Is self-esteem embodied? The influence of vertical orientation on self-esteem and domain specific sociometers.

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Abstract

Combining sociometer theory's assumption that self-esteem (SE) is a reflection of our relationship with the social world, and embodiment theory's proposition that this relationship is influenced by the body, it was predicted that SE should be malleable via manipulation of the body and/or its physical relation to the world. Three studies tested whether differences in vertical spatial orientation (high versus low chair height) would influence explicit and implicit SE (Study 1), and SE related social comparisons relevant to domain specific sociometers (Studies 2-3). While effects on SE were inconclusive, participants seated in high chairs preferred higher status mates than participants in low chairs, suggesting activation of a sociometer specific to the mating domain. Possible explanations for these findings, how they compare with previous research on the embodied self-concept, and suggestions for future research are discussed.

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Introduction

Since James (1890) first suggested that the need to feel good about oneself is a fundamental human impulse, self-esteem (SE) has become one of the most studied constructs in behavioural science, and has been linked to a multitude of cognitive, affective, and behavioural reactions by psychologists of many different persuasions (Leary & Baumeister, 2000). SE is widely regarded as important to mental health and successful functioning (but see Baumeister, Campbell, Krueger & Vohs, 2003 for a review and critique), and much social psychological research has focussed on the influence of SE on a wide variety of intra- and interpersonal outcomes, including prejudice, school performance, aggression, criminality, sexual promiscuity, and serious mental health disorders such as major depression and eating disorders (Baumeister et al., 2003).

Less work, however, has examined what function, if any, SE serves, and why it came to exist in the first place – questions that should be answered before studying how – or whether – it can (or should) be enhanced. In this thesis I will argue that the few functional theories of SE that do exist implicitly assume that SE is an internal representation of one's relationship with the external environment (particularly one's social environment), and that two evolutionary theories of SE – dominance theory (Barkow, 1975, 1980), and sociometer theory (Leary, 1995; Leary & Baumeister, 2000; Kirkpatrick & Ellis, 2001) – explicitly argue that this is the case. These theories suggest that SE is the output of a pre-attentive mechanism that evolved prior to the development of conscious thought, at which time self-valenced feelings were communicated from – and to – others by way of bodily orientation and facial expressions. If so, SE is not only grounded in our bodily relationship with the world, but it cannot be fully understood without taking this relationship into account.

Previous research on these theories has not considered the role of the body in SE. However, recent theories of "embodied cognition" (EC) which suggest that bodily movements and orientation to the environment influence social thoughts, feelings, and behaviours, have now furnished a framework in which to do so. EC research has repeatedly shown that bodily manipulation influences social information processing (see Anderson, 2007; Barsalou, Niedenthal, Barbey & Ruppert, 2003, and Semin & Smith, 2002, for reviews). It is proposed that this is because bodily positions that are repeatedly experienced during acquisition of a concept become an integral part of how that concept is represented in memory. Once established, these "situated concepts" can be activated bi-directionally; i.e. thinking about the concept can activate the modality specific brain regions that were activated during concept acquisition, and manipulating the body directly can activate the concept via a pattern completion process in which the embodied state "activates a larger pattern that contains it, with non-perceived aspects of the pattern constituting inferences about the situation" (Neidenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005, p. 198).

If SE is a representation of one's relationship with the world (as suggested by functional theories), that is attuned to situated conceptualisations of SE-relevant body positions (as suggested by EC theory), it should be possible to influence SE by "re-enacting" those states without feedback that is semantically related to the self. The current studies tested this hypothesis, focussing on one of the most basic and fundamental ways in which bodily orientation is likely to become associated with SE: vertical spatial orientation. Specifically, I manipulated participants' relative vertical body position (i.e., their height relative to their workstation) and measured consequences for SE and SE-relevant social perceptions.

What is self-esteem?

Broadly defined, SE is an affectively laden evaluation of the self along such dimensions as good-bad, positive-negative, and valuable-worthless (Leary & Baumeister, 2000). SE is by definition a subjective judgement, and as such does not imply an accurate, objective evaluation of one's abilities (Baumeister et al., 2003). In fact, research has consistently shown that people over-estimate their abilities and interpersonal attributes relative to objective measures, viewing themselves as more attractive (e.g. Diener, Wolsic, & Fujita, 1995), more socially desirable (e.g. Buhrmester, Furman, Wittenberg, & Reis, 1988), and more intelligent (e.g. Gabriel, Critelli, & Ee, 1994) than they actually are. In defining SE researchers have distinguished between *trait* SE and *state* SE. Trait SE is a person's "average tone of self-feeling" (James, 1890), a relatively stable self-evaluation that is independent of the particular situation. By contrast, state SE consists of self-evaluations based on reactions to valenced events (Brown & Marshall, 2006).

In addition, SE is conceptualised as *global* or *domain* specific. Global SE is "the level of global regard that has for oneself as a person" (Harter, 1993, p. 88), whereas domain specific SE refers to self-evaluations of particular abilities or attributes such as intelligence, social skills, and appearance (Gentile, Grabe, Dolan-Pascoe, Twenge, Wells & Brooke, 2009). Measures of global SE are moderately correlated with other global measures of mental well-being such as self-efficacy and locus of control (e.g. Judge and Bono, 2001), and are highly correlated with domain specific measures (Robins, Hendin, & Trzesniewski, 2001). However, they are less effective than domain specific measures at predicting behavioural outcomes (Crocker & Wolfe, 2001). The use of global SE measures in research on the nature and function of SE is therefore problematic, because they make it difficult to test hypotheses derived from particular functional theories. For example, reflected self-appraisal models of

SE such as sociometer theory (Kirkpatrick & Ellis, 2001, 2006), which suggest that people's feelings towards themselves are determined by what others think of them, predict that SE is more easily influenced by domains that are readily apparent to others (e.g. attractiveness SE) than those that are more internal (e.g. academic SE). Therefore, domain specific measures are more likely to detect changes in SE via experimental manipulation when investigating these theories than are global measures.

More recently, researchers have also distinguished between *explicit* SE and *implicit* SE. Explicit measures such as the widely used Rosenberg self-esteem scale (1965) ask directly about participants' specific or general self-evaluations (e.g. "I feel that I am a person of worth"). They typically have high face validity and positively correlate with other markers of mental health, including life satisfaction and positive and negative affect (Schimmack & Diener, 2003). Although these measures enjoy widespread use, their interpretation is clouded by self-deception and impression management issues (Lindeman & Verkasalo, 1995; Wells & Marwell, 1976). Furthermore, they do not control for maladaptive personality traits, such as narcissism and antisocial personality, which are associated with very high scores (Bushman & Baumiester, 1998). Also, because they rely on conscious evaluations, self-report measures are unable to measure facets of the self-concept that are below the level of conscious awareness. This is an issue of particular significance for clinical researchers, as much of psychopathology is conceived as being due to self-beliefs that are inaccessible to the conscious mind (e.g. Beck, 1967; De Howuer, 2002).

Due to the perceived limitations of self-report measures researchers have attempted to measure *implicit* SE, defined as "an automatic, overlearned, and non-conscious evaluation of

the self that guides spontaneous reactions to self-relevant stimuli" (Koestner & Mageau, 2006). Common measures of implicit SE include the Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998) and the Name Letter Task (Nuttin, 1985). The IAT is a categorisation task that measures the speed with which people associate pleasant or unpleasant words with the self, with faster reaction times to pleasant relative to unpleasant words assumed to reflect higher implicit SE. The name letter task asks participants to rate the attractiveness of the letters of the alphabet, and implicit SE is measured by the degree to which they prefer their own initials relative to other letters.

Implicit measures of SE are only moderately correlated with explicit measures (Farnham, Greenwald, & Banaji, 1999; Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005), which has led to debate about the validity of implicit SE as a construct (Rudolph, Schröder-Abé, Schültz, Gregg, & Sedikides, 2008). However, implicit SE has been found to better predict spontaneous and affectively driven responses to threatening feedback than explicit SE (Bosson, Swann, & Pennebaker, 2000), including non-verbal anxiety (as assessed by an interviewer; Spalding & Hardin, 1999) and negative mood (Greenwald & Farnham, 2000). Furthermore, the consistency of implicit and explicit self-esteem is itself predictive of other psychological variables: individuals with implicit-explicit incongruity, for example, score high on measures of narcissism (e.g. Bosson & Swann, 1998), while congruency is associated with SE stability (e.g. Zeigler-Hill, 2006).

The function of self-esteem

SE is universal among people of all cultures, which suggests that it may be an evolutionary, functional adaptation (Leary, 2005). Nevertheless, it is only relatively recently that researchers have begun to focus on explanations of SE from this perspective. In general, existing functional theories of SE assume that SE provides a signal or internal readout of an individual's relationship with his or her social environment, although individual theories differ on what particular aspect of this relationship SE is signalling.

The two theories that are most explicit in their conception of SE as a signalling system are dominance theory (Barkow, 1975; 1980), and sociometer theory (Leary & Baumeister, 2000; Kirkpatrick & Ellis, 2001, 2006), both of which propose that SE is a mirror of how people perceive others' estimations of their worth. These theories suggest that SE is the output of a cognitive mechanism that constantly monitors the social environment for cues denoting relative relational value.

The dominance theory of SE (Barkow,1975, 1980) argues that this mechanism monitors relative dominance in social relationships and that it evolved in conjunction with humans' capacity to self-reflect, such that "natural selection transformed primate social dominance into human self-esteem" (Barkow, 1975, p.557). This theory suggests that SE became associated with the feelings of attention and deference accorded to the more dominant members in the social hierarchy, and the SE motive (i.e. the motive to feel good about oneself) therefore equates with the motive to improve one's social status, thereby increasing one's chances of reproductive success. The sociometer theory of SE (Kirkpatrick & Ellis, 2001; Leary & Buttermore, 2003; Leary, Tambor, Terdal, & Downs, 1995) also argues that

this mechanism is an adaptation that evolved to improve one's chances of reproductive success, though unlike dominance theory it proposes that the mechanism evolved to monitor social inclusion (Leary & Baumeister, 2000) or, more generally, "social value" (Leary et al, 2001). Of the two theories sociometer theory is the most well formulated and has the most empirical support. Sociometer theory therefore provides a framework in which to consider whether there might be an embodied aspect to SE.

The sociometer theory of SE

According to theory, the sociometer is a psychological mechanism that continually monitors the social environment at a pre-attentive, non-conscious level for cues indicating one's relational value/inclusionary status (Leary, 2005). In this respect the SE system has all the qualities of an automatic cognitive mechanism (Bargh, 1984,1990) in that it is operates autonomously, effortlessly, involuntarily, and unintentionally (Leary, 2005). When a change in relational value (particularly a decrease) is detected the sociometer brings this to a person's conscious attention in the form of positively or negatively valenced self-appraisals, which motivate them to take action to address the situation (Leary, 1999). Sociometer theory suggests these self-appraisals – the "output" of the sociometer – constitute SE, which Leary defines as "a marker of one's [perceived] relational value" (Leary & Baumeister, 2000).

According to sociometer theory trait SE is considered the resting state of the sociometer in the absence of any incoming social information, while state SE is the acute component of the sociometer that alerts individuals to change – when people perceive cues indicating increased relational value their state SE temporarily increases, whereas if they perceive cues indicating decreased relational value it temporarily decreases.

As with Barkow's dominance theory (1975, 1980) Leary (2005) suggests that the sociometer existed on a non-conscious level prior to the development of self-awareness in our species, after which it operated via affective responses to nonverbal cues. Thus, bodily cues such as negative facial expressions (e.g. frowns, scowls) and social distancing produced negative feelings that signalled a potential threat to well-being, which in turn motivated compensatory behaviour. MacDonald and Leary (2005) suggest that such compensatory behaviour was of evolutionary significance to our pre-human ancestors, in that survival was dependent on quickly recognising and responding to bodily cues indicating acceptance or rejection with appropriate response mechanisms. Leary and Buttermore (2003) suggest that when human beings became self-aware these social cues elicited conscious evaluation of the eliciting situation, including consideration of the individual's own role in producing the cues denoting lowered relational value. At this point the sociometer evolved into a dual process system; threats to relational value continued to be detected automatically (i.e. without consciously searching for them), but they were followed by a second, conscious evaluative process. The positively or negatively valenced feelings people have towards themselves based on such conscious evaluations of their perceived value are what we now refer to as SE (Leary, 2005).

