The Embodiment of "Good" and "Bad" via Vertical Space: An Investigation of Conceptual Metaphor in Impression Formation

Ryan Daniel McMullan

Doctor of Philosophy

Western Sydney University

2016

Acknowledgements

I would like to thank Western Sydney University (formerly known as the University of Western Sydney) for the opportunity to complete this PhD thesis. I would like to thank my two supervisors Dr Rebecca Pinkus and Dr Agnes Petocz for their guidance and support over the course of my candidature. They are certainly two individuals that any student and researcher can look up to. I would also like to thank the staff at the School of Social Sciences and Psychology and my fellow PhD students for their support.

Statement of Authentication

This thesis is submitted in partial fulfillment of the requirements for the Doctorate of Philosophy degree. To the best of my knowledge, this is my own work except where otherwise specified and I hereby declare that I have not presented this material, either in whole or in part, for a degree at another institution.

[redacted]

Table of Contents

Abstract……………………..…………………………………………………………..1

Chapter One: Introduction…………………..………..………………………………2

Computational Theory of Mind……………………………………………………..3

Connectionism………………………………………………………………………6

Roots of Embodied Cognition………………………………………………………7

What exactly is Embodied Cognition?………………………………………………10

Conceptualisation: Embodied Cognition……………………………………………11

Replacement: Radical Embodied Cognitive Science………………………………...18

Conceptual Metaphor……………………………………………………………...23

GOOD IS UP………………………………………………………………………28

Impression Formation……………………………………………………………..38

Overview…………………………………………………………………………..41

Chapter 2: Pilot Study 1 and Experiment 1……………………...………..………42

Pilot Study 1…………………………………………..42

Overview…………………………………………………………………..…42

Method…………………………………………………………..…………...42

Results…………………………………………………………..……………43

Experiment 1…………………………………………………………..……......44

Overview…………………………………………………………..…………44

Method…………………………………………………………………..……...45

Results…………………………………………………………………………..51

Discussion……………………………………………………………………………56

Chapter Three: Pilot Study 2 and Experiments 2A and 2B…………………………...59

Pilot Study 2…………………………………………………………………………59

Overview……………………………………………………………………..59

Method…………………………………………………………………….59

Results……………………………………………………………………..60

Experiment 2A-2B Overview…………………………………………………………61

Experiment 2A……………………………………………………………………….62

Method…………………………………………………………………….62

Results……………………………………………………………………..65

Discussion…………………………………………………………………66

Experiment 2B..70

Method…………………………………………………………………….70

Results……………………………………………………………………..73

Discussion…………………………………………………………………77

Chapter Four: Experiment 3………………………………………………………….83

Experiment 3…………………………………………………………..……………..83

Overview……………………………………………………………………..83

Method…………………………………………………………………….84

Results……………………………………………………………………..87

Discussion…………………………………………………………………88

Chapter Five: General Discussion……………………………………………………92

The Current Project…………………………………………………………..92

Summary of results…………………………………………………..92

Bias……………………………………………………………………………..96

Replication……………………………………………………………………...99

Future directions………………………………………………...………………103

References……………………………………………………………………...……..108

Appendices……………………………………………………………………….129

Abstract

A popular notion in psychology today is that cognition is embodied, such that the physical body and its interaction with the environment actively shape cognitive processes. According to one theory of embodied cognition, Conceptual Metaphor Theory (Lakoff & Johnson, 1980; 1999), people understand abstract concepts in terms of more concrete, physical domains. A conceptual metaphor that has been examined empirically is the GOOD IS UP conceptual metaphor (e.g., Meier & Robinson, 2004). This conceptual metaphor consists of an association between valence (*good* and *bad*) and verticality (*up* and *down*). The current project aimed to investigate whether the GOOD IS UP conceptual metaphor influences impression formation processes. This project consisted of four experiments in which reaction time, memory, and target evaluations were measured as dependent variables. Experiment 1 examined whether the vertical location of behavioural information influenced reaction time, memory, and target evaluations. Experiment 2A examined whether the vertical location of trait words influenced reaction time. Experiment 2B examined whether the vertical location of trait words influenced memory and target evaluations. Experiment 3 examined the reproducibility of Meier and Robinson's (2004) original effect. Across the set of experiments, I hypothesised that the vertical location of the stimuli would influence reaction time, memory, and target evaluations in metaphor-consistent ways. However, this hypothesis was not supported. The current climate in psychological science is now beginning both to emphasise the importance of negative results and to encourage replication. The findings of the present project are discussed within this changing climate, which will better serve the development and refinement of Conceptual Metaphor Theory. Despite the negative results (i.e., $p > .05$), the four experiments are informative and provide direction for future research on conceptual metaphor and embodied cognition.

Chapter One: Introduction

The last thirty years have seen a considerable shift in theories of cognition from what has been referred to as "first generation cognitive science" to what is now considered "second generation cognitive science" (Kövecses, 2005; Lakoff & Johnson, 1999). During the mid to late 20th century, computational theory of mind[1] (henceforth CTM; first generation cognitive science) rose to popularity and was recognised and widely embraced inside and outside of psychology circles (e.g., Fodor, 1975; Newell & Simon, 1972). This computational approach rests on the assumption that the mind is like a computer in the sense that the processes of the mind involve the rule-governed manipulation of internal symbols. Moreover, these symbolic processes of mind are held to be amodal, such that they are independent of sensory and motor systems associated with the body and its interaction with the world. In fact, in this approach, the body is relegated to an input and output device (Wilson, 2002). These assumptions, particularly those relating to the role of the body in cognition, have been challenged by an approach referred to as embodied cognition (EC), an approach that lies at the heart of second generation cognitive science.

The central notion of EC (today) is that the physical body and its sensorimotor experiences with the environment actively shape cognitive processes such that the body has both a causal and a constitutive role in cognition (e.g., Lakoff & Johnson, 1999; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Wilson, 2002). Researchers in EC have subsequently turned away from amodal symbols, focussing instead on bodily states, simulation, situated action, and modal symbols. Accounts of EC reject the claim that the mind and body are independent and instead emphasise an interactive brain-body-environment system through which intelligent action is generated (Wheeler, 2005). Currently, much work in cognitive science attempts to explain the role of sensory and motor systems in conceptual

[1] CTM should not be confused with Theory of Mind. That is, CTM refers to an approach that attempts to understand how the mind works (e.g., Fodor, 1975), whereas Theory of Mind refers to the ability of individuals to understand other people's mental states (e.g., Premack & Woodruff, 1978).

processing. Although prominent in the last two to three decades, the notion of EC stretches back to the work of James, Dewey, Freud, Piaget, Heidegger, Merleau-Ponty, and Gibson.

The aim of this introduction is to outline the background shift from first generation to second generation cognitive science, and then to introduce and explore a particular theory of EC known as Conceptual Metaphor Theory (henceforth CMT) with a view to applying CMT to the social phenomenon of impression formation.

A common approach to explaining EC is to begin by discussing why traditional theories such as CTM should be criticised and consequently why they are being replaced. This approach will be followed in order to map both the independent history of embodiment approaches and the move from first generation cognitive science to second generation cognitive science. Embodied cognitive science is not only a critical opponent of traditional theories, such as CTM, but also includes a rich research programme (Anderson, 2006). Following an account of traditional theories of mind, EC will be introduced and explored. A theory of EC known as CMT will subsequently be presented and then applied to impression formation.

Computational Theory of Mind

CTM has a long history. For instance, Hobbes (1651) in the 17th century believed rational thought to be computation. In *Leviathan*, Hobbes explains what he called ratiocination (i.e., rational thought) as the rule-governed processing of internal symbols that represent external objects. CTM has additional roots in the 1940s cybernetics movement, which saw the promotion of mathematical logic to understand the underlying processes of mental activity. This movement also saw the invention of the first digital computers. It was during the mid to late 20th century, however, with the advent of the digital computer, that CTM was established as the favoured theory of the mind (Fodor, 1975; Newell & Simon, 1972). Put simply, this theory views the operation of the mind to be similar to that of a computer. That is, the popular *mind-as-a-computer* metaphor refers to a distinction between the brain as the hardware and the mind as the software. CTM's major assumption is that cognitive processes can be defined as computations, that is, as algorithmic operations that are performed on internal symbolic codes. Although the exact form or character of these symbols has been debated (e.g., Anderson, 1978; Pylyshyn, 1973), it is generally assumed that a symbol is some kind of internal representation of an external object. In other words, symbols are referents or 'stand ins' for the external environment and are manipulated by rule as part of cognitive processing. Fodor (1975) notably developed CTM in *The Language of Thought* (henceforth LOT).

In LOT, cognition is the rule-governed manipulation of symbols in a language of thought. In other words, internal representations (i.e., symbols) are stored and manipulated in a system (i.e., thought) that is itself a language. Certain parallels can be drawn between a Fodorian account of cognition and human language. For instance, the mind stores symbols (just as language stores words); symbols can be combined into more complex symbolic codes (just as words are combined to form sentences); the combination of symbols into more complex symbolic codes is based on rule (just as in grammar, where the make-up of sentences is governed by syntax); and the meaning of symbolic codes are derived from their constituent symbols (just as in semantics, where the meaning of sentences is derived from the meaning of words). In this system, cognitive processes involve three stages: first, the transduction of input information from the external world into internal symbols as part of the language of thought; second, the rule-governed manipulation of these symbols; and third, the production of behavioural ouput. Fodor (1975) famously claimed that CTM was the "only game in town" (and more recently, 2008, declared that Representational Theory of Mind *remains* the "only game in town"). However, despite the implication that the only way to understand cognition is via an account that includes internal representations (symbols), there are notable problems with any theory that postulates such internal mental entities.

For instance, a problem is that internal representations are perhaps redundant and cannot actually do what they are claimed to do. According to CTM, the meaning of an external object is known indirectly via internal representations. However, to understand the meaning of the symbol “blue” for example, it is essential to know both the thing that is symbolised (the colour blue), and that “blue” is used as a symbol for that thing. Therefore, to know the meaning of “blue” presumes knowledge of the colour blue. In other words, direct knowledge presupposes the process of accessing and understanding the meaning of internal symbols. Gibson (1979) consequently argued, “Knowledge of the world cannot be explained by supposing that knowledge of the world already exists” (p. 253). Accordingly, the question arises as to how symbols acquire their meaning. This problem has been referred to as the semantic problem of mental representations, which Fodor (1985) famously admitted has not yet been solved: “[O]f the semanticity of mental representations we have, as things now stand, no adequate account” (p. 99). Evidently, it is not known how internal symbols come to represent external, independent objects (e.g., Harnad, 1990).

Furthermore, according to CTM, cognition involves accessing and manipulating symbols that are inside the brain (Fodor, 1975). This assumption raises additional issues that are related to the homunculus problem. This problem refers to the inference that an inner homunculus (“little man”) who knows what symbols are and what they represent is required in order for CTM’s cognition to occur (McMullen, 2001). This problem is encapsulated by the following questions: who or what does the manipulating of internal symbols (a homunculus?)? How does the manipulator access the symbols in order to do the manipulating? The notion of a homunculus also leads to an infinite and vicious regress (Ryle, 1949), which is a problem for both CTM and LOT. For example, in order to learn a language one must invoke another language, such that one must know certain rules. Consequently, a language of thought presupposes another language, and that language presupposes another language, and so on (Heil, 1981). Therefore, it is unclear how an internal language is learned and understood.

Despite the logical incoherence of internal mental entities such as representations, the view that CTM is the “only game in town” has been supported over the years with arguments that favour the claim (albeit a claim that turns out to be false) that no alternatives exist. This position has subsequently become known as the “What else could it be?” argument (Haugeland, 1978). Newell (1990) explained:

> [A]lthough a small chance exists that we will see a new paradigm emerge for mind, it seems unlikely to me. Basically, there do not seem to be any viable alternatives. This position is not surprising. In lots of sciences we end up where there are no major alternatives around to the particular theories we have. Then, all the interesting kinds of scientific action occur inside the major view. It seems to me that we are getting rather close to that situation with respect to the computational theory of mind (p.56).

However, there do exist alternatives to CTM despite this claim made by supporters of the theory. One approach that has been identified as an alternative is Connectionism.

Connectionism

During the 1980s, connectionism gained prominence as a theory of mind (e.g., McClelland & Rumelhart, 1986; Rumelhart & McClelland, 1986). This theory is based on the notion that theories of cognition should be modelled after the neural systems of the biological brain. This approach, like CTM, has a long history. It is customary to first acknowledge the contributions of Hebb (1949) and Rosenblatt (1962). However, connectionist assumptions can be traced back to the 19th century. For example, Spencer (1855) believed that all mental phenomena are related to neural mechanisms and that intelligence develops from associations among psychological states. Other notables include James (1890), Freud (1895), and McCulloch and Pitts (1943; for a review of the history of connectionism see Walker, 1992).

Connectionism, as it is known today, refers to interconnected networks that consist of simple units in the mind. Like CTM, connectionist networks also employ representations. However, in contrast with CTM, these representations are not symbolic, rather representations in a connectionist network refer to patterns of activation spread across a number of processing units. Put simply, then, experience leads to changes in the connections between units and these changes lead to learning (Munakata & McClelland, 2003).

There is controversy, however, as to whether connectionism does provide a viable and novel theory of mind in opposition to CTM (e.g., Fodor & Pylyshyn, 1988). The critics maintain that, although there are differences between CTM and connectionism, they both rest on the assumption of representationism (Bickhard, 1996). It is irrelevant as to whether representations are symbols or patterns of activation because both accounts are vulnerable to the same criticisms (Michell, 1988).

Another alternative to CTM is EC. However, EC comes in several different versions. The version known as embodied cognitive science (e.g., Barsalou, 1999; Clark, 1997) is perhaps more accurately defined as an extension of CTM, in that representations are retained. In contrast, the versions known as direct realism and radical embodied cognitive science (henceforth RECS) are genuine alternatives to CTM, in that they do not rest on the assumption of representationism.

Roots of Embodied Cognition

For centuries, philosophers have attempted to understand how the mind, which is said to contain thoughts, beliefs, attitudes and so on, is related to the external world. This investigation is primarily motivated by an assumed, centuries old dichotomy between the mind and the body. This dichotomy was first laid out in Descartes' *Discourse on the Method* (1637) and is known as Cartesian Dualism. It refers to a divide between two kinds of metaphysical substances; the mind and the body. That is, the mind is a non-physical (or immaterial) entity whereas the body is a physical (or material) entity. The question of precisely how these two different substances interact is today known as the mind-body problem.

Accounts of EC, in contrast, do not explicitly adhere to a notion of a dichotomy between the mind and body. Instead, the mind is embodied, such that cognition first develops and is subsequently shaped by an active and ongoing interaction between the body and the environment. This notion can be traced back to the work of pragmatists such as William James (1890) and John Dewey (1925), American new realists, and later Eliminativists such as Gilbert Ryle (1949) and Richard Rorty (1979), who all affirmed that cognition cannot be understood as mirroring the world, but can be understood in relation to the whole animal and its actions. Famously, Dewey (1925) stated that "to see the organism *in* nature, the nervous system in the organism, the brain in the nervous system, the cortex in the brain is the answer to the problems which haunt philosophy" (p.198). In other words, the mind can be understood as being shaped by the situated and embodied nature of the organism. Moreover, Dewey claimed that abstract thought has roots in organism-environment interactions. Such interactions include perception and bodily movement in the environment. For Dewey, this meant a connectedness between rational thought and organic processes.

EC also has roots in Phenomenology with the work of Heidegger and Merleau-Ponty. For instance, Heidegger (1962) rejected Cartesianism and the assumption that we represent the world. Instead, Heidegger (1962) emphasised the actions and practices of being-in-the-world as constituting cognition. Merleau-Ponty is also of particular note here as his work features significantly in some of the contemporary approaches to embodied cognition. In *Phenomenology of Perception,* Merleau-Ponty (1962) emphasises the importance of the body as it 'gears' us into a meaningful world, such that it is the body that is the source of meaning. The key argument in this work, which is particularly relevant for the current view of EC, is that mental states and processes are constituted by the body and its interaction with the world, such that mental processes are the result of brain-body-environment synergies.

Finally, Gibson's (1966, 1979) ecological psychology has also influenced current notions of EC. The antecedents of Gibson's approach can be traced back to Aristotle, Reid, and the American new realists. Similar to the accounts already mentioned, Gibson rejected the principle tenets of CTM. For instance, according to Gibson, perception is direct, such that perception does not, as proposed by CTM, involve the elaboration of inadequate and impoverished sensory input via inferences, memories, and representations. Instead, perception is the detection of information which specifies the structure of the environment to the animal. More specifically, it is the detection of affordances, which are opportunities in the environment for action, that provide meaning for an animal in its environment. According to Gibson, sensory input is not impoverished. As a result, perception is a central resource in cognition due to its role in detecting important information in the environment which subsequently leads to the animal producing appropriate action. Thus, an interactive brain-body-environment system that posseses perception-action couplings does not require internal representations of the world. Gibson's theory is thus anti-representationalist and has led to what has been labelled RECS (Chemero, 2009).

What is clear from this brief survey of the foundations of EC is that there is a claim – shared by all of the approaches – that the body has a significant role in cognition. The differences in the various approaches relate to exactly *how* the body influences cognition. This question also appears in the contemporary EC literature, along with the major disagreement concerning whether representations are required to explain cognition or whether they should be abandoned in an embodied account of cognition. In-house disagreement over representations has subsequently led to a divide among supporters of an embodied approach into representationalists and anti-representationalists, and to disagreement about what the term *embodied cognition* actually means and what it explains. Exploring the meaning of EC is important for two reasons; first, it allows for an identification of where EC is presently in the literature and where it is headed, and second, it provides an opportunity to clarify its definition particularly for the current thesis.

What Exactly is Embodied Cognition?

In the last 30 years the concept of 'embodied' has been used frequently yet disparately throughout the cognitive science literature. For instance, there are terms such as: *embodied mind* (Lakoff & Johnson, 1999; Varela, Thompson, & Rosch, 1991), *embodied-embedded cognitive science* (Wheeler, 2005), *embodied action* (Varela et al., 1991), *embodied AI* (Franklin, 1997), *embodied cognitive science* (Clark, 1997; Pfeifer & Scheier, 1999), *radical embodied cognitive science* (Chemero, 2009) and *embodied cognition* (Clark, 1997). Furthermore, there are a variety of areas in which research has been conducted in relation to what could be called an EC paradigm. These areas include: philosophy, artificial intelligence, neuroscience, cognitive psychology, developmental psychology, linguistics, cognitive neuropsychology, and social pychology. The current diversity in the claims of what 'embodied' actually means and how it is used in the literature is clearly problematic for the field (Wilson, 2002). Consequently, attempts have been made to outline common themes or claims that are related to EC.

For instance, Wilson (2002) identified six different claims related to EC. These six claims are: (1) cognition is situated, (2) cognition is time-pressured, (3) we off-load cognitive work onto the environment, (4) the environment is part of the cognitive system, (5) cognition is for action, and (6) offline cognition is body based. According to some scholars, treating EC as a single, unified theory is perhaps a mistake and the dominant claims, such as those identified by Wilson (2002), should be treated as independent projects (Shapiro, 2007, 2011; Wilson, 2002).

Shapiro (2011) identified three major themes of EC: (1) conceptualisation, (2) replacement, and (3) constitution. According to Shapiro (2011), these are the more prominent themes found in the EC literature and a failure to acknowledge these themes would lead to an inaccurate description of EC. Briefly, conceptualisation refers to the view that concepts in the mind allow us to understand our environment and to function adaptively. Replacement refers to the view which rejects internal representations and subsequently promotes the body's interaction with the world in an attempt to understand cognition. Finally, constitution refers to the aforementioned notion that the body has a constitutive role in cognition rather than just a causal role. That is, the body and sensory and motor systems are actively involved in cognitive processes. Importantly, the first two themes relate to a divide in the EC community and require further examination.

Conceptualisation: Embodied Cognition

What the mainstream readily identify as EC draws some inspiration from the various assumptions discussed in Andy Clark's (1997) *Being There: Putting Brain, Body, and World Together Again*. Clark's aim in this book was for the reform of representational theories of mind such as CTM. Clark agreed with the claim that intelligent action is generated from the active utilisation of both the body and the environment. That is, the brain, bodily action, and environmental structures operate collectively to fulfill the goals of what can consequently be called an embodied agent. Clark, however, opposes anti-representationalism. Instead, Clark (1997) insists that minds "*still* depend crucially on brains which compute and represent" (p. 143). Thus, Clark argues that attempts to better understand embodied minds should develop what he sees as a more encompassing representational account, rather than leaping to the promotion of a non-computational and non-representational account of cognition.

Clark attempts to develop such an account by promoting the role of action-oriented representations in cognition. Clark first distinguished between two distinct notions of representation: 1) the idea that there exists in the mind internal representations, such as inner states and processes, whose role is to carry specific information to action-guiding systems, or 2) the idea that internal representations are "*action-neutral*" encodings of aspects of the external world. Clark supports the former to the extent that the aspects of the real world that are represented by the brain can be geared to action. That is, representations can be action-oriented. Thus, Clark's more encompassing representations provide not only a description of the situation, but also guide appropriate action in response to the situation.

According to Clark and Toribio (1994), internal representations are required because the environment does not always provide adequate information to guide behaviour. For instance, the ability to reason about the abstract, absent, non-existent, or spatio-temporally distant, must require some inner resource such as internal representation (Clark & Toribio, 1994). A wholesale abandonment of traditional accounts of cognition would therefore be a mistake. Clark has consequently retained various elements from first generation cognitive science by re-emphasising the role of representations in computational processes in the mind. In fact, Clark suggested that 'replacement' views of representation are perhaps too narrow and restrictive. In particular, anti-representationalist accounts do not accurately separate the different notions of representation (Clark & Toribio, 1994).

There are, however, problems with Clark's reformist approach to cognition and the notion of action-oriented representations. The primary problem is that Clark's approach to cognition is vulnerable to the same criticisms that are levelled at CTM. Clark's distinction between internal representations that are action-oriented and those that are neutral merely amounts to a red herring. That is, the debate about whether symbols are amodal or modal deflects attention from the more fundamental questions that are related to any kind of internal representation. How do internal representations acquire their meaning and how are they used or manipulated without adherence to the notion of a homunculus? In the case of action-oriented (internal) representations that are geared to action, who or what has access to them so as to make use of that gearing? Clark's account of cognition is only "embodied" in the sense that the internal representations are connected to the body's actions.

Another "embodied" theory of cognition that retains internal representations is Barsalou's (1999) Perceptual Symbol Systems model (henceforth PSS). PSS, like Clark's notion of action-oriented representations, rejects the abstract, amodal symbols of CTM. Instead, PSS promotes perceptual symbols or modal symbols as the building blocks of cognition.

A challenge to first generation cognitive science and a possible catalyst for Barsalou's PSS is the symbol grounding problem. This problem refers to how symbols acquire their meaning. Recall that according to CTM, modal representations of the world are initially transduced into amodal symbols that are later involved in computational processes in a language of thought that supports higher cognitive functions, such as memory and language. That is, representations are detached from the modal systems activated during interactions with the external environment via what is called a transduction process (a process which has yet to be clarified in this theory). Cognitive processes subsequently involve the rule-governed manipulation of these amodal symbols on the basis of their relationship with other amodal symbols. A question that has been asked is: How can the meaning of symbols be grounded in anything other than other meaningless symbols (Harnad, 1990)? This problem is captured by Searle's (1980) Chinese Room thought experiment.

Searle's thought experiment involves an English-speaking individual locked in a room. This individual knows nothing about the Chinese language, either written or spoken. Through a slot in the wall a bundle of papers is handed to the individual. On these papers are Chinese symbols. Although the individual may hazard a guess that the symbols are Chinese, he/she would not be able to distinguish the Chinese symbols from Japanese symbols or other meaningless squiggles on a page. A second bundle of papers is then handed through the slot to the individual. On these papers are instructions written in English that provide rules for responding to the Chinese symbols written on the first bundle of papers. Responses are made with Chinese symbols. After a period of time the individual can successfully follow the instructions to produce Chinese symbols in response to the papers handed through the slot in the wall. It would appear from outside the room that whoever is returning the pages can understand Chinese.

