the HFS groups answered similarly to one another regardless of the pre-test, as did those in the CFS and FFS groups respectively. This demonstrated that participants in this study did not experience significant pre-test sensitisation. Furthermore, the presence of the pre-test had no significant effect on IAQ scores, or HADS anxiety and depression scale scores.

In terms of randomisation, all groups reported approximately equal scores on the pre-test tasks. This suggests that the randomisation procedure used was successful in randomly allocating participants to groups.

5.2.2 Hypothesis 1

The first hypothesis considered the between-group impact of the possible selves priming on post-test anticipated activity scores. It was suggested that those in the FFS group would anticipate and report less activity post-priming than participants in the other groups. A statistically significant difference in post-test anticipated activity scores was observed between the FFS group and the HFS and CFS groups, with FFS primed participants reporting significantly less anticipated activity than either of the other two

groups. There was also a smaller significant difference found between the HFS and CFS groups, with the latter group predicting significantly more post-intervention anticipated activity levels. This finding provided initial support for hypothesis 1, however, a within-participant examination was required to rule out the effect of individual participant factors.

5.2.3 Hypothesis 2

The second hypothesis considered the within-group impact of the possible selves priming. Similarly to the first hypothesis, it was predicted that those undergoing the FFS induction would report significantly lower post-intervention anticipated activity scores then their pre-intervention anticipated activity scores. An ANOVA analysis comparing these anticipated pre- and post intervention activity scores for the pre-test groups found that individuals primed with the FFS reported significantly less post-intervention anticipated activity than their pre-intervention scores. This provided support for the second hypothesis and also provided further support for hypothesis 1. To provide a context to the FFS group, participants primed with the HFS reported slightly less post-intervention anticipated activity than their current self-reports, but this difference was not significant. Surprisingly, the CFS group predicted slightly more activity post-priming than pre-priming, again a non-significant difference. These observations provided further support for both hypotheses.

5.2.4 Hypothesis 3

The final hypothesis related to considering the impact of priming individuals with a hoped-for pain-related future. It was tentatively suggested that those in the HFS group would anticipate more post-priming activity levels than those in the feared-for self group but less than those in the CFS group. As noted in section 5.2.2 these differences were observed in the findings, providing support for this hypothesis.

5.3 Findings in the context of the literature

The results of this study fit well within the context of the literature. The most important finding from this study is that possible selves significantly impact on expected behavioural activity. Specifically, we have seen that inducing pain-related possible selves in a healthy population results in participants anticipating less activity than control group participants. Moreover, the type of possible self one generated determined the behavioural response reported. In this study, those asked to imagine FFS reported much less post-intervention anticipated activity than the other two groups. Furthermore, individuals in the FFS group also thought they would be much less active in this eventuality than they predicted for their current selves.

5.3.1 The Self

The current study demonstrated that the self has the potential to play a significant role in influencing pain and anticipated behaviours. How one views a situation is inevitably influenced by the experiences and knowledge held within the self. This may generate a range of possible self-goals which determine the available self-regulatory behaviours available to an individual. These suggestions are consistent with much of the literature presented in the introduction pertaining to the self.

Student's abilities to imagine engaging possible selves supported the findings of Markus and Nurius' (1986) original study. The ability of our sample to imagine varied possible selves was congruous with their observation that "individuals can reflect on their possible selves and that these selves are not identical with descriptions of their current, or now selves" (Markus & Nurius, 1986, p.959). However, our study extended this idea, and found that with priming, students are able to anticipate behaviours from the point of view of their possible selves, linking these with SDT and self-regulation. This suggests that possible selves do play a role in motivating behaviours, consistent with much of

Oyserman's work in academic settings (Oyserman, 2007; Oyserman et al., 2004; 2006). Furthermore, the current study suggests that possible selves can be induced and used as driving forces to encourage particular behavioural responses. This is consistent with the studies into exercise possible selves, which found associations between the generation of hoped-for exercise possible selves and increases in exercise-related behaviours (Marcotte, 2013; Murru & Martin-Ginis; 2008). It is clear that the same mechanisms of the self are likely to underlie this link between possible self generation and behaviour, namely SDT and self-regulation.