A substantial body of research supports sociometer theory's proposition that SE is a gauge of one's relational status by demonstrating that social exclusion has detrimental effects on state SE (for a review see Leary, 2005). Typically, these studies have manipulated inclusionary status either explicitly or implicitly. A common way of explicitly manipulating inclusionary status is by informing participants that they have been chosen or excluded from an experimental group by their peers. For example, using this manipulation, Leary et al. (1995) found that excluded participants reported lower state SE compared to included participants. An equally common method of manipulating inclusionary status implicitly is via experiments using online games such as "cyberball," in which participants, believing they are playing with

real people, are initially included, but after a time excluded, from a virtual game of catch played on a computer. For example, using this manipulation Onada and colleagues (2010) found that participants with low trait SE showed greater feelings of social pain when excluded as opposed to included in a game of cyberball (Onoda, Okamoto, Nakashima, Nittono, Yoshimura, Yamawaki, Yamaguchi & Ura, 2010).

Multiple sociometers

As initially formulated the sociometer theory of SE proposed that SE evolved as a monitor of social inclusion and exclusion (Leary et al., 1995; Leary & Baumeister, 2000). However, the theory has since been elaborated by Kirkpatrick and Ellis (2001, 2006), who argue that "belongingness" is too domain specific to capture the multifaceted nature of SE. Instead, the researchers proposed multiple sociometers (analogous to domain specific measures of explicit SE), each of which evolved to monitor different types of relationships (e.g. rank and status, mating aspirations, coalitions and alliances) which in turn reflect different aspects of one's social value more generally.

Support for the idea that the SE construct is not fully encapsulated by the concept of belongingness has been found in three studies by Leary et al. (2001), who compared the effects of feelings of dominance and acceptance on SE. In the first two studies feelings of dominance and acceptance were manipulated independently by leading participants to believe that four other participants had rated them favourably as either a potential leader or as a potential member of their group. They found that state SE was equally affected by both manipulations (Study 1) and that this was not due to individual differences in the extent to which participants' SE was based on their chronic dominance or acceptance (Study 2). In

Study 3 participants were assessed on a number of different personality measures of self-perceived acceptance, self-perceived dominance, and trait SE. The results showed that while individual differences in self-perceived acceptance and dominance accounted for unique variance in trait SE, they were highly correlated both with trait self-esteem and with each other. On the basis of these studies Leary et. al. (2001) concluded that dominance and acceptance are "naturally confounded" and that their findings therefore supported the predictions of both dominance and sociometer theories. This led them to suggest, in line with Kirkpatrick and Ellis's (2001, 2006) proposal, that dominance and acceptance may reflect aspects of the same higher order concept of "social value," but the relative role that dominance or belongingness plays in these kinds of relationships will be differentially reflected in one's state SE. This contention also accords with the interpersonal circumplex model of human relationships, which proposes that all human transactions can be characterised along the two major dimensions of dominance and affiliation (e.g., Benjamin, 1974; Carson, 1969; Leary, 1957, Gurtman, 2009).

Thus, both dominance theory and sociometer theory suggest we have a need for a system to monitor threats to relational value so that we can respond to them. SE is merely the conscious "output" of this system, and as such mediates the relationship between an individual's sense of social status and their behavioural responses designed to elevate and sustain it. The notion that there are multiple sociometers suggests that SE may be influenced differentially depending on whether dominance or belongingness cues are activated.

Both theories also share the assumption that SE, as the output of a preconscious, evolutionary mechanism that monitors the environment for cues indicating inclusion or exclusion (Barkow, 1975, 1980; Leary, 2005) is, at least in part, a reflection of one's physical

relationship to the environment. Despite this assumption, neither theory has previously tested how the body may influence SE or SE related behaviours directly, perhaps because at the time the theories were developed there was scant theoretical or empirical work to suggest that this would be a fruitful line of enquiry. However, recent research in the field of embodied cognition has demonstrated that body position and movement influence both perception of the self and others, with consequent effects on behaviour. This work has thus provided a theoretical and empirical base from which to explore the assumption that SE is influenced by the body's relationship to the world.

Embodied cognition theory

EC theory suggests that the human brain and nervous system evolved to enable the successful planning and execution of action in the world (e.g. Anderson, 2007; Kashek & Maner, 2009). Therefore, cognition cannot be fully understood without taking into account how perception and action influence, and are influenced by, the body and its relationship to the environment. In recent years a vast amount of research on EC has been undertaken in a number of different disciplines, including developmental, cognitive, and social psychology, robotics, and linguistics. While individual theories differ in their specific conception of "embodiment", they share the assumption that mental representations and operations are "grounded" in the body's physical relationship to the world, such that cognition relies heavily on both actual body position and movements in conjunction with modality-specific brain areas. This view stands in contrast to the traditional computational theory of the mind (e.g. Dennett, 1969; Fodor, 1975), which assumes that human cognition is analogous to computer information processing: information is represented as amodal (i.e. abstract) symbolic representations that are independent of the sensory "inputs" and motor "outputs" from which the information was obtained.

While the computational view remains pervasive in research on cognition, it has recently been challenged on two major fronts. Firstly, there is no direct empirical evidence of a cognitive system that re-codes lived experience into amodal symbols as the computational theory proposes, or even that the brain contains amodal symbols in the first place (Barsalou, 2005). Secondly, an increasing volume of research on EC shows not only that bodily orientation and movement affect conceptual processing but that modality specific areas of the brain are activated when recalling conceptual information. Barsalou (1999) calls these activations "simulations," and the distributed network of conjunctive neurons which give rise to them "simulators." A simulator, analogous to a concept or category in traditional theories of cognition (Barsalou, 1999), develops in response to any aspect of experience that is attended to repeatedly. This can include encounters with similar objects, actions, or situations, including social situations. Each encounter activates similar neural states in modality specific areas which, over time, are bound together by conjunctive neurons into feature networks, thus establishing a multimodal representation of the concept. For example, the simulator for the concept "car" will be an integration of the visual, auditory, somatosensory, and feeling states that an individual's previous experiences of a car have activated. Once established, a simulator re-enacts situation-specific subsets of its content as a unique simulation whenever the representation is recalled or encountered. Simulations can be activated bi-directionally via a process of pattern completion; i.e. recalling a concept can activate the sensory-motor states experienced during concept acquisition, *and* reproducing the sensory-motor states experienced during concept acquisition can activate (prime) the concept. The content of a simulation depends both on previous encounters with the simulator and one's current situation. For example, on one occasion the simulator for "car" might simulate driving a car in heavy traffic, while on others it may simulate changing a tyre, refuelling, and so forth (Barsalou, 1999, 2005).

Empirical evidence for embodied social cognition

Early evidence in support of the embodiment of social concepts came primarily from studies that manipulated facial expressions, head movements, and arm movements. For example, by manipulating facial expressions to test the "facial feedback hypothesis" Duclos, Laird, Schneider, Sexter, Stern, & Van Lighten (1989) found that participants rated musical tones higher on the dimensions of sadness, fear, anger, and disgust when induced to exhibit the facial expressions associated with these emotions, and Strack, Martin, & Stepper (1988) found that inducing participants to inhibit or contract their zygomaticus muscle (the "smiling muscle") by asking them to hold a pen either between their lips or between their teeth, led them to report that cartoons were funnier when "smiling" than when "frowning" (Strack, Martin, & Stepper, 1988).

Analogously, inducing participants to either nod or shake their heads (signalling agreement and disagreement respectively) has been shown to influence the processing of negatively and positively valenced material. For example, under the pretext of testing how well a pair of headphones remained affixed to the head when walking or dancing, Wells and Petty (1980) found that participants reported more positive attitudes to the persuasive messages that were being played through the headphones while nodding compared to shaking the head (see also Forster, 2004; Forster & Strack, 1996).

Arm flexion and extension have been found to be associated with approach and avoidance tendencies respectively. For example, Cacioppo, Priester, and Bernston (1993) asked participants to either press upwards (flexion/approach) or downwards (extension/avoidance) on a table while viewing novel visual stimuli (Chinese ideographs) and found that

participants subsequently rated the stimuli as more pleasant in the flexion condition than in the extension condition. Similarly, Chen and Bargh (1999) found that participants responded faster than controls to positively valenced words while pulling (flexion) and to negatively valenced words while pushing (extension; see also Neumann & Strack, 2000).

The embodied self-concept

Other research suggests that embodiments can influence not only the evaluation of external stimuli, but also the processing of self-related information. For example, in a study ostensibly studying motion and memory Fayant and colleagues (2011) asked participants to walk either two steps forward (approach condition) or two steps backward (avoidance condition) while memorising photographs of attractive or unattractive members of the same sex. When participants were later asked to judge their own attractiveness they evaluated themselves as more attractive in the approach/attractive condition and in the avoid/unattractive condition, suggesting assimilation and contrast effects respectively. (Fayant, Muller, Nurra, Alexopoulus, and Palleul-Germain, 2011, Study 3).

Other experimental manipulations have influenced behaviours directly relevant to the self-concept. For example, in studying persistence Riskind and Gotay (1982) found that a slumped posture was related to lack of persistence on a helplessness task (unsolvable puzzles). By contrast, Friedman and Elliot (2008) found that arm crossing – a bodily cue hypothesised to be associated with perseverance in achievement contexts – led to greater persistence at attempting to solve unsolvable anagrams. Such manipulations have also been found to influence explicit self-evaluations. For example, Stepper and Strack (1993) showed that success at an achievement task invoked greater feelings of pride in response to task

feedback when participants were in an upright as opposed to a slumped body posture. Relatedly, Riskind (1984) found that participants with a hunched, threatened posture reported greater anxiety than controls, and that participants whose body posture was incongruent with either success or failure (i.e. upright/failure, slumped/success) reported greater external locus of control, lower motivation, and lower mood than those with congruent postures (upright/success, slumped/failure; Riskind, 1984). More recently, Schubert (2005) demonstrated that men who were unobtrusively manipulated to make a fist (a gesture associated with power) rated themselves as having higher social SE and assertiveness than men who made a neutral gesture.

Intriguingly, embodiments have been found to influence implicit self-concepts independent of explicit beliefs, suggesting that some aspects of the self-concept may be directly embodied (in that they are not mediated by conscious self-perception). This was demonstrated in three recent studies investigating the embodiment of power by Huang and colleagues who found that an "expansive" open body posture that takes up space, compared to a slouched, "constricted posture" activated an implicit sense of power independent of participants actual status and independent of their conscious (i.e. explicit) evaluation of how powerful they felt (Huang, Galinsky, Gruenfeld, & Guillory, 2011). In the first two studies they manipulated the power implied by their social roles (manager or subordinate) and of their physical postures. While both the high power posture and the high power role influenced self-perceived power, only the high power posture activated an implicit sense of power, as measured by facilitated access to power related words in a word completion task, greater abstract thought, and riskier gambling behaviour. In a third study participants in high power postures indicated that they would behave more actively (e.g. by opting to speak first in a debate) than those in constricted postures, independent of prior power priming. These results

suggest that aspects of the self-concept (in this case a sense of power/agency) may be directly embodied outside of awareness.

Is the sociometer embodied?

The studies described above suggest that manipulating embodied states can influence the self-concept either explicitly, in the form of self-evaluation, and/or implicitly, in the form of self-relevant behavioural responses. Since sociometer theory assumes that SE is based on comparisons people make between themselves and the social world, and given that these comparisons have their evolutionary genesis in reactions to pre-verbal bodily cues (Macdonald & Leary, 2005), those comparisons are likely to be instantiated in our bodily movements and orientation to the environment. It is therefore plausible that the sociometer is either directly embodied or at least influenced by embodied states. Therefore, manipulating embodiments associated with SE should also influence SE explicitly, via self-report, or implicitly, in the form of perceptions and behaviours indicating either enhanced or lowered SE.

From the perspective of sociometer theory, there are a number of bodily positions and movements that are likely to become associated with either SE threat or SE enhancement, including particular facial expressions, gestures, and bodily orientations. In the current studies I focussed on people's vertical spatial orientation to the environment, for two reasons. First, vertical spatial orientation is one of the most fundamental and universal ways in which people relate to, and comprehend, the physical world, in that other people and objects are always literally above, below, or level with us in our interactions (Lakoff & Johnson, 1980). Furthermore, SE and vertical orientation are likely to simultaneously become salient in many

repeated situation specific interactions such that, over time, they become associated in memory. For example, a "high" upright posture indicative of pride, positive affect, or dominance is likely to become associated with high SE and a "low" slumped posture indicative of resignation, negative affect, or submission is likely to become associated with low SE (Riskind, 1984; Riskind & Gotay, 1982). Second, EC experiments have already demonstrated that vertical orientation influences perception and attitudes towards both the self and others, including those relevant to SE. For example, verticality has been shown to influence the processing of positively and negatively valenced stimuli (Meier & Robinson, 2004), representations of power relations (Schubert, 2005), and personality dominance (Moeller, Robinson, & Zabelina, 2008), all of which are linked to SE. I therefore wished to extend this research to investigate whether vertical spatial orientation influences SE, either directly, or via SE related perceptions and behaviours.