However, this is not an accurate conclusion. The individual in the room may have the ability to produce symbols in response to other symbols, but the individual does not understand the meaning of the symbols. In fact, Searle's thought experiment illustrates that symbols do not acquire their meaning based on their relationship to other symbols. Evidently, the instructions given to the individual in the room are written by a cogniser who does understand the symbols – just like a computer programmer, which suggests that meaning is extrinsic and that cognition of both symbol and the thing symbolised is necessary. Searle uses this thought experiment to highlight a fundamental limitation of CTM insofar as it claims that computations in the mind involve rule-governed manipulation of symbols according to their syntactic relationship to other symbols, not according to their meaning. If the symbols are to be meaningful they need to be grounded in something other than additional symbols.

According to Barsalou's (1999) PSS, symbols can be meaningful if they are grounded in perception and action. PSS retains an important role for symbols in knowledge representation and cognition. However, unlike CTM, symbols are not considered to be amodal and arbitrarily linked to their referents. Additionally, the essential transduction process of CTM from sensorimotor experience to amodal symbols is considered unnecessary for the foundation of knowledge in cognition. Instead, the underlying sensory, motor, and introspective states present during perceptual experience are partially stored as perceptual symbols. These perceptual symbols are neural representations in the sensory and motor systems in the brain that originally produced them. Furthermore, perceptual symbols that are related become integrated into a simulator whose role is to produce simulations. When knowledge of an object or event becomes relevant in thought, the original sensory, motor, and introspective states are partially simulated via the activation of perceptual symbols. For example, when you hear, read, or think about the word *dog,* all of the perceptual symbols related to this concept, such as size, colour, texture, shape, and sound, are partially re-activated by simulators to produce a simulation in the modality-specific systems in the brain. This simulation process allows for an understanding of concepts and the ability to reason about such concepts.

Concrete concepts are referents for things that are physically experienced via the perceptual system. For example, *dog* is a concrete concept because it consists of an integration of all the sensations that have been directly experienced during interactions with dogs. The same perceptual processes that allow one to experience the percept of a dog subsequently allow for an understanding of the concept *dog*. There are, however, concepts (i.e., abstract concepts) that cannot be directly peceived via bodily experience. Such concepts can pose a problem for Barsalou's PSS and other theories of cognition that ground knowledge in modality-specific systems in the brain. For example, the concept *truth* is not physically experienced nor is it spatially constrained. That is, you cannot see, hear, taste, touch, or smell *truth*. Based on this distinction between concrete and abstract concepts, the relevant question for supporters of a perceptual theory of cognition is: How are abstract concepts represented in the mind if not via perceptual experience?

Supporters of the central principles of Barsalou's PSS and the notion of perceptual simulation have indeed attempted to account for abstract concepts and how they are represented in the mind (Barsalou, 1999; Barsalou & Wiemer-Hastings, 2005; Glenberg & Kaschak, 2002). According to Barsalou (1999), perceptual symbol systems can directly represent all abstract concepts via three mechanisms, which are the simulation of an event sequence, selective attention, and introspective states.

For instance, Barsalou (1999) provides an example of how the abstract concept *truth* is represented in the mind by perceptual symbols. Beforehand, Barsalou concedes that this example of representation does not encapsulate all senses of *truth*, but an everyday sense of *truth*, such as, whether a claim about the world is accurate. The example begins with the claim from a speaker that "There's a balloon above a cloud outside". In response to hearing this claim from the speaker, an agent will construct a perceptual simulation of a balloon above a cloud using various sensorimotor modalities in the brain. Next, the agent will attempt to perceive the relevant event (i.e., the balloon above a cloud). Next, the agent will determine whether the constructed perceptual simulation maps onto this event. If the perceptual simulation does map onto the perceived event the agent will conclude that the original claim is *true*.

More specifically, the representation of *truth* in this instance is via three mechanisms. The first mechanism refers to the agent simulating the balloon above the cloud (i.e., the event sequence) to frame the concept. The second mechanism refers to selective attention which allowed the agent to focus on the relevant aspects of the event, which subsequently allowed the agent to map the perceptual simulation onto the perceived event. Finally, the third mechanism refers to the role of introspective states that allowed the agent to map the perceptual simulation onto the perceived event, which then allowed for a conclusion to be made about the mapping and the event (i.e., whether the statement made by the speaker was *true*). If such processes are repeated for other event sequences eventually a simulator will develop for the *truth* concept. This simulator would then be activated to allow an agent to understand whether something is *true*. The *truth* or *true* concept in this account is grounded in the mapping between the simulation and the event.

However, there is a fundamental problem with this account. According to Barsalou (1999), the agent maps a simulation of the event onto the perceived event. This activity suggests that the agent can directly perceive the event, otherwise mapping would not occur. Therefore, if the agent can directly perceive the event, then there is no need for any kind of internal simulation. In other words, the agent hears the linguistic token ("There's a balloon above a cloud outside") and, by virtue of understanding English, knows that the speaker is making a claim about the world. The agent can then look at the world to see if the claim is true. Consequently, internal simulation is not necessary due to the ability of the agent to directly perceive the world in response to the claim. The mapping between the internal simulation and the perceived event is itself problematic because the agent does not have access to the internal simulation or the mapping. This issue raises the question as to who or what maps the simulation to the perceived event, which suggests that PSS is vulnerable to the homunculus problem. Additionally, like Clark's account of action-oriented representations, Barsalou's attempt to develop an embodied account of cognition by promoting modal symbols serves as a red herring. It seems, then, that Barsalou's PSS, like Clark's account, is more accurately characterised as an extension of CTM, rather than being a genuine alternative. Such a genuine alternative is offered by RECS.

Replacement: Radical Embodied Cognitive Science

The term *radical embodied cognitive science* was originally coined by Clark (1997) who used it to contrast it with *embodied cognitive science,* which can be described as an extension of mainstream computationalism (i.e., representations, concepts). However, this term is currently used by Chemero (2009) as the name for a psychology that combines the seminal work of Gibson and the work of ecological psychologists (e.g., Turvey, Shaw, Reed, & Mace, 1981; Wilson & Golonka, 2013) and enactivists (e.g., Hutto & Myin, 2013; Varela et al., 1991). RECS not only rejects computationalism, it also rejects representationalism totally. It is thus anti-representationalist and it is because of this that the word 'radical' is used in conjunction with embodied cognitive science. However, Chemero (2013) disputes the label "radical" with its connotations of a departure from traditional approaches, on the grounds that, rather than being a recent reaction to and abandonment of computationalism, RECS actually continues a much earlier line of thinking that simply bypasses CTM and its logical problems. This line stems from James and ecological psychology. Hence, according to Chemero, it is EC that is a watered-down version of RECS by virtue of attempting to combine a Jamesian psychology (i.e., Jamesian functionalism) with computationalism (i.e.,Wundtian structuralism). For a graphical depiction of this progression see Figure 1.

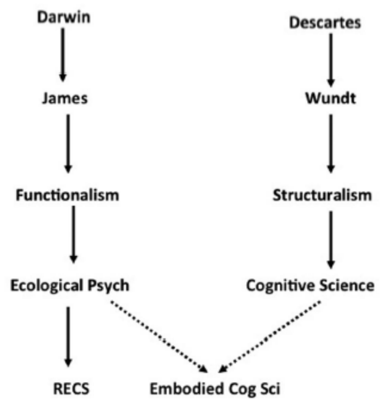


Figure 1. Lineage of EC and RECS (Chemero, 2009).

The key assumption of RECS is that a thinking organism is embedded in an environment where perception leads to action and action leads to further perception (Chemero, 2009). The organism does not require representations of the environment to effectively interact with it (Chemero, 2009). To support these claims, researchers have turned to dynamical systems modelling to empirically test the assumptions found in Gibson's ecological psychology. A dynamical system is any system that changes over time. These changes occur in accordance with dynamical laws which often take the form of differential equations. In a dynamical approach to cognition, the brain dynamically interacts with the body which dynamically interacts with an environment. Thus, cognition emerges from an interactive system comprising the brain, the body, and the environment. According to Chemero (2009), by using dynamical systems modelling researchers attempt to understand cognition as intelligent behaviour and attempt to understand how a whole system changes over time.

A source of support for the "replacement" account is the collection of reactive real-time mobile robots developed by Rodney Brooks. Traditional AI robots typically function by following what Brooks calls a *sense-model-plan-act* framework (Brooks, 1991a), in which sensory input is transformed by a central system (i.e., the computer) into symbolic codes which are then manipulated to produce motoric output for appropriate action. In this model the body is an input-output device. In contrast, Brooks's robots have a *subsumption* architecture (Brooks, 1986), which consists of a set of subsystems that independently produce behaviour by directly connecting sensory input to action. By sensing the environment regularly, the robot can successfully navigate a changing real world environment and assess the appropriateness of relevant goals in relation to the state of the environment.

These behaviour-based robots support one of the more prominent assumptions of Gibson's approach to perception; that is, these robots function appropriately in the environment without mediation from a central system or a world model. They are robust and respond quickly to unpredictable and constantly changing environments due to direct pathways that link sensory input to action. Consequently, they are not limited by the impracticality of a central system and a "representational bottleneck" that would restrict fast, real-time interactions with the environment (Brooks, 1991b). According to Brooks, this work provides preliminary evidence for adaptive behaviour without a central system or the concept of representations.

Varela, Thompson, and Rosch (1991), in their book *The Embodied Mind: Cognitive Science and Human Experience,* cited Brooks' work with robots as an example of their enactive approach to cognition. Specifically, they see Brooks's robots as being structurally coupled to the environment. In other words, the robots and the environment in which they are situated are inseparable. This notion is explored in what Varela et al. (1991) called embodied action:

> By using the term *embodied* we mean to highlight two points: first, that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural

> context. By using the term *action* we mean to emphasize once again that sensory and motor processes, perception and action, are fundamentally inseparable in lived cognition. (p.173)

Although it can be assumed that a supporter of CTM would not entirely disagree with the first point – that cognition depends on the body's interaction with the world – it is the emphasis on a recurrent loop between perception and action that distinguishes the enactivist approach from CTM. It is this tight loop between perception and action that allows for the capacity to successfully interact with the environment. Specifically, an organism's movement allows for new perceptions of the environment, which in turn produces and guides new action, which in turn determines new perceptions, and so on. Thus, cognition, perception, and action are not divided; instead, cognition is structured by perceptually guided action.

The aim of Varela et al.'s (1991) book was to kick off a revolution based on a rejection of both computation and the concept of representation and a promotion of what they consider a middle path between realism and idealism. Briefly, realism asserts that the properties of the world are pregiven such that they exist independently of our perception, whereas idealism asserts that cognition projects its own world where the world reflects the make-up of the internal system. According to Varela et al. (1991) both realism and idealism rely on representation, such that in realism "representation is used to recover what is outer" (p.172), whereas in idealism representation "is used to project what is inner" (p.172). The enactive approach suggests that representation is not needed because organisms and the world are not separate and because the sensorimotor capabilities of the organism enact or "bring forth" the world. Varela et al. (1991) claim that by studying cognition as embodied action both realism and idealism are sidestepped.

However, there cannot be a middle path between realism and idealism. Evidently, Varela et al.'s (1991) central claim that an organism's world is determined or brought forth by the nature of its sensorimotor activity seemingly coincides with idealism. This confusion about a false middle path perhaps reflects the authors' misconception of realism. That is, Varela et al. (1991) perhaps follow a Fodorian position which claims to be realist because it *really* holds that cognitions exist, and that cognitions cannot be thought of without representations. However, a key principle of realism and approaches such as direct realism, is that cognition is not mediated by representations (Maze, 1983). That is, representationism involves epistemological mediation (idealism), whereas realism involves no epistemological mediation. There cannot be a middle path between mediated cognition and non-mediated cognition. Therefore, Varela et al.'s (1991) attempt to locate their enactive approach is misguided. It is important to clearly distinguish between realism and idealism in order for second generation cognitive science to avoid the problems that plague first generation cognitive science. Other alternatives to CTM, such as direct realism, are more clearly defined within the epistemological debate.

Direct realism rejects internal representations and idealist accounts of cognition (Maze, 1983). This approach to cognition has historical roots in Aristotle, Freud, British and American realists, such as Russell and Holt, and the philosopher John Anderson (1962). Although Maze (1983) agrees with Gibson's theory of direct perception, the tradition of direct realism (developed by Anderson, 1962) is independent of Gibson. According to direct realism, cognition is the direct relation between the knower (subject) and the known (object; Maze, 1983). The knower is the living organism that consists of evolved motivational structures (instinctual drives) connected to the organism's physiological perceptual systems – and it is these systems that are involved in cognitive relations with the enviornment. The instinctual drives are neurophysiological structures, rather than mental structures. The known or objects of knowledge are objective situations (e.g., events). According to Maze (1983), cognitive processes such as perceiving, knowing, remembering, and so on are relations. That is, such processes are relations between bodily processes and the external environment. As Maze (1983, p. 84) put it: "To know something is to enter into a relation *with it*, rather than to possess some token that refers to it." Direct realism rejects the notion that cognition is inner because objects of cognition are external to the subject. This account of cognition is a genuine alternative to CTM.

Conceptual Metaphor

Direct realism can potentially provide the framework for another account (i.e., in contrast to PSS) of the embodied nature of abstract thought – that is, Lakoff and Johnson's (1980, 1999) Conceptual Metaphor Theory. Unlike PSS, CMT is open to its epistemological position, such that it could be situated and developed within a representationist framework or within a direct realist/RECS framework. If representationist approaches are logically problematic, then CMT's amenability to a realist approach is a favourable asset. The historical context reveals that CMT does reflect a tradition via James, Freud, Piaget, and so on, that foregrounds the conscious and unconscious role of the body and its actions in cognition. This tradition converges with American new realists, Gibson's ecological psychology, RECS, Radicalised Enactivism (Hutto & Myin, 2013), and direct realism. Despite not being explicitly framed and developed within an epistemological position at this stage, CMT has led to an explosion of empirical research investigating the role of metaphor in cognition.

Metaphor has long been recognised as a linguistic tool used in art and rhetoric to compare one thing in terms of another. However, CMT has extended the role of metaphor beyond language to encompass thought in general (Lakoff & Johnson, 1980, 1999). In CMT, metaphor is defined as understanding an abstract concept in terms of a more concrete physical domain. In other words, abstract concepts are understood metaphorically by drawing on connections with physical and bodily experiences. These connections refer to cross-domain mappings between a source domain and a target domain. Specifically, target domains are abstract and complex concepts that are difficult to understand due to not having an inherent physical actuality, whereas source domains are physical and embodied experiences of objects and situations. Cross-domain mappings produce a set of systematic correspondences between elements of the source domain and elements of the target domain. These mappings allow people to understand the target domain in terms of the source domain.

The preceding account is typically how conceptual metaphor is presented and explained in the literature. However, without identifying the temporal sequence of the acquisition of metaphorical thinking, this account paints conceptual metaphor as a useful tool that *allows for* understanding. Alternatively, conceptual metaphor can be explained in a more naturalistic, deterministic way. That is, people *are caused* to see and understand abstract things in more concrete terms because our more immediate and primary focus and experience is bodily. The association between abstract concepts and concrete, physical experience is "used constantly and automatically, with neither effort nor awareness" (Lakoff, 1993, pp. 227-228). In other words, individuals' biological structure and physical experiences may unconsciously influence their thinking about less immediate, more abstract concepts.

For example, as depicted in Figure 2, the conceptual metaphor LOVE IS A JOURNEY maps elements of the concept of journey onto elements of the abstract notion of love.

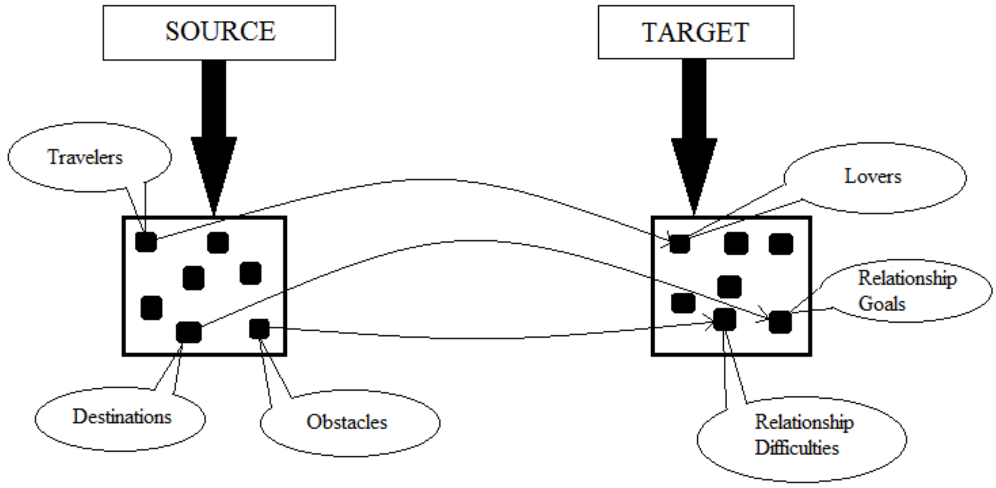


Figure 2. Cross-domain mapping produced by the LOVE IS A JOURNEY conceptual metaphor.

The connections between elements of both domains are evident in everyday metaphoric expressions, such as: "our relationship is at a crossroads", "it's been a long, bumpy road", "we've made a lot of headway", "we're spinning our wheels", and "we've gotten off track". The source domain elements that are mapped to target domain elements include: travelers to lovers, the journey to the relationship, obstacles to difficulties experienced in the relationship, intended destination of the journey to the expected overall goal of the relationship, and so on. These mappings are partial such that they highlight and hide certain elements of the source domain. That is, not all elements of the source domain are mapped onto the target domain. The focus remains on the elements that are consistent with the metaphor. For instance, the main focus of the LOVE IS A JOURNEY metaphor is progress. Of course, *love* is not only conceptualised as a journey but is structured by many physical objects and experiences such as physical force, closeness, illness, and numerous others.

Many abstract concepts are structured by several source domains. The different source domains that are mapped onto the target domain highlight and hide different elements, such that each source domain contributes a particular focus on the target domain. For instance, an additional conceptual metaphor that structures *love* is the LOVE IS A NUTRIENT metaphor. The source domain in this instance allows for utilising knowledge of the positive effects of being well nourished, the desire for nourishment, and the negative effects of not being sufficiently nourished. The correspondences between the source domain and the target domain of this conceptual metaphor are evident in everyday metaphoric expressions, such as: "He's starved for affection", "I was given new strength by her love", "She's hungry for love". This conceptual metaphor highlights and hides different elements of the source domain which results in a different focus compared to the LOVE IS A JOURNEY metaphor. The elements that are hidden in this conceptual metaphor include: the fact that we store nutrients in a cupboard or refrigerator and that some nutrients exit the body and so on. The main focus of the LOVE IS A NUTRIENT metaphor is desire and the consequences of having what is desired. The reason why several source domains such as journey and nutrient come to structure the *love* concept is that the latter consists of a variety of different aspects. People naturally and automatically draw on physical experiences with objects and the environment to understand, reason about, and communicate about abstract concepts (Lakoff & Johnson, 1980).

Since the 1980s, numerous cognitive studies have conducted linguistic analyses that have identified metaphoric expressions that exhibit systematic correspondences consistent with conceptual metaphors (e.g., Johnson, 1987; Lakoff, 1987; Lakoff, 1993; Lakoff & Johnson, 1980; Lakoff & Turner, 1989; Turner, 1987). These studies have examined abstract concepts such as emotion, morality, politics, time, power, mathematics, and economics. These studies have explored these concepts not only in English, but also in Chinese, Hungarian, Arabic, Japanese, Spanish, Dutch, Persian, French, Cora, and Swedish. Lakoff and Johnson (1980) claim that metaphoric linguistic expressions present in everyday language are manifestations of conceptual metaphors. They therefore use these metaphoric expressions to infer underlying conceptual metaphors. A key issue concerning CMT is whether expressions found in everyday language actually do reflect conceptual metaphors or whether they simply reflect linguistic conventions and patterns.

According to McGlone (2007), the claim that linguistic expressions are manifestations of conceptual metaphor and that they imply the existence of conceptual metaphors is an example of “circular reasoning” (p. 115). For instance, we know that people think of love in terms of journey (i.e., a conceptual metaphor) because they use journey-related terminology (i.e., metaphoric linguistic expressions) to talk about love. McGlone (2007) and others (e.g., Ritchie, 2003) conclude that Lakoff and Johnson have developed a hypothesis (i.e., the existence of conceptual metaphors) based on data (i.e., metaphoric expressions) and then have used the same data to support the hypothesis. In other words, Lakoff and Johnson do not provide supporting evidence that is independent of the linguistic expressions that they used to form their initial hypothesis. On these grounds CMT has been labelled unfalsifiable due to the nature of the so-called data used to support conceptual metaphor (Vervaeke & Kennedy, 1996). That is, there is a reliance on linguistic evidence and a subsequent lack of substantial non-linguistic evidence for conceptual metaphors and their role in cognition (McGlone, 2007; Murphy, 1996; Pinker, 2007).

Despite these claims of circular reasoning and the apparent lack of evidence, there is growing literature in experimental psychology that provides non-linguistic evidence for conceptual metaphor. McGlone (2011) later agreed with Gibbs (2011) that studies in embodiment research do in fact examine the influence of conceptual metaphor on non-linguistic behavior. For example, one study found that participants who held a warm cup of coffee judged a fictitious person as having a “warmer” personality (Williams & Bargh, 2008), which is consistent with the conceptual metaphor AFFECTION IS WARMTH. Another study found that participants rated people’s behaviour as more immoral when that rating was made in a dirty work area compared to a clean work area (Schnall, Benton, & Harvey, 2008).

Similarly, when asked to remember an immoral act, compared to a moral act, participants were more likely to select an antiseptic wipe rather than a pen as a free gift for their involvement in the experiment (Zhong & Liljenquist, 2006). These last two findings are consistent with the association between moral purity and physical cleanliness and the metaphors GOOD IS CLEAN and BAD IS DIRTY. These results support Lakoff and Johnson’s (1980) original hypothesis, which suggests that conceptual metaphors do shape cognition such that people both think and behave in metaphoric terms.

GOOD IS UP. One conceptual metaphor that has been investigated in experimental psychology is the GOOD IS UP conceptual metaphor (which is accompanied by the BAD IS DOWN conceptual metaphor). This metaphor is represented by everyday expressions framed around a metaphoric association between evaluation and vertical spatial position (e.g., “they are at the top of their game”, which indicates positivity; “they played below their best”, which indicates negativity). Spatial concepts, such as *up* (e.g., sky) and *down* (e.g., ground), develop directly through concrete physical experience. Spatial concepts (e.g., *up* and *down*) are commonly defined based on an upright human body. In contrast, abstract evaluative concepts, such as *good* and *bad*, cannot be directly perceived through bodily experience. Instead, they are conceptualised indirectly through knowledge of the body and physical situations (e.g., verticality; Lakoff & Johnson, 1980, 1999). In general, things that are *up* are considered to be *good*, whereas things that are *down* are considered to be *bad*. As with all conceptual metaphors, linguistic evidence for the GOOD IS UP conceptual metaphor can readily be identified. For instance, in film reviews, film critics give *good* films “thumbs up” and *bad* films “thumbs down”. In relation to mood, happy people are said to be “feeling up” and sad people are said to be “feeling down”. In Christianity, righteous people go *up* to heaven and sinners go *down* to hell. Such associations between evaluation and spatial location appear to be determined by correlations in experience.