The suggestion that SDT and self-regulation are part of a self-process resulting in purposeful action was made in chapter 1 (Higgins, 1986; Carver & Scheier, 2002). This thesis has provided additional support for the presence and impact of these constructs, although these were not directly measureable. In addition to generating the possible self, this study tasked individuals to imagine this possible self as their current self and anticipate their engagement in behaviours accordingly. Although the possible self was assigned, a participant could still have judged its proximity to an imagined hoped-for future self (Higgins, 1986). Perceptions of discrepancies may have then further motivated anticipated self-regulation, as a participant made behavioural selections as an attempt to approach or avoid that possible self (Carver & Scheier, 2002). The control theory of self-regulation therefore plays a key part in this interpretation of the findings. Individuals in the HFS and FFS were motivated towards two respective and distinct patterns of responding not observed in the CFS group; their presence determined what was behaviourally possible. Carver and Scheier (2002) suggest that influences in the self-system can come top-down or bottom up. This experiment seems to result in a top-down influence, as we present a system concept which limits the number of options at the levels of principles, procedures and can be observed to reduce behavioural sequences (i.e., repertoires). This reordering of the self-system is what Carver,

Lawrence and Scheier (1999) would predict as a response to blocked goals, particularly those caused by "outside disturbances" such as pain (p. 140). Interestingly, the findings of this study are also consistent with Leary and Tangney's (2003) suggestion that self-reflection is the essential basis for generating these self-states and judging their impact.

Therefore this study provides support to the literature of the self presented in chapter 1 and presents potential for a significant impact of the self on pain.

5.3.2 Pain

Evidence that the type of possible self primed can result in very specific pain behaviours suggests that our understandings of our possible selves have some commonalities with each other, which has been previously observed (Asbring; 2001; Kindermans, 2012; Hellestrom; 2001). It is likely that pain possible selves comprise, at least in part, of a shared understanding of what it means to experience pain cognitively, physically and emotionally. For example, Kindermans (2012) collected many varied responses in her qualitative study on pain and possible selves, but she noted that there were strong themes of loss, disability and fear in her sample. These themes have also been identified in other qualitative studies of pain samples (Asbring, 2001; Hellestrom, 2001). These understandings may therefore contribute to the clinical implications in terms of intervention at an early stage.

5.3.3 The self and pain

The impact of the self on activity seen in this study was not consistent with Goossens et al. (2010), who found no relationship between threats to the self and behaviour measured by daily functioning. This discrepancy may be explained by a number of factors relating to their sample which was much smaller than the current study and comprised solely of work related upper extremity disorder (WRUED) pain patients.

Although this would appear to be a strength in comparison to the current study, WRUED patients have been found to generally have personality traits of "overcommitting themselves" and "perfectionism" (van den Heuvel, van der Beek, Blatter, & Bongers, 2007, p. 13). In the context of SDT, this suggests that WRUED patients may have strong "ought" selves. It may be that they are more likely to use persistence behaviours than avoidance behaviours, as these would allow them to maintain their daily functioning. Therefore there would be little impact of their pain-related selves on daily functioning, which may explain the differences between our findings. To examine this, a similar experiment using WRUED patients which manipulates "ought" selves could be conducted to investigate whether this leads to an increase in behavioural activity.

The current study's findings are consistent with the avoidance behaviour that the fear-avoidance and avoidance-persistence models of pain would predict (Asmundson et al., 2012; de Leeuw et al., 2005; Vlaeyen & Linton, 2000, 2012). That is, the psychological impact of the FFS induction appeared to lead individuals to predict less activity than the other groups and their current selves. These models were originally presented as attempts to explain the development of chronic pain from acute injury. So it is interesting that the current study demonstrates that the psychological relationship between pain and avoidance behaviours can be induced even without injury or pain. This suggests that people may be predisposed to interpreting pain in the context of their understandings of the world, whether that comes from personal experience, or suggestions from within their systems, cultures or social contexts, consistent with the ideas of Turk and Okifuji (2002).

Therefore similarly to Vlaeyen et al. (2012), the current study re-emphasises the importance of considering a person's pre-existing interpretation of pain in order to understand subsequent development of their pain behaviours.

5.4 Additional Findings

5.4.1 Hoped-for self findings

As previously mentioned in section 2.3, the nature of the hoped-for self group as used in this thesis is different to that traditionally described in the wider literature. In this study it refers to a hoped-for pain related self, which is the best self one could hope for if experiencing ongoing pain. This is important to consider in the interpretation of the findings.

The participants in the HFS group reported significantly less post-intervention anticipated activity than the control group. Furthermore, those who completed the pre-test reported less anticipated activity after the induction than before it, although this difference was not found to be statistically significant.