Specifically, I predicted that manipulating participants' vertical orientation relative to their computer workstation would influence state SE, such that participants in a high position would exhibit higher explicit and implicit SE. Further, I predicted that alterations to state SE caused by the manipulation would influence one or more SE related social cognitions: intergroup bias, perceived social status, and perceived mate value.

Study 1

This study tested the hypothesis that SE is embodied on the vertical spatial dimension, such that a higher spatial position is associated with higher SE than a lower spatial position. Specifically, participants completed measures of implicit and explicit SE presented on a computer monitor while seated in either a tall or short chair (henceforth referred to as the "high" and "low" conditions), which required them to orient their body downward or upward with respect to the computer in order to complete the tasks. It was predicted that participants in the high condition would show greater implicit and explicit SE than those in the low condition, and that these effects would not be mediated by any mood or discomfort that the different orientations might introduce.

Method

Participants

One hundred and forty-one undergraduate psychology students (40 male, 101 female) from the University of Otago participated in the experiment as part of a research participation requirement for their first or second year paper.

Materials

Explicit SE was measured with the Heatherton and Polivy (1991) 20-item state self-esteem scale (the "Current Thoughts Scale"), which was chosen because it has high reliability (Cronbach's α =.97; Heatherton & Polivy, 1991). The scale includes three subscales: appearance SE (six items, e.g., "I feel satisfied with the way my body looks right now"), performance SE (seven items, e.g., "I feel confident that I understand things"), and social SE

(seven items, e.g., “I am worried if I am regarded as a success or a failure”). Participants were asked to indicate the extent to which they agreed with each statement “as it is true for you right now,” on a Likert-type scale anchored at 1 (“not at all“) and 9 (“extremely”). The order of presentation for this measure was not randomised. A copy of this measure is included in Appendix A.

Implicit SE was assessed using the name letter task (Nuttin, 1985). Participants were asked to rate their liking for each uppercase letter of the alphabet on a Likert-type scale anchored at 1 (“dislike very much”) and 9 (“like very much”). Each letter was presented mid-screen in large font (size 158) with the scale presented horizontally across the bottom of the screen. A new letter appeared after each response. For this measure, high implicit SE is indicated by a preference for one’s own initials compared to other letters of the alphabet. The order of letter presentation was randomized for each participant. The instructions for this measure are included in Appendix B.

Participants’ current mood was measured on a 9-point Likert-type scale anchored at 1 (“very negative”) and 9 (“very positive”), and their current level of physical comfort on a 9-point scale anchored at 1 (“very uncomfortable”) and 9 (“very comfortable”). See Appendix C for the full instructions for these measures.

Procedure

After providing informed consent participants were randomly seated in one of two armless, cushioned chairs located in light and sound attenuated experimental cubicles containing an

iMac computer with a 17 inch monitor. As seen in Figure 1, the "high" chair was a 72cm tall stool; the "low" chair was a 28cm tall desk chair. Neither seat could be adjusted in any way. The height from the floor to the center of the computer screen was 110cm. Based on census data (Wilson, Russell, & Wilson, 1993) the average height of a New Zealander aged between 19-45 is 171cm. Therefore, the average participant's eye-line when looking straight ahead would be approximately 7 degrees below mid-screen in the low condition and approximately 34 degrees above mid-screen in the high position. The recommended angle for viewing a computer monitor is to be oriented such that one looks at a downward angle of 15 degrees to the center of the screen (Heuer, Bruwer, Romer, Kroger, & Knapp, 1991.); thus, in the low condition participants viewed their monitor at 22 degrees below the typical viewing angle and in high condition 19 degrees above the typical angle. Figure 1 depicts the two conditions.

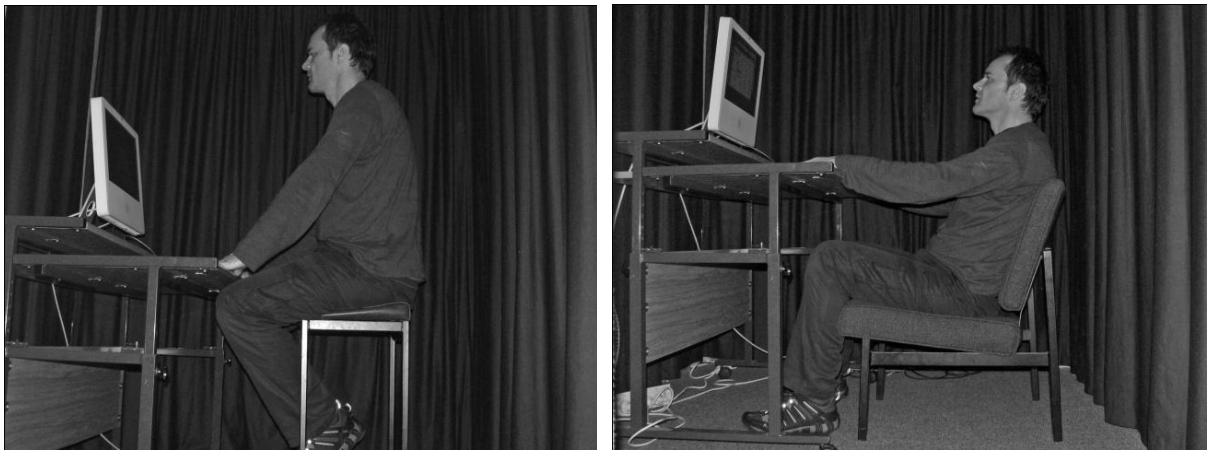


Figure 1.The high chair condition (left) and low chair condition (right).

All measures were completed on the computer, via custom software written in Superlab version 4.0 (Cedrus Corporation, 2008). Except where indicated, questions appeared in the center of the screen, randomised for each participant, with the scales presented horizontally beneath them. The font used was Lucinda Grande, with font size 24, unless otherwise

specified. Participants indicated their response by using the number keys on the computer keyboard. Following an introductory screen participants completed the name letter task, current thoughts scale, and current mood and comfort measures, always in the same order. Other measures, not relevant to the current study, were also completed. Overall, the procedure took approximately 20 minutes, after which all participants were debriefed.

Results

Descriptive statistics

The overall means, means by condition, and *t* scores for between-condition comparisons appear in Table 1.

Table 1

Dependent Variable Means and t-tests Between Conditions, Study 1

Variable	Overall mean (SD)	High (N=72) (SD)	Low (N=69) (SD)	*t* (139)
Average SE	5.52 (1.25)	5.74 (1.22)	5.28 (1.25)	2.22*
Appearance SE	5.54 (1.55)	5.88 (1.35)	5.13 (1.67)	2.72*
Social SE	5.34 (1.51)	5.62 (1.50)	5.01 (1.48)	2.22*
Performance SE	5.67 (1.44)	5.75 (1.49)	5.58 (1.40)	.69
NLT first name initial	2.41 (2.12)	2.39 (2.05)	2.43 (2.20)	-.10
NLT surname initial	1.75 (1.96)	1.95 (1.88)	1.55 (2.05)	1.22
Mood	5.89 (1.74)	6.03 (1.69)	5.75 (1.79)	.94
Comfort	5.43 (1.98)	5.53 (1.88)	5.33 (2.09)	.58

Note: Standard deviations appear in parentheses. * $p<.05$

Explicit SE

Social, appearance, and performance SE were calculated separately by averaging responses, reverse-scored when necessary, to the items within each dimension. All three factors displayed good internal consistency (performance SE, α = .82, appearance SE, α = 86, and social SE α = .83).

A 2 (condition) X 3 (SE dimension) X 2 (participant gender[1]) mixed model ANOVA, with the second factor treated as a repeated measure, revealed a significant main effect of SE dimension, $F(2, 274) = 5.55$, $p = .004$. Paired *t*-tests indicated that participants reported higher performance SE than social SE, $t(140) = 2.89$, $p = .004$, but that there was no significant difference between performance SE and appearance SE, or between social SE and appearance SE, *p*s > .1. The analysis also revealed a marginal main effect of gender, $F(1, 137) = 3.38$, $p = .07$, such that men reported overall higher SE than women (*M*s 5.88 vs 5.37).

Most importantly, the analysis also revealed the predicted main effect of experimental condition, $F(1, 137) = 3.92$, $p = .05$, such that participants in the high chair reported higher SE than those in the low chair. The effect was qualified, however, by a marginal interaction between condition and SE dimension, $F(2, 274) = 2.35$, $p < .10$. As shown in Table 1, participants in the high condition reported significantly greater appearance SE ($p = .008$) and

[1] Gender has been included as an additional between subjects variable in all analyses as previous research has consistently shown that males consistently score slightly higher on measures of global SE than women (Kling, Hyde, Showers, Carolin, & Buswell, 1999).

social SE (p = .028) than those in the low condition. There was no significant difference between high and low conditions for performance SE (p = .485).

Implicit SE

Implicit SE was calculated using the "self-corrected algorithm" (LeBel & Gawronski, 2009) – the difference between participants' ratings of their own initials and their mean ratings of the remaining letters of the alphabet – and analysed in two condition X gender between-subjects ANOVAs, one for first name initials and one for surname initials. There were no effects for first name initials, but the analysis of surname initials revealed a main effect of gender, $F(1,137) = 8.82$, p = .004, such that women displayed higher implicit SE than men (Ms = 2.34 vs 1.54). In addition there was a marginal interaction between gender and condition, $F(1, 137)$ p = .09. To explore this interaction, independent sample t-tests were conducted between experimental conditions on males and females separately. These revealed a significant effect for female surname scores, $t(99) = 2.51$ p = .014, but not for male surname scores, $t(38) = -.505$, p = .616. The mean difference surname scores for males and females are depicted in Figure 2 below.

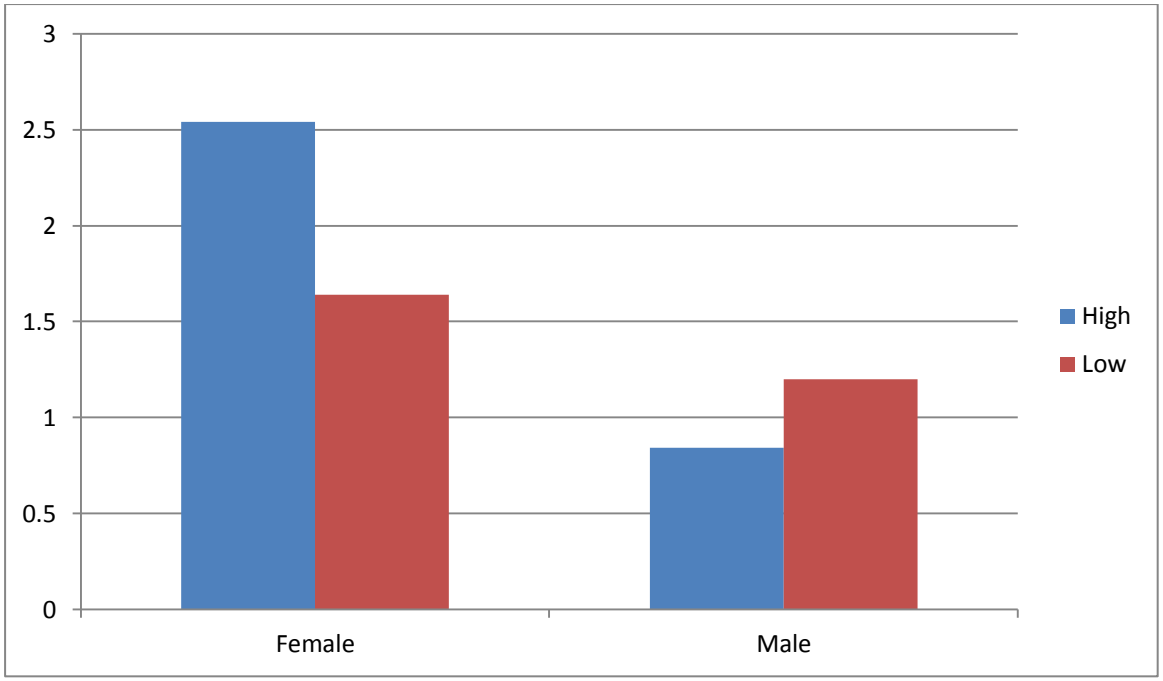


Figure 2. Mean difference surname initial scores, by condition, for male and female participants in the name letter task.

Correlations between explicit and implicit SE

There were no significant correlations between any of the factors of the explicit SE measure and the implicit SE measures (all *rs* < .2).

Mood and comfort

Separate condition X gender ANOVAs on mood and comfort found no significant main or interaction effects for either of the variables.