The development of the GOOD IS UP conceptual metaphor is argued to have followed the general process underlying all conceptual metaphor – that is, via the grounding of abstract concepts in sensory experience (Gibbs, 2006; Kövecses, 2002; Lakoff & Johnson, 1980, 1999). Accordingly, the mapping between affect/evaluation/valence and verticality in the GOOD IS UP conceptual metaphor has roots in early perceptual experience. It has been proposed that early sensorimotor experiences ground later abstract thinking in adulthood via the process of scaffolding (Williams, Huang, & Bargh, 2009). For example, for infants all good things such as food, protection, and care come from parents or caregivers who approach the infant from above (Tolaas, 1991). It is during early development that people are first exposed to such correlations in experience between positive affect and vertical space that is located above the self. In contrast, being down is often when one is ill or incapacitated. Moreover, dead things are typically found in lower space and are often buried below ground in Western cultures. Furthermore, when people are sad or depressed they typically hold a stooped posture in which the head tilts downward, whereas when people are happy they hold a more erect posture (Lafrance & Mayo, 1978). These experiences occur regularly and repeatedly such that they provide the experiential basis for the grounding of the GOOD IS UP conceptual metaphor.

Numerous studies in experimental social psychology have examined this metaphor by adopting what is referred to as the *metaphoric transfer strategy* (Landau, Meier, & Keefer, 2010). The key assumption of this empirical research strategy is that if people do utilise a more concrete, physical source domain (e.g., verticality) to understand a complex, abstract target concept (e.g., affect/valence), then manipulating how people experience the concrete, physical domain should have predictable effects on the processing of information related to the abstract concept. In other words, the manipulations should transfer across the cross-domain mappings and produce metaphor-consistent changes in the processing of information (e.g., attitude, judgement, memory, evaluation) about the abstract concept. This metaphoric transfer strategy has been utilised by several studies to examine the influence of the GOOD IS UP conceptual metaphor on processes such as memory, judgement, and person perception. There are also a number of early studies that did not explicitly examine conceptual metaphor but nevertheless provide empirical support and non-linguistic evidence for an association between affect and verticality.

One example of a study that was not specifically designed with CMT in mind was an early study that aimed to examine the affective tone of lines in art to determine whether lines themselves hold an affective character or whether the affective character is suggested by the literary subject of the artwork (Lundholm, 1921). Participants were verbally given individual adjectives and were instructed to draw a single line that they believed expressed each adjective. They did this on a piece of paper using a pencil. There was a total of 48 adjectives that were divided into 13 groups. One group contained words with a positive meaning (merry, cheerful, gay, jolly, and joyous) and one group contained words with a negative meaning (sad, melancholy, mournful, doleful, and sorrowful). Lundholm (1921) found that 84% of the lines drawn in response to the negative adjectives had a downward direction. In contrast, 58% of the lines drawn in response to the positive adjectives had an upward direction. These findings suggest that the production of the lines was influenced in a metaphor-consistent way such that the lines were biased by the implicit associations between *up* and *good* and *down* and *bad*.

Another early study examined the influence of emotional states (i.e., experiences of success and failure) on spatial localisation (Wapner, Werner, & Krus, 1957). This study had a test-retest design. First, participants were presented with a luminous square which was horizontally bisected by a black line. Participants were asked to instruct the experimenter to move the square so that the black line appeared at eye level (i.e., a subjective horizon).

Second, participants received their grade for a real-life mid-term examination. It was expected that participants who received an A would experience feelings of success, whereas participants who received an F would experience feelings of failure such as sadness. These expectations were supported by spontaneous behavioural expressions from participants (e.g., smiles, tears). Third, participants were again presented with the luminous square and asked to instruct the experimenter to move the square so that the black line appeared at eye level. The results indicated an upward shift in perceived horizon for the participants who received an A. In contrast, there was a downward shift in perceived horizon for the participants who received an F. Again, these findings suggest that perceptual judgements were influenced by feelings of happiness and sadness in a metaphor-consistent way.

This notion of an impact of mood states on perceptual judgements was further examined in order to evaluate whether different levels of sadness and depression influence spatial perception at different degrees (Fisher, 1964). Participants' mood states were first measured by having them describe the expressions of eight individually presented facial masks that each had a neutral expression. It was presumed that participants would project their own mood onto the neutral facial masks. Participant responses were scored between 0 and 8 as to whether they used sadness-related terms such as sad, depressed, unhappy, tragic, crying, grieving, worried, and suffering. Participants then completed two tasks. The first task involved the autokinetic effect to explore participants' possible preferences for upward or downward movement. Participants sat in a dark room and were instructed to trace the movement of a small point of light. Although this pinpoint of light appears to move it actually remains stationary. The second task was similar to the one used in the Wapner et al. (1957) study where a black line is adjusted in relation to participants' eye level such that it horizontally bisects a luminous square. The results indicated that participants high in sadness displayed more downward directional responses in both the autokinetic task and the luminous square task. Again, these findings suggest that mood states bias perceptual attention in a way that is consistent with the BAD IS DOWN conceptual metaphor.

Meier and Robinson (2004) were the first to investigate this phenomenon empirically while explicitly identifying their focus to be that of the conceptual metaphor GOOD IS UP. They conducted two studies. In the first study they examined whether evaluation activates metaphor-congruent spatial locations. Participants were instructed to indicate for each of 100 words whether the word had a positive or negative meaning by using a response box. Fifty of these words had a positive meaning and fifty had a negative meaning. The vertical position of these words on a computer screen was randomised so that they appeared individually at either the top or the bottom of the screen. The results indicated that participants categorised the positively-valenced words faster when the words appeared at the top of the screen (vs. bottom of the screen), whereas they categorised the negatively-valenced words faster when the words appeared at the bottom of the screen (vs. top of the screen). The authors concluded that the results suggested that evaluation of the words activated perceptual representations of verticality, which facilitated the processing of consistent pairings (i.e., positive–up, negative–down) and inhibited inconsistent pairings (i.e., positive–down, negative–up). Such findings provide further non-linguistic evidence for the GOOD IS UP conceptual metaphor.

In their second study, Meier and Robinson (2004) investigated whether evaluating the valence of a word can shift spatial attention up or down. As in their first experiment, participants were instructed to indicate for each of 100 words whether the word had a positive or negative meaning. However, in this experiment, words were presented in the centre of a computer screen and participants responded verbally by saying “positive” or “negative”. Immediately following this evaluation, the letter *q* or *p* appeared randomly either at the top or at the bottom of the screen. Participants were instructed to quickly press the “p” key on the keyboard if *p* appeared and to press the “q” key if *q* appeared. Results indicated that discrimination of *p* and *q* was faster in upward locations if a positive word preceded the presentation of the letter, whereas discrimination of *p* and *q* was faster in downward locations if a negative word preceded the letter. These findings suggested that making an evaluation can shift spatial attention upward or downward in a metaphor-congruent direction.

Meier and Robinson (2006) further examined the GOOD IS UP conceptual metaphor by building on earlier studies (Fisher, 1964; Wapner et al., 1957) that investigated negative affect. Across two studies, they examined whether neuroticism and depressive symptoms are associated with a downward bias in spatial attention. In the first study, participants were exposed to 10 words. Five of these words were flower words and the other five words were insect words. These words appeared individually in the centre of a computer screen. Participants were instructed to say “flower” if the word that appeared on the screen was a flower or “insect” if the word that appeared was an insect. These two words were used as neutral stimuli. Immediately following a response to the word, the letter *p* or *q* appeared at the top or the bottom of the computer screen. Participants were instructed to press the “p” key if the letter *p* appeared and to press the “q” key if the letter *q* appeared on the screen. There were 160 trials such that each of the 10 words randomly appeared 16 times. Finally, participants completed Goldberg’s (1999) Neuroticism scale. Results indicated that neuroticism predicted the direction of spatial attention. That is, participants higher in neuroticism responded faster to the *p* and *q* letters when they appeared in lower space (vs. upper space).

In the second study, it was hypothesised that depression may be more strongly associated with vertical spatial attention compared to neuroticism due to the abundance of metaphors for depression that mention vertical location (i.e., down, low). In this study, the procedure remained identical to the first study except for three changes. The first change was that participants evaluated positive and negative words rather than flower and insect words.

They did this by saying “positive” if the word had a positive meaning and by saying “negative” if the word had a negative meaning. Second, participants completed 100 trials instead of 160 trials. Third, they completed the 21-item Beck Depression Inventory (Beck, Rush, Shaw, & Emery, 1979) as well as Goldberg’s (1999) Neuroticism scale. The results replicated the first study’s findings: Participants higher in neuroticism reponded faster to the *p* and *q* letters when they appeared in lower space (vs. upper space). The same association held for participants high in depressive symptoms. Further, the results indicated a stronger relation between participants high in depressive symptoms and a downward bias in spatial attention compared to participants high in neuroticism. The observed relation between negative affect (i.e., neuroticism and depression) and a downward bias in spatial attention provided further support for the BAD IS DOWN (and GOOD IS UP) conceptual metaphor.

In an attempt to determine whether the association between evaluation and verticality can also affect memory, Crawford, Margolies, Drake, and Murphy (2006) examined how the valence of images can influence spatial memory for location. In one study, 60 images (30 positive images and 30 negative images) were randomly presented in various vertical locations on a computer screen. Each image appeared individually for 4 seconds followed by a 2.5 second interstimulus interval. Following the presentation of the 60 images, participants were instructed to reproduce the location of each image from memory. That is, each image appeared in the centre of the screen and participants were instructed to move the picture back to the location where it previously appeared. The results indicated that memory for location was influenced by image valence, such that there was an upward bias for positive images and a downward bias for negative images. These findings suggested that performance on the non-linguistic, spatial memory task was influenced by an association between affect and verticality.

A further study explored the association between spiritual concepts such as God and the Devil and verticality (Meier, Hauser, Robinson, Friesen, & Schjeldahl, 2007). In everyday discourse, God and Heaven are generally located in high positions and the Devil and Hell in low positions. In one of their six experiments, Meier et al. (2007) found that people were faster to respond to words related to God (e.g., *lord*) and the Devil (e.g., *Satan*) when they were presented in a high and low position, respectively, on a computer screen. Another experiment revealed that people rated photographed individuals as possessing a greater belief in God when the images were presented in a vertically high position, as opposed to a low position. These findings suggested that perceptual representations were activated by divinity-related concepts such as God and the Devil.

Notably, previous studies (Crawford et al., 2006; Meier et al., 2007; Meier & Robinson, 2004) on the GOOD IS UP conceptual metaphor have relied on discrete stimulus materials such as individually presented words and images. These studies therefore have not utilised richer, more complex stimulus materials such as person descriptions. Such stimulus materials were, however, used in two experiments by Palma, Garrido, and Semin (2011), which examined the GOOD IS UP conceptual metaphor in person memory. In the first study, participants were presented with behavioural information about a childcare professional (positive target) or a skinhead (negative target) and were instructed to form an overall impression of the person. For each target, the presented information consisted of 12 relevant (i.e., stereotype-congruent) behavioural descriptions (i.e., friendly behaviours such as “He helped a friend to study for an exam” for the childcare professional and unfriendly behaviours such as “He always parks his car occupying two parking spaces” for the skinhead) and 12 irrelevant (i.e., stereotype-neutral) behavioural descriptions (i.e., behaviours that were neutral for a childcare professional or a skinhead such as “He looked at the clock to see the time”). Six of each group of behaviours were presented one sentence at a time at the top of a large screen (200cm × 220cm) and 6 were presented at the bottom of the screen. Following this impression formation task, participants completed a free recall task in which they were instructed to recall all of the behaviours that were presented in the impression formation task. Results indicated a recall advantage for relevant behaviours presented in compatible locations on the screen (i.e., positive behaviours at the top of the screen and negative behaviours at the bottom of the screen) than for relevant behaviours presented in incompatible locations. Palma et al. (2011) concluded that memory for person-specific behavioural information was influenced by the vertical spatial dimensions of *up* and *down*.

In Palma et al.'s (2011) second study, verticality was manipulated via upward and downward arm movements. Participants stood in front of a bookcase that consisted of a top, middle, and bottom shelf. The middle shelf was adjusted so that it was at shoulder height for each participant. The top shelf and bottom shelf were positioned at equal distances from the middle shelf. On the middle shelf was a deck of cards. On these cards (10cm × 14cm) were the same behavioural descriptions that were used in the first study. Each card also had an arrow on it that indicated the shelf where the card should be placed after the behavioural description had been read. Participants were instructed that they had 8 seconds to pick up a card from the middle shelf, read the behavioural description, form an impression of the person, and place it on either the top or the bottom shelf (as listed on the card). After the 8 seconds, participants were then instructed to pick up another card. This was repeated until all of the cards had been read and relocated to the top or bottom shelf. After this impression formation task, participants completed a free recall task in which they were instructed to recall the behaviours that were presented on the cards. Results indicated that recall was better for behaviours placed in compatible locations (i.e., positive behaviours placed on the top shelf and negative behaviours placed on the bottom shelf) than for behaviours placed in incompatible locations. These results suggested that the upward and downward arm movements influenced memory for the behavioural information in a metaphor-consistent way.

Meier, Moller, Chen, and Riemer-Peltz (2011) also investigated the influence of the GOOD IS UP conceptual metaphor on person perception. Specifically, the abstract concepts *north* and *south* were examined in a series of studies to determine their relation to verticality and affect. Previous findings had suggested that there is a strong tendency to communicate and reason about *north* and *south* in terms of up and down (Carreiras & Garling, 1990; Nelson & Simmons, 2009). This tendency occurs despite the fact that there is no actual relation between these cardinal directions and verticality. Meier et al. (2011) hypothesised that if there is a learned association between *north* and *up* and *south* and *down* then perhaps north is associated with positivity and south is associated with negativity. In one study (Experiment 2), participants rated the word ‘north’ as more positive than the word ‘south’. In a subsequent study (Experiment 3), participants were provided with a paper map of a fictional city. North was at the top and South was at the bottom of the map. Participants were asked to place an ‘x’ on the map to indicate where they would like to live in this fictional city. Results indicated that participants preferred to live in the top half (i.e., northern areas) of the city map compared to the bottom half (i.e., southern areas). These initial findings suggested that *north* and *south* are associated with *good* and *bad* which is consistent with the GOOD IS UP conceptual metaphor.

In their final study (Experiment 4), Meier et al. (2011) examined the effects of this evaluation cardinal direction association on person perception. Participants were randomly assigned to read either about an individual with high SES or about an individual with low SES. After reading the short description about the individual, participants were asked to place an ‘x’ on a paper map of a fictional city to indicate where they believed the individual lived. The map of the fictional city included labels that specified the directions of North, South, East, and West. The results indicated that participants believed the high SES individual lived in the northern area of the city (i.e., top half of the map), whereas participants believed the low SES individual lived in the southern area of the city (i.e., bottom half of the map). These results suggest that *north* is more positive than *south* because *north* is generally seen as being *up* and *up* is generally associated with positivity. These findings further suggest that learned associations that are consistent with metaphors such as GOOD IS UP can influence evaluative behaviour in metaphor-consistent ways.

The various studies on the GOOD IS UP conceptual metaphor reveal how abstract concepts are grounded metaphorically by perceptual experience. These findings support theory that suggests that abstract concepts such as *good* and *bad* are conceptualised by perceptual experience of verticality. Moreover, the empirical research that has investigated this conceptual metaphor has found that manipulating bodily states and the physical location of stimuli has metaphor-consistent effects on the processing of abstract concepts.

The investigation of conceptual metaphor using more complex materials such as person descriptions is still in its infancy, and the limits of conceptual metaphor have not yet been established. Preliminary findings concerning the role of the GOOD IS UP conceptual metaphor in the social cognitive area of person perception (Meier et al., 2011; Palma et al., 2011) are an encouraging starting point for the present thesis. This thesis aims to investigate further the influence of this metaphor on impressions or evaluations of a person.

Impression Formation

It is a natural process for people to evaluate and make sense of others in order to navigate their social worlds. People form impressions of others through a variety of processes, which typically include the integration of available information (Fiske & Neuberg, 1990). Exposure to others via physical interactions, verbal descriptions, and even digital encounters in cyberspace lead to people forming impressions of others (e.g., Jacobson, 1999).

Impression formation is important and evolutionarily essential for everyday life (Schneider, Hastorf, & Ellsworth, 1979). For instance, it is adaptive to be able to determine whether an approaching individual is trustworthy or untrustworthy, helpful or threatening, harmless or dangerous, and so on. The underlying principles involved in impression formation have been investigated since the early-to-mid 20th century. This investigation extends from impressions based on physical appearance (e.g., Thornton, 1944) to impressions developed from more complex information such as behaviours and traits (e.g., Asch, 1946). What information is used and how it is used when forming impressions of others is a primary focus in social cognition.

Asch's (1946) gestalt theory of impression formation suggests that the overall impression of an individual is shaped by central traits. That is, certain traits (i.e., central traits) such as *warm* and *cold* will have more of an influence on the overall impression of an individual compared to less significant traits (i.e., peripheral traits) such as *polite* and *blunt*. Seemingly, central traits overshadow peripheral traits in the configuration of final impressions. In contrast, according to Anderson's (1965, 1971) cognitive algebraic models (i.e., the additive model and the averaging or weighted averaging model), all traits influence the final, overall impression of an individual. That is, each trait has a (weighted) value that can be combined with other traits to obtain an overall evaluation of an individual.

However, the accounts of impression formation from both Asch and Anderson neglect several important factors, including the ideas that the same information can be processed in a top-down and bottom-up way, we have limited cognitive resources, and the perceiver has certain goals and motivations (Brewer, 1988). After Asch's seminal paper and the development of Anderson's algebraic models, researchers remained divided on what processes are involved in impression formation. That is, there was a division as to whether impression formation involves a top-down process (i.e., Asch's configural, holistic account:

e.g., Burnstein & Schul, 1982) or a bottom-up process (i.e., Anderson's information integration, attribute-oriented, piecemeal account: e.g., Fishbein & Ajzen, 1975). However, over the past 25 years, the dominant accounts of impression formation promote a dual-process model, which proposes that person information can be processed in both a top-down way and in a bottom-up manner (e.g., Brewer, 1988; Fiske & Neuberg, 1990; Fiske & Pavelchak, 1986). Factors that may determine whether category-based or piecemeal processing occurs include a perceiver's motivations (Brewer, 1988) and characteristics of stimulus information (Fiske & Pavelchak, 1986; Pavelchak, 1989). These factors and the processes that they influence were further examined in the continuum model of impression formation (Fiske & Neuberg, 1990).

According to Fiske and Neuberg's (1990) continuum model, category-based (configural, holistic) processes and piecemeal (attribute oriented) processes lie at opposite ends of a continuum. However, this model suggests that impression formation does not always exclusively involve one process over another. That is, impression formation may admit of degrees rather then involve absolute shifts to the left or right of the continuum. The model proposes a 6 stage sequence where both category-based and piecemeal processing are influenced by informational and motivational processes.

Fiske and Neuberg's (1990) continuum model outlines how the formation of impressions in everyday life can be shaped by informational and motivational factors and how impressions can be formed automatically. The automaticity of impression formation has been examined within the spontaneous trait inference literature (for a review see Uleman, Rim, Saribay, & Kressel, 2012). Spontaneous inferences are those that occur "without intentions or instructions, at the encoding stage of processing behavioual information" (Winter & Uleman, 1984, p. 237). For instance, it has been found that people infer traits (e.g., *romantic*) from behavioural descriptions (e.g., "Tonight is my anniversary. I have fixed a candlelight dinner for my husband. I'm going to serve dinner on a table that I have set up in our bedroom") without intention or awareness (Carlston & Skowronski, 1994). Although the automaticity and other cognitive, motivational, and emotional factors have been examined empirically (for reviews see Hamilton & Sherman, 1996; Macrae & Bodenhausen, 2000), there is little research that has investigated the role of embodied processes in impression formation. One study, for example, found that approach and avoidance (i.e., arm flexion and arm extension) influenced participants' judgements as to whether people were trustworthy or untrustworthy, respectively (Slepian, Young, Rule, Weisbuch, & Ambady, 2012). This study provides both support for the notion that bodily processes influence impression formation and impetus for further investigation of conceptual metaphor and embodied processes that may underlie impression formation.

Overview

The experiments in the current project aim to investigate whether the GOOD IS UP conceptual metaphor influences impression formation processes. These processes will be indexed with various combinations of three dependent variables (reaction time, memory, and target evaluations). Experiment 1 examines whether the vertical location of behavioural information influences reaction time, memory, and target evaluations. Experiment 2A examines whether the vertical location of trait words influences reaction time. Experiment 2B examines whether the vertical location of trait words influences memory and target evaluations. Experiment 3 is a replication study of Meier and Robinson (2004), conducted to assess the reproducibility of their original effect. Across the set of experiments, I hypothesised that the vertical location of the stimuli would influence reaction time, memory, and target evaluations in metaphor-consistent ways.

Chapter 2: Pilot Study 1 and Experiment 1

Pilot Study 1

Overview

The aim of Pilot Study 1 was to test the valence of 76 behavioural descriptions. The results of this pilot study determined the behavioural descriptions that were used in Experiment 1.

Method

Participants

Both pilot studies and all subsequent experiments were approved by the university's Human Research Ethics Committee (HREC, approval code H10044; see Appendix A). For this pilot study, 103 U.S. participants were recruited via Amazon Mechanical Turk (MTurk) and received USD$0.50 for their participation. Recent research has indicated that respondents to online surveys through MTurk are demographically diverse and representative of the general population (Berinsky, Huber, & Lenz, 2012). Data collected from such samples have also been found to be reliable (Buhrmester, Kwang, & Gosling, 2011). The average age of participants was 28.67 years (*SD* = 7.15, range = 18-57 years).

Materials and Procedure

I created 76 behavioural descriptions (see Appendix B), 29 of which were about the successful adjustment to post-university life (e.g., "Alex has been described by the principal as a talented teacher"), 27 of which were about the unsuccessful adjustment to post-university life (e.g., "Casey has attended nine unsuccessful job interviews"), and 20 of which were neutral; that is, they were not related to adjustment to post-university life (e.g., "Ashley checks the mailbox after arriving home from work each day"). The names that were included in the behavioural descriptions were gender neutral. Seven screening questions (e.g., "What is the current month?") were also included, as recommended by Prince, Litovsky, and

Friedman-Wheeler (2012), in order to protect against automated respondents on MTurk. Participants viewed these behavioural descriptions online and responded to questionnaires about the descriptions using Qualtrics software (Qualtrics, 2013).

Participants were told that they would read about several recent university graduates. They were asked to rate how positive or negative each behaviour was on a 9-point scale with endpoints labelled 1 (*Extremely negative*) and 9 (*Extremely positive*). Each survey page consisted of 10 randomly presented behavioural descriptions (rather than 1 behavioural description per page). After completing the ratings for the 76 behavioural descriptions, participants viewed a page that thanked them for their participation and provided a code with which they could claim the reimbursement to their Amazon.com account.

Results

Three participants were excluded from the analyses due to failing at least one of the seven screening questions. A further three participants were excluded due to a failure to provide responses for any of the items. Thus, the final sample included 97 participants.

Behavioural descriptions with a mean score between 1 and 3.99 were classified as negative, descriptions with a mean score between 4 and 5.99 were classified as neutral, and descriptions with a mean score between 6 and 9 were classified as positive. Only one behavioural description's ratings fell outside of its intended group (i.e., positive, neutral, or negative). This behavioural description ("Charlie is a cleaner at a local Walmart") was intended as a negative description, but it had a mean score of 5.00, which indicates that it was considered neutral by participants. Nevertheless, it was retained within the negative behavioural description group for subsequent analyses.

Participants rated the 29 positive behavioural descriptions ($M = 7.17$, $SD = 0.85$) significantly more positively than the 27 negative behavioural descriptions ($M = 2.80$, $SD = 0.94$), $t(96) = 25.36$, $p < .001$, $d = 4.88$. Participants also rated the positive behavioural descriptions significantly more positively than the 20 neutral behavioural descriptions (*M* = 5.30, *SD* = 0.53), $t(96) = 24.07$, $p < .001$, $d = 2.64$. Participants rated the negative behavioural descriptions significantly more negatively than the neutral behavioural descriptions, $t(96) = 20.51$, $p < .001$, $d = -3.28$.