Therefore this induction influenced people to anticipate less activity as a result of the mention of chronic pain in the script. However, the within-participant findings were non-significant and they reported significantly more post-intervention anticipated activity then the FFS group who also received scripts referencing pain. This suggests that the presence of pain alone is not enough to influence behaviours and individual psychological factors are involved, such as fear and fatigue, which is consistent with previous literature (Solberg Nes et al., 2010; Solberg Nes et al., 2009; Van Damme & Kindermans, 2015; Vohs et al., 2005).

Unfortunately, it is not possible to determine from this study whether participants in the HFS group reported higher predicted activity than the FFS group because they were

anticipating using persistence behaviours to continue being active. However, this could be investigated in the future using a similar task alongside qualitative investigation of anticipated behaviours.

5.4.2 Control group findings

Although the CFS group found it slightly more challenging to imagine a realistic future possible self, they also reported significantly more post-intervention anticipated activity than the other two groups. This interesting as this group was provided with less contextual information to guide their future possible selves and were therefore free to imagine any future they desired. However, this lack of guidance may have resulted in this task seeming more challenging than the other two conditions (HFS and FFS). Despite this challenge, participants in the pre-test groups reported higher post-test anticipated activity scores for their future possible selves than their current selves. The explanation for this may lie in the timing of the study. Most students participating would have been completing revision for their exams at the time the experiment was open. During exam periods, students often reduce their usual activities to a minimum in order to increase time for study (Kushner, Kessler, & McGaghie, 2011). Therefore when the CFS group were asked about their future selves, but given no context, they may have simply anticipated their future self would be more active than their current self as the restrictions to their behaviour posed by their exams would have ended. Potentially, all of the groups could have been influenced by this and the impact of the pain-related scripts in reducing anticipated behavioural activity may have been far greater than observed. However, there is no way of investigating this from the current study.

5.4.3 Method

It is worth noting that this study needed to develop a method in order to investigate the research aims. In some ways, parts of this method are not "new", having been based on the Solomon's four group design and previous possible selves research. Nonetheless, to the author's knowledge no previous research has developed a way to manipulate pain possible selves and measure their impact on behaviours. This is the first time such a method has been used and the findings suggest proof of principle; it is possible to induce internal states and measure them experimentally. This may seem unimportant, but Bowling (2014) states that existing methods need to be adapted and developed in novel ways in order to make advances in health care research. Although the findings of this study may be limited, it does provide an initial foundation on which other studies could be based.

5.5 Limitations

This research has numerous limitations which may have affected the validity and reliability of the findings. This section examines all identified limitations and considers their possible influence on the results.

5.5.1 Recruitment

This study used a self-selecting sample, as employed in previous research in this area. The implication of this type of recruitment is that participants who opted to complete the experiment may fundamentally differ from those who did not. Usually, this presents a challenge to validity as participants may self-select to complete studies they have a particular interest in, biasing the sample (Wainer, 2013). This research was set up so that participants were unaware of the study's true purpose until completion. Therefore participants could not choose to complete the study due to an interest in the topics (e.g., of pain or the self), which would minimise this bias (Kimmel, 2012). However,

individual differences in factors relating to completing an online study (e.g., the trait of willingness) could have influenced the results. Therefore a replication of this study which also takes these factors into account could be prudent.

5.5.2 Participants

The sample the current study used were all students. Both undergraduates and postgraduates were invited to participate, however, the average age of participation of 20 years reflected a largely undergraduate group of participants. We have no information about those participants who did not complete the study. Thus it is impossible to determine whether this sample is typical of the wider student population. As noted it is possible those individuals completing this study differed somehow to both the student and general population. However, the demographic information collected for the current study suggests that participants were proportionately representative of the general University of Leeds population. The current study participants are also similar in demographics of the previous student studies (Marcotte, 2013; Markus & Nurius, 1986; Murru & Martin Ginis, 2010). Therefore it is possible that the sample used in this study is representative of the general student population.

The main criticism for studies using student research is that students may not be representative of a general population. Students may vary on a number of demographic factors such as socioeconomic status and age which has potential to impact perceptions of pain and therefore their imagined possible selves (Elliott, 2010). Due to these limitations the results of this study were interpreted relative to a student population, rather than generalising to a pain group or a general population. Using students was appropriate for this study, due to the large, readily available sample which would be needed to test the novel method (Druckman & Kam, 2009). Therefore the current study represents a foundation for further research using this method. It would be sensible,

however, to replicate this study with samples from different populations and compare the findings before generalising the results.

5.5.3 Design

This study developed and used a novel experimental design with randomisation to groups to investigate the research aims. There are no previous studies which have manipulated pain-related possible selves and assessed the impact of these on behaviours, therefore this research provides a unique contribution to the literature base. However, this also means this is the first time such a design has been used in this way. Furthermore, this was not a longitudinal study. Although this allowed differences between and within groups at a single time point to be explored, causality can not be ascertained.