Discussion

Study 1 tested the hypothesis that manipulating participants' vertical orientation would influence their explicit and/or implicit SE. This hypothesis is based on the assumptions of sociometer theory – which suggests that SE is a representation of one's relationship with the environment, and EC theory – which suggests that concepts, including aspects of the self-concept, are encoded in the body and the environment with which it interacts. According to EC theory, concepts become embodied by the repeated pairing of particular body positions and movements with a concept during concept acquisition. Empirical research has supported EC theory by demonstrating that concepts, including aspects of the self-concept, can be activated bi-directionally by a process of pattern completion; i.e. a concept can be activated either by recalling the concept or by activating the sensory-motor states employed during concept acquisition. Therefore, given that sociometer theory implicitly assumes that SE is a situated concept it should be possible to influence SE by manipulating bodily orientation and/or movement.

In light of previous theory, Study 1 tested whether vertical spatial orientation – one of the most basic bodily relationships associated with SE – influences SE. Specifically, participants sat in either a high or low chair relative to their workstation while completing measures of explicit and implicit SE. It was predicted that participants would report higher explicit and implicit SE in the high relative to low conditions.

The results showed that compared to those in the low condition, participants in the high condition reported greater explicit social SE and appearance SE. In addition, women in the high condition rated their surname more positively in the name letter task, a measure of

implicit SE, than women in the low condition. These effects were not due to changes in mood or comfort, which were not influenced by vertical orientation.

While encouraging, these results did not fully support the hypotheses for either explicit or implicit SE. First, there was no effect for the performance SE factor of the explicit SE measure. Although differences among SE dimensions were not predicted, this finding is not inconsistent with sociometer theory, which predicts that domains of SE may be differentially affected depending on the basis of relational evaluation that are salient in particular contexts (Leary & Baumeister, 2000), and that such differential effects may be due to the activation of different sociometers (Kirkpatrick & Ellis, 2001, 2006). The Current Thoughts Scale (Heatherton & Polivy, 1991) used to measure explicit SE in this study has been shown to be sensitive to changes to different aspects of the self-concept depending on the manipulation. For example, in developing and validating the scale the researchers found that performance SE, but not appearance or social SE, was affected by academic feedback (reactions to exam results) while appearance SE and social SE, but not performance SE, were influenced by an intervention aimed at increasing the general SE of severely obese women. It remains to be determined how robust the differential effects on explicit SE found in Study 1 are, and what sociometer(s) are implicated by these effects.

The results for implicit SE were less robust, in that the experimental conditions differed only for surnames, and only among female participants. In addition, the explicit and implicit SE measures were only weakly correlated. This may be because the implicit SE measure was not specific enough to be sensitive to any embodied changes engendered by the manipulation. It is also possible that women were more affected by the manipulation due to women's average

height being lower than men; i.e., while the relative difference between the two conditions would be the same for individuals of the same height the average female would be lower than the average male in both conditions of the experiment. Unfortunately this experiment did not include a measure of participant height so this possibility could not be investigated further.

Although the results are mixed, they were deemed sufficiently promising to warrant replication and extension. Therefore, in Study 2, participants were given the same manipulation and primary dependent measures. In addition, in order to cross-validate the effects on SE, and to explore whether the manipulation differentially influenced domain specific sociometers, additional measures were included to gauge perceptions of within and between group relational value, and perceived mate value. A measure of participants' height was also included to control for this variable in all analyses.

Study 2

The finding in Study 1 that both appearance and social SE were influenced by the manipulation raised the question of whether changes in SE engendered by differences in vertical body position have implications for the perception of, and behaviour towards, social targets. If people perceive social targets differently this will likely influence whether and how they engage with them; for example, individuals are more likely to approach those they view in a positive light and more likely to avoid those they view in a negative light (e.g. Wojciszke & Struzynska–Kujalowicz, 2007). As Kirkpatrick and Ellis point out in their elaboration of sociometer theory (2001) there are many types of social relationships that may be differentially affected by domain specific sociometers. Among the distinct sociometers suggested by Kirkpatrick and Ellis (2001) are those that monitor: (1) intergroup relationships (e.g., discrimination); (2) intragroup relationships (e.g., social status); and (3) mating relationships (e.g., perceived mate value). Three new measures were included in Study 2 to test the differential effects of the manipulation on each of these three proposed sociometers.

The first of these examined the output of the intergroup sociometer by measuring intergroup bias. Intergroup bias is a behaviour associated with low SE as predicted by social identity theory's self-esteem hypothesis (SEH; Abrams & Hogg, 1988). According to the SEH intergroup discrimination enhances SE (which is assumed to be a need) and, because of this, low or threatened SE will lead to greater intergroup discrimination (Abrams & Hogg, 1988). Several studies have found support for the predictions of the SEH (for a review, see Aberson, Healy & Romero, 2000). In light of Study 1's findings, and in accordance with both the SEH and Kirkpatrick and Ellis' proposal that there is a sociometer that monitors between group competition, it was predicted that as a consequence of their comparatively lower SE, those in

the low condition would show greater discrimination towards an out-group (Maori) than those in the high condition.

The second new measure included in Study 2 examined the output of the intragroup sociometer by measuring perceived status. This sociometer is akin to Barkow's (1975, 1980) suggestion that SE is an output of a mechanism that monitors relative dominance in social relationships. This measure consisted of two scales that directly asked participants to judge their status compared to others within their social group. If participants feel higher in the social hierarchy in the high condition relative to the low condition this would provide support for a sociometer that monitors within group relational value.

The third new measure examined the output of the mating sociometer. Kirkpatrick and Ellis (2001, 2006) suggest that an important function of SE is to guide people to approach social relationships, and that this is of particular evolutionary significance in mate selection. They therefore propose the existence of a mating sociometer that influences individuals' aspirations in approaching potential partners of perceived similar value. As previous research has already demonstrated that individuals with high self-perceived mate value have higher standards in mate selection than those with low self-perceived mate value (e.g. Buston and Emlen, 2003), it was predicted that participants in the high condition would rate attractive social targets as higher in mate value than unattractive targets, compared with participants in the low condition.

Method

Participants

One hundred and seventy-one undergraduate psychology students (63 male, 108 female) from the University of Otago participated in the experiment. As with Study 1, this was part of a research participation requirement for their first or second year paper.

Materials

In addition to the materials described below, twenty male and twenty female colour images of Caucasian faces from the Facelab database at the University of Western Australia were used in the study (contact author for examples). All individuals in the photographs had neutral expressions and had given permission for their photographs to be used anonymously in research on face perception. The photographs were taken at a standard distance and rotated to make the pupils horizontal. The faces had been judged by pretest participants at the University of Australia in terms of their attractiveness, using a 1-7 scale. The mean score of the "attractive" faces was 5.19 for females (Range 4.29 - 6.48, SD = 0.72) and 4.35 for males (Range 3.83 - 5.08, SD = 0.54). The mean score for the unattractive faces was 2.01 for females (Range 1.42 - 2.42, SD = 0.28) and 1.90 for males (Range 1.29 - 2.38, SD = 0.43).

Participants rated opposite sex faces in terms of their mate value, in randomised trials. Participants were asked to assume they were "single and looking for a potential partner," and to judge how likely they would be to consider dating each target person, using a 9-point scale anchored at "very unlikely" and "very likely". The full instructions for this measure are included as Appendix D.

Study 2 used the same individual difference measures as Study 1, with the following three alterations: Perceived social status was assessed with a modified version of the MacArthur scale of subjective social status (Adler & Stewart, 2007). Participants indicated the rungs of two "social ladders" – one representing socio-economic status; one representing community standing – on which they thought they sat. These scales are typically depicted as images of ladders, with the highest rung indicating the highest social standing. However, in this experiment the images of the ladders were replaced with a horizontal scale out of concern that participants in the high condition may be particularly prone to indicate high ratings, either due to a congruency of height metaphors, or simply due to a better line of sight. The modified horizontal scale was a 9-point measure anchored at 1 ("bottom rung of ladder") and 9 ("top rung of ladder"). Participants were asked where they would place themselves on the ladders by clicking on the rung "where you think you stand at this time in your life, relative to other people in your community." These measures are included in Appendix E.

In addition to these changes the following two additional measures were included: Intergroup bias was measured by assessing participants' attitudes towards Maori (New Zealand's minority indigenous population), using the Modern Racism Scale (MRS; McConahay, Hardy, & Batts,1981) adapted for the New Zealand context. In previous studies this scale has been shown to have good reliability ($\alpha = .86$, McConahay, 1983). Participants were asked to rate six statements about Maori in contemporary New Zealand society (e.g., "Maori are getting too demanding in their push for equal rights") on a 9-point Likert-type scale anchored at 1 ("strongly disagree") and 9 ("strongly agree"). This scale has three factors: "antagonism" (three items) and "resentment" toward the out-group (two items), and "denial" that racism is a problem (one item). The order of presentation of the items was randomised. This measure is included in Appendix F.

The second additional measure consisted of two questions asking participants to indicate their height (in cms) and weight (in kgs) by typing their answer into a response box using the number keys on the computer keyboard.

Procedure

The procedure was identical to that of Study 1, with the exception that participants completed a pen and paper demographics form prior to the experiment.

Following an introductory screen participants completed the implicit and explicit SE measures, social status measure, intergroup bias measure, perceived mate value measures, body esteem scale, height and weight measures, and current mood and comfort measures, always in the same order. The procedure took approximately 30 minutes, after which all participants were debriefed.

Results

Four participants (3 males, 1 female) were excluded from the analysis due to incomplete data. Initial inclusion of height and weight as covariates did not influence the outcome of any analyses, and so these variables are not included in the final analyses.

Descriptive statistics

The overall means, means by condition, and *t* scores for between-condition comparisons appear in Table 2.

Table 2

Dependent Variable Means and t-tests Between Conditions, Study 2

Variable (N)	Overall mean (SD)	High	Low	*t*
Average SE (167)	5.42 (1.19)	5.50 (1.24)	5.35 (1.14)	.767
Appearance SE (167)	5.53 (1.55)	5.49 (1.59)	5.57 (1.50)	-.329
Social SE (167)	5.16 (1.34)	5.30 (1.36)	5.02 (1.32)	1.35
Performance SE (167)	5.59 (1.36)	5.70 (1.40)	5.48 (1.32)	1.05
NLT first initial (167)	1.80 (1.78)	1.75 (1.87)	1.84 (1.67)	-.293
NLT surname initial (167)	1.34 (2.23)	1.31 (2.34)	1.36 (2.11)	.117
Mood (167)	6.05 (1.43)	6.05 (1.43)	6.10 (1.469)	-.23
Comfort (167)	5.48 (1.97)	5.48 (1.98)	5.94 (1.72)	-1.59
Socio-economic status (167)	5.71 (1.49)	5.73 (1.60)	5.70 (1.38)	.15
Community standing (167)	5.50 (1.49)	5.59 (1.50)	5.40 (1.48)	.81
MRS – Antagonism (149)	4.91 (1.23)	4.93 (1.31)	4.89 (1.14)	.18
MRS – Denial (149)	3.83 (2.23)	3.74 (2.30)	3.92 (2.16)	.64
MRS – Resentment (149)	3.69 (1.84)	3.49 (1.94)	3.91 (1.70)	-1.40
Perceived mate value: attractive targets (156)	4.60 (1.59)	4.74 (1.54)	4.44 (1.63)	1.21
Perceived mate value: unattractive targets (156)	2.17 (1.13)	2.11 (1.11)	2.23 (1.17)	-.69

Note: Standard deviations appear in parentheses. The conditions did not differ at $p < .05$ on any of the variables.

Explicit SE

As with Study 1, social, appearance, and performance SE were calculated separately by averaging responses, reverse-scored when necessary, to corresponding items. All three factors displayed good internal consistency (performance SE, $\alpha = .82$, appearance SE, $\alpha = .87$, and social SE, $\alpha = .76$).

A 2 (condition) X 3 (SE dimension) X 2 (participant gender) mixed model ANOVA, with the second factor treated as a repeated measure, revealed a significant main effect of SE dimension, $F(2, 330) = 12.52$, $p < .001$. Paired *t*-tests indicated that participants reported higher performance SE than social SE, $t(168) = -5.29$, $p < .001$, which replicated Study 1. In addition, participants in Study 2 reported higher appearance SE than social SE, $t(168) = -3.41$, $p < .05$. The difference between performance SE and appearance SE was nonsignificant, $p > .5$. The analysis also revealed a main effect of gender, $F(1, 664)$, $p < .05$, such that men reported higher SE than women (*M*s 5.93 vs 5.25).