The results indicated that a majority (i.e., all except one) of the behavioural descriptions had the originally intended valence. Thus, a selection of the behavioural descriptions generated from this pilot study were used in Experiment 1. Specifically, the behavioural descriptions that had the highest ratings for each valence category were selected for Experiment 1.

Experiment 1

Overview

The overall aim of Experiment 1 was to replicate and extend Palma et al. (2011) and to extend Meier and Robinson (2004). The findings presented by these two studies suggest that the GOOD IS UP conceptual metaphor influences both the evaluation of words and memory for behavioural information. The present study aimed to test whether the GOOD IS UP conceptual metaphor influences not only reaction time and memory for behavioural descriptions, but also target evaluations. To do this, an impression formation task was used in which descriptions of six target persons were presented in various vertical locations. Exposure to behavioural descriptions and subsequent ratings of a target on a set of traits is a standard and direct way to measure impression formation (e.g., Hamilton, Katz, & Leirer, 1980). Unlike previous research on the GOOD IS UP conceptual metaphor, stimuli in the current experiment were presented at the top, centre, and bottom of a projection. By adding a central location, this experiment could examine whether the metaphor-congruent effect is due to looking up, or looking down, or is due to a combination of both. Consequently, differences in the dependent variables were examined relative to a central position, rather than just comparing relative up-down positions.

On the basis of CMT, I proposed the following hypotheses:

(1) Reaction time would be faster for behavioural information presented in metaphor-congruent spatial locations (i.e., positive information in upper space and negative information in lower space) than in metaphor-incongruent spatial locations (i.e., positive information in lower space and negative information in upper space).

(2) Memory recall and recognition memory would be better for behavioural information presented in metaphor-congruent spatial locations than in metaphor-incongruent spatial locations. That is, positive information would be better remembered when it appeared in upper space and negative information would be better remembered when it appeared in lower space.

(3) Target evaluations would be more positive for the positive targets when behavioural information was presented in upper space (vs. lower space). Also, target evaluations would be more negative for the negative targets when behavioural information was presented in lower space (vs. upper space).

Method

Participants

Twenty-six (19 female, 7 male) introductory psychology students at the University of Western Sydney participated in the experiment in exchange for course credit. Participants were recruited through the University's research participation system (SONA). There were no exclusion criteria for this experiment. The average age of participants was 21.61 years (*SD* = 4.60, range = 18-37 years). A majority of participants identified as Middle Eastern (31%). Additionally, 23% were Caucasian, 23% were East and Southeast Asian, 11.5% identified as Other, and 11.5% of participants did not provide a response. English was the first language of 58% of participants. The average self-rated English language proficiency of the remaining

42% of participants was 4.25 (*SD* = 1.04; range = 1-5; 1 = *poor*, 5 = *superior*). The average time they had been speaking English was 14.38 years (*SD* = 5.68).[2]

Design

The experiment had a 2 (valence: positive vs. negative) × 3 (verticality: top, centre, bottom) within-subjects design. A power analysis using G*Power 3.1 software (Faul, Erdfelder, Buchner, & Lang, 2009) revealed that a sample size of 26 participants would be required in order to detect a medium effect size with an alpha set at .05 and power set at .80.

Materials

The descriptions were projected onto a white wall using a data projector. The size of the projected image was 150cm×120cm. Stimuli were presented using E-Prime software (Schneider, Eschman, & Zuccolotto, 2002). Questionnaires were presented using Qualtrics software (Qualtrics, 2013) on a University-issued MacBook Pro. A drafting chair was used for the purpose of raising or lowering the chair in order to align participants' eye level with the centre of the projection.

Stimuli. The stimuli consisted of 48 behavioural descriptions from the pilot-tested stimuli. The 48 behavioural descriptions were grouped into 6 target persons (see Appendix C). Each target had a unisex name (i.e., Alex, Kelly) and was portrayed with eight sentences (behavioural descriptions). Three targets were positive and three targets were negative. Neutral information was also included to make the impression formation task more plausible. For the three positive targets, six of the eight sentences were positive behavioural descriptions and two sentences were neutral behavioural descriptions, whereas for the three negative targets, six of the eight sentences were negative behavioural descriptions and two sentences were neutral behavioural descriptions.

Each behavioural description was displayed individually (in 18-point black Arial font

[2] Responses from English as a second language (ESL) participants were not significantly different from English as a first language (EFL) participants across all of the experiments (all *p*s > .05).

on a white background, which translated to approximately 10cm in height on the projection). One positive target's description was presented at the top of the projection, another positive target's description was presented at the centre of the projection, and the other positive target's description was presented at the bottom of the projection. Similarly, the vertical spatial locations for the presentation of the three negative targets' descriptions were at the top, centre, and bottom of the projection. The vertical spatial location of the targets was counterbalanced. For example, 1/3 of the participants viewed Alex's description at the top, 1/3 of the participants viewed Alex's description in the centre, and 1/3 of the participants viewed Alex's description at the bottom of the projection. Both the order of the behavioural descriptions within each target and the order of behavioural descriptions across all targets was randomised. Prior to the presentation of each behavioural description, a fixation cross (+) was presented in the centre of the projection for 300ms.

The behavioural descriptions for the targets presented at the top of the projection appeared 60cm above the centre of the projection, whereas the behavioural descriptions for the targets presented at the bottom of the projection appeared 60cm below the centre of the projection. Therefore, the behavioural descriptions that were projected up and down were displayed at an equal distance from the centre of the projection. All of the behavioural descriptions were positioned across the full width of the projection.

Following the collection of the reaction time dependent measures, participants completed a 5-min filler task (e.g., Palma et al., 2011; see Appendix D) before completing the remaining dependent measures. Participants were instructed to cross off all instances of the letter 'e' (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998) in two printed pages of text describing eucalyptus (http://en.wikipedia.org/wiki/Eucalyptus). This is a relatively low load cognitive task compared to one in which participants have to also follow a set of rules (e.g., do not cross off an *e* that is adjacent to another vowel).

Responses during the experimental phase were made using a keyboard that was placed on participants' laps as they were seated. One key on the number pad was labelled with the symbol '-' to indicate negative, one key was labelled '0' to indicate neutral, and one key was labelled '+' to indicate positive. These keys were counterbalanced, such that the positive key was on the right side of the neutral key for half of the participants and on the left side of the neutral key for the other half of participants.

Dependent variables. Reaction time was recorded directly via the E-Prime software. It was measured from the moment the behavioural description appeared on the screen (i.e., after the fixation cross) until participants responded with a button press. That is, participants evaluated each behavioural description by pressing the labelled keys on the number pad, after which a fixation cross appeared followed by the next behavioural description.

Memory recall for each target was measured with an unexpected free recall task (see Appendix E). The instructions for the free recall task were: "Take a minute to think back about the people you read about. In the spaces provided list as many of each person's behaviours as possible. Please don't spend longer than 1 minute on each person." Responses were made in an open-ended format.

Recognition memory for each target was measured with a multiple-choice task (see Appendix F), which consisted of 48 items (i.e., 8 items for each target). The instructions for the multiple-choice task were: "Take a minute to think back about the people you read about in the descriptions. Which of the 6 people that you learned about performed each of these behaviours? Please select the name of the person that corresponds to each behaviour." Each behavioural description was presented without the name (e.g., "has been described by the principal as a talented teacher."). The multiple choice response options consisted simply of the names of each target.

Target evaluations were measured with a scale modified from Lockwood and Kunda

(1997). The instructions for target evaluations were: "Take a minute to think back about the people you read about in the descriptions. We would like to ask you about your perceptions of these people. Using the corresponding scale, please rate what you think each person is like on the traits that follow." Participants rated targets on 22 traits (see Appendix G). Ratings were made on a 7-point scale with endpoints labelled 1 (*Not at all*) and 7 (*Very much*). Ratings for the 12 positive items were averaged to form a positive evaluations subscale (α = .86) and ratings for the 10 negative items were averaged to form a negative evaluations subscale (α = .78) and the overall evaluation variable was created by subtracting the negative evaluations from the positive evaluations.

Procedure

Participants were invited to take part in a study about the effects of distraction on visual and auditory perception. This cover story was used to minimise demand characteristics. Participants were tested individually. On arrival at the lab, participants were greeted by the experimenter who directed them to a drafting chair. Next, the experimenter had participants read an information sheet about the study (see Appendix A) and read and sign an informed consent form (see Appendix A). Upon obtaining consent, participants were given verbal instructions by the experimenter about the tasks (see Appendix H). Participants were then asked to position themselves in the drafting chair such that it was located in line with a piece of tape 180cm from the wall. The drafting chair was then raised so that participants' eye level was in the centre of the projection on the wall. The keyboard was then placed on participants' laps. The experimenter remained in the room to ensure that participants did not alter their physical position during exposure to the stimuli and also to monitor participants' progress throughout the experiment.

Participants progressed through the instructions (which were projected onto the wall) by using a mouse to click 'next'. This mouse was on a table positioned to the left side of participants. The instructions included more information about the ostensible aim of the experiment. That is, participants read that the purpose of the current study was to investigate whether particular forms of distraction can affect visual perception and also whether there are benefits of reading web-based University of Western Sydney (UWS) news stories for university online services and possible applications for iPads. Participants then read that during the experimental phase they would read about six recent UWS graduates. Participants were told that the sentences they would read had been taken from online news articles from the UWS nUWS (pronounced "news") webpage.

Participants first completed a practice phase to familiarise themselves with the task. Prior to the presentation of each practice sentence[3] (e.g., "Ronald Weasley broke his leg after crashing his broomstick"; see Appendix C), a fixation cross (+) appeared in the centre of the projection for 300ms. In the practice trials five sentences appeared individually in the centre of the projection. Participants were instructed to read each sentence carefully and at their own pace so that they could form an overall impression of each person that they read about. Participants had to indicate whether the behaviour described in the sentence was positive, neutral, or negative using the number pad on the keyboard. Once a response was made, a fixation cross would appear in the centre of the projection and then the next behavioural description would appear.

Following the practice phase participants read that the experimental phase would begin next. They read that the experimental phase would be similar to the practice phase and that their task would be the same. Participants were then exposed to the 48 behavioural descriptions of the six targets.

After the experimental phase participants were repositioned behind a table and were given the 5-min filler task, which was completed using pen and paper. They then completed

[3] There was no overlap between the sentences in the practice trials and the experimental trials.

the remaining dependent measures on a laptop at their own pace. Participants then provided demographic information including age, gender, and ethnicity (see Appendix I). Next, participants completed a suspicion probe (see Appendix J), which included several items related to determining whether participants were aware of the experiment's aim and hypotheses (e.g., "Had you heard anything about the study before today?"). After completing these measures, participants were debriefed by the experimenter. The experimenter also verbally checked for suspicion and gave participants a debriefing form to read and take with them (see Appendix A). Participants were then thanked for their participation and assigned their experimental credit.

Results

No participants reported any suspicions about the experiment. Data screening was undertaken to ensure the accuracy of the data and to check the assumptions of analysis of variance (ANOVA). Data screening identified several cases with missing data on the memory recall, recognition memory, and target evaluations dependent variables. However, because less than 10% of the data were missing (5%), the scores were treated as though they were missing randomly (Allison, Gorman, & Primavera, 1993). Therefore, all available cases were retained for analysis. Assumptions of normality were satisfactory. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for reaction times for the valence × verticality interaction ($\chi^2(2) = 9.923$, $p = .007$). Accordingly, the Greenhouse-Geisser correction was used for this analysis (Tabachnick & Fidell, 2013).

A series of two-way valence (positive, negative) × verticality (top, centre, bottom) repeated measures ANOVAs with alpha at .05 were conducted to examine potential differences in reaction time, target evaluations, memory recall, and recognition memory.

Reaction Time

Reaction time data for neutral descriptions were excluded from the analysis (25.00%). Next, trials with inaccurate responses (i.e., an incorrect response for the categorisation of a behavioural description) were excluded from the analysis (4.57% of trials). In order to normalise the distribution of the reaction time data, these values were subjected to a log transformation (Ratcliff, 1993). Next, trials that were 2.5 *SD*s above or below the grand latency mean (2.64% of trials) were replaced with the 2.5 *SD* value (e.g., Miller, 1991). Descriptive statistics are shown in Table 1. The analysis for reaction time revealed that although the main effect of valence was not significant, $F(1, 25) = 0.18$, $p = .678$, $\eta_p^2 = .01$, the main effect of verticality was significant, $F(2,50) = 4.47$, $p = .016$, $\eta_p^2 = .15$. Sidak post hoc comparisons revealed that the only pairwise comparison difference was that reaction times were faster for behavioural descriptions presented at the bottom of the projection compared to behavioural descriptions presented at the top of the projection ($M_{Diff} = -324.05$, Sidak 95%, CI: -598.12-49.99). The predicted valence × verticality interaction was not significant, $F(1.494, 37.351) = 1.33$, $p = .271$, $\eta_p^2 = .05$[4].

Two composite variables were created: a metaphor-congruent composite, which combined the trials of positive descriptions presented at the top of the projection with the trials of negative descriptions presented at the bottom of the projection; and a metaphor-incongruent composite, which combined the trials of positive descriptions presented at the bottom of the projection with the trials of negative descriptions presented at the top of the projection. These two composite variables were created because the hypothesis was that reaction time would be faster for positive and negative behavioural information presented respectively at the top or the bottom of the projection compared to the opposite vertical presentation of positive and negative behavioural information. There was no significant

[4] There were no differences among the positive targets or negative targets for reaction time ($p > .05$). Consequently, reaction time data were collapsed into one "positive" target category and one "negative" target category.

difference in reaction time for target descriptions presented in metaphor-congruent locations (*M* = 3588.54, *SD* = 714.33) compared to target descriptions presented in metaphor-incongruent locations (*M* = 3698.91, *SD* = 940.39), $t(25) = -0.84$, $p = .411$, $d = -.13$.

Table 1

Reaction Time (ms) for Targets by Valence and Verticality

Valence	Verticality			
	Up	Centre	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Positive Targets	3733.45 (934.93)	3816.22 (982.93)	3519.76 (958.42)	3689.81 (958.76)
Negative Targets	3878.05 (1155.16)	3584.26 (818.29)	3443.63 (722.74)	3635.31 (898.73)
Overall	3805.75_a (1045.05)	3700.24 (900.61)	3481.70_b (840.58)	

Note. Means with different subscripts within a given row are significantly different from one another ($p < .05$).

Memory Recall

The data from the free recall task were not analysed due to the difficulty participants had in accurately listing the behaviours presented in the experimental phase. Across the 156 recall sections (i.e., responses of 26 participants about the 6 targets), 29 included 1-4 behavioural descriptions, 107 included 1-9 traits, 7 included a statement about not remembering, and 13 were blank. Of the 29 responses that included at least 1 behavioural description, a total of 47 behavioural descriptions were reported and 37 of these were incorrect. This poor recall performance will be discussed further in the Discussion section.

Recognition Memory

The analysis for recognition memory revealed that the main effect of valence was significant, $F(1, 20) = 11.63$, $p = .003$, $\eta_p^2 = .37$. Sidak post hoc comparisons revealed that negative behaviours were more accurately identified than positive behaviours ($M_{\text{Diff}} = 0.78$, Sidak 95%, CI: 0.30-1.23). The analysis revealed that the main effect of verticality was not significant, $F(2, 40) = 1.82$, $p = .175$, $\eta_p^2 = .08$. The predicted valence × verticality interaction was not significant, $F(2, 40) = 1.49$, $p = .238$, $\eta_p^2 = .07$[5]. Descriptive statistics are shown in Table 2. There was no significant difference in recognition memory for target descriptions presented in metaphor-congruent locations ($M = 1.34$, $SD = 1.49$) compared to target descriptions presented in metaphor-incongruent locations ($M = 1.74$, $SD = 1.57$), $t(24) = -0.96$, $p = .346$, $d = -.26$. An error rate (i.e., incorrect responses for the multiple choice items) was calculated due to the acknowledged difficulty participants had in recalling the behaviours for each target. The error rate was 52.40%, which suggests that participants also had difficulty recognising the behaviours.

---

[5] There were no differences among the positive targets or negative targets for recognition memory ($p > .05$). Consequently, recognition memory data were collapsed into one "positive" target category and one "negative" target category.

Table 2

Recognition Memory for Targets by Valence and Verticality

Valence	Verticality			
	Up	Centre	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Positive Targets	1.10 (1.51)	1.48 (1.60)	2.00 (2.05)	1.52_a (1.72)
Negative Targets	2.00 (1.61)	2.95 (2.09)	1.95 (2.11)	2.30_b (1.94)
Overall	1.55 (1.56)	2.21 (1.84)	1.98 (2.03)	

Note. Means with different subscripts within a given column are significantly different from one another ($p <$ .05).

Target Evaluations

The analysis for target evaluations revealed a signficant main effect of valence, $F(1, 25) = 7.01$, $p = .014$, $\eta_p^2 = .22$. Sidak post hoc comparisons revealed that positive targets overall were rated more positively than negative targets ($M_{\text{Diff}} = 0.671$, Sidak 95%, CI: 0.15-1.19). The main effect of verticality was not significant, $F(2, 50) = 1.41$, $p = .254$, $\eta_p^2 = .05$. The predicted valence × verticality interaction was not significant, $F(2, 50) = 0.64$, $p = .532$, $\eta_p^2 = .03$[6]. Descriptive statistics are shown in Table 3.

[6] There were no differences among the positive targets or negative targets for target evaluations ($p > .05$). Consequently, target evaluation data were collapsed into one “positive” target category and one “negative” target category.

Table 3

Target Evaluations for Targets by Valence and Verticality

Valence	Verticality			
	Up	Centre	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Positive Targets	4.91 (1.13)	5.04 (0.80)	4.90 (0.82)	4.95_a (0.92)
Negative Targets	4.24 (1.34)	4.53 (1.23)	4.07 (1.02)	4.28_b (1.20)
Overall	4.58 (1.24)	4.79 (1.02)	4.49 (0.92)	

Note. Means with different subscripts within a given column are significantly different from one another ($p <$ .05).

Discussion

The three hypotheses were not supported by the results. That is, positive behavioural information was not processed faster when it appeared at the top of the projection compared to when it appeared at the bottom, and negative behavioural information was not processed faster when it appeared at the bottom of the projection compared to when it appeared at the top. Positive and negative behavioural information was not better remembered when the information appeared in metaphor-congruent spatial locations. Positive targets were not rated more positively when they appeared at the top of the projection compared to when they appeared at the bottom, and negative targets were not rated more negatively when they appeared at the bottom of the projection compared to when they appeared at the top. In sum, these results are not consistent with those of Palma et al. (2011) and Meier and Robinson (2004), nor do they support CMT in general. However, before concluding that these results provide convincing disconfirming evidence, it is worth noting that the experiment contained a number of methodological limitations which, taken together, are likely to have led to the negative results (i.e., *p*s > .05). There are four specific problems.

First, it was not ideal to measure both reaction time and target evaluations in the same experiment. The instruction to "read each sentence carefully and at your own pace so that you can form an overall impression of each person that you read about" does not correspond with typical instructions for measuring reaction time. That is, instructions for a reaction time task typically ask participants to respond as quickly and accurately as possible (e.g., Meier & Robinson, 2004). The aim of measuring reaction time was to examine whether there was an automatic association between valence and verticality in the mind. However, inferences about the processing of positive and negative behavioural information were problematic due to the instructions that were used in the current experiment.

Second, there was variance in both the content and the length of each behavioural description sentence (6-14 words). This suggests that perhaps traits would be more appropriate for a reaction time task rather than behavioural descriptions of varying lengths. That is, variance created by sentence length could be reduced if (single word) traits and more precise instructions were incorporated into the design of the experiment.

Third, participants may have looked down to make a response on the keyboard, which would have disrupted the manipulation of 'up' and 'down'. Reaction times may have also been slowed due to participants searching for the correct key to make a response. A solution to this issue would be to collect verbal responses in order to control the bodily states of looking up and looking down.

Fourth, all the evidence points to the fact that the number of targets and behavioural descriptions was too high to accurately measure memory recall and recognition memory. The results for both memory recall and recognition memory reflect participants' difficulty remembering the behavioural descriptions for each target. The capacity of short-term memory is typically considered to be 7 ± 2 items (Miller, 1956). In the current experiment, the limited capacity of participants' short-term memory would have been exceeded by the 48 behavioural descriptions (Cowan, 2000; Miller, 1956). Moreover, that load would have been increased due to the arbitrary names that were attached to the descriptions. Clearly, then, the total number of behavioural descriptions needs to be closer to the short-term memory capacity range. Notably, however, negative behaviours were more accurately identified than positive behaviours, which is consistent with previous literature (e.g., Palma et al., 2011; also see Kensinger, 2009, for a review). Nevertheless, the inability of participants to recall the behavioural descriptions may have also influenced target evaluations. That is, precise target evaluations would not be expected if participants were not able to recall the behaviours of each target.

These limitations indicate that the testing of the proposed hypotheses was likely to have been compromised. That is, assessing reaction time, memory, and target evaluations in a single experiment, and doing so with the complex and extensive materials used in Experiment 1, was likely to have interfered with the dependent variable data that were required to satisfactorily test the hypotheses of interest. I therefore decided to examine reaction time separately from memory and target evaluations. I also decided to reduce memory load both by minimising the complexity of the behavioural descriptions to single trait terms, and by reducing the number of targets from six to four. To address the possible confound introduced if participants looked down at the keyboard, a switch to verbal responses was made. Finally, I decided to omit the centre position on the projection and retain only the top and bottom locations, consistent with previous studies.

Chapter Three: Pilot Study 2 and Experiments 2A and 2B

Pilot Study 2

Overview

The aim of Pilot Study 2 was to test the valence of 24 traits. The results of this pilot study determined the traits that were used in Experiment 2A and Experiment 2B.

Method

Participants

One hundred and seven U.S. participants were recruited via MTurk and received USD$0.20 for their participation. The average age of participants was 29.65 years (*SD* = 10.93, range = 18-99 years).

Materials and Procedure

I selected traits that map onto the dimensions of warmth and competence because they are both fundamental to interpersonal perception (Fiske, Cuddy, & Glick, 2007). I selected 24 traits from Rosenberg, Nelson, and Vivekananthan (1968; see Appendix K), 6 of which were related to competence (e.g., industrious), 6 of which were related to social warmth (e.g., helpful), 6 of which were related to incompetence (e.g., inefficient), and 6 of which were related to social coldness (e.g., moody). These traits were grouped into 4 target persons. Of these four target persons, two were positive targets (i.e., 1 competent target and 1 warm target) and 2 were negative targets (i.e., 1 incompetent target and 1 cold target). The traits were presented with the target person's name (e.g., Alex: industrious). As in Pilot Study 1, six screening questions were also included. Participants viewed these traits online and responded to questionnaires about the targets using Qualtrics software (Qualtrics, 2013).

Participants were told that they would read about several recent university graduates. Each survey page consisted of a target's 6 randomly presented traits. Participants were asked to rate how positive or negative each trait was on a 9-point scale with endpoints labelled 1 (*extremely negative*) and 9 (*extremely positive*). They were also asked to form an overall impression of each target. Following each block of traits, participants rated how likeable they considered the person on a 9-point scale with endpoints labelled 1 (*not at all likeable*) and 9 (*extremely likeable*). Participants also rated how much they would like to spend time with the person on a 9-point scale with endpoints labelled 1 (*not at all*) and 9 (*very much*). After rating the 24 traits and providing overall impressions of the 4 targets, participants viewed a page that thanked them for their participation and provided a code with which they could claim reimbursement to their Amazon.com account.

Results

Four participants were excluded from the analysis due to failing at least one of the six screening questions. A further 11 participants were excluded due to a failure to provide responses for any of the items. Thus, the final sample included 92 participants.

Traits with a mean score between 1 and 3.99 were classified as negative, traits with a mean score between 4 and 5.99 were classified as neutral, and traits with a mean score between 6 and 9 were classified as positive. All traits fell within each intended category (i.e., positive and negative).