5.5.4 Activity Measures

The current study used five questions respectively pre- and post the possible selves intervention. On reflection, using more activity questions might have given a fuller picture of the impact of the possible selves on behaviour. However, as detailed in the methodology, the current study chose five questions to minimise completion time and participant fatigue effects. When using online surveys, guidelines suggest that there is a balance to be made between collecting a small amount of meaningful data and a large amount of data where participants have not been thoughtful about their responses (Nulty, 2008; Patton, 2005; Umbach, 2004).

Shorter surveys using questions are also often criticised as they may lack reliability (Marsden & Wright, 2010). However, there is no optimal number of questions indicated in best practice guidelines for internet-based surveys (Krosnick & Presser, 2010). Some studies have suggested that surveys of "intermediate length", meaning

around 10 items, are optimal and result in the best reliability (Givon & Shapira, 1984). Conversely, there is an abundance of studies which have found that surveys which comprise 5 items or more on the same topic are just as reliable as longer surveys, up to 19 items (Birkett, 1986; Jacoby & Matell, 1971).

Nevertheless, in order to test the reliability of the activity measure findings, it would be sensible to replicate the current research with more activity questions. However, the compromise between increased question numbers and participant effects must once again be carefully considered.

5.5.5 Pain possible selves intervention

A consideration discussed in the methodology was whether students would be able to generate a realistic pain-related future self. As could be seen from the additional questions section in the results (section 4.2.4), all but one of the participants felt they were able to generate a realistic imagined self, consistent with Markus and Nurius's sample (1986). Only a single participant reported difficulty with generating a possible self in the study. This participant was in the control group, not the pain-related group, therefore it seems that the majority of the participants in the HFS and FFS groups were able to produce a realistic possible self. This was consistent with participant's qualitative responses to the questions used to engage them with the possible selves scripts. As the purpose of these questions was to help participants focus on future selves, the responses were not part of the study results. However, on examination of these responses individual's descriptions of their imagined possible selves were mostly detailed portraits of what they had generated.

The non-specific nature of the pain-related possible selves intervention may have influenced the amount of activity anticipated. The scripts suggest that the participants experienced pain, but did not specify a pain type or site, leaving this to participants to

reduce demand characteristics. On reflection, although not instructed to do so, participants may have imagined specific pain sites for their possible selves. As the current and previous studies have shown, our stored mental conceptualisations of pain imply a restricted range of movement and activity (e.g., Goossens et al., 2010). However, some pain sites, for example the legs, are more vulnerable to pain from movement and may impact perceived mobility (LeResche & Von Korff, 1999; Vlaeyen et al., 2012). As there was no guidance as to pain sites, it is possible that some participants imagined pain sites for themselves that would naturally restrict their mobility and therefore their activities. Since a participant's imagined pain site was not recorded, there is no way of knowing whether this influenced the reported activity scores. However, it can be argued that all pain, regardless of site, impairs activity through physical and psychological processes (e.g., Vlaeyen & Linton, 2000). Moreover, individuals use their knowledge and experiences of the world to create their possible selves (Markus & Nurius, 1986). The previously discussed large European study by Breivik et al. (2006) found a significantly larger prevalence of back pain and head pain than any other type of chronic pain, including leg and joint pain. Moreover, another large Worldwide sample found leg and ankle pain the least prevalent of all pain sites (van der Windt et al., 2000). Thus individuals may be more likely to have the former pain sites as part of their experiences and therefore incorporate them into the possible selves they generated. Nonetheless, future studies should consider whether they wish to prime a particular pain site, or record participant's imagined pain site as an extra factor for consideration.

5.5.7 Analysis

A small amount of the scale data deviated from the expected normal distribution. Although this appeared to be important, on examination of the standard deviations it

was apparent that this was caused by the presence of outliers. Transformations of the data were attempted, but this did not improve the normality of this data. Although this did not influence the main statistical analyses, it did mean that all supplementary analyses had to use non-parametric statistical methods. These tests have historically been criticised for lacking power (Whitley & Ball, 2002), however there is evidence that non-parametric analyses, when used appropriately in health research, are just as powerful as their parametric counterparts (Blair & Higgins, 1985; Tomkins, 2006). Moreover, Tomkins (2006) recommends that when the method of analysis is not clear, as in this study, both parametric and non-parametric analyses should be used in combination and the analyses resulting in the greatest power should be presented.