As in Study 1, the analysis revealed a marginal interaction between condition and SE dimension, $F(2, 326) = 2.56$, $p = .08$, (the main effect of condition was not significant). Further inspection revealed that the interaction was driven entirely by males $F(2, 122) = 3.58$, $p < .05$ (for females, $F < 1$). *T*-tests indicated that males in the high condition reported significantly higher performance SE (*M*s: 6.41 vs 5.69, $t(63) = 2.47$, $p = .016$) and nonsignificantly higher social SE (*M*s: 5.58 vs 5.08, $t(63) = 1.60$, $p = .11$). The conditions did not differ on appearance SE, *p*s >.7.

Implicit SE

As in Study 1, implicit SE was calculated using the self-corrected algorithm (LeBel & Gawronski, 2009), and analysed in two condition X gender between-subjects ANOVAs, one for first name initials and one for surname initials. There were no effects for surname initials, but the analysis of first name initials revealed a main effect of gender ($F(1, 163)$, $p = .05$), such that women displayed higher implicit SE than men (*M*s 2.03 vs 1.42). Independent sample *t*-tests conducted between experimental conditions on males and females separately revealed no significant differences between conditions for either gender.

Correlations between explicit and implicit SE

There were no significant correlations between any of the factors of the explicit SE measure and the implicit SE measures (all *rs* < .1)

Social status

The two social status measures (socioeconomic status and community standing) were analysed in separate condition X gender between subjects' ANOVAs. This analyses revealed no significant main or interaction effects for the community standing measure. While there was an interaction effect of gender and condition for the socioeconomic status measure, $F(1, 163) = 3.90$, $p < .05$, independent sample *t*-tests conducted between experimental conditions on males and females separately revealed no significant differences between conditions for either gender. The interaction effect was due to the opposite direction of effects for males and females, with males recording numerically higher scores in the low condition than the

high condition (*M*s 5.39 vs 5.94) and females scoring numerically higher in the high than low condition (*M*s 5.93 vs 5.54).

Intergroup bias

Due to the nature of the measure only participants of European descent were included in these analyses (n=149). The 6 questions from the MRS were averaged for the three factors of antagonism, denial, and resentment. Cronbach's alpha for the three factors was $\alpha = .57$, suggesting "questionable" internal consistency (George & Mallery, 2003). Ratings were analysed in a 2 (condition) X 3 (bias dimension) X 2 (gender) mixed model ANOVA, with the second factor treated as a repeated measure. The analysis revealed a significant main effect of bias dimension, $F(2, 326) = 30.55$, $p < .001$. Paired *t*-tests revealed that participants reported greater antagonism than denial, $t(148) = 5.89$, $p < .001$, and greater antagonism than resentment bias, $t(148) = 8.92$, $p < .001$. There was no significant difference between denial and resentment. There were no other significant effects.

Perceived mate value[2]

Mate value ratings displayed high internal consistency ($\alpha = .94$). Ratings were analysed in a 2 (condition) X 2 (target attractiveness) X 2 (participant gender) mixed model ANOVA, with the second factor treated as a repeated measure, although gender effects were not interpreted due to the inherent confounding of participant and target gender (i.e., male and female

[2] While homosexual participants were asked to rate same sex partners, and bisexual partners were asked to rate opposite sex partners by default, the sample size of these participants was too small for them to be included as factors in these analyses. Therefore only heterosexual participants' responses were used.

participants rated different faces). The analysis revealed a significant main effect of target attractiveness, $F(1, 101) = 622$, $p < .001$, such that attractive targets were rated as more desirable partners than unattractive targets (*M*s 4.60 vs 2.17), as well as a significant interaction between condition and attractiveness, $F(1, 152) = 6.29$, $p < .05$. The interaction was due to greater discrimination between attractive and unattractive targets in the high condition (*M*s 4.75 vs 2.11) than in the low condition (*M*s 4.44 vs 2.23), although differences were significant in both cases, both *p*s < .05. The mean scores for attractive and unattractive targets are depicted in Figure 3 below.

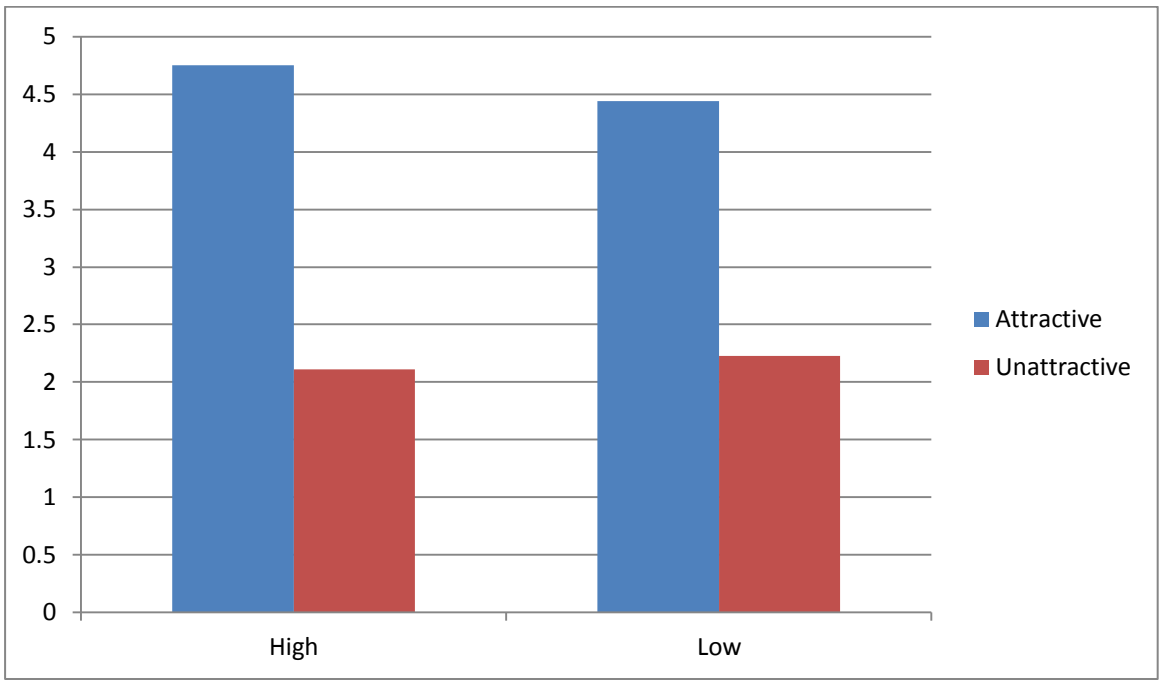


Figure 3. Perceived mate value of attractive and unattractive targets by condition, Study 2.

Mood and comfort

Separate condition X gender ANOVAs on mood and comfort found no significant main or interaction effects for either of the variables.

Discussion

Study 2 was designed to replicate and extend the findings of Study 1, which had provided some support for a direct effect of vertical orientation on self-esteem, consistent with the notion of an embodied sociometer. According to this conception, SE is a subjective readout of one's social relationships, which includes representations of the body's relationship with the environment. Study 1's results suggested that two of three SE dimensions were influenced by the manipulation, with participants in the high condition reporting higher appearance and social SE than participants in the low condition. Unexpectedly, there was no effect on performance SE, but, as discussed above, this may have been due to the domain specificity of the manipulation. The first goal of Study 2, therefore, was to attempt to replicate this pattern of results. The second goal was to test whether three of the domain specific sociometers suggested by Kirkpatrick and Ellis (2001, 2006; associated with appearance and social SE) were influenced by the manipulation. Three new measures – of intergroup bias, intragroup bias, and perceived mate value – were assessed to provide evidence for the activation of the corresponding sociometers.

The results of Study 2 were consistent with the activation of a mate value sociometer. Specifically, participants in the high condition discriminated more between attractive and unattractive mates, compared to participants in the low condition. There was no support for the hypothesis that the manipulation would influence the intergroup or intragroup sociometers.

Unexpectedly, however, the effect on explicit SE itself was not replicated. In Study 1 participants in the high condition reported higher appearance and social SE than those in the

low condition, and there were no effects on performance SE. However, in Study 2 there was a significant effect on performance SE and a marginal effect on social SE for males only. The implicit SE findings were similarly inconsistent; while in Study 1 there was partial support that the manipulation influenced implicit SE for female participants, in Study 2 there were no significant differences between conditions for either gender.

It is not clear why the SE results are inconsistent across the two studies. One possible account relates to other physical covariates of the manipulation, such as postural differences. As discussed in the introduction to this thesis, previous studies have found a relationship between body posture and subjective feelings. For example, it has been found that a slumped posture evokes greater feelings of helplessness and stress (Riskind & Gotay, 1982) and depression (Riskind, 1984) than an upright posture, while Stepper & Strack (1993) reported that an upright upper body posture evokes greater feelings of personal pride than a bent over upper body posture when receiving achievement feedback.

Given these previous results it is possible that body posture influenced the results in the present studies. In reviewing the manipulation it became evident that due to the relative height differences in relation to the computer monitor between the two conditions, there may have been a tendency for participants to slouch when sitting in the high chair and to sit upright in the low chair. Thus, two different aspects of the manipulation – vertical position and posture – are associated with opposite effects on SE, and may have cancelled each other out. The fact that the results were inconsistent across the two studies suggests that they are unreliable. Therefore, if the results were confounded by posture, controlling for this variable would help to minimise its influence and isolate the vertical spatial dimension as the

independent variable. To this end, posture was controlled in Study 3 by using a cover story asking participants in both conditions to retain the same upright posture for the duration of the experiment. The use of this cover story also provided an explanation (not provided in Study 1 or Study 2) for why participants were seated in high and low chairs, thereby reducing the potential for experimenter demand effects. With this exception, Study 3 used the same design and measures as Study 2.

Study 3

Method

Participants

One hundred and forty-one undergraduate psychology students (23 male, 118 female) from the University of Otago participated in the experiment. The procedure took approximately 30 minutes, after which all participants were debriefed.

Materials

With the exception of mood and comfort measures, which were not included, Study 3 used the same measures as Study 2.

Procedure

The procedure was identical to that of Study 2, with the following exceptions. First, demographic information was collected online using professional questionnaire software (QuestionPro.com, 2010). Second, the experiment was reprogrammed in Java, allowing for mouse based rather than keyboard based responding, thereby minimizing participants' extraneous movements.

Third, and most important, the experiment was described as a study testing the effect of posture on a number of analytical and social reasoning tasks. The experimenter demonstrated the seating position required for the study emphasizing that the participant's feet should remain flat on the floor and shoulder width apart, their spine upright and at a 90 degree angle to the floor, their shoulders were straight but relaxed, and their hands resting on the desk at

either side of the computer keyboard, with their dominant hand used to manipulate the computer's mouse.

After an introductory screen, participants were presented with the following cover story to explain the rationale for the chair they were seated in:

> "When seated in regular office chairs people tend to move about and change their posture over time. For example, they may slouch, move from side to side, cross their legs, etc. There has been an ongoing debate in psychology about whether such body movements affect how people perform on analytical and social reasoning tasks, with some psychologists arguing that movement aids processing and others arguing that it disrupts processing.
>
> This study addresses this issue by controlling for body movement. Participants have been randomly assigned to one of two conditions:
>
> Condition 1: participants are seated in a chair that promotes movement and are instructed to make specified movements throughout the experiment.
>
> Condition 2: participants are seated in a chair that minimizes movement and are instructed to maintain a specified posture throughout the experiment."

All participants were told they were assigned to "Condition 2," and that people found it easier to maintain an upright posture of the type demonstrated by the experimenter when in the type of chair they were seated in. They then completed the name letter task, current thoughts scale, social status measure, MRS items, perceived mate value measure and height and weight measures, always in the same order. After each measure a screen appeared for 10 seconds reminding participants to maintain the posture demonstrated by the experimenter. The procedure took approximately 35 minutes, after which all participants were debriefed.

Results

Three female participants (all female) were excluded due to incomplete data. As in Study 2, initial inclusion of height and weight as covariates did not influence the outcome of any analyses, and so are not reported here.

Descriptive statistics

The overall means, means by condition, and *t* scores for between-condition comparisons appear in Table 3.

Table 3

Dependent Variable Means and t-tests Between Conditions, Study 3

Variable (N)	Overall mean (SD)	High (SD)	Low (SD)	*t*
Average SE (138)	5.12 (1.12)	5.49 (1.86)	5.54 (1.03)	-.29
Appearance SE (138)	5.41 (1.56)	5.33 (1.53)	5.49 (1.59)	-.57
Social SE (138)	5.42 (1.19)	5.42 (1.29)	5.41 (1.08)	.02
Performance SE (138)	5.72 (1.23)	5.71 (1.30)	5.73 (1.58)	-.08
NLT first initial (138)	2.25 (1.95)	2.29 (1.67)	2.12 (2.20)	.28
NLT surname initial (138)	.88 (2.00)	.96 (1.79)	.79 (2.21)	.48
MRS – Antagonism (99)	5.00 (1.26)	5.01 (1.21)	4.94 (1.31)	.51
MRS – Denial (99)	3.42 (1.77)	3.87 (1.83)	3.02 (1.63)	2.45*
MRS – Resentment (99)	3.48 (1.66)	3.28 (1.58)	3.66 (1.72)	-1.16
Socio-economic status (138)	5.48 (1.45)	5.38 (1.34)	5.58 (1.56)	-.82
Community standing (138)	5.12 (1.55)	5.10 (1.46)	5.13 (1.64)	-.11
Perceived mate value, attractive targets (118)	3.72 (1.50)	3.91 (1.44)	3.53 (1.55)	1.40
Perceived mate value, unattractive targets (118)	1.95 (.94)	1.97 (.91)	1.93 (.99)	.23

Note: Standard deviations appear in parentheses. * $p<.05$.