Participants rated the positive traits (M = 7.56, SD = 1.18) significantly more positively than the negative traits (M = 2.95, SD = 1.08), $t(86) = 21.78$, $p < .001$, $d = 4.08$. Participants rated the positive targets (M = 5.93, SD = 0.83) as significantly more likeable than the negative targets (M = 2.61, SD = 1.08), $t(86) = 19.87$, $p < .001$, $d = 3.45$. Participants reported wanting to spend more time with the positive targets (M = 5.69, SD = 1.07) than with the negative targets (M = 2.33, SD = 1.13), $t(86) = 19.02$, $p < .001$, $d = 3.05$. More specifically, participants rated the warm target (M = 7.67, SD = 1.29) more positively than the competent target (M = 7.44, SD = 1.16), $t(85) = 2.58$, $p = .012$, $d = 0.19$. Participants rated the incompetent target (*M* = 2.77, *SD* = 1.25) more negatively than the socially-cold target (*M* = 3.09, *SD* = 1.15), *t*(85) = 2.67, *p* = .009, *d* = 0.27.

These results indicated that all of the traits were rated as having the intended positivity or negativity. Thus, all of the traits generated from this pilot study were used in Experiment 2A and Experiment 2B.

Experiment 2A and 2B

Overview

The overall aims of Experiment 2A and Experiment 2B were to examine reaction time separately from both memory and target evaluations, and to do so with adjustments to stimulus materials in the direction of reduced memory load and cognitive complexity. More specifically, the aim of Experiment 2A was to examine the influence of the GOOD IS UP conceptual metaphor on reaction time. Traits were used rather than behavioural descriptions in order to reduce variability in both reading speed and length of the stimuli. The traits were presented in various vertical locations. I predicted that reaction time would be faster for traits presented in metaphor-congruent spatial locations than in metaphor-incongruent spatial locations. That is, I predicted that reaction times would be faster when positive traits appeared at the top of the projection compared to when they appeared at the bottom of the projection. I also predicted that reaction times would be faster when negative traits appeared at the bottom of the projection compared to when they appeared at the top of the projection.

The overall aim of Experiment 2B was to examine the influence of the GOOD IS UP conceptual metaphor on memory and target evaluations. To do this, an impression formation task was used in which the four targets were presented in two vertical locations. Experiment 2B also used traits in order not to exceed short-term memory capacity and to reduce variability in stimulus complexity. I made the following predictions for Experiment 2B:

(1) Memory recall would be better for traits presented in metaphor-congruent spatial

locations than in metaphor-incongruent spatial locations. That is, I expected that positive traits would be better remembered when they appeared in upper space (vs. lower space) and negative traits would be better remembered when they appeared in lower space (vs. upper space).

(2) Recognition memory would be better for traits presented in metaphor-congruent spatial locations than in metaphor-incongruent spatial locations. That is, I expected that positive traits would be better recognised when they appeared in upper space (vs. lower space) and negative traits would be better recognised when they appeared in lower space (vs. upper space).

(3) Target evaluations would be more positive for the positive targets when the traits appeared in upper space (vs. lower space). Conversely, target evaluations would be more negative for the negative target when the traits appeared in lower space (vs. upper space).

Experiment 2A

Method

Participants

Twenty-nine (27 female, 2 male) introductory psychology students at the University of Western Sydney participated in the experiment in exchange for course credit. The average age of participants was 20.90 years (*SD* = 5.04, range = 18-38 years). A majority of participants identified as Middle Eastern (38%). Additionally, 28% were Caucasian, 10% were South Asian, 7% were East and Southeast Asian, 3% were African, and 14% identified as Other. English was the first language of 55% of participants. The average self-rated English language proficiency of the remaining 45% of participants was 4.31 (*SD* = 0.86; range = 1-5; 1 = *poor*, 5 = *superior*). The average time they had been speaking English was 16.23 years (*SD* = 7.19). Participants were recruited through the university's research participation system (SONA). There were no exclusion criteria for this experiment.

Design

The experiment had a 2 (valence: positive vs. negative) × 2 (verticality: top vs. bottom) within-subjects design. The centre position from Experiment 1 was dropped in order to simplify the design and examine reaction time differences relative to up and down positions only. As in Experiment 1, a power analysis using G*Power 3.1 software (Faul et al., 2009) revealed that a sample size of 26 participants would be required for this experiment.

Materials

The materials were largely the same as in Experiment 1, with the following differences. Traits, rather than behavioural descriptions, were projected onto a white wall using a data projector. A wireless lavalier microphone (PG185 Lavalier Microphone System) was used to capture participants' verbal responses, rather than a keyboard. These verbal responses were recorded using the computer program Audacity 2.0.3 (Audacity Team, 2013).

Stimuli. The stimuli consisted of the 24 pilot-tested traits described above. As in Pilot Study 2, the 24 traits were grouped into four target persons (see Appendix L). Two of the targets consisted of positive traits and two of the targets consisted of negative traits.

The traits were presented in E-Prime (Schneider et al., 2002). Each trait was displayed individually with the target name (in 18-point black Arial font on a white background, which translated to approximately 10cm in height on the projection). One positive target was presented at the top of the projection and one positive target was presented at the bottom of the projection. Similarly, the vertical spatial locations for the presentation of the two negative targets' traits were at the top and bottom of the projection. The vertical spatial location of the targets was counterbalanced. For example, 1/2 of the participants viewed Alex's traits at the top and 1/2 of the participants viewed Alex's traits at the bottom of the projection. As in Experiment 1, both the order of the traits within each target and the order of traits across all targets was randomised. Prior to the presentation of each trait, a fixation cross (+) was presented in the centre of the projection for 300ms. As in Experiment 1, the stimuli presented at the top and bottom of the projection were equidistant from the centre (60cm).

Dependent variable. Reaction time was recorded directly via the E-Prime software and was operationalised as the time between the presentation of the target name and trait (which co-occurred) until the onset of a verbal response.

Procedure

Participants were invited to take part in a study about the effects of distraction on visual perception. As in Experiment 1, this cover story was used to minimise demand characteristics. The procedure was largely the same as in Experiment 1, with the following difference: Participants read that during the experimental phase they would read about four recent UWS graduates.

Participants completed a practice phase to familiarise themselves with the task. Prior to the presentation of each target name and trait[7] (e.g., "Superman: strong"; see Appendix L), a fixation cross (+) appeared in the centre of the projection for 300ms. In the practice trials, five target name and trait combinations appeared individually in the centre of the projection. Participants had to verbally indicate as quickly and as accurately as possible whether the trait was positive, neutral, or negative. Participants were instructed to say "good" if they thought the trait was positive, "neutral" if they thought the trait was neutral[8], and "bad" if they thought the trait was negative. Once a verbal response was made, a fixation cross would appear in the centre of the projection and then the next target name and trait would appear.

Following the practice phase, participants read that the experimental phase would begin. They were told that the experimental phase would be similar to the practice phase and

---

[7] There was no overlap between the traits in the practice trials and the experimental trials.

[8] Although none of the traits were rated as neutral in Pilot Study 2, a neutral option was included to reduce instances of false responses. That is, participants could select neutral if they were unsure or believed that a trait was not clearly positive or negative.

that their task would be the same. Participants were then exposed to the 24 traits of the four targets.

After the experimental phase, participants provided demographic information including age, gender, and ethnicity. Next, participants completed the same suspicion probe as in Experiment 1. After completing the demographics and the suspicion probe, participants were debriefed. The experimenter verbally checked for suspicion and gave participants a debriefing form to read and take with them. Participants were then thanked for their participation and assigned their experimental credit.

Results

None of the participants reported any suspicions about the experiment. Data screening was undertaken to ensure the accuracy of the data and to check assumptions of analysis of variance (ANOVA). Data screening identified one case with unreadable data (i.e., verbal responses for this participant were not recorded properly). One participant was dropped due to providing responses that were 100% inaccurate. Trials with inaccurate responses were excluded from the analysis (32.87% of trials). This included, for example, trials where participants said “neutral” in response to a trait that was positive or negative. In order to normalise the distribution of the reaction time data, these values were subjected to a log transformation (Ratcliff, 1993). Next, trials that were 2.5 *SD*s above or below the grand latency mean (1.08% of latencies) were replaced with the 2.5 *SD* value (e.g., Miller, 1991). All other available cases were retained for analysis. Assumptions of normality were satisfactory. A two-way valence (positive vs. negative) × verticality (up vs. down) repeated measures ANOVA with alpha at .05 was conducted to examine potential differences in reaction time.

The analysis for reaction time revealed that the main effect of valence was significant, $F(1, 25) = 16.35$, $p < .001$, $\eta_p^2 = .40$. Sidak post hoc comparisons revealed that reaction times were faster for positive traits than for negative traits ($M_{Diff} = -359.50$, Sidak 95%, CI: -542.62-176.38). The main effect of verticality was not significant, $F(1, 25) = 0.02$, $p = .893$, $\eta_p^2 = .001$. The predicted valence × verticality interaction was not significant, $F(1, 25) = 0.61$, $p = .442$, $\eta_p^2 = .02$. Descriptive statistics are shown in Table 4. There was also no significant difference in reaction times for traits presented in metaphor-congruent locations (M = 2120.71, SD = 583.69) compared to traits presented in metaphor-incongruent locations (M = 2147.04, SD = 609.08), $t(26) = -0.50$, $p = .621$, $d = -.04$.

Table 4

Reaction Time (ms) for Targets by Valence and Verticality

Valence	Verticality		
	Up	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Positive Targets	1913.77 (551.41)	1945.92 (560.43)	1929.85_a (555.92)
Negative Targets	2314.32 (752.89)	2264.36 (734.55)	2289.34_b (743.72)
Overall	2114.04 (652.15)	2105.14 (647.49)	

Note. Means with different subscripts within a given column are significantly different from one another ($p < .05$).

Discussion

The hypotheses were not supported by the results. That is, positive traits were not processed faster when they appeared at the top of the projection compared to when they appeared at the bottom. Similarly, negative traits were not processed faster when they appeared at the bottom of the projection compared to when they appeared at the top. These results are not consistent with those of Meier and Robinson (2004), nor do they support CMT in general. However, there are three aspects of the current experiment which may have contributed to the results, and would thus render premature any conclusion regarding failure of evidential support.

First, because the focus was on evaluating the valence of trait terms, word length and word frequency were not controlled. As a result, variability in word length and frequency may have produced variability in the data, thus overshadowing any association between valence and verticality. The results therefore could possibly instead reflect an association between word length or word frequency and verticality.

With respect to word length, although this was not controlled, post hoc analyses indicated that the number of letters was similar across the warm, competent, cold, and incompetent traits (i.e., all *p*s > .05). Nevertheless, the significantly faster reaction time for positive traits might be explained by the fact that the total number of syllables across the positive traits was 32, whereas the total number of syllables across the negative traits was 41.

With respect to word frequency, in everyday language certain words occur more frequently than other words (Balota et al., 2007; Kučera & Francis, 1967). Words that occur more frequently are processed faster (Balota et al., 2007; Howes & Solomon, 1951; Unkelbach et al., 2010). For example, the word 'intelligent' occurs more frequently than 'industrious' (Balota et al., 2007). Consequently, in Balota et al.'s (2007) study, 'intelligent' (*M* = 671.24 ms, *SD* = 172.65) was recognised faster than 'industrious' (*M* = 996.03 ms, *SD* = 431.87) in a lexical decision task and speeded naming task. The traits that were used in the current experiment did vary in frequency (see Appendix M; frequency range: 54-26425, higher scores indicate greater frequency; Balota et al., 2007). Therefore, there was variability across the stimuli that was due to failing to control for word frequency.

An additional aspect of the frequency issue is the fact that positive words are used more frequently in everyday discourse than equally familiar negative words (Matlin & Stang, 1978). This phenomenon has been referred to as the Pollyanna hypothesis or the linguistic positivity bias (Boucher & Osgood, 1969; Rozin, Berman, & Royzman, 2010). Such a bias may be because in everyday life we experience more positive events than negative events which we then talk about (Gable, Reis, & Elliot, 2000). Another explanation is that positive information has a higher density in memory, whereas negative information is more precise and diverse. This is known as the density hypothesis, which refers to the notion that positive information is overall more similar to other positive information than negative information is to other negative information (Unkelbach, Fiedler, Bayer, Stegmuller, & Danner, 2008). The processing of positive information is facilitated because there is a greater association among positive units in memory (Unkelbach et al., 2008). Consequently, positive words are processed faster than negative words (Unkelbach et al., 2010). This density processing advantage for positive words may explain the main effect of valence in the current experiment.

Second, target names were included in the current experiment because it was set up as a linking stage to the assessment of target evaluations in the next experiment. However, the repeated presentation of a target name with the set of traits was not necessary for the current experiment. The aim of this experiment was to examine reaction time for traits, not target evaluations of each target based on the traits, nor reaction time for target names *and* traits. The inclusion of the target names may have increased reaction time for categorising the traits across all of the trials. For instance, if participants consecutively viewed several traits belonging to Alex (e.g., “Alex: intelligent; “Alex: industrious”; “Alex: persistent”; “Alex: determined”), they then may have been distracted by the presentation of a trait belonging to another target (e.g., “Charlie: critical”). That is, the change in target name may have distracted participants from responding to the trait alone. Additionally, the frequency of each target name in everyday language may have influenced the results. For instance, the name ‘Alex’ occurs more frequently than the name ‘Charlie’ in everyday language (Balota et al., 2007). Consequently, in Balota et al.’s (2007) lexical decision task and speeded naming task, the name ‘Alex’ (*M* = 586.21 ms, *SD* = 134.98) was recognised faster than the name ‘Charlie’ (*M* = 671.75 ms, *SD* = 177.06). The target names may have increased variability, which may have then reduced the interaction between the valence of the traits and verticality. Reaction time to the traits and subsequent inferences about the influence of the GOOD IS UP conceptual metaphor on reaction time would have been more precise and more valid if the target names had not been included during the experimental phase for the current experiment.

It could be argued that the reaction time data may be imprecise due to the response mode. Typically, in reaction time tasks participants’ responses are collected using a manual response such as a key or button press (e.g., Meier & Robinson, 2004; Neely, Keefe, & Ross, 1989). However, verbal responses were collected in the current experiment. Verbal responses have been found to have shorter reaction times compared to manual responses in tasks (Repovs, 2004; Sternberg, 2004). Verbal responses were used in the current experiment with the aim of controlling the physical bodily states of looking up and looking down. That is, had a keyboard or button box been used in the present experiment, then participants may have at some point during the experimental phase looked down at the keyboard or button box to reassure themselves that they were pressing the correct key or button. Participants looking down to search for the correct key would have also slowed reaction times. Therefore, verbal responses were considered to be an appropriate and valid measure of reaction time in the current experiment despite the commonality of manual responses in the literature (Repovs, 2004; Sternberg, 2004).

These limitations suggest that the testing of the proposed hypotheses was likely to have been compromised. Any conclusions about the influence of the GOOD IS UP conceptual metaphor on reaction time for positive and negative traits therefore are not comparable to the Meier and Robinson (2004) paper. These limitations would at least need to be acknowledged and rectified for future research if valid conclusions are to be made about the GOOD IS UP conceptual metaphor.

Experiment 2B

Method

Participants

Two hundred and forty (194 female, 46 male) psychology students at the University of Western Sydney participated in exchange for either course credit (n = 237) or for an entry into a draw to win 1 of 2 $50 Coles/Myer gift cards (n = 3). The average age of participants was 21.44 years (SD = 5.89, range = 17-54 years). A majority of participants identified as Caucasian (33%). Additionally, 19% were East and Southeast Asian, 19% were Middle Eastern, 7% were South Asian, 6% were from the Pacific Islands, 3% were African, 2.5% were Latin, Central, and South American, 0.4% were from the Caribbean, 0.4% were Indigenous Australians, and 10% identified as Other. English was the first language of 65% of participants. The average self-rated English language proficiency of the remaining 35% of participants was 4.04 (SD = 0.80; range = 1-5; 1 = *poor*, 5 = *superior*). The average time they had been speaking English was 14.62 years (SD = 6.83). Participants were recruited through the university's research participation system (SONA). There were no exclusion criteria for this experiment.

Design

The experiment had a 4 (target: warm, competent, cold, incompetent) × 2 (verticality: top vs. bottom) between-subjects design[9]. This design was required to examine impression formation because an investigation of the influence of verticality on target evaluations would not be possible if participants read about a target whose traits appeared at the top and the bottom of the projection. A power analysis using G*Power 3.1 software (Faul et al., 2009) revealed that a sample size of 240 participants would be required in order to detect a medium effect size with an alpha set at .05 and power set at .80.

Materials

The materials were largely the same as in Experiment 1 and Experiment 2A. However, unlike Experiment 1 and Experiment 2A, neither a keyboard nor a wireless lavalier microphone were used because reaction time was not measured.

Stimuli. The stimuli consisted of the same 24 traits used in Pilot Study 2 and Experiment 2A.

The traits were presented in E-Prime (Schneider et al., 2002). Each trait was displayed individually with the target name for 8 seconds (in 18-point black Arial font on a white background, which translated to approximately 10cm in height on the projection). The order of the traits within each condition was randomised. For example, in one of the conditions, all of the traits for the warm target were individually presented at the bottom of the projection, whereas in another condition, all of the traits for the same target were individually presented at the top of the projection. Prior to the presentation of each trait, a fixation cross (+) was presented in the centre of the projection for 300ms. As in Experiment 2A, the traits presented at the top and bottom of the projection were equidistant from the centre (60cm). Participants

[9] The four targets consisted of the same traits used in Experiment 2A. However, the traits were grouped in terms of warm, competent, cold, and incompetent to examine any differences in type of positive target and type of negative target. Pilot Study 2 results indicated that the positive targets were significantly different from each other, and the negative targets were signficantly different from each other.

completed the same 5-min filler task that was used in Experiment 1.

Dependent variables. Target evaluations were measured using the same two items that were used in Pilot Study 2. Memory recall was measured with a similar free recall task that was used in Experiment 1 (see Appendix N).

Recognition memory was measured with a 12-item sliding scale task (Griffiths & Mitchell, 2008; see Appendix O). Participants were presented with each trait and asked whether they remembered seeing each of the traits earlier. Each trait was presented next to a sliding scale with endpoints labelled *Definitely NO* (0) and *Definitely YES* (100). A midpoint, *Not sure* (50), was also included. Participants were instructed to drag a marker on the scale to the left or to the right. The sliding scale allowed participants to indicate their confidence in their response. The 12-items consisted of the six traits previously viewed during the experimental phase (e.g., incompetence-related traits) and six other similarly-valenced traits that were not presented (e.g., cold-related traits).

Procedure

Participants were invited to take part in a study about the effects of distraction on visual and auditory perception. As in the previous two experiments, this cover story was used to minimise demand characteristics. The procedure was largely the same as in Experiment 2A, with the following differences: Participants were only exposed to one of the four targets and they learned that during the experimental phase they would read about a recent UWS graduate.

Participants were randomly assigned to one of the eight conditions. That is, participants viewed 6 traits about a competent, warm, incompetent, or cold target person that were either presented at the top or the bottom of the projection. Participants were instructed to read each trait carefully and at their own pace, so that they could form an overall impression of the person. They were also instructed to maintain focus on the trait for however long it was displayed (8 seconds) and not to respond in any way. A fixation cross appeared in the centre of the projection for 300ms prior to the presentation of each trait.

After exposure to the traits, participants completed the filler task and then the dependent measures. Participants then provided demographic information including age, gender, and ethnicity. Next, participants completed the same suspicion probe as in the previous experiments. After completing the demographics and the suspicion probe, participants were debriefed. The experimenter verbally checked for suspicion and gave participants a debriefing form to read and take with them. Participants were then thanked for their participation and assigned their experimental credit or entered into the draw to win the gift card (as applicable).

Results

None of the participants reported any suspicions about the experiment. Data screening was undertaken to ensure the accuracy of the data and to check assumptions of analysis of variance (ANOVA). Data screening identified several cases with missing data on the memory recall and recognition memory dependent variables. However, because less than 15% of participants had missing data (1.25%), and because less than 10% of the data was missing (0.67%), the scores were treated as though they were missing randomly (Allison et al., 1993). Therefore, all available cases were retained for analysis. Assumptions of normality were satisfactory.

A series of two-way target (warm, competent, cold, incompetent) × verticality (top, bottom) between-subjects ANOVAs with alpha at .05 were conducted to examine potential differences in target evaluations, memory recall, and recognition memory.

Target Evaluations

A composite variable for target evaluations was created by combining the two target evaluation items (Cronbach's $\alpha = .91$). The analysis for target evaluations revealed that the main effect of target was significant, $F(3, 232) = 202.38$, $p < .001$, $\eta_p^2 = .72$. Sidak post hoc comparisons revealed that the warm target was rated more positively than the competent target ($M_{\text{Diff}} = 0.933$, Sidak 95%, CI: 0.45-1.42), the incompetent target ($M_{\text{Diff}} = 3.68$, Sidak 95%, CI: 3.20-4.17), and the socially cold target ($M_{\text{Diff}} = 3.48$, Sidak 95%, CI: 3.00-3.97). The competent target was rated more positively than the incompetent target ($M_{\text{Diff}} = 2.75$, Sidak 95%, CI: 2.26-3.24) and the socially-cold target ($M_{\text{Diff}} = 2.55$, Sidak 95%, CI: 2.06-3.04). There was no significant difference in ratings between the incompetent target and the socially cold target. The main effect of verticality for target evaluations was not significant, $F(1, 232) = 0.02$, $p = .898$, $\eta_p^2 = .00$. The predicted target × verticality interaction for target evaluations was not significant, $F(3, 232) = 0.07$, $p = .545$, $\eta_p^2 = .009$. Descriptive statistics are shown in Table 5.

Table 5

Target Evaluations by Target and Verticality

Target	Verticality		
	Up	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Competent	5.05 (0.71)	5.08 (0.91)	5.07_a (0.81)
Warm	6.12 (0.84)	5.88 (0.87)	6.00_b (0.85)
Incompetent	2.38 (1.06)	2.25 (1.05)	2.32_c (1.05)
Cold	2.38 (1.19)	2.65 (1.27)	2.52_c (1.22)
Overall	3.98 (1.91)	3.97 (1.86)	

Note. Means with different subscripts within a given column are significantly different from one another ($p < .05$).

Memory Recall

The analysis for memory recall revealed that the main effect of target was significant,

$F(3, 232) = 6.87$, $p < .001$, $\eta_p^2 = .08$. Sidak post hoc comparisons revealed that competent traits were better remembered than incompetent traits ($M_{Diff} = 1.02$, Sidak 95%, CI: 0.40-1.64), warm traits were better remembered than incompetent traits ($M_{Diff} = 0.73$, Sidak 95%, CI: 0.11-1.35), and socially cold traits were better remembered than incompetent traits ($M_{Diff} = 0.72$, Sidak 95%, CI: 0.10-1.34). There was no significant difference between warm traits and socially cold traits. The analysis revealed that the main effect of verticality was not significant, $F(1, 232) = 1.72$, $p = .191$, $\eta_p^2 = .007$. The predicted target × verticality interaction was not significant, $F(3, 232) = 0.71$, $p = .548$, $\eta_p^2 = .009$. Descriptive statistics are shown in Table 6. There was also no significant difference in memory recall for target traits presented in metaphor-congruent locations ($M = 3.02$, $SD = 1.32$) compared to target traits presented in metaphor-incongruent locations ($M = 2.85$, $SD = 1.34$), $t(238) = 0.97$, $p = .332$, $d = .13$.

Table 6

Recall Memory for Traits by Target and Verticality

Target	Verticality		
	Up	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Competent	3.20 (1.35)	3.47 (1.20)	3.33_a (0.81)
Warm	3.13 (1.48)	2.97 (1.35)	3.05_a (1.41)
Incompetent	2.07 (1.20)	2.57 (1.17)	2.32_b (1.20)
Cold	2.90 (1.27)	3.17 (1.21)	3.03_a(1.24)
Overall	3.98 (1.33)	3.97 (1.23)	

Note. Means with different subscripts within a given column are significantly different from one another ($p < .05$).