5.5.6 Affect measure

The timing of the study have impacted on participants' responses to the HADS measure. The BOS surveys were open from February to March 2015, which corresponds with the revision and examination periods for most faculties. There is evidence that during exam periods students report higher levels of anxiety and depression than at other times of the year (Shiels, Gabbay, & Exley, 2008), conversely there are suggestions that these higher levels are related to other factors (e.g., financial situation, Andrews & Wilding, 2004). Nonetheless, the instructions for the HADS measure state that participants should consider whether they have experienced the list of symptoms over the previous two weeks. Participants in this study would certainly have been in the revision period, if not their examination period. Therefore it is possible that the results observed from the HADS measure may have been higher than a student would report at other points in the academic year. However, this does emphasise the importance of large replications of this study with different populations.

5.6 Clinical Implications

The results of this thesis show that priming individuals with pain-related possible selves influences the choices they make in relation to avoiding or persisting with behaviour. Those primed with a feared-for self avoided activities, even if they reported being active in the pre-test. Those participants who were primed with the hoped-for self generally appeared to persist with activities. Although these general pattern of responses were found, it is important to consider that pain-related behaviours are complex and there were some exceptions to this.

The clinical implications of this project are first considered in the context of the development of chronic pain. If there are individuals who are more vulnerable to the development of chronic pain due to self related variables, then this could potentially support the development of preventative interventions at the point of acute pain. At present, pain management services are offered once an individual has experienced at least three months of ongoing pain. This allows for a diagnosis which then enables access to these services. However, this leads to a lack of psychological intervention with problematic pain at a point when it is more treatable (D'Arcy, 2008; Turk, 1999; Turk & Flor, 1999). Potentially, the findings of the current project could eventually lead to two important implications for the way pain patients are considered in health services. First, there may be an argument for early intervention in those with pain and second, further research could develop pain selves screening techniques which could determine the necessity of treatment. Instead of intervening in an entrenched pattern of pain behaviour, it may be more therapeutically and economically effective to assess risk of development of pain and intervene preventatively (e.g., Turk & Okifuji, 2002). However, it is clear that these are areas for further research.

In relation to a wider population, the observations made in this study may have important implications for psychotherapy. The results support the important role of individual psychological factors, the possible selves, in imagining different futures and links these to important self-regulatory functions. As noted in chapter 1, possible selves appear to influence well-being and are thought to affect behaviour by representing goal self-states (Carver & Scheier, 1981; Higgins, 1987; Markus & Nurius, 1986). Given that a purpose of psychotherapy is often cognitive or behavioural change, then motivating self-states are therefore potentially significant aspects of the change process (Bak, 2015; Dunkel, 2000). The findings of this study and the literature reviewed imply that difficulties which relate to a challenge of the self-concept would benefit from therapeutic approaches which focus on supporting individuals to move towards hoped-for, valued selves and encourage effective self-regulation in spite of blocks to goals. One approach which may be important to consider in terms of clinical implications is Acceptance and Commitment therapy (ACT).

ACT is a psychotherapeutic approach which focuses on relieving distress by increasing psychological flexibility and working towards important life values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). The mechanisms of this are suggested to involve a focus on the present moment, a reduction in avoidance behaviours motivated by fear-inducing situations (e.g., the FFS) and support to help individuals to identify their values and live according to these. Similarly to the last point, hoped-for selves represent valued goal states which promote behaviour consistent with these values. Therefore ACT may provide a useful way of therapeutically considering both feared-for and hoped-for selves and their impact on behaviours and emotion. Moreover, this could link to chronic pain and control theory. Using ACT to encourage important hoped-for selves and consider the behaviours one is using to achieve them may reduce the goal blocking effect of pain by offering alternative ways to achieve the value. For those in

pain, this could result in increases in activity and reduced distress. Alternatively, control theory would suggest there are times when goals are permanently blocked by the presence of pain. In these cases, ACT may allow for a shift in focus, away from goals blocked by pain and instead to goals the individual considers more important. Goal shifting has been suggested to be an effective approach in terms of offering a varied selection of valued goals to work towards (Miller & Wrosch, 2007).

There is an increasing evidence base supporting the effectiveness of ACT with chronic pain patients. Studies focusing on meta-analysis of therapy outcomes has suggested it is effective in improving both cognitive and behavioural outcomes (McCracken & Vowles, 2008; Powers, Zum Vörde Sive Vörding, & Emmelkamp, 2009; Veehof, Oskam, Schreurs, & Bohlmeijer, 2011). Moreover, the importance of values-based action has been specifically identified as a key mechanism associated with improvements in emotional and behavioural outcomes (Vowles & McCracken, 2008). Therefore ACT may be a useful approach when working with circumstances which present significant challenge to the self-concept and obstruct valued goals.