Explicit SE

As with Study 1 and Study 2, social, appearance, and performance SE were calculated separately by averaging responses, reverse-scored when necessary, to corresponding items. Appearance and social SE displayed adequate to good internal consistency (α = .63 and .76), but the reliability of performance SE was unexpectedly low (α = .21). A 2 (condition) X 3 (SE dimension) X 2 (participant gender) mixed model ANOVA, with the second factor treated as a repeated measure, revealed a significant main effect of SE dimension, $F(2, 226) = 4.38$, $p < .05$. Paired *t*-tests indicated that participants reported higher performance SE than social SE, $t(137) = 3.54$, $p < .001$ (replicating Study 1 and Study 2) and higher performance SE than appearance SE, $t(137) = 2.75$, $p < .05$ (not found in either Study 1 or Study 2). As with both previous studies the difference between social SE and appearance SE was non-significant, $p > .9$. No other effects reached significance.

Implicit SE

Implicit SE was calculated as in Studies 1 and 2 and analysed in two condition X gender between-subjects ANOVAs, one for first name initials and one for surname initials. There were no significant effects for first name initials. There was an interaction effect of gender and condition for surname initials, $F(1, 134) = 3.93$, $p < .05$, but independent sample *t*-tests conducted between experimental conditions on males and females separately revealed no significant differences between conditions for either gender (the interaction effect was caused by opposing pattern of results for males and females, with males recording higher scores in the low compared to high condition and vice versa for females).

Correlations between explicit and implicit SE

There were no significant correlations between any of the factors of the explicit SE measure and the implicit SE measures (all *rs* < .1).

Social status

The two social status measures (socioeconomic status and community standing) were analysed in separate condition X gender between subjects ANOVAs. These analyses revealed no significant main or interaction effects for either variable.

Intergroup bias

As with Study 2, only participants of European descent were included in these analyses (n=99). Cronbach's alpha for the three factors was the same as for Study 2 ($\alpha = .57$). The items within each of the three factors of the MRS were averaged as in Study 2 and analysed in a 2 (condition) X 3 (bias dimension) X 2 (gender) mixed model ANOVA, with the second factor treated as a repeated measure. The analysis revealed a significant main effect of intergroup bias dimension, $F(2, 190) = 23.15$, $p < .001$. Replicating Study 2, paired *t*-tests revealed that participants reported greater antagonism than denial, $t(98) = -8.90$, $p < .001$, and greater antagonism than resentment, $t(98) = 10.07$, $p < .001$. Also replicating Study 2 there was no significant difference between denial and resentment intergroup bias. There was also a marginal main effect of condition, $F(1, 95) = 3.37$, $p = .07$, which was qualified by a condition X bias dimension interaction $F(2,190) = 5.86$, $p = .003$. As seen in Table 3 people in the high chair were more likely to deny that racism is a problem, however the two groups did not differ on other two dimensions (antagonism and resentment). There was also a

marginal interaction between condition and gender with intergroup bias dimension, $F(1, 95) = 3.27$, $p = .06$, such that men expressed more overall bias in the high chair than the low chair (*M*s 3.71 vs 3.60), $t(16) = 1.89$ $p = .08$, but women's judgements didn't differ by chair height (*M*s 3.96 vs 3.95), $t < 1$.

Perceived mate value

Perceived mate value ratings displayed high reliability ($\alpha = .94$) and were analysed as in Study 2. The mixed model ANOVA revealed a significant main effect of target attractiveness, $F(1, 50) = 311$, $p < .001$, such that attractive targets were rated as higher value mates than unattractive targets (*M*s 3.72 vs 1.95), as well as a significant interaction between condition and attractiveness, $F(1, 292)$, $p < .05$. The interaction was due to greater discrimination between attractive and unattractive targets in the high condition (*M*s 3.91 vs 1.97) than in the low condition (*M*s 3.53 vs 1.93), although differences were significant in both cases.

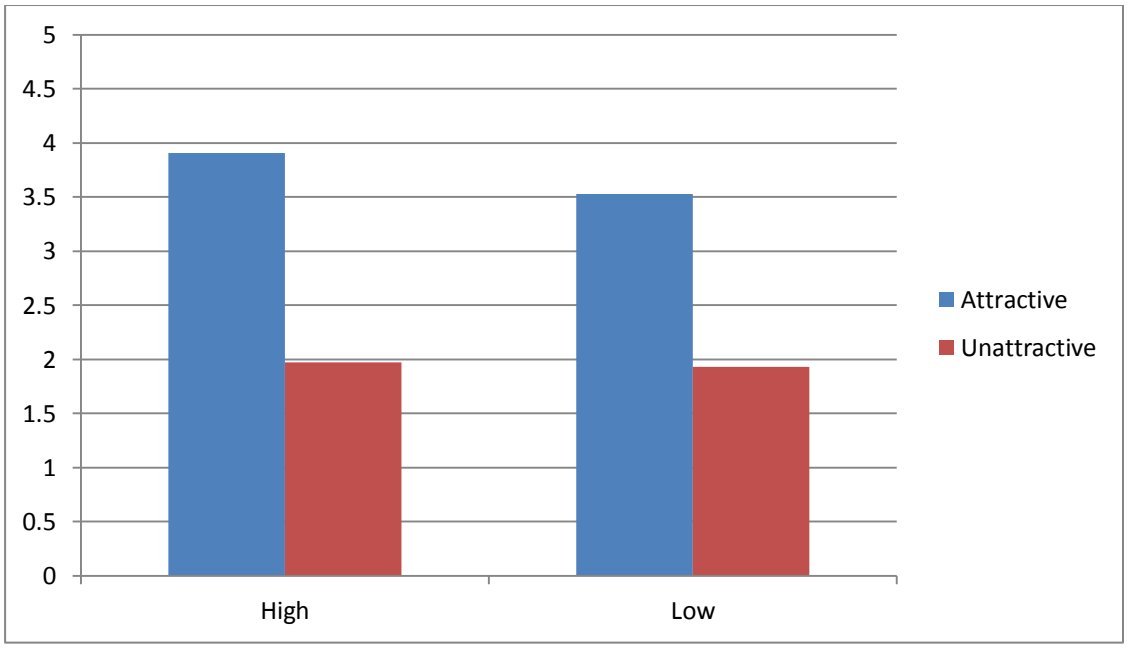


Figure 4. perceived mate value of attractive and unattractive targets by condition, Study 3.

Discussion

Following the inconsistent findings of Study 1 and 2, Study 3 was designed to strengthen the manipulation by controlling for the potential confound of posture and offering a plausible cover story. In fact, Study 2 was fully replicated: once again, participants in the high condition discriminated more between attractive and unattractive targets than those in the low condition. These unique effects on perceived mate value are consistent with a domain specific effect on SE via an embodied mating sociometer.

Unfortunately, the largely nonsignificant effects on SE itself were also replicated. Unlike in Study 1, which found effects for appearance and social SE on the explicit SE measures, there were no significant effects on any of the three factors of the explicit SE measure used in this study. There was a significant effect for one factor of the intergroup bias measure, however since this factor was represented by a single question this result requires replication before it can be considered reliable.

Together, then, this series of studies suggest that explicit SE is not reliably influenced by vertical orientation as hypothesised. However, vertical orientation does appear to influence thought processes associated with SE; namely perceptions of mate value. Implications of this finding, and the various effects across the three studies are considered in the General Discussion.

General Discussion

The three studies reported herein tested the hypothesis that behaviours associated with the concept of SE should influence SE and SE-related judgments and behaviours. This hypothesis follows from the sociometer theory of SE, which conceptualizes SE as a reflection of others' appraisal of our relational status (the extent to which we are included in a relevant social group). Although relational status has been manipulated linguistically in previous research – typically by informing participants that they have been chosen or rejected from a group (versus randomly selected, e.g. Leary, et al., 1995), or via virtual games such as cyberball (Willams & Jarvis, 2006) sociometer theory explicitly links the origin of the sociometer to bodily cues such as posture and facial expressions (Leary & Buttermore, 2003). That is, relational status, and in turn the emotional marker of that status (the sociometer), may be "embodied," and therefore, according to embodiment theory, inextricably linked with body positioning and movement. Indeed, although no studies have tested for embodied SE per se, researchers have shown that embodiments influence cognition and behaviour relevant to the self-concept, including self-perceived power (Schubert, 2005), attractiveness (Fayant et al., 2011), and pride (Stepper & Strack, 1993).

Given sociometer theory's assumption that SE is a reflection of our relationship with the social world, and embodiment theory's proposition that this relationship is influenced by the body, I hypothesized that SE should be malleable via manipulation of the body and/or its physical relation to the world. Three studies therefore tested whether a specific embodied aspect of relational status – vertical spatial orientation – influences experienced SE and SE related behaviours. It was hypothesised that differences in vertical spatial orientation would influence explicit and implicit SE (Study 1), and SE related social comparisons relevant to

domain specific sociometers (Study 2). Study 3 repeated Study 2, controlling for the potential confound of posture.

Study 1 found support for the hypothesis that explicit SE is influenced by the vertical spatial dimension: participants sitting in a high chair reported significantly higher appearance and social SE than those sitting in a low chair. While null effects on performance SE were not predicted, this finding is not necessarily inconsistent with sociometer theory, which predicts that SE domains may be differentially affected depending on which domain(s) the manipulation makes salient (Leary et al, 2001). Study 1 also demonstrated some support for changes to implicit SE, but this was limited to female participants' surnames.

Study 2 sought to replicate and build upon the findings of Study 1. If the explicit SE findings could be replicated in a second study this would provide evidence that the manipulation had a consistent influence on appearance and social SE. In addition, Study 2 sought to identify whether the experimental manipulation influences social comparison processes in theory-consistent ways. Specifically, Kirkpatrick and Ellis (2001) suggest there are distinct sociometers for intergroup comparisons, intragroup comparisons, and mating comparisons. These three domains were assessed in Study 2 using (respectively) a measure of racism, a measure of social status, and a measure of the appeal of attractive and unattractive romantic prospects. Surprisingly, neither the explicit nor the implicit SE findings from Study 1 were replicated in Study 2. However, there was a significant effect for mate choice with participants seated in a high chair indicating a greater preference for attractive over unattractive mates than those in a low chair. Given the inconsistency of the SE results, and the novelty of the mate choice findings, a second replication was conducted, which in

addition controlled for a possible postural confound in the manipulation. With a minor exception the results of Study 3 replicated those of Study 2.

In sum, the three studies together suggest that while vertical orientation has an inconsistent influence on reported SE, it reliably influenced judgments of mate quality. I now discuss each of these effects.

Explicit and implicit SE

As noted, the evidence for the primary hypothesis that explicit and implicit SE would vary with an individual's height relative to their environment was weak in these studies, with clear support in only one of three replications. However, despite the non-significant findings in Study 2 and Study 3 the hypothesized pattern of results was found in all three studies, and an analysis of all three data sets together revealed a marginal main effect on social SE ($p<.1$). Though the results are still too weak to be definitive, it is possible that one or more uncontrolled variables may have been moderating the effects of vertical orientation. It may be, for example, that vertical orientation interacts with some aspect of posture, with trait SE, or with other personality variables. Future studies should include measures of such variables to clarify the inconsistent effects found here. It is also possible that the explicit SE measure used in these studies was not sensitive to the domain specific effects on social and appearance SE. Therefore, including domain specific measures of attractiveness esteem (e.g. the Franzoi & Shields body esteem scale, 1984) and social SE (e.g. the social self-esteem inventory; Lawson, Marshall, & McGrath, 1979) in future research may help to determine the influence of vertical orientation in these domains more precisely.

It may also be useful to employ an alternative measure of implicit SE in future studies. Implicit SE is a relatively new concept, and the different measures of implicit SE do not correlate highly with each other, or with measures of explicit SE (Bosson, Swann, and Pennebaker, 2000). It is therefore possible that an alternative measure, such as the Implicit Association Test (Greenwald & Farnham, 2000) may be more sensitive to the manipulation than the Name Letter Task (Nuttin, 1985) employed in the current studies.