Recognition Memory

For the recognition memory analysis, participants' recognition ratings for traits were converted into a sensitivity value (*d'*). This was done using the principles of signal detection theory (Green & Swets, 1966). That is, the recognition ratings were organised into hits, misses, false alarms, and correct rejections. The *d'* value (or d-prime) refers to the difference between hits and false alarms. This value is calculated by subtracting the *z*-score for false alarms from the *z*-score for hits [i.e., $d' = z(H) - z(F)$]. A high *d'* value indicates high sensitivity and good recognition memory.

The main effect of target was significant, $F(3, 231) = 2.70$, $p = .047$, $\eta_p^2 = .03$. Further Sidak post hoc comparisons revealed that there were no significant differences among the targets. The main effect of verticality was not significant $F(1, 231) = 0.21$, $p = .651$, $\eta_p^2 = .001$. The predicted target × verticality interaction was not significant, $F(3, 232) = 0.77$, $p = .512$, $\eta_p^2 = .01$. Descriptive statistics are shown in Table 7. There was also no significant difference in recognition memory for target traits presented in metaphor-congruent locations ($M = 2.22$, $SD = 0.64$) compared to target traits presented in metaphor-incongruent locations ($M = 2.13$, $SD = 0.69$), $t(237) = 1.07$, $p = .287$, $d = .14$.

Table 7

Memory Recognition for Traits by Target and Verticality

Target	Verticality		
	Up	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Competent	2.25 (0.51)	2.33 (0.58)	2.29 (0.54)
Warm	2.23 (0.73)	2.04 (0.80)	2.14 (0.76)
Incompetent	1.93 (0.72)	2.07 (0.74)	2.00 (0.73)
Cold	2.22 (0.58)	2.34 (0.53)	2.28 (0.55)
Overall	2.16 (0.65)	2.20 (0.68)	

Discussion

The hypotheses were not supported by the results. That is, positive and negative traits were not better remembered when they appeared in metaphor-congruent spatial locations. Positive targets were not rated more positively when the traits appeared at the top of the projection compared to when they appeared at the bottom. Similarly, negative targets were not rated more negatively when the traits appeared at the bottom of the projection compared to when they appeared at the top.

However, one characteristic of the current experiment notably differs from previous research on the GOOD IS UP conceptual metaphor. That is, the current experiment had a between-subjects design, such that each participant was only exposed to one opposite of the perceptual dimension (i.e., up or down) and one opposite of the conceptual dimension (i.e., positive or negative traits). A survey of previous research on the GOOD IS UP conceptual metaphor (see Table 8) reveals that no studies used a between-subjects design in which participants were exposed to one opposite only of either the conceptual or the perceptual dimension. When between-subjects designs have been used, the participants were exposed to *both* opposites of at least one dimension.

Table 8

Experimental Designs and Manipulations

Report	Design	Manipulation
Meier & Robinson (2004); Crawford et al. (2006); Meier et al. (Experiment 2, 2007)	Within-subjects	Both opposites of the perceptual and conceptual dimensions
Meier & Robinson (Experiment 1, 2006); Meier et al. (Experiment 4, 2007)	Within-subjects or between-subjects	One opposite of the conceptual dimension and both opposites of the perceptual dimension
Meier & Robinson (Experiment 2, 2006)	Within-subjects	Both opposites of both the perceptual and conceptual dimensions[10]
Meier et al. (Experiment 4, 2011)	Between-subjects	Both opposites of the conceptual dimension; the dependent variable was both opposites of the perceptual dimension
Palma et al. (2011)	Mixed-designs	Within-subjects factor was both opposites of the perceptual dimension; between-subjects factor was both opposites of the conceptual dimension

The relevance of experimental design in the investigation of conceptual metaphor was

[10] The inclusion of the opposites for the conceptual dimension did not relate to the hypotheses of the experiment.

explored by Lakens, Semin, and Foroni (2011). Research suggests that there is an automatic association between brightness and valence (Meier, Robinson, & Clore, 2004; Sherman & Clore, 2009). That is, bright objects are automatically associated with positivity and dark objects are automatically associated with negativity (Meier et al., 2004). In contrast, colour research suggests that white is affectively neutral (e.g., Burkitt, Barrett, & Davis, 2003; Götz & Götz, 1974). Due to this discrepancy, Lakens et al. (2011) examined the association between brightness (white and black) and valence (positive and negative) across several experiments that varied in design (i.e., within-subjects vs. between-subjects). The results across the six experiments indicated that black ideographs were consistently perceived to be representative of negative words, whereas white ideographs were only perceived to be representative of positive words when the negativity of black was also activated. That is, there was only an observed association between white and positivity in the initial experiment that had a within-subjects design. The same association between white and positivity was not observed across the experiments that had a between-subjects design. According to Lakens et al. (2011), these findings can be explained by what they refer to as a shared relational structures view. This view emphasises that the mapping or association between the white-black and positive-negative opposites is due to their shared relational structures. For instance, the valence of brightness is context specific, such that white is only associated with positivity when co-activated with the association between black and negativity. The presence of both opposites of both dimensions increases the salience of the brightness-valence association. That is, the presence of both white and black increases the salience of the positive and negative associations. Therefore, when white is evaluated independently it is affectively neutral; however, when white is evaluated in opposition to black, it is more strongly associated with positivity.

The finding that the activation of both opposites of the perceptual and conceptual dimensions increases the saliency of the association is relevant for the current experiment. As noted above, previous research that supports the GOOD IS UP conceptual metaphor does not include an experiment with a between-subjects design, such that participants are only exposed to one opposite of each perceptual and conceptual dimension. The current experiment contributes such a study to the literature on the GOOD IS UP conceptual metaphor. The negative results of the current experiment could possibly be due to a decrease in saliency as a result of the absence of stimuli in the opposite perceptual dimension.

The automatic association between valence and verticality may still exist when participants are randomly allocated to a between-subjects condition and expected to evaluate a target person whose positive traits only appear in upper space (for example); however, it may be that the size of the effect is smaller than if positive traits appeared in both upper and lower space. In contrast, when both opposites for both perceptual and conceptual dimensions are present, saliency of the association may be stronger and consequently may lead to an observable difference between conditions. The results of the experiments in the GOOD IS UP conceptual metaphor literature perhaps confirm this notion of increased saliency of the association when both opposites of both dimensions are co-activated (i.e., in a within-subjects design).

The proposed increase in saliency of the association may be conditional on the up-down opposition, such that participants must look both up *and* down in a given experiment. This explanation consequently leads to the possibility that the automatic association between good–up and bad–down may be activated by bodily movement rather than a fixed bodily state. This notion highlights another difference between the current experiment and those in the past literature. That is, in previous studies participants were always exposed to stimuli that were presented in both vertical locations. However, in the current experiment, participants were exposed to stimuli that appeared in only one vertical location. Consequently, they remained in a fixed bodily state of looking up or looking down (although a fixation cross appeared before each trait, participants most likely continued to look up or down after the presentation of the first few traits). This question as to whether the GOOD IS UP conceptual metaphor is activated only by bodily movement, or whether it can also be activated during fixed bodily states, is worth further investigation.

The selection of stimuli for future research can also be informed by the current experiment. The traits, and the combination of the traits, were suitably positive or negative. That is, the ratings for the traits and the targets were not at ceiling or floor, which was evident in the Pilot Study 2 results: $M_{competent}$ = 7.42, *SD* = 1.18; M_{warm} = 7.64, *SD* = 1.31; $M_{incompetent}$ = 2.81, *SD* = 1.26; M_{cold} = 3.15, *SD* = 1.24. However, because the stimuli in the current experiment were identical to those used in Experiment 2A, since the aim was to use the same stimuli but investigate reaction time separately from memory and target evaluation, there was no control for word frequency. Research suggests that high frequency words are better recalled than low frequency words (Hall, 1954), whereas low frequency words are recognised better than high frequency words (Gorman, 1961; Shepard, 1967). However, when the list of words is a mix of high and low frequency words, the word frequency effect disappears such that low frequency words are recalled as well as and even slightly better than high frequency words (e.g., Gregg, 1976). Enhanced recognition memory for low frequency words is more consistent regardless of whether the list is a pure list (i.e., contains either high *or* low frequency words) or a mixed list (i.e., contains both high *and* low frequency words; Balota & Neely, 1980).

Nevertheless, the current experiment has important methodological implications for future empirical investigations of the GOOD IS UP conceptual metaphor. The results of the current experiment in comparison with previous research on the GOOD IS UP conceptual metaphor suggest that perhaps the saliency of the association between valence and verticality is influenced by the co-activation of the opposite perceptual dimension. The current experiment also highlights the relevant question as to whether this conceptual metaphor is activated by bodily movement, fixed bodily states, or both.

Given the negative results and despite various adjustments from Experiment 1 to Experiments 2A and 2B, the question arose as to the robustness of the original Meier and Robinson (2004) finding. It was decided, therefore, to revisit the original finding and conduct a close replication.

Chapter Four: Experiment 3

Experiment 3

Overview

The aim of the current experiment was to conduct a close replication of Meier and Robinson's (2004) Experiment 1. The term *close replication* refers to a replication that adheres as closely as possible to the method of the original study (Brandt et al., 2014). This experiment was the final step in the current project due primarily to the negative results of Experiments 1-2B. That is, the aim was to take a step back and attempt to replicate the original effect due to the failure of Experiments 1-2B to find a positive result for the GOOD IS UP conceptual metaphor. In hindsight, a close replication of Meier and Robinson (2004) could have served as a useful Experiment 1. However, the current climate in psychology that is now beginning to encourage replication was not as prominent at the beginning of this thesis project. Nevertheless, a close replication of Meier and Robinson (2004) could examine the tenets of the shared relational structures view by examining bodily movement (i.e., eye movement) rather than a fixed bodily state. Therefore, such a close replication would not only be relevant within the present series of experiments, but would be an important addition to the CMT literature insofar as it examines the processes underlying the GOOD IS UP conceptual metaphor, it tests the robustness of an original effect, and contributes to an overall estimate of an original effect size.

Meier and Robinson (2004) were the first to examine and explicitly hypothesise about the GOOD IS UP conceptual metaphor. According to Google Scholar, the Meier and Robinson (2004) article has been cited 374 times. In their first experiment, Meier and Robinson found that the categorisation of positive words was facilitated when they appeared at the top of the computer screen (vs. the bottom of the computer screen), whereas the categorisation of negative words was facilitated when they appeared at the bottom of the computer screen (vs.

the top of the computer screen). The notion of an automatic association between valence and verticality was supported by these results. The current experiment aimed to replicate this effect.

For the current experiment, I requested and obtained the original instructions from the lead author of the 2004 publication (B. P. Meier, personal communication, July 30, 2014). Additional details such as stimuli presentation and screen resolution were also graciously provided. The procedure in the original publication provided the remaining details that were required to conduct a close replication. Consequently, the current experiment followed the method (i.e., procedure, participant recruitment, instructions, stimuli, dependent measures) and analyses of Meier and Robinson (2004) as closely as possible.

It was predicted that positive words would be categorised faster when they appeared at the top of the computer screen (vs. the bottom of the computer screen), whereas it was predicted that negative words would be categorised faster when they appeared at the bottom of the computer screen (vs. the top of the computer screen).

Method

Participants

Fifty-seven (46 female, 11 male) psychology students at the University of Western Sydney participated in exchange for course credit. The average age of participants was 21.11 years (*SD* = 5.43, range = 17-47 years). A majority of participants identified as Caucasian (30%). Additionally, 28% were Middle Eastern, 21% were East and Southeast Asian, 7% were South Asian, 5% were from the Pacific Islands, 5% were Latin, 2% were African, and 2% identified as Other. English was the first language of 67% of participants. The average self-rated English language proficiency of the remaining 33% of participants was 4.00 (*SD* = 0.58; range = 1-5; 1 = *poor*, 5 = *superior*). The average time they had been speaking English was 13.79 years (*SD* = 5.05). Participants were recruited through the university's research participation system (SONA). There were no exclusion criteria for this experiment.

Design

The experiment had a 2 (valence: positive vs. negative) × 2 (verticality: top vs. bottom) within-subjects design. Meier and Robinson's original study had a sample size of 34 and found a large effect size ($\eta_p^2 = .16$). A power analysis using G*Power 3.1 software (Faul et al., 2009) revealed that a sample size of 54 participants would be required in order to detect a medium effect size with an alpha set at .05 and power set at .95. Because initial estimates of effect sizes for new findings are typically biased large (Kepes, Banks, McDaniel, & Whetzel, 2012), I elected to assume a medium effect size for the power analysis. Power was set at .95 in order to adhere to recent guidelines for sufficient statistical power (Open Science Collaboration, 2012).

Materials

The stimuli were presented using a standard desktop computer. Screen resolution was set at 1920 × 1080. Stimuli were presented using E-Prime software (Schneider et al., 2002). Questionnaires were presented using Qualtrics software (Qualtrics, 2013) on a University-issued MacBook Pro. A drafting chair was used for the purpose of raising or lowering the chair in order to align participants' eye level with the centre of the computer screen.

Stimuli. The stimuli consisted of 100 words: 50 had a positive meaning and 50 had a negative meaning (see Appendix P). As in the original study, each word was displayed individually (in 18-point white Arial font on a black background). The vertical spatial location of the words was counterbalanced. For example, ½ of participants viewed 25 of the 50 positive words at the top of the screen, whereas ½ of the participants viewed the same 25 positive words at the bottom of the screen. The order of the words was randomised. Responses during the practice phase and the experimental phase were made using a keyboard. The keys 'z' and 'm' were used to indicate positive or negative. These keys were counterbalanced, such that the positive key was ‘z’ for half of the participants and ‘m’ for the other half of participants.

Dependent variables. Reaction time was recorded directly via the E-Prime software (Schneider et al., 2002) and was measured as the time between the presentation of the word until the onset of a key response.

Procedure

The procedure was largely the same as in Experiment 2A, with the following differences. Participants were positioned in front of a standard desktop computer with the keyboard on the table. Participants read the instructions, which included information about the aim of the experiment and the task. The order of presentation was identical to the original 2004 study, and was as follows.

> Prior to the presentation of each word, a fixation cue (+++) was presented at the center of the screen for 300 ms. Following this central cue, a subsequent fixation cue (+++) was flashed for 300 ms 1.5 in. either above or below (determined at random) the central cue. Then, so that participants would fixate near the location where the word would appear, a third fixation cue (+++) was flashed for 300 ms 3 in. either above or below the central cue (in the same vertical direction as the second cue). The word then appeared 4 in. above or below the central cue (in the same vertical direction as the third cue). The spatial cues were not intended to prime locations, although they may have done so. Rather, the spatial cues were intended to direct attention to the spot of the word’s appearance (thereby reducing random spatial exploration and its addition of error variance). Words appeared in white, centered horizontally on the screen. Participants were instructed to evaluate each word as quickly and as accurately as possible. (Meier & Robinson, 2004, p. 244)

Following Meier and Robinson’s (2004) procedure, “[i]f the response was inaccurate, the word ‘‘INCORRECT’’ appeared in a red font for 1.5 s. Accurate trials were separated by a blank screen for 500 ms.” (p. 244).

Participants first completed a practice phase to familiarise themselves with the task. The practice phase included 12 words (6 positive and 6 negative; see Appendix P) that did not appear in the experimental phase. After the practice phase, participants then completed the experimental phase, which consisted of 100 trials. Participants then provided demographic information including age, gender, and ethnicity. Next, participants completed the same suspicion probe as in the previous experiments. After completing the demographics and the suspicion probe, participants were debriefed. The experimenter verbally checked for suspicion and gave participants a debriefing form to read and take with them. Participants were then thanked for their participation and awarded their experimental credit.

Results

None of the participants reported any suspicions about the experiment. Data screening was undertaken to ensure the accuracy of the data and to check assumptions of analysis of variance (ANOVA). Trials with inaccurate responses were excluded from the analysis (8.00% of trials). In order to normalise the distribution of the reaction time data, these values were subjected to a log transformation (Ratcliff, 1993). Next, trials that were 2.5 *SD*s above or below the grand latency mean (2.00% of latencies) were replaced with the 2.5 *SD* value (e.g., Miller, 1991). All other available cases were retained for analysis. Assumptions of normality were satisfactory. A two-way valence (positive, negative) × verticality (up, down) repeated measures ANOVA with alpha at .05 was conducted to examine potential differences in reaction time.

The analysis for reaction time revealed that the main effect of valence was significant, $F(1, 56) = 44.39$, $p < .001$, $\eta_p^2 = .44$. Sidak post hoc comparisons revealed that reaction times were faster for positive words than for negative words ($M_{\text{Diff}} = -51.23$, Sidak 95%, CI: -66.64-

35.83). The main effect of verticality was significant, $F(1, 56) = 7.68$, $p = .008$, $\eta_p^2 = .12$. Sidak post hoc comparisons revealed that reaction times were faster for words presented at the top of the screen than for words presented at the bottom of the screen ($M_{Diff} = -19.32$, Sidak 95%, CI: -33.28-5.35). The predicted valence × verticality interaction was not significant, $F(1, 56) = 0.69$, $p = .410$, $\eta_p^2 = .01$, 95% CI [0.00-0.12]. Descriptive statistics are shown in Table 9. There was also no significant difference in reaction times for words presented in metaphor-congruent locations ($M = 806.57$, $SD = 188.32$) compared to words presented in metaphor-incongruent locations ($M = 801.49$, $SD = 175.67$), $t(56) = 0.83$, $p = .410$, $d = .03$.

Table 9

Reaction Time (ms) for Words by Valence and Verticality

Valence	Verticality		
	Up	Down	Overall
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Positive Words	771.30 (180.52)	785.53 (168.46)	778.41_a (174.49)
Negative Words	817.45 (189.36)	841.85 (204.86)	829.65_b (197.11)
Overall	794.37_c (184.94)	813.69_d (186.66)	

Note. Means with different subscripts within a given row or column are significantly different from one another ($p < .05$).

Discussion

The hypotheses were not supported by the results. That is, positive words were not categorised faster when they appeared at the top of the computer screen compared to when they appeared at the bottom of the computer screen. Similarly, negative words were not categorised faster when they appeared at the bottom of the computer screen compared to when they appeared at the top of the computer screen. The results of this experiment consequently did not replicate the findings of Meier and Robinson (2004).

The identification of the reasons as to why a close replication failed to find a ‘positive’ effect can be a difficult process. The current close replication failed to replicate Meier and Robinson (2004) despite having desirably high power (.95) and as close as possible adherence to the original method and analyses. However, there are several common explanations for a failed replication (Open Science Collaboration, 2012). A first putative explanation is that the original effect is false. That is, perhaps Meier and Robinson’s (2004) original effect was due to a Type 1 error. Of course, the opposite could also be true, such that the current experiment’s results may have been due to a Type 2 error. Importantly, however, one ‘negative’ effect does not provide conclusive evidence that an effect *does not* exist, just as one ‘positive’ effect does not provide conclusive evidence that an effect *does* exist. Hence, there is no reason to question the legitimacy of the original study’s results purely on the basis of this failed replication attempt.

Another possible explanation is that the actual effect size may be smaller than first reported, which would make it more difficult to detect. The effect size of Meier and Robinson’s (2004) original study was large ($\eta_p^2 = .16$), whereas the effect size for the current experiment was small ($\eta_p^2 = .01$, 95% CI [0.00-0.12]). The results of this experiment perhaps suggest that the effect size is smaller than originally reported, which would not be surprising due to the tendency for initial effect size estimates for new findings to be overestimated (Kepes et al., 2012). Additional close replications would be required to obtain a more precise estimate of the effect size.

A third possible explanation is that the method of replication may not be identical. In the current study, the only difference (apart from the inevitable difference in samples) was that a keyboard was used for participants' responses instead of a response box as was used in the original study. A response box was not available for the replication. Keyboards are widely used for reaction time measurements; however, they can produce large variations and timing errors (Li, Liang, Kleiner, & Lu, 2010). The variability produced by a keyboard may subsequently make a small difference in reaction time undetectable. This type of discrepancy between Meier and Robinson's (2004) original study and the current experiment would have to be further investigated to determine whether a method that includes a keyboard rather than a response box would systematically influence the results.

Finally, the method or analysis of the original study or the replication study may be flawed. The only potential problem with the method of Meier and Robinson's (2004) original study is that word frequency was not controlled. As already discussed for Experiments 2A-2B, words that occur more frequently in everyday language are processed faster (Balota et al., 2007; Howes & Solomon, 1951; Unkelbach et al., 2010). The words that were used in both the original study and Experiment 3 did vary in frequency (see Appendix Q; frequency range: 114-187656, higher scores indicate greater frequency; Balota et al., 2007). Differences in word frequency may have led to additional variability across stimuli in both the original study and the current experiment. With respect to statistical analysis, both studies used the same type of analysis (repeated measures ANOVA) on log-transformed reaction time data after excluding inaccurate trials and replacing trials that were 2.5 *SD*s above or below the grand latency mean with the 2.5 *SD* value. However, although it is assumed that the analyses conducted for each experiment were performed accurately, there is always the possibility of errors in the analyses for either study.

The current experiment contributes to the GOOD IS UP conceptual metaphor literature in numerous ways despite failing to replicate Meier and Robinson's (2004) original study. For instance, this experiment examined the robustness of the original effect outside the original laboratory. Additionally, a more accurate identification of the specific conditions (e.g., keyboard vs. response box) required to observe the original effect can be obtained by comparing the method of this replication and further replications with the method of the original study. Finally, a more precise estimate of the effect size can be obtained by comparing the original study to this replication and all subsequent close replications. It will be beneficial to the literature if this replication is compared, contrasted, and combined with additional close replications in order to generate a conclusion regarding the robustness and the size of the effect originally found by Meier and Robinson (2004).

Chapter Five: General Discussion

The overall aim of this project was to examine the influence of the GOOD IS UP conceptual metaphor on impression formation. To accomplish this aim, a series of four experiments were conducted investigating the influence of vertical location (i.e., up, centre, down) of stimuli (i.e., positive and negative behavioural descriptions, traits, and words) on reaction time, memory, and target evaluations. Across the four experiments, I hypothesised that metaphor-congruent material (positive-up, negative-down) would be more quickly processed, better recalled and recognised, and evaluated more positively or negatively, than metaphor-incongruent material (positive-down, negative-up). These hypotheses were not supported (i.e., all *p*s > .05; these are termed negative results). Nevertheless, despite the negative and inconclusive results, the four experiments considered together provide important information regarding the investigation of conceptual metaphor in general and of the GOOD IS UP conceptual metaphor in particular. The following discussion will include a review and interpretation of the findings of the current project, an outline of two important research methods issues (i.e., bias and replication) that helps situate the present findings, and a breakdown of the implications of this thesis for CMT.

The Current Project

Summary of results. The aim of Experiment 1 was to examine the influence of vertical location (i.e., up, centre, down) of positive and negative behavioural information on reaction time, memory, and target evaluations. The hypotheses were not supported by the results. However, the experiment contained a number of methodological limitations which are likely to have led to the negative results. That is, it was too ambitious to measure reaction time, memory, and target evaluations in the same experiment. After considering the memory load and the different instructions required for measuring reaction time versus assessing memory and target evaluations, I decided to separate the dependent measures that were used in Experiment 1 into two independent experiments. The findings also led to the conclusion that when measuring reaction time it would perhaps be less problematic to use traits (i.e., single words) rather than behavioural descriptions (i.e., sentences) in order to limit variability caused by sentence length. Consequently, Experiment 1 provided valuable information that was used to simplify the design by (1) separating the measurement of the dependent variables into two experiments and (2) using less rich stimuli.