5.7 Future Research

This discussion has emphasised the need for further research into pain possible selves and their behavioural consequences.

First, the significant findings of this study suggest that there is potential for consistent findings in other samples. A replication of the current research with a large general population sample could investigate whether this finding is universal. It would also serve to further understand the role of different possible selves in predisposing people to particular pain behaviours. If the behaviours that are employed do depend on the range of possibilities defined by our selves, then future research with pain patients would be the next logical step. A longitudinal study similar to Vangronsveld et al. (2011),

examining the relationship between acute pain, possible selves and behaviours would help investigate whether our possible selves ultimately contribute to the development of pain behaviours and chronic pain.

The way in which pain possible selves develop and link with self-regulatory possibilities for activity may be another future avenue for research. It is interesting that pain selves are highly individual, yet seem to result in just a few behavioural repertoires common in a pain clinical population. The current research suggests that there is a commonality in the ways people respond to pain, which may be based on their assessments of what activities are possible from the point of view of primed selves. This assessment in turn is based on the possible selves and the information which comprises them. Future studies which investigate the content of pain selves, where this content comes from and considers the relationship with behaviours may contribute to confirming links between the work of Markus and Nurius (1986) and Carver and Scheier (1981).

Finally, research into possible selves which replicates the novel method used in this study would allow the literature to move towards explanations of causality. Furthermore, it would allow for further refinement and validation of this novel method. Appropriate adjustments to the method would need to be made in order to address the limitations discussed in the section above. Nonetheless, this method could be used to measure the impact of health-related possible selves on a variety of factors.

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APPENDICES

Appendix 1: Behavioural Preferences Task pool data

Table 13: Activity pool items to choose from for the Behavioural Preferences Task

Activity	Modal categories respondents chose	% agreement
Cleaning the house	Staying in, individual	100
Writing or typing	Staying in, individual	100
Joking with family members	Staying in, social	86
Visiting friends	Going out, social	100
Going to the cinema	Going out, social	88
Communicating by gestures	Going out, social	62
Lying down	Staying in, individual	100
Doing the gardening	Staying in, individual	88
Watching TV	Staying in, social	78
Doing the food shopping	Going out, individual	100
Using kitchen gadgets	Staying in, individual	100
Paying bills	Staying in, individual	100
Preparing a meal	Staying in, social	92
Working on a house repair	Staying in, individual	88
Washing the car	Staying in, individual	82
Taking a holiday with others	Going out, social	100
Going to a party	Going out, social	100
Eating out with friends	Going out, social	100
Doing chores around the house	Staying in, individual	89

Laughing	Going out, social	66
Dressing myself	Staying in, individual	100
Going to a park or beach	Going out, social	96
Taking care of business affairs	Staying in, individual	100
Spending time with family	Staying in, social	100
Doing leisure time activities	Going out, social	82
Listening to other people's problems	Staying in, social	100
Learning new things in a class	Going out, social	100
Working out a budget	Staying in, individual	100
Being affectionate	Staying in, social	100
Go out walking alone	Going out, individual	100
Sleeping in the daytime	Staying in, individual	100
Carrying on a conversation	Going out, social	58
Feeding myself	Staying in, individual	100
Reading a book	Staying in, individual	100
Tidying up	Staying in, individual	100
Going out for entertainment	Going out, social	100
Mowing the lawn	Staying in, individual	100
Concentrating	Staying in, individual	100
Caring for myself	Staying in, individual	100
Cleaning the windows	Staying in, individual	89
Working	Going out, social	100

Volunteering	Going out, social	100
Taking part in family life	Staying in, social	100
Run around the block	Going out, individual	100
Drive a car	Going out, individual	67
Catch the bus	Going out, individual	100
Throw a ball	Going out, social	100

Items randomly selected for use in the task are highlighted in bold.