Another possible explanation for the weak SE findings is that vertical orientation requires further contextualisation to be interpreted as social comparison data (leading to sociometer activation), which could help explain differential effecst in different SE domains. Another important implication of context dependence is that the effects of verticality might only become manifest as changes to SE *after* the presentation of the contextualising stimuli/measures that might produce effects in particular domains (in the current experiments the images of potential romantic partners). Therefore, future experiments should present explicit and implicit SE measures following the presentation of this contextualising stimuli (unlike in the present experiments, which measured SE at the start of the experiment).

Domain specific sociometer measures

According to sociometer theory, experiences of acceptance and rejection feed into domain specific sociometers, which influence SE and in turn behaviour (Kirkpatrick & Ellis, 2001, 2006). Of the three measures included in Study 2 and Study 3 to investigate the influence of the manipulation in domains for which specific sociometers have been proposed, there were no reliable differences on the intragroup or intergroup measures. However, there was a significant difference between conditions for the mate choice measure: in both studies

participants reported a greater preference for attractive over unattractive potential partners in the high compared to the low chair. This suggests that the manipulation may have influenced self-perceived mate value, which accords with Buston and Emlen's (2003) finding that people with high self-perceived mate value have higher standards in mate selection than those low in self-perceived mate value. Given that there were no significant differences on the other domain specific measures this indicates that the manipulation has a unique, or at least stronger, influence on social comparisons in the mating domain than in the intergroup and intragroup domains.

One reason for domain specificity in the current studies may be that the mating sociometer is more sensitive than other sociometers. In support of this notion, Pass and colleagues argue that romantic relationships are a domain in which people are especially vigilant, both because of the stable and intimate psychological bonds that such relationships provide and because of their evolutionary significance (Pass, Lindenberg, & Park, 2010). To test this hypothesis these researchers compared (Study 1) participants' reactions to negative feedback about their acceptability as a friend with negative feedback about their acceptability as a romantic partner and found that, while participants felt rejected in both conditions, state SE was only significantly affected when the negative feedback concerned their acceptability as a romantic partner.

While according with Pass et al.'s (2010) emphasis on the mating domain, the current findings failed to find corresponding effects on SE. Nevertheless, effects on mate choice could have a downstream influence on SE via its influence on behaviour. This is because, if vertical orientation influences how people perceive potential dating partners, it is likely to

consequently influence who they approach versus avoid when seeking a mate. Based on the results of Studies 2 and 3 it seems that those participants in the high condition would be more likely to initiate social interactions with attractive versus unattractive partners compared to the low condition. Given that EC theory proposes that perception and action are indistinguishable on a neurological level (Martin, 2001, 2007) – an assumption that is supported both by empirical evidence from fMRI studies (e.g. Buccino et al, 2001), and by studies that demonstrate the "perception-action link" (e.g. Bargh, Chen, & Burrows, 1996) – it is possible that engaging in such "high self-esteem" behaviour is sufficient to influence SE. Indeed, as discussed in the introduction, evidence that embodiment influences self-evaluated attractiveness (a component of SE) has been demonstrated in a series of approach/avoidance studies by Fayant and colleagues (2011). Using a body locomotion procedure these researchers found that, compared to controls, participants asked to memorise photographs of attractive or unattractive targets of the same sex later evaluated themselves as more attractive when approaching attractive targets, and less attractive when approaching unattractive targets, in the approach condition (taking two steps toward the stimuli), while the converse was true for the avoidance condition (taking two steps away from the target stimuli). Similarly, if vertical position influences who participants approach, the approach itself may improve SE, even if verticality itself does not.

Alternative explanations for the unique effect in the mating domain

While the findings in these studies provide some evidence for a unique or stronger effect of vertical orientation on mate choice (potentially influencing SE in this domain) it is important to note that the mate choice measure differed from the other two domain specific sociometer measures in at least three important respects, and it could be these differences in measurement, rather than the nature of mating perceptions, that produced the effects.

First, the mate choice task was the only measure designed to test the impact of vertical orientation on both appearance SE and social SE (the intragroup and intergroup tasks were designed to test the manipulation's effect on social SE alone). The effect could therefore have been driven in whole or in part by alterations in appearance SE; i.e. it may be that participants perceived themselves (at least implicitly) as more attractive in the high compared to low condition (as suggested by Study 1), and this translated into participants "matching" themselves with targets who were as attractive as they perceived themselves to be. This accords with Walster and colleagues' "matching hypothesis," which suggests that people choose partners who are as attractive as themselves (Walster, Aronson, Abrahams, & Rottman, 1966). Inclusion of more domain specific SE measures in future studies, as discussed above, may help to answer this question by determining the relative effects of the manipulation on appearance SE and social SE.

Second, the mate choice measure differed from the intergroup and intragroup measures in that it did not directly ask participants to reflect on their relative status within or between groups, but rather assessed their desire to interact with specific individuals to form new relationships. In this respect it was the only one of the three measures that activated a particular social goal. As the sociometer is an online gauge of one's relative social inclusion it may be that activation of such goal pursuit is necessary to contextualise the manipulation.

Third, the nature of the stimuli participants were asked to respond to in the mating measure differed from the other measures in these studies; only the mating domain measure asked participants to respond to pictorial social stimuli – photographs of faces of potential dating partners – rather than to evaluate (written) semantic information. It could be that such experiential social stimuli are required, in interaction with bodily orientation, to activate social comparison processes of the type suggested by sociometer theory. In EC terms this

suggests that a combination of vertical orientation and specific social stimuli may be needed to activate a pattern completion process (i.e. a simulation) of SE threat or enhancement.

To address these problems future studies should therefore use stimuli that (1) are consistently word or image based, (2) activate specific social goals, and (3) make the domain in question salient so that valid comparisons can be made between the different measures.

Which aspect of the manipulation caused the effects?

It is important to note that it cannot be discerned from the experiments whether the high condition or the low condition – or both – drove the effects. It is also unclear what specific aspects of bodily movement were critical to the effects (e.g., looking downwards as opposed to upwards to view the stimuli; reaching downwards versus upwards to interact with the computer). It is also conceivable that the different visual perspectives altered the subjective appearance of the faces in the mate choice task (if so, however, one would expect a similar effect for both attractive and unattractive faces, rather than greater discrimination between them). Future experiments that include a control condition in which participants sit at a normal height relative to the computer screen could establish the relative effects of the high and low conditions. This relative influence of the two conditions is particularly important for interpreting intergroup discrimination, which may depend specifically on SE threat rather than enhancement.

Direct versus indirect effects?

It is also important to note that whatever behavioural effects vertical positioning produces, there is little evidence in the current studies that they are mediated by changes in state SE. This raises the question of whether the effect is due to indirect or direct embodied cognition (i.e. whether it is, or is not, mediated by thoughts or emotions). Barsalou et al. (2003) suggest that both direct and indirect embodiment effects are common, and propose two reasons why some embodiment effects may be direct: (1) After repeated pairings of a stimulus and response the mediating state is no longer required as the mapping becomes direct (leading to automatic responses); (2) The brain is not organized in a linear, hierarchical manner; rather, there are numerous long distance pathways without mediating states residing between them (e.g., avoiding a thrown object reflects a direct link between the visual and motor areas), which, Barsolou notes, would be advantageous from an evolutionary perspective in speeding actions relating to survival and reproduction. Several embodiment experiments have shown evidence of both indirect (e.g. Wheeler & Petty, 2001) and direct effects (e.g. Bargh, Chen, & Burrows, 1996; Chartrand & Bargh, 1999).

In the present studies direct embodiment would have occurred if simply being in a high position produced positive evaluation of the faces with no mediating mental states. Conversely, indirect embodiment would have occurred if, for example, vertical orientation activated an emotional state (e.g., positive affect) or thought process (e.g., increased accessibility of positive thoughts) that in turn led to positive evaluation. There is no evidence from this series of studies that the effect is indirect – it does not appear to be mediated by SE, mood, or comfort – but this does not of course preclude the possibility of mediating effects. One important avenue that future studies should explore is whether any embodiment effects are mediated by semantic activation of SE related concepts by, for example, including a word

stem completion task to assess the accessibility of concepts related to high and low SE, status, and appearance.

Relationship of the current findings to previous research

Interestingly, these findings are in accord with recent research on a concept related to SE – power – and it is useful to consider them within the context of this research.

In particular, from a theoretical standpoint the findings align with the approach/inhibition theory of power (Keltner, et al, 2003) which suggests that high power focusses attention on rewarding aspects of the social environment and activates approach related behaviours, whereas low power focusses attention on threatening aspects of the social environment and activates inhibition (i.e. avoidance) related behaviours (Keltner et al, 2003). This is because having high power is associated with attaining more rewards and experiencing fewer threats from the environment than low power. Research has borne out the predictions of this theory: people with high power report greater positive emotions and lower negative emotions than those low in power (Anderson & Berdahl, 2002), are more flirtatious (Gonzaga, Keltner, Londahl, & Smith, 2001), and take more risks (Anderson & Galinsky, 2006).

Furthermore, power has also been linked to verticality in previous embodiment experiments. For example Moeller, Robinson, and Zabelina (2008) found that personality dominance is related to enhanced attention to the vertical spatial dimension: participants high in dominant personality traits were faster to identify spatial probes (the letters p or q) when they were presented on the vertical spatial dimension on a computer screen than on the horizontal

spatial dimension compared with participants low in personality dominance. Similarly Schubert (2005) found that dominant stimuli are categorised faster when presented higher in visual space.

Power is of course closely related to SE; the two concepts are positively correlated and interdependent. For example, a meta-analysis by Judge, Bono, Ilies and Gerhardt (2002) found a positive correlation between SE and leadership, extraversion, dominance, and low neuroticism. As Wojciszke and Struzynska–Kujalowicz (2007) note, SE and power are likely related due to the reciprocal influence they have on each other: increased power may lead to higher SE and the self-confidence that high SE engenders may be necessary to attain power. As discussed in the introduction the close relationship between SE and power is consistent with the fact that Leary et al. (2001) found support both for dominance theory's assumption that SE is the output of a mechanism that monitors interpersonal power, and sociometer theory's assumption that SE is the output of a mechanism that monitors social inclusion. This led these researchers to conclude that dominance and social inclusion are subsumed under a higher order "social value" (as are the domain specific sociometers proposed by Kirkpatrick & Ellis, 2001, 2006).

Considering the close relationship between power and SE, and sociometer theory's assumption that SE is a reflection of our interpersonal worth based on feelings of affiliation, it may be useful to consider SE – and how it may be influenced by embodiments – by way of the circumplex model of human relationships (e.g. Benjamin, 1974; Carson, 1969; Leary, 1957, Gurtman, 2009). This model suggests that all relationships exist on a circumplex with orthogonal axes of dominance–submission and inclusion–exclusion, with each point on the

circumplex representing a different combination of power and affiliation. If this model is correct, manipulations that influence either interpersonal power or affiliation related perceptions and actions should also influence SE, with the extent and nature of this influence determined by the location of a particular sociometer on the circumplex.

Conclusion

This series of studies investigated the implications of both sociometer theory and EC theory by testing whether vertical spatial orientation influences explicit and implicit SE, and whether it does so via domain specific sociometers. Though the explicit and implicit SE results did not reach significance across the three studies, they were in the predicted direction (and marginally significant for social SE), with participants in the high condition reporting higher SE than those in the low condition. This, combined with the replication of the significant results for the perceived mate value measure – in which participants in the high condition showed a greater preference for attractive over unattractive potential mates than those in the low – provides suggestive evidence that differences in vertical orientation may activate the mating sociometer, which could potentially influence SE related behaviours and ultimately SE itself.

The findings for the mate choice measure are consistent with the role that SE is proposed to play in functional theories of SE such as sociometer theory (Kirkpatrick & Ellis, 2001, 2006) and dominance theory (Barkow, 1975,1980) in that, from an EC perspective, they can be interpreted as a partial re-enactment of high versus low SE behaviours. Thus these findings suggest that if SE is not encoded directly in the body that the body may at least influence SE related perceptions. Further research is required to determine if the observed influence of

verticality is exclusive to the mating domain, has consequential effects on behaviour, and whether it ultimately affects explicit and/or implicit SE. As detailed above, these studies should consider the relative role of power as opposed to other aspects of SE (e.g. affiliation). They should also include domain specific measures of explicit SE, a control condition to determine the relative influence on the high and low chairs, presentation of the SE measures after the domain specific sociometers (in the event that these activate sociometers), and the use of measures equivalent in both their ecological validity and task goal.