The aim of Experiment 2A was to examine reaction time separately from memory and target evaluations. That is, the aim was to examine the influence of the vertical location of positive and negative traits on reaction time. Again, despite the unsupported hypotheses, the results were informative. For instance, variance in the data could have been due to the confounding variables of word length and word frequency. Therefore, researchers should strive to ensure consistency in both word length and word frequency if close or conceptual replications of Meier and Robinson's (2004) original study on the GOOD IS UP conceptual metaphor are conducted in the future. In addition, variance in the data could have been increased due to the inclusion of target names with the traits, which could have distracted participants and slowed their reaction times.

The fixation cue used in Experiment 1 and Experiment 2A to focus attention to the centre of the projection prior to the presentation of each sentence may have been insufficient. Meier and Robinson (2004) included in their original experiment three consecutive fixation cues before the presentation of each word. That is, prior to the presentation of a word that appeared at the top of the screen, a fixation cue appeared in the centre of the screen, followed by a fixation cue 1.5 inches above the central cue, and then finally a fixation cue 3 inches above the central cue. The aim of using three spatial cues was to direct attention to the vertical location of each word, thereby reducing random spatial exploration. In contrast, however, Experiment 1 and Experiment 2A employed only one fixation cue, which appeared in the centre of the projection. This fixation cue would not have controlled random spatial exploration. Consequently, reaction time may have been slowed in both experiments due to error variance caused by random spatial exploration.

The aim of Experiment 2B was to examine the influence of the vertical location of positive and negative traits on memory and target evaluations. The results did not support the hypotheses. However, the negative findings notably highlight that the design (within-subjects vs. between-subjects) of a GOOD IS UP conceptual metaphor experiment could possibly influence the saliency of the association between valence and verticality. Experiment 2B adds to the psychological literature by hypothesising about the influence of the GOOD IS UP conceptual metaphor when participants are only exposed to one opposite of the perceptual dimension (e.g., up *or* down) and one opposite of the conceptual dimension (e.g., good *or* bad); that is, when the design used is a between-subjects design. The results of Experiment 2B provide indirect support for the tenets of the shared relational structures view (Lakens et al., 2011). That is, it may be that the association between *good* and *up* and *bad* and *down* can only be observed when both opposites for the perceptual and conceptual dimensions of the association are co-activated, as in the design of a within-subjects study. Alternatively, the presentation of only one opposite of the perceptual dimension and one opposite of the conceptual dimension perhaps produces a weaker association and consequently a smaller effect size.

The notion that the co-activation of both opposites could lead to a stronger association between valence and verticality highlights another notable difference between the current experiment and previous research. That is, participants in Experiment 2B only had to physically look up *or* down during exposure to the traits, whereas in previous research participants were required to look up *and* down to view the stimuli (e.g., Meier & Robinson, 2004; Palma et al., 2011). Consequently, in Experiment 2B, participants were engaged in a fixed bodily state, whereas in previous research, participants were engaged in bodily movement (i.e., eye movement) from trial to trial. These findings perhaps suggest that the nature of the physical experience could influence the strength of the association. Thus, a relevant question for future research is whether a fixed bodily state is enough to activate the GOOD IS UP conceptual metaphor or whether bodily movement is fundamental to the association. Bodily movement was examined in the final experiment.

The last step in this project was to conduct a close replication (Experiment 3) of Meier and Robinson (2004) due to the negative results obtained in Experiments 1-2B. That is, it was important to attempt to rule out alternative explanations for the negative results by examining whether the original effect would replicate. A close replication of Meier and Robinson (2004) could also examine the tenets of the shared relational structures view by examining bodily movement rather than a fixed bodily state. In hindsight, it would have been useful to begin this project with a close replication of Meier and Robinson (2004), and then proceed to extend that work in subsequent experiments. However, it was not until the later stages of this project that the importance of replication (re)surfaced in psychological science. Experiment 3 followed the method of the original study as closely as possible; however, the results did not support the hypotheses that positive and negative words would be categorised faster when they appeared in metaphor-congruent spatial locations. Nevertheless, a comparison between the original study and Experiment 3 yielded useful information about the empirical investigation of the GOOD IS UP conceptual metaphor. For instance, the true effect size may be smaller than first reported (Kepes et al., 2012). If so, the current experiment may have lacked power to detect that smaller effect size. Therefore, perhaps sample size calculations for future research could include a smaller effect size value, rather than a conservative (i.e., medium) effect size as was used to calculate the sample size for the current experiment. Additionally, word frequency was not controlled in either the original study or in Experiment 3, which used the same stimuli. The variability in word frequency may have produced variability in the data by reducing the association between the variables of interest, namely valence and verticality, such that the results may instead reflect an association between word frequency and verticality. A systematic comparison of the method of both experiments revealed that the only differences that could plausibly have accounted for the discrepant results were that Experiment 3 had a different sample and that a keyboard was used rather than a response box to capture participants' responses. Evidently, Experiment 3 is informative because it allowed for a comparison between the original study and a close replication, which identified both word frequency and measurement device as possible factors that could account for the negative results. These factors should be controlled in future experiments. Ideally, the results of Experiment 3 should be combined with further close replications in order to examine the robustness of the effect and to obtain a more precise estimate of the effect.

Until recently, the present findings may have been dismissed and considered unimportant due to the negative results. However, substantial changes are now taking place in psychological science such that there has been a renewed emphasis on the importance of negative results and replication studies. Therefore, it is worthwhile to reconsider the present findings in the context of both bias (publication bias and reporting bias) and replication.

Bias

It is well known that there is a bias in the scientific literature for positive results (Csada, James, & Espie, 1996; Statzner & Resh, 2010). That is, there is a bias toward reporting results that reach statistical significance (i.e., $p < .05$; these are termed positive results). Journals typically publish novel findings and positive results because innovative research is regarded as an important key to advancing science. The current bias for positive results was investigated by Fanelli (2010) who examined 2434 papers published between

2000-2007 across a range of disciplines and found that positive results are more prevalent in psychology and psychiatry (91.5%) than in a hard science such as space science (70.2%). In a further study across 19 disciplines, Fanelli (2012) found that the frequency of papers reporting a positive result increased by 22% between 1990 and 2007. Novel and positive results are unquestionably important in the pursuit of truth and the accumulation of knowledge. However, the reluctance to publish negative results has led to numerous problems across many scientific disciplines including psychology. These problems include the file-drawer problem, the threat to the notion of science as requiring both falsifiability and openness to self-correction, and more specific problems such as effect size overestimation.

The most notable problem resulting from the publication bias against negative results is the file-drawer problem, a phenomenon in which studies that obtain negative results are recognised by researchers as unpublishable and consequently relegated to the bottom of the "file drawer". Thirty-six years ago, Rosenthal (1979) noted that the extreme view of this problem is "that the journals are filled with the 5% of the studies that show Type I errors, while the file drawers back at the lab are filled with the 95% of the studies that show nonsignificant (e.g., $p > .05$) results" (p. 638). Evidently, the file drawer problem is not a recent phenomenon. In fact, the discussion of publication bias extends back at least 56 years (McNemar, 1960; Smart, 1964; Tullock, 1959). One notable study found that 97% of papers published in psychology in the mid-20th century included positive results (Sterling, 1959), which is higher than the percentage subsequently reported by Fanelli (2010). A consequence of this enduring trend of journals dismissing negative results is that researchers are less likely to even report negative results for fear that the entire paper will be rejected (Greenwald, 1975).

It is perhaps unsurprising that researchers are less likely to report negative results due to an awareness that such results are unlikely to be published. Typically, research practices ultimately aim for positive results that confirm and support *a priori* hypotheses. The primary advantage of confirmatory and consistent results is that they are considered to provide a clear presentation of an investigation that can be communicated both to the scientific community and to the general public. Positive results are described as “neat”, “clean” and easy to interpret, whereas negative results are described as being “ugly”, “messy”, and hard to interpret (Giner-Sorolla, 2012). However, the dichotomous categorisation of results into “positive” and “negative” connotes that the two types of results possess either a positive quality or a negative quality. The reluctance of both researchers and journals to acknowledge the importance of negative results can lead to predictions and conclusions that are misguided. The problematic issue of positively-biased literature has implications for the idea that falsifiability is an important criterion for the scientific status of a theory.

Generally, psychology, like other scientific disciplines, follows a hypothetico-deductive model (Popper, 1934; 1959). This model of science involves the generation of a hypothesis that can then be either supported or not supported by evidence that is collected via empirical research. The notion of the falsifiability of a theory is fundamental to science. According to Popper (1963), “the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability” (p. 37). One of the most important and crucial elements of falsification is negative results. The absence of negative results in the literature and their perceived unimportance reflects a misunderstanding of a fundamental aim of science which is to attempt falsifications. Instead, the literature reflects an overall aim to produce a “good story” rather than a “true story” (King, 2012). Investigators are consequently only aware of studies that support hypotheses and unaware of studies that do not support hypotheses. The question then arises as to how theories and hypotheses can be falsified and refuted if there is a bias toward publishing only positive results.

Another problem associated with publication bias is the loss of the notion that science is self-correcting (Merton, 1973). Self-correction is the idea that if a claim about a phenomenon is wrong, sooner or later it will be shown to be wrong by empirical evidence, and consequently an understanding of that phenomenon will be changed for the better. However, this does not mean that all science at this moment in time is correct or that there has been, is, or will be a trend that improves scientific credibility (Ioannidis, 2012). In fact, the notion that scientific practices do adhere to the principles of self-correction may be a myth due to the recognition that once a finding is published it is unlikely to be challenged in the literature by contradictory findings – that is, negative results (Nosek, Spies, & Motyl, 2012). In other words, publication bias ultimately impedes not only falsification, but also self-correction. In order for falsification and self-correction processes to occur in psychological science, a shift toward greater recognition of negative results is essential.

There are also more specific problems with dismissing and/or neglecting negative results. These problems include: effect size overestimation in general, the inflation of effect size estimates in meta-analyses, the inability to identify possible false positives, the inability to identify boundary conditions, the exaggeration of the importance of effects, and the waste of time and resources that occurs after an attempt to replicate effects that have previously already failed to replicate (for further details see Ioannidis, 2005; Song et al., 2010). For instance, the results of meta-analytic reviews may overstimate mean effect sizes due to the possibility that they do not include negative results and/or do not correct for publication bias (Field, 2003). In sum, the problems that are associated with publication bias and an overall reluctance to report negative results affect many different aspects of research practices.

Replication

The avoidance of negative results in research practices is comparable to the avoidance of replication studies. Replication studies, like negative results, are fundamental to scientific progress (Nosek & Lakens, 2014; Schmidt, 2009). Generally, replications aim to confirm or disconfirm findings by examining whether results can be reproduced by another researcher in another lab (Schmidt, 2009). The common goals of replication include: an investigation of the underlying processes of a theory, the refinement of a theory, a contribution to a more precise estimate of the effect size, a test of the robustness and reliability of the effect, and the identification and subsequent removal of artifacts and false positives (Brandt et al., 2014; Schmidt, 2009). Replication is typically viewed by researchers as an integral process of verification that is required to determine the validity of empirical results (Francis, 2012). Some researchers even consider replication to be the gold standard of science (Jasny, Chin, Chong, & Vignieri, 2011). Replication is undeniably important for building a cumulative science (for further details see Asendorpf et al., 2013).

However, replications in the published psychological literature are extremely rare (Madden, Easley, & Dunn, 1995; Sterling, Rosenbaum, & Weinkam, 1995). For instance, across 100 of the most cited psychology journals since 1900, only 1.07% of all publications were replications (Makel, Plucker, & Hegarty, 2012). Only 14% of these replications were direct replications (also known as "close" replications) as opposed to 81.9% which were "conceptual" replications (see discussion below for the nature of this distinction). This low percentage of published replications in the psychological literature is perhaps owing to replications being undervalued by journals because they are viewed as lacking prestige, originality, and excitement (Lyndsay & Ehrenberg, 1993; Neuliep & Crandall, 1990, 1993). Consequently, replication studies, like negative results, are unlikely to be submitted by researchers to journals due to the awareness that they are unlikely to be published (Neuliep & Crandall, 1990).

However, attitudes toward replications have recently begun to change as a consequence of the current replicability crisis in psychological science (Pashler &

Wagenmakers, 2012). Whether this crisis is overblown or not (Pashler & Harris, 2012), there is a perceived lack of confidence in psychological science due to recent concerns about questionable research practices and failed replications of high-profile studies (see Doyen, Klein, Pichon, & Cleeremans, 2012; Simmons, Nelson, & Simonsohn, 2011). However, the so-called 'crisis' is not a new phenomenon in psychological science (for an overview, see Sturm & Mülberger, 2012). The crisis that is comparable and most relevant to today's crisis is that which occurred in psychology in the 1970s (Elms, 1975; Greenwald, 1975). During this time, psychology suffered from a crisis of confidence due to concerns about publication bias and the limitations of null-hypothesis significance testing. The solutions promoted in the 1970s (e.g., the establishment of specialised journals that would publish replication studies), however, did not have the desired effect and ultimately failed (e.g., *Representative Research in Social Psychology* and *Replications in Social Psychology*). In contrast, the response to the current 'crisis' in psychology has seen a somewhat warmer embrace of replication studies. For instance, high impact psychology journals such as the *Journal of Personality and Social Psychology* and *Psychological Science* are beginning to express willingness to publish both successful and failed replication studies (e.g., Ranehill et al., 2015). There are also projects such as the Reproducibility Project: Psychology, which was a large-scale collaborative effort with the aim of examining the rate of reproducibility in psychological science (Open Science Collaboration, 2012).

The replications that were conducted in the Reproducibility Project were direct replications. Replications are divided into two categories: direct replications and conceptual replications (Schmidt, 2009). Here, direct replications will be referred to as 'close replications' due to the faulty assumption that an experiment can ever be an identical reproduction of an original study (Blandt et al., 2014; Rosenthal, 1991; Tsang & Kwan, 1999). That is, inevitably, certain elements of an experiment, such as the participants, will always differ across studies. Nevertheless, close replications aim to reproduce studies as closely as possible. In contrast, conceptual replications investigate the same hypotheses of the original studies by adopting different methods (Schmidt, 2009). It is important to distinguish between these two types of replication because their conclusions and implications are not the same.

For instance, a successful close replication will support both the reproducibility of an original finding and also the original hypothesis by using the same operationalised variables. In contrast, a successful conceptual replication validates only the hypothesis of an original study, because the same hypothesis is supported by two experiments with variables that have been operationalised differently. It has been argued that conceptual replications are more effective than close replications because they test both validity and generality (e.g., Stroebe & Strack, 2014). However, a failed conceptual replication is far from being effective due to the uncertain inferences that can be drawn from the results. That is, the negative results could be due to numerous factors such as the operationalised variables not having the hypothesised effect or even the historical context and the physical setting of the experiment (Hendrick, 1991). It is therefore difficult to determine whether the lack of replicability is due to the original experiment or the conceptual replication. Although the results of failed close replications can also be difficult to interpret, stronger conclusions can be drawn about the original experiment and the replication study due to their similarities. Inferences can also be made about the likelihood that the original finding was due to a Type I error.

Close replications would appear to be the first logical step in an investigation of the replicability of an effect. The primary goal of the first step should be to examine whether a reliable and robust effect exists. The second step would then be to investigate the original effect's generalisability and validity by manipulating the method (i.e., conduct a conceptual replication). However, researchers often bypass this first step; the second step is of greater benefit to them as researchers because conceptual replications are more likely to be published. Consequently, conceptual replications interact with publication bias (Pashler & Harris, 2012). That is, successful conceptual replications are perceived as novel and more interesting than close replications and are therefore more likely to be published. Just as publication bias obscures the importance of negative results, so too does it obscure the importance of close replications.

The importance of replication is not limited to the specific goals (e.g., contribution to a more precise estimate of an effect size) that have already been mentioned. In a broader sense, the process of replication is fundamental to any experimental science. For instance, replication is assumed to be the principal mechanism of self-correction and is essential to establishing objective knowledge (Broad & Wade, 1982; Radder, 1996). Processes such as falsification and self-correction will continue to be impeded if the bias against replication studies in the psychological literature is not addressed and corrected. Notably, there are signs in the current climate that psychology is beginning to be more receptive and supportive of negative results and replication studies, which seems to be influencing research practices.

The highlighted importance of both replication and negative results is relevant for interpreting and situating the present experiments. Taken together, the set of experiments has valuable implications for and can make a contribution both to future empirical investigations of the GOOD IS UP conceptual metaphor and to the development of CMT.

Future directions

Overall, the current project highlights several issues that should be investigated further in future research. Notably, the experiments underline the importance of examining both the influence of the tenets of a shared relational structures view (i.e., within-subjects design vs. between-subjects design) and different bodily experiences (i.e., fixed bodily states vs. bodily movement) on the processing of abstract evaluative concepts. Although a solid conclusion was not reached regarding the current project's original hypothesis about the influence of the GOOD IS UP conceptual metaphor on impression formation, the four experiments have led to the identification of several variables that may need to be considered in the design of future empirical investigations of the metaphor (e.g., word frequency, word length, and the design of the experiment). Additionally, the findings can be used to inform and perhaps refine CMT. For instance, the context in which the GOOD IS UP conceptual metaphor influences cognitive processes may have to include the co-activation of both opposites of both dimensions of the association. Additionally, the context may also require specific bodily experiences such as bodily movement (e.g., eye movement, head movement), rather than fixed bodily states in order to observe an effect. The theoretical boundary conditions of CMT will become clearer with further empirical investigation of conceptual metaphor.

Future research also has the potential to identify social processes that might be influenced by the GOOD IS UP conceptual metaphor. For instance, if successful experimental demonstrations of the metaphor's influence on impression formation with unambiguous targets can be achieved (e.g., using the types of behavioural descriptions used in Experiment 1, but in a way that avoids memory overload), then an important next step would be to investigate whether conceptual metaphor influences the interpretation and evaluation of ambiguous target persons. The conceptual dimension of morality (in which 'good' and 'bad' are opposites) could be examined by using morally ambiguous targets. For instance, evaluating a morally-ambiguous description when it is presented in upper space may lead to a positive interpretation, whereas evaluating the same description when it is presented in lower space may lead to a negative interpretation. Such an investigation would further contribute to an understanding of the embodied processes underlying target evaluations.

Further research could then investigate whether the embodied processes of evaluating another individual flow on to influence the self via social comparison processes. Social comparisons occur when people evaluate themselves relative to another person on a given dimension and can happen spontaneously and effortlessly (e.g., Gilbert, Giesler, & Morris, 1995). For instance, participants may rate a relevant target more positively when that target's behavioural descriptions are presented up compared to when they are presented down. Consequently, self-evaluations of participants may shift up or down in parallel with target evaluations, such that self-evaluations will be more positive after reading the behavioural descriptions of the target whilst looking up compared to when looking down to read the same information. Thus, there are numerous avenues for future research investigating the influence of this conceptual metaphor on impression formation and social comparison, which will lead to the identification of the boundary conditions of the GOOD IS UP conceptual metaphor and CMT.

This future research will not only have implications for CMT, but it can also have real world practical applications. For example, if politicians want to be evaluated more positively during an election campaign, perhaps they should have their billboards up high near motorways rather than down low on kerbside A-frame signs. Similarly, if supermarkets want consumers to purchase particular products, perhaps those products should be placed on higher shelves rather than lower shelves. Although eye level ("Eye level is buy level") is important for product placement (Lantos, 2011), perhaps the subtle cues of up and down might play a role via the utilisation of digital media, which has become an important tool in the changing landscape of marketing and public relations. The possibilities for future research on the GOOD IS UP conceptual metaphor that have real-world applications are numerous.

There are also many avenues for future research investigating CMT because conceptual metaphor has such a broad relevance in everyday life due to the countless social phenomena that involve the processing of abstract concepts (see Meier, Schnall, Schwarz, &

Bargh, 2012). A pattern in the literature has emerged whereby an individual metaphor is selected and hypotheses about its influence on certain cognitive processes are tested by using the metaphoric transfer strategy (Landau et al., 2010). Although this metaphor-focused approach is informative and does have implications for CMT, it is perhaps a somewhat limited approach; that is, it may ultimately lead to a collection of novel, albeit isolated findings that consequently do not provide a comprehensive account of the specific conditions, such as situations or contexts, in which cognition is more or less likely to be influenced by conceptual metaphor. This limitation and potential risk of researchers simply jumping from metaphor to metaphor has led to the recommendation that researchers should perhaps complement a metaphor-focused approach with a phenomenon-focused approach (Landau et al., 2010; Meier, Schnall, Schwarz, & Bargh, 2012). This approach involves selecting a phenomenon (e.g., romantic courtship), identifying the metaphors that are related to understanding the phenomenon (e.g., romantic courtship may be viewed as a dance, a game, or a conquest), and examining the influence of the different metaphors on the evaluation and interpretation of the phenomenon (e.g., people who view romantic courtship as a dance may be more sympathetic to potential romantic partners than people who view it as a conquest; Landau, Robinson, & Meier, 2014). Perhaps researchers can use the alternate source strategy, which relates back to the notion that people use more than one source domain (e.g., dance, game, conquest) to understand and think about a given target concept (e.g., romantic courtship; Lakoff & Johnson, 1980; Landau et al., 2010). This strategy can adopt the phenomenon-focused approach by priming different source domains to examine whether they influence the processing of target-relevant information in different ways (Landau et al., 2010).

It is important for research on conceptual metaphor to be theory driven and motivated by intentions to understand the phenomena. Consequently, the key ingredients of an empirical investigation of CMT include the integration of both positive *and* negative results and successful *and* failed (close) replications. A relevant question that is often asked is what determines which effect needs replicating? Aside from the obvious answer that every effect should at some point be replicated, the next answer would certainly be to include important and influential experiments that have had an impact on theory. An empirical investigation of CMT that includes replication of seminal experiments will contribute to the important processes of self-correction and falsification.

CMT is still in its infancy in terms of both robust and reliable empirical findings and a commitment to solid theoretical tenets. A distinctive quality of CMT is that it is not inherently connected to Computational Theory of Mind (representationalist). Seemingly, CMT would perhaps be more valuable if it were to be developed within a Direct realist/RECS framework (non-representationalist), rather than becoming a mechanism within a conservative embodied cognition approach or simply an extension of CTM. If CMT were to be developed within a Direct realist/RECS framework it would avoid the fundamental problems that are faced by representational accounts (including Perceptual Symbol Systems), such as the symbol grounding problem and the homunculus problem. Additionally, the development of CMT within such a framework has the potential to contribute to the establishment of a more comprehensive Direct realist/RECS account of cognition, which, to date, is somewhat limited in its theorising and empirical research on higher order cognition. A Direct realist/RECS approach could then develop a truly embodied account of cognition and consequently provide a new perspective that identifies and explains some of the processes that are fundamental to human behaviour.

References

Allison, D. B., Gorman, B. S., & Primavera, L. H. (1993). Some of the most common questions asked of statistical consultants: Our favourite responses and recommended readings. *Genetic, Social, and General Psychology Monographs*, *119*, 153-185. Retrieved from http://web.a.ebscohost.com.ezproxy.uws.edu.au

Anderson, J. (1962). *Studies in empirical philosophy.* Sydney, Australia: Angus and Robertson.

Anderson, J. (1978). Arguments concerning representations for mental imagery. *Psychological Review, 85,* 249-277. doi:10.1037/0033-295X.85.4.249

Anderson, M. L. (2006). Evolution, embodiment and the nature of the mind. In B. Hardy-Vallee & N. Payette (Eds.), *Beyond the brain: Embodied, situated & distributed cognition* (pp. 15-28). Newcastle, UK: Cambridge Scholars Publishing.