Appendix 2: Preferences Distractor Task pool data
Table 14: Preferences generated from the PDT pool task

Items generated	
Fizzy Drinks	Popcorn
Rollercoaster rides	History
Shoes	The beach
Raspberrys	Guitar
Blue	Buying presents
Football	Sunshine
Sunny days	Money
Rugby	Art
Soaps	Make up
Facebook	Mum
The News	Starbursts
Showers	Yellow
Cake	Fishing
Coffee	Gossip magazines
Rain	Science fiction
Classical Music	Sausages
Pop Music	Dogs
Action Movies	Weddings
RomCom Movies	Beer
Spy Movies	Video games
Fish	Italy
Photographs	Cherry cola
Rainbows	Sand

Appendix 3: Letter Granting Ethical Approval

UNIVERSITY OF LEEDS

Faculty of Medicine and Health Research Office
School of Medicine Research Ethics Committee (SoMREC)

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Clarendon Way
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06 August 2014

Miss Louise Maclean
Doctorate of Clinical Psychology Student
School of Medicine
Academic Unit of Psychiatry and Behavioural Sciences
Clinical Psychology,
Charles Thackrah Building
University of Leeds
LS2 9LJ

Dear Ms Maclean

Ref no: **SoMREC/13/080**

Title: **The impact of motivating aspects of chronic pain-related hoped-for and feared-for selves on future behaviour choices.**

Your research application has been reviewed by the School of Medicine Ethics Committee (SoMREC) and we can confirm that ethics approval is granted based on the following documentation received from you.

Document	Version	Date Submitted
Ethical_Review_Form_V3[2]	1	06/05/14
Flow_Diagram_Ethics	1	06/05/14
CF_Form	1	06/05/14
DB_Ethics	1	06/05/14
Demographics_Ethics	1	06/05/14
HADS_Ethics	1	06/05/14
Imaging_Ability_Scale_Ethics	1	06/05/14
PIS_Form	1	06/05/14
Recruitment poster	1	06/05/14
CF_Form_version2_11.07	2	04/08/14
DB_Ethics_version2_11.07	2	04/08/14
Demographics_Ethics_version2_11.07	2	04/08/14
Ethical_Review_Form_V3[2]	2	04/08/14
Flow_Diagram_Ethics_Version2	2	04/08/14
HADS_Ethics_verison2_11.07	2	04/08/14
Imaging_Ability_Scale_Ethics_version2_11.07	2	04/08/14
PIS_Form_version2_11.07	2	04/08/14

Recruitment poster version 2 04.08	2	04/08/14
Proposed Email text version 1	2	04/08/14

Please notify the committee if you intend to make any amendments to the original research ethics application or documentation. All changes must receive ethics approval prior to implementation. Please contact the Faculty Research Ethics Administrator for further information (fmhuniethics@leeds.ac.uk)   .
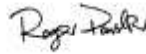
Ethics approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. The committee takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

We wish you every success with the project.

Yours sincerely

Roger Parslow

Dr Roger Parslow
Chair, SoMREC, University of Leeds

SoMRECApproval letter v2_0   September 2013

Appendix 4: Student Recruitment Poster and Email

Email Text Version 1

Clinical Psychology Department: LIHS, Charles Thackrah Building, Clarendon Road, Leeds
LS2 9LJ

UNIVERSITY OF LEEDS

Research Participants Needed

Would you like to take part in a quick online study on activity choices and imagined futures in return for £3 printer credits?

We need research participants for our study. We are interested in what your preferences to do certain activities are now, and what they might be in the future.

We are asking participants to complete a one-off online survey which will take 15 minutes maximum. In return for your time, you will receive £3 in University printer credits!

To learn more about this study please visit:

www.survey123.co.uk

Appendix 5: Hospital Anxiety and Depression Scale (HADS)

Page 6: Mood questionnaire

We are aware that emotions play an important part in how much we feel able to do activities.

Please read each item and select the reply which comes closest to how you have been feeling in the past week. Please respond with your immediate reaction to each item.

22 I feel tense or "wound up"

- ○ Most of the time
- ○ A lot of the time
- ○ Occasionally
- ○ Not at all

23 I feel as if I am slowed down

- ○ Nearly all of the time
- ○ Very often
- ○ Sometimes
- ○ Not at all

24 I still enjoy the things I used to enjoy

- ○ Definitely as much
- ○ Not quite so much
- ○ Only a little
- ○ Not at all

25 I get a sort of frightened feeling like 'butterflies in the stomach'

- ○ Not at all
- ○ Occasionally
- ○ Quite often
- ○ Very often

26 I get a sort of frightened feeling like something awful is about to happen

- ○ Very definitely and quite badly
- ○ Yes, but not too badly
- ○ A little, but it doesn't worry me
- ○ Not at all