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Appendices

Appendix A

Current Thoughts Scale (Heatherton & Polivy, 1991)

This is a questionnaire designed to measure what you are thinking at this moment. There is, of course, no right or wrong answer for any statement. The best answer is what you feel is true for yourself at this moment. Be sure to answer all the items, even if you are not certain of the best answer. Again, answer these questions as they are true for you RIGHT NOW.

1. I feel confident about my abilities. (P)
2. *I am worried about whether I am regarded as a success or a failure. (S)
3. I feel satisfied with the way my body looks right now. (A)
4. *I feel frustrated or rattled about my performance. (P)
5. *I feel that I am having trouble understanding things that I read. (P)
6. I feel that others respect and admire me. (A)
7. *I feel dissatisfied with my weight. (A)
8. *I feel self-conscious. (S)
9. I feel as smart as others. (P)
10. *I feel displeased with myself. (S)
11. I feel good about myself. (A)
12. I am pleased with my appearance right now. (A)
13. *I am worried about what other people think of me. (S)
14. I feel confident that I understand things. (P)
15. *I feel inferior to others at this moment. (S)
16. *I feel unattractive. (A)
17. *I feel concerned about the impression I am making. (S)
18. *I feel I have less scholastic ability right now than others. (P)
19. *I feel like I'm not doing well. (P)
20. *I am worried about looking foolish. (S)

Note:

- The statements with an asterisk are reverse scored items.
- The letter in brackets after each item indicates which of the three factors of self-esteem each item belongs to: appearance self-esteem (A), performance self-esteem (P) or social self-esteem (S).

Appendix B

Name Letter Task (Nuttin, 1985). Below are the instructions for this task as they appeared onscreen:

In this task you will be presented with a series of letters. Your task will be simply to judge how much you like each letter, using the number keys '1' to '9' on the keyboard, going from '1' (dislike very much) to '9' (like very much.



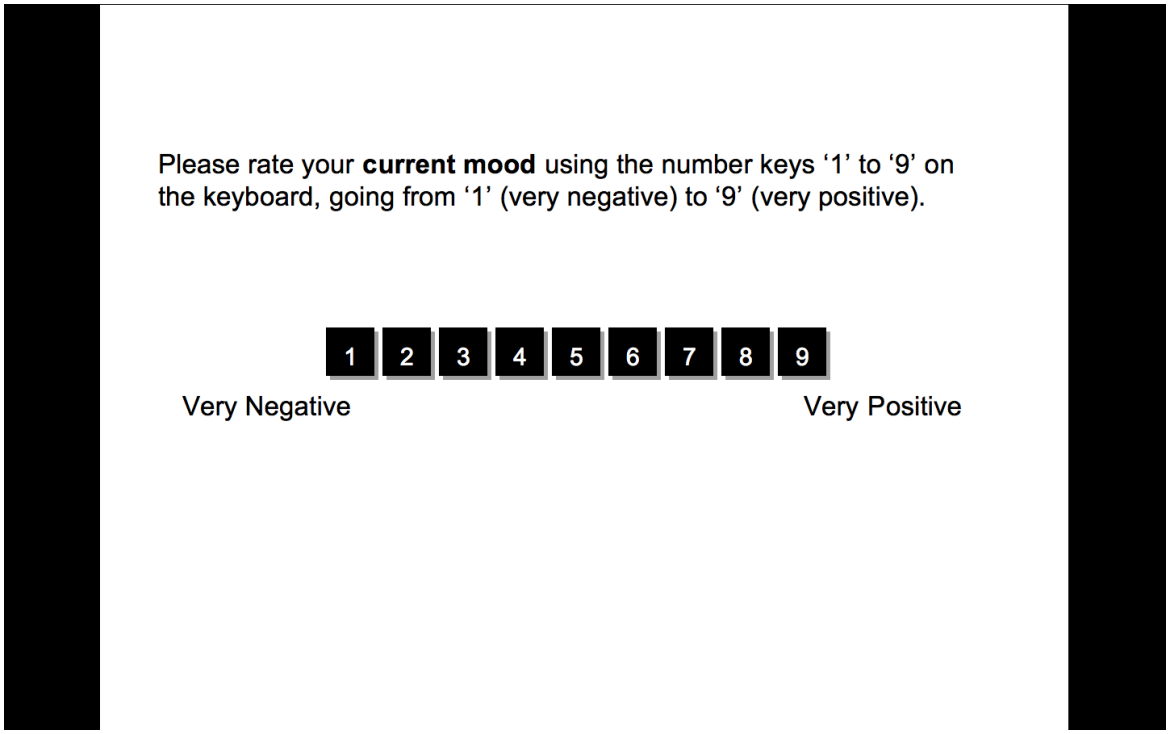
Dislike very much Like very much

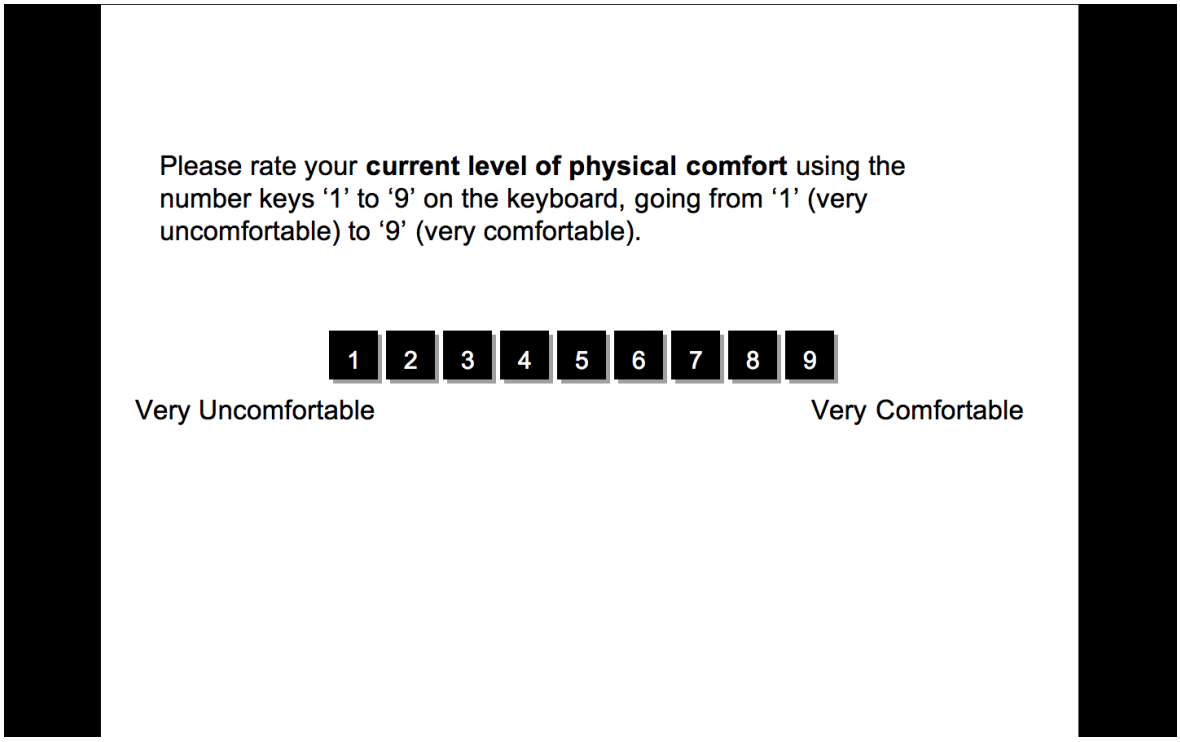
Do not spend a lot of time on these judgments; there is no need to analyse the shape, meaning or format of each letter. Instead let your choice be governed by your overall, spontaneous feelings toward the letters. There are no right or wrong answers.

Press the 'Space' bar to start.

Appendix C

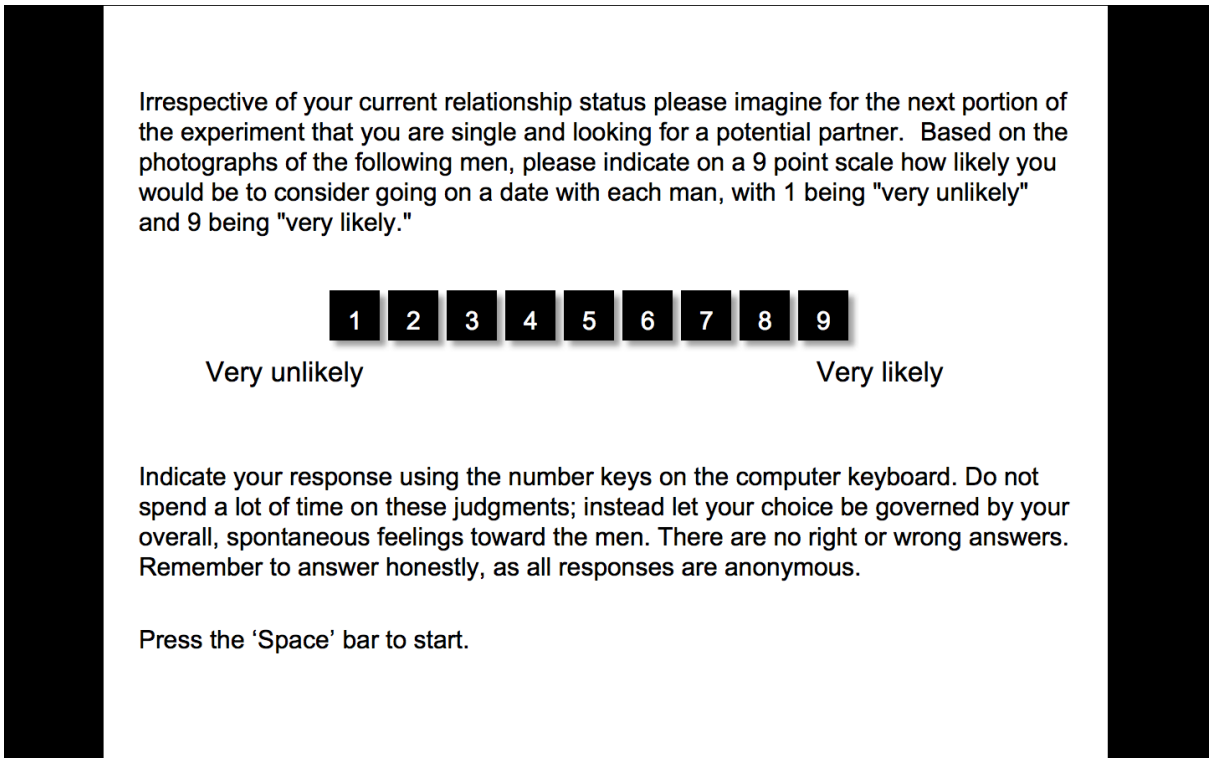
Mood and Comfort measures





Appendix D

Instruction screen for the perceived mate value measure for female participants. For male participants the word “women” was substituted for “men.”



Appendix E

McArthur Scale of subjective social status (Adler & Stewart, 2007).

Below are the modified versions of the MacArthur scale of subjective social status (Adler & Stewart, 2007) as they appeared in Study 2 and Study 3.

Think of where people stand in New Zealand in terms of a ladder.

A the top of the ladder (rung 9) are the people who are the best off – those who have the most money, the most education, and the most respected jobs. At the bottom of the ladder (rung 1) are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on the ladder, the closer you are to the people at the very top; the lower on the ladder you are, the closer you are to the people at the very bottom.

Think of the below scale as representing the rungs of this ladder. Please type the number of the rung where you think you stand at this time, relative to other people in New Zealand.



Think of where people stand in their communities in terms of a ladder.

People define community in different ways; please define it in whatever way is most meaningful to you. At the top of the ladder (rung 9) are the people who have the highest standing in their community. At the bottom of the ladder (rung 1) are people who have the lowest standing in their community.

Think of the below scale as representing the rungs of this ladder. Please type the number of the rung where you think you stand at this time, relative to other people in your community.



Appendix F

Modern Racism Scale (McConahay, et al.,1981).

1. Over the past few years, Maori have gotten more economically than they deserve. (R)
2. Over the past few years, the government and news media have shown more respect for Maori than they deserve. (R)
3. It is easy to understand the anger of Maori people in New Zealand.*(A)
4. Discrimination against Maori is no longer a problem in New Zealand. (D)
5. Maori are getting too demanding in their push for equal rights. (A)
6. Maori should not push themselves where they are not wanted. (A)

Notes:

- The statement with an asterisk is reverse scored.
- The letter in brackets after each item indicates which of the three factors of discrimination each item belongs to: antagonism towards Maori (A), denial that racism is a problem (D), and resentment toward Maori for getting special favours from society (R).
- This scale has been adapted for a New Zealand context by replacing “blacks” with “Maori” (New Zealand’s indigenous minority group).