Anderson, N. H. (1965). Adding versus averaging as a stimulus combination rule in impression formation. *Journal of Experimental Psychology*, *70*, 394-400. doi: 10.1037/h0022280

Anderson, N. H. (1971). Integration theory and attitude change. *Psychological Review*, *78*, 171-206. doi: 10.1037/h0030834

Asch, S. E. (1946). Forming impressions of personality. *The Journal of Abnormal and Social Psychology*, *41*, 258-290. doi: 10.1037/h0055756

Asendorpf, J. B., Conner, M., De Fruyt, F., De Houwer, J., Denissen, J. J. A., Fiedler, K., . . . & Wicherts, J. M. (2013). Recommendations for increasing replicability in psychology. *European Journal of Personality*, *27*, 108-119. doi: 10.1002/per.1919

Audacity Team (2013). Audacity(R): Free Audio Editor and Recorder: Version 2.0.3 [Computer software]. Retrieved from http://audacityteam.org

Balota, D. A., & Neely, J. H. (1980). Test-expectancy and word-frequency effects in recall and recognition. *Journal of Experimental Psychology: Human Learning and Memory*, *6*, 576-587. doi: 10.1037/0278-7393.6.5.576

Balota, D. A., Yap, M. J., Cortese, M. J., Hutchison, K. A., Kessler, B., Loftis, B., . . . & Treiman, R. (2007). The English lexicon project. *Behavior Research Methods*, *39*, 445-459. Retrieved from http://elexicon.wustl.edu/userguide.pdf

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22,* 577-609. doi:10.1017/S0140525X99002149

Barsalou, L. W., & Wiemer-Hastings, K. (2005). Situating abstract concepts. In D. Pecher & R. Zwaan (Eds.), *Grounding cognition: The role of perception and action in memory, language, and thought* (pp. 129–63). New York, NY: Cambridge University Press.

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*, 1252-1265. doi: 10.1037/0022-3514.74.5.1252

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York: Guilford Press.

Berinsky, A. J., Huber, G. A., & Lenz, G. S. (2012). Evaluating online labor markets for experimental research: Amazon.com's Mechanical Turk. *Political Analysis*, *20*, 351-368. doi:10.1093/pan/mpr057

Bickhard, M. H. (1996). Troubles with computationalism. In W. O'Donohue & R. Kitcher (Eds.), *The philosophy of psychology* (pp. 173-184). London: Sage.

Boucher, J., & Osgood, C. E. (1969). The Pollyanna Hypothesis. *Journal of Verbal Learning and Behavior*, *8*, 1-8. doi: 10.1016/S0022-5371(69)80002-2

Brandt, M. J., IJzerman, H., Dijksterhuis, A., Farach, F. J., Geller, J., Giner- Sorolla, R., … & Veer, A. V. (2014). The replication recipe: What makes for a convincing replication? *Journal of Experimental Social Psychology*, *50*, 217-224. doi: 10.2139/ssrn.2283856

Brewer, M. B. (1988). A dual process model of impression formation. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition: A dual process model of impression formation* (Vol. 1, pp. 1-36). Hillsdale, NJ: Erlbaum.

Broad, W., & Wade, N. (1982). *Betrayers of the truth*. New York, NY: Simon and Schuster.

Brooks, R. A. (1986). A robust layered control system for a mobile robot. *IEEE Journal of Robotics and Automation, 2,* 14-23. doi: 10.1109/JRA.1986.1087032

Brooks, R. A. (1991a). New approaches to robotics. *Science, 253,* 1227-1232. doi: 10.1126/science.253.5025.1227

Brooks, R. A. (1991b). Intelligence without representation. *Artificial Intelligence, 47,* 139–159. doi:10.1016/0004-3702(91)90053-M

Buhrmester, M. D., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, *6*, 3–5. doi: 10.1177/1745691610393980

Burkitt, E., Barrett, M., & Davis, A. (2003). Children's colour choices for completing drawings of affectively characterised topics. *Journal of Child Psychology and Psychiatry, 44,* 445–455. doi:10.1111/1469-7610.00134

Burnstein, E., & Schul, Y. (1982). The informational basis of social judgments: The operations in forming an impression of another person. *Journal of Experimental Social Psychology*, *18*, 217-234. doi: 10.1016/0022-1031(82)90051-8

Carlston, D. E., & Skowronski, J. J. (1994). Savings in the relearning of trait information as evidence for spontaneous inference generation. *Journal of Personality and Social Psychology*, *66*, 840–856. doi: 10.1037/0022-3514.66.5.840

Carreiras, M., & Garling, T. (1990). Discrimination of cardinal compass directions. *Acta Psychologica*, *73*, 3-11. doi: 10.1016/0001-6918(90)90055-K

Chemero, A. (2009). *Radical embodied cognitive science.* Cambridge, MA: MIT Press.

Chemero, A. (2013). Radical embodied cognitive science. *Review of General Psychology, 17,* 145-150. doi: 10.1037/a0032923

Clark, A. (1997). *Being there: Putting brain, body, and world together again.* Cambridge, MA: The MIT Press.

Clark, A., & Toribio, J. (1994). Doing without representing? *Synthese, 101,* 401–431. doi: 10.1007/BF01063896

Cowan, N. (2000). The magical number 4 in short-term memory: A reconsideration of mental storage capacity. *Behavioral and Brain Sciences*, *24*, 87-185. doi: 10.1177/0963721409359277

Crawford, L. E., Margolies, S. M., Drake, J. T., & Murphy, M. E. (2006). Affect biases memory of location: Evidence for the spatial representation of affect. *Cognition & Emotion, 20,* 1153-1169. doi: 10.1080/02699930500347794

Csada, R. D., James, P. C., & Espie, R. H. M. (1996). The "file drawer problem" of non-significant results: Does it apply to biological research? *Oikos*, *76*, 591-593. doi: 10.2307/3546355

Descartes, R. (1637). *Discourse on the method* [eBook]. Retrieved from https://ebooks.adelaide.edu.au/d/descartes/rene/d44dm/

Dewey, J. (1925/1929). *Experience and nature.* New York, NY: W W Norton & Company.

Doyen, S., Klein, O., Pichon, C-L., & Cleeremans, A. (2012). Behavioral priming: It's all in the mind, but whose mind? *PLoS ONE*, *7*, e29081. doi:10.1371/journal.pone.0029081

Elms, A. C. (1975). The crisis of confidence in social psychology. *American Psychologist*, *30*, 967-976. doi: 10.1037/0003-066X.30.10. 967

Fanelli, D. (2010). ‘‘Positive’’ results increase down the hierarchy of the sciences. *PLoS ONE*, *5*, e10068. doi:10.1371/journal.pone.0010068

Fanelli, D. (2012). Negative results are disappearing from most disciplines and countries. *Scientometrics*, *90*, 891-904. doi: 10.1007/s11192-011-0494-7

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavioral Research Methods*, *41*, 1149-1160. doi: 10.3758/BRM.41.4.1149.

Field, A. P. (2003). Can meta-analysis be trusted? *The Psychologist*, *16*, 642-645. Retrieved from http://sro.sussex.ac.uk/714/1/CAN_META-ANALYSIS_BE_TRUSTED.pdf

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory und research.* Reading, MA: Addison-Wesley.

Fisher, S. (1964). Depressive affect and perception of up-down. *Journal of Psychiatric Research*, *2*, 25-30. doi: 10.1016/0022-3956(64)90026-3

Fiske, S. T., Cuddy, A. J. C., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in Cognitive Sciences*, *11*, 77-83. doi: 10.1016/j.tics.2006.11.005

Fiske, S. T., & Neuberg, S. L. (1990). A continuum of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. *Advances in Experimental Social Psychology*, *23*, 1-74. Retrieved from https://psychology.clas.asu.edu/sites/default/files/fiske__neuberg_1990.pdf

Fiske, S. T., & Pavelchak, M. A. (1986). Category-based versus piecemeal-based affective responses: Developments in schema-triggered affect. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook* of *motivation and cognition: Foundations of social behavior* (pp. 167-203). New York, NY: Guilford Press.

Fodor, J. A. (1975). *The language of thought*. New York, NY: Crowell.

Fodor, J. A. (1985). Fodor's guide to mental representation: The intelligent auntie's vade-mecum. *Mind, 94,* 76-100. Retrieved from http://www.jstor.org/stable/2254700

Fodor, J. A. (2008). *LOT2: The language of thought revisited.* Oxford, UK: Clarendon Press.

Fodor, J. A., & Pylyshyn, Z. (1988). Connectionism and cognitive architecture: A critical analysis. *Cognition*, *28*, 3-71. Retrieved from http://www.lscp.net/persons/dupoux/teaching/AT1_2014/papers/Fodor_Pylyshyn_1988_Connectionism.Cognition.pdf

Francis, G. (2012). Publication bias and the failure of replication in experimental psychology. *Psychonomic Bulletin and Review*, *19*, 975–991. doi: 10.3758/s13423-012-0322-y.

Franklin, S. (1997). Autonomous agents as embodied AI. *Cybernetics and Systems*, *25*, 499-520. doi: 10.1080/019697297126029

Freud, S. (1895/1954). Project for a scientific psychology. In M. Bonaparte, A. Freud, & E. Kris (Eds.), *The origins of psycho-analysis: Letters to Wilhelm Fliess, drafts and notes: 1887-1902* (pp. 347-445). New York, NY: Basic Books.

Gable, S. L., Reis, H. T., & Elliot, A. J. (2000). Behavioral activation and inhibition in everyday life. *Journal of Personality and Social Psychology*, *78*, 1135-1149. doi: 10.1037//0022-3514.78.6.1135

Gibbs, R. W. (2006). *Embodiment and cognitive science*. Cambridge, UK: Cambridge University Press.

Gibbs, R. W. (2011). Evaluating conceptual metaphor theory. *Discourse Processes, 48,* 529-562. doi: 10.1080/0163853X.2011.606103

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston, MA: Houghton Mifflin.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Boston, MA: Houghton Mifflin.

Gilbert, D. T., Giesler, R. B., & Morris, K. A. (1995). When comparisons arise. *Journal of Personality and Social Psychology, 69,* 227-236. doi: 10.1037/0022-3514.69.2.227

Giner-Sorolla, R. (2012). Science or art? How aesthetic standards grease the way through the publication bottleneck but undermine science. *Perspectives on Psychological Science*, *7*, 562-571. doi:10.1177/1745691612457576

Glenberg, A. M., & Kaschak, M. P. (2002). Grounding language in action. *Psychonomic Bulletin & Review, 9,* 558-565. doi: 10.3758/BF03196313

Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.

Gorman, A. M. (1961). Recognition memory for nouns as a function of abstractness and frequency. *Journal of Experimental Psychology*, *61*, 23-29. doi: 10.1037/h0040561

Götz, K. O., & Götz, K. (1974). Color attitudes of art students and university students: I. Imagined colors. *Perceptual and Motor Skills, 38,* 63-70. doi:10.2466/pms.1974.38.1.63

Green D.M., & Swets, J.A. (1966). *Signal detection theory and psychophysics*. New

York, NY: Wiley.

Greenwald, A. G. (1975). Consequences of prejudice against the null hypothesis. *Psychological Bulletin*, *82*, 1-20. doi: 10.1037/h0076157

Gregg, V. (1976). Word frequency, recognition and recall. In J. Brown (Ed.), *Recall and recognition* (pp. 183-216). Oxford, England: John Wiley and Sons.

Griffiths, O., & Mitchell, C. J. (2008). Selective attention in human associative learning and recognition memory. *Journal of Experimental Psychology: General*, *137*, 626-648. doi: 10.1037/a0013685

Hall, J. (1954). Learning as a function of word-frequency. *American Journal of Psychology*, *67*, 138-140. doi: 10.2307/1418080

Hamilton, D. L., Katz, L. B., & Leirer, V. O. (1980). Cognitive representation of personality impressions: Organizational processes in first impression formation. *Journal of Personality and Social Psychology, 39,* 1050-1063. doi:10.1037/h0077711

Hamilton, D. L., & Sherman, S. J. (1996). Perceiving persons and groups. *Psychological Review, 103*, 336-355. doi:10.1037/0033-295X.103.2.336

Harnad, S. (1990). The symbol grounding problem. *Physica D, 42,* 335-346. doi: 10.1016/0167-2789(90)90087-6

Haugeland, J. (1978). The nature and plausibility of cognitivism. *Behavioral and Brain Sciences, 1,* 215-226. doi: 10.1017/S0140525X00074148

Hebb, D. O. (1949). *The organization of behavior*. New York, NY: Wiley.

Heidegger, M. (1962). *Being and time.* London, UK: SCM Press.

Heil, J. (1981). Does cognitive psychology rest on a mistake? *Mind, 90,* 321-342. Retrieved from http://www.jstor.org/stable/2253090

Hendrick, C. (1991). Replications, strict replications, and conceptual replications: Are they important? In J. W. Neuliep (Ed.), *Replication research in the social sciences* (pp. 41-49). Newbury Park, CA: Sage.

Hobbes, T. (1651). *Leviathan*. Memphis, TN: General Books.

Howes, D. H., & Solomon, R. L. (1951). Visual duration threshold as a function of word-probability. *Journal of Experimental Psychology*, *41*, 401-410. doi: 10.1037/h0047217

Hutto, D., & Myin, E. (2013). *Radicalizing enactivism: Basic minds without content*. Cambridge, MA: MIT Press.

Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLoS Medicine, 2*, e124. doi: 10.1371/journal.pmed.0020124

Ioannidis, J. P. A. (2012). Why science is not necessarily self-correcting. *Perspectives on Psychological Science*, *7*, 645-654. doi: 10.1177/1745691612464056

Jacobson, D. (1999), Impression Formation in Cyberspace: Online Expectations and Offline Experiences in Text-based Virtual Communities. *Journal of Computer-Mediated Communication*, *5,* 0. doi: 10.1111/j.1083-6101.1999.tb00333.x

James, W. (1890/1983). *The principles of psychology*. Cambridge, MA: Harvard University Press.

Jasny, B. R., Chin, G., Chong, L., & Vignieri, S. (2011). Again, and again, and again... *Science*, *334*, 1225. doi:10.1126/science.334.6060.1225

Johnson, M. (1987). *The body in the mind: The bodily basis of meaning, imagination, and reason.* Chicago, IL: University of Chicago Press.

Kensinger, E. A. (2009). Remembering the details: Effects of emotion. *Emotion Review, 1,* 99-113. doi: 10.1177/1754073908100432

Kepes, S., Banks, G. C., McDaniel, M. A., & Whetzel, D. L. (2012). Publication bias in the organizational sciences. *Organizational Research Methods*, *15*, 624-662. doi:10.1177/1094428112452760

King, L. A. (2012). Science: A true story. *Dialogue*, *26*, 6–8.

Kövecses, Z. (2002). *Metaphor: A practical introduction.* Oxford, UK: Cambridge University Press.

Kövecses, Z. (2005). *Metaphor in culture: Universality and variation.* Cambridge, UK: Cambridge University Press.

Kučera, H., & Francis, W. N. (1967). *Computational analysis of present-day American English*. Providence, RI: Brown University press.

LaFrance, M., & Mayo, C. (1978). Cultural aspects of nonverbal communication. *International Journal of Intercultural Relations*, *2*, 71–89. doi: 10.1016/0147-1767(78)90029-9

Lakens, D., Semin, G. R., & Foroni, F. (2011). But for the bad, there would not be good: Grounding valence in brightness through shared relational structures. *Journal of Experimental Psychology: General*, *141*, 584-594. doi: 10.1037/a0026468

Lakoff, G. (1987). *Women, fire, and dangerous things.* Chicago, IL: University of Chicago Press.

Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202-251). Cambridge, UK: Cambridge University Press.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago, IL: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought.* New York, NY: Basic Books.

Lakoff, G., & Turner, M. (1989). *More than cool reason.* Chicago, IL: University of Chicago Press.

Landau, M. J., Meier, B. P., & Keefer, L. A. (2010). A metaphor-enriched social cognition. *Psychological Bulletin*, *136,* 1045-1067. doi: 10.1037/a0020970

Landau, M. J., Robinson, M. D., & Meier, B. P. (2014). Metaphor research in social-personality psychology: The road ahead. In M. J. Landau, M. D. Robinson & B. P. Meier (Eds.). *The power of metaphor: Examining its influence on social life* (pp. 269-286). Washington, DC: American Psychological Association.

Lantos, G. P. (2011). *Consumer behaviour in action: Real-life applications for marketing managers*. New York, NY: Routledge.

Lockwood, P., & Kunda, Z. (1997). Superstars and me: Predicting the impact of role models on the self. *Journal of Personality and Social Psychology, 73,* 91-103. doi: 10.1037/0022-3514.73.1.91

Lundholm, H. (1921). The affective tone of lines: Experimental researches. *Psychological Review*, *28*, 43-60. doi: 10.1037/h0072647

Lyndsay, R. M., & Ehrenberg, A. S. C. (1993). The design of replicated studies. *The American Statistician*, *47*, 217–228. doi:10.2307/ 2684982

Macrae, C. N., & Bodenhausen, G. V. (2000). Social cognition: Thinking categorically about others. *Annual Review of Psychology*, *51*, 93-120. doi: 10.1146/annurev.psych.51.1.93

Madden, C. S., Easley, R. W., & Dunn, M. G. (1995). How journal editors view replication research. *Journal of Advertising*, *24*, 78-87. Retrieved from http://www.jstor.org.ezproxy.uws.edu.au/stable/4188990

Makel, M. C., Plucker, J. A., & Hegarty, B. (2012). Replications in psychology research: How often do they really occur? *Perspectives on Psychological Science*, *7*, 537-542. doi: 10.1177/1745691612460688

Mandler, G. (1980). Recognizing: The judgement of previous occurrence. *Psychological Review*, *87*, 252–271. doi: 10.1037/0033-295X.87.3.252

Matlin, M. W., & Stang, D. J. (1978). *The Pollyanna principle*. Cambridge, MA: Schenkman.

Maze, J. R. (1983). *The meaning of behaviour.* London, UK: George Allen & Unwin.

McClelland, J. L., & Rumelhart, D. E. (1986). *Parallel Distributed Processing. Explorations in the microstructure of cognition. Volume 2: Psychological and Biological Models*. Cambridge, MA: MIT Press.

McCulloch, W. S., & Pitts, W. (1943). A logical calculus of the ideas immanent in nervous activity. *Bulletin of Mathematical Biology, 52,* 99-115. Retrieved from http://deeplearning.cs.cmu.edu/pdfs/McCulloch.and.Pitts.pdf

McGlone, M. S. (2007). What is the explanatory value of a conceptual metaphor? *Language & Communication, 27,* 109-126. doi: 10.1016/j.langcom.2006.02.016

McGlone, M. S. (2011). Hyperbole, homunculi, and hindsight bias: An alternative evaluation of Conceptual Metaphor Theory. *Discourse Processes*, *48*, 563-574. doi: 10.1080/0163853X.2011.606104

McMullen, T. (2001). Getting rid of the homunculus: A direct realist approach. In J. E. Morss, N. Stephenson & H. V. Rappard (Eds.), *Theoretical issues in psychology* (pp. 159-167). Norwell, MA: Kluwer Academic Publishers.

McNemar, Q. (1960). At random: Sense and nonsense. *American Psychologist*, *15*, 295-300. doi: 10.1037/h0049193

Meier, B. P., Hauser, D. J., Robinson, M. D., Friesen, C. K., & Schjeldahl, K. (2007). What's "up" with God? Vertical space as a representation of the divine. *Journal of Personality and Social Psychology, 93,* 699-710. doi: 10.1037/0022-3514.93.5.699

Meier, B. P., Moller, A. C., Chen, J., & Riemer-Peltz, M. (2011). Spatial metaphor and real estate: North-south location biases housing preference. *Social Psychological and Personality Science, 2,* 547-553. doi: 10.1177/1948550611401042

Meier, B. P., & Robinson, M. D. (2004). Why the sunny side is up. *Psychological Science, 15,* 243-247. doi: 10.1111/j.0956-7976.2004.00659.x

Meier, B. P., & Robinson, M. D. (2006). Does “feeling down” mean seeing down? Depressive symptoms and vertical selective attention. *Journal of Research in Personality*, *40*, 451-461. doi: 10.1016/j.jrp.2005.03.001

Meier, B. P., Robinson, M.D., & Clore, G. L. (2004). Why good guys wear white: Automatic inferences about stimulus valence based on color. *Psychological Science*, *15*, 82-87. doi: 10.1111/j.0963-7214.2004.01502002.x

Meier, B. P., Schnall, S., Schwarz, N., & Bargh, J. (2012). Embodiment in social psychology. *Topics in Cognitive Science*, *4*, 705-716. doi: 10.1111/j.1756-8765.2012.01212.x

Merleau-Ponty, M. (1962), *Phenomenology of perception*. London, UK: Routledge and Kegan Paul.

Merton, R. K. (1973). *The sociology of science, Theoretical and empirical investigations*. Chicago, IL: The University of Chicago Press.

Michell, J. (1988). Maze’s direct realism and the character of cognition. *Australian Journal of Psychology*, *40*, 227-249. doi: 10.1080/00049538808260045

Miller, G. A. (1956) The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, *63*, 81-97. doi: 10.1037/h0043158

Miller, J. (1991). Short report: Reaction time analysis with outlier exclusion: Bias varies with sample size. *The Quarterly Journal of Experimental Psychology Section A: Human Experimental Psychology*, *43*, 907-912, doi: 10.1080/14640749108400962

Munakata, Y., & McClelland, J. L. (2003). Connectionist models of development. *Developmental Science, 6*, 413-429. doi: 10.1111/1467-7687.00296

Murphy, G. L. (1996). On metaphoric representation. *Cognition, 60*, 173-204. doi:

10.1016/0010-0277(96)00711-1

Neely, J. H., Keefe, D. E., & Ross, K. L. (1989). Semantic priming in the lexical decision task: Roles of prospective prime-generated expectancies and retrospective semantic matching. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *15*, 1003-1019. doi: 10.1037/0278-7393.15.6.1003

Nelson, L. D., & Simmons, J. P. (2009). On southbound ease and northbound fees: Literal consequences of the metaphoric link between vertical position and cardinal direction. *Journal of Marketing Research*, *46*, 715-726. Retrieved from http://www.jstor.org.ezproxy.uws.edu.au/stable/20618935

Neuliep, J. W., & Crandall, R. (1990). Editorial bias against replication research. *Journal of Social Behavior and Personality, 5,* 85-90. Retrieved from http://search.proquest.com/docview/1292299467?accountid=36155

Neuliep, J. W., & Crandall, R. (1993). Reviewer bias against replication research. *Journal of Social Behavior and Personality*, *8*, 21-29. Retrieved from http://search.proquest.com/docview/1292304227?accountid=36155

Newell, A. (1990). *Unified theories of cognition*. Cambridge, MA: Harvard University Press.

Newell, A., & Simon, H. A. (1972). *Human problem solving.* Englewood Cliffs, NJ: Prentice-Hall.

Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review, 9,* 184-211. doi:10.1207/s15327957pspr0903_1

Nosek, B. A., & Lakens, D. (2014). Registered reports: A method to increase the credibility of published results. *Social Psychology*, *45*, 137-141. doi: 10.1027/1864-9335/a000192

Nosek, B. A., Spies, J. R., & Motyl, M. (2012). Scientific utopia II: Restructuring incentives and practices to promote truth over publishability. *Perspectives on Psychological Science*, *7*, 615-631. doi: 10.1177/1745691612459058

Open Science Collaboration. (2012). An open, large-scale, collaborative effort to estimate the reproducibility of psychological science. *Perspectives on Psychological Science*, *7*, 657–660. doi: 10.1177/1745691612462588

Palma, T. A., Garrido, M. V., & Semin, G. R. (2011). Grounding person memory in space: Does spatial anchoring of behaviors improve recall? *European Journal of Social Psychology, 41*, 275-280. doi: 10.1002/ejsp.795

Pashler, H., & Harris, C. R. (2012). Is the replicability crisis overblown? Three arguments examined. *Perspectives on Psychological Science*, *7*, 531-536. doi: 10.1177/1745691612463401

Pashler, H., & Wagenmakers, E. J. (2012). Editors' introduction to the special section on replicability in psychological science: A crisis of confidence? *Perspectives on Psychological Science*, *7*, 528–530. doi:10.1177/1745691612465253

Pavelchak, M. (1989). Forming impressions of others: A demonstration of two distinct processes using an idiographic measurement technique. *Journal of Personality and Social Psychology*, *56*, 354-363. doi