27 I have lost interest in my appearance

○ Definitely

○ I don't take as much care as I should

○ I may not take quite as much care

○ I take just as much care as ever

28 I can laugh and see the funny side of things

○ As much as I always could

○ Not quite so much now

○ Definitely not so much now

○ Not at all

29 I feel restless as if I have to be on the move

○ Very much indeed

○ Quite a lot

○ Not very much

○ Not at all

30 Worrying thoughts go through my mind

○ A great deal of the time

○ A lot of the time

○ From time to time but not too often

○ Only occasionally

31 I look forward with enjoyment to things

○ A much as I ever did

○ Rather less than I used to

○ Definitely less than I used to

○ Hardly at all

32 I feel cheerful

○ Not at all
○ Not often
○ Sometimes
○ Most of the time

33 I get sudden feelings of panic

○ Very often indeed
○ Quite often
○ Not very often
○ Not at all

34 I can sit at ease and feel relaxed

○ Definitely
○ Usually
○ Not often
○ Not at all

35 I can enjoy a good book or radio or TV programme

○ Often
○ Sometimes
○ Not often
○ Very seldom

Appendix 6: Imaging Ability Questionnaire

Page 5: Short Imagery Questionnaire

Questions 12 - 17 contain statements about how people experience memories, images, and other occurrences. Read each statement and describe how true it is for you using the scale underneath.

12 While watching a movie, a T.V. show, or a play, I may become so involved that I forget about myself and my surroundings and experience the story as if it were real and as if I were taking part in it.

- ○ 0 - Not true at all for me
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5 - Very true

13 I can imagine (or daydream) some things so vividly that they hold my attention as a good movie or story does.

- ○ 0 - Not true at all for me
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5 - Very true

14 I can imagine that my body is so heavy that I could not move it if I wanted to.

- ○ 0 - Not true at all for me
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5 - Very true

15 I can often sense the presence of another person before I actually see or hear that person.

○ 0 - Not true at all for me
○ 1
○ 2
○ 3
○ 4
○ 5 - Very true

16 I can sometimes recall certain past experiences in my life with such clarity and vividness that it is like living them again or almost so.

○ 0 - Not true at all for me
○ 1
○ 2
○ 3
○ 4
○ 5 - Very true

17 My thoughts often occur as visual images rather than words.

○ 0 - Not true at all for me
○ 1
○ 2
○ 3
○ 4
○ 5 - Very true

Questions 18 - 21 are descriptions of several images. Picture each image in your mind and then rate its vividness using the scale underneath. Circle the number that describes the vividness of YOUR image.

18 Imagine the sun rising above the horizon into a hazy sky.

- ○ 0 - No image at all
- ○ 1 - Vague and dim
- ○ 2 - Moderately clear and vivid
- ○ 3 - Reasonable clear and vivid
- ○ 4 - Perfectly clear and vivid

19 Imagine clouds with a storm blowing up and flashes of lightening.

- ○ 0 - No image at all
- ○ 1 - Vague and dim
- ○ 2 - Moderately clear and vivid
- ○ 3 - Reasonable clear and vivid
- ○ 4 - Perfectly clear and vivid

20 Imagine feeling or touching sand.

- ○ 0 - No image at all
- ○ 1 - Vague and dim
- ○ 2 - Moderately clear and vivid
- ○ 3 - Reasonable clear and vivid
- ○ 4 - Perfectly clear and vivid

21 Imagine the taste of jelly.

- ○ 0 - No image at all
- ○ 1 - Vague and dim
- ○ 2 - Moderately clear and vivid
- ○ 3 - Reasonable clear and vivid
- ○ 4 - Perfectly clear and vivid

Appendix 7: Study Debrief Screen

Final Page

Thank you for participating in this research about activity choices and imagined futures!

This study looked at whether imagining your future as someone with chronic pain influences what activities you would choose to do. We know from current research that how people with chronic pain imagine their future is important in influencing what activities they choose to participate in. However, there is no information about how people who don't suffer chronic pain might be affected, which this study has attempted to find out.

The results from this study will provide us with information about how people's imagined versions of themselves can influence their activity choices. The results from this study will be published, and we hope to be able to influence treatment for pain patients.

If you have been upset or affected negatively in any way during this study and need to talk to someone, please feel free to contact one of the following:

* **Leeds University Nightline**, a student support service running 8pm to 8am on 0113 380 1381 or access their online messaging service here: http://www.leedsnightline.co.uk/e-nightline.html

* **The Samaritans**, a 24 hour telephone support service on 08457 909090

* **Leeds University Student Counselling Centre**, a service which offers face to face counselling amongst other helpful advice on 0113 343 4107 or online at: http://www.leeds.ac.uk/uscs/index.html

If you know of any friends that are going to participate in this study, we ask that you **don't** talk to them about the details on this page. Sometimes knowing about the aim of a study can influence the results we get.

Thank you again for participating in this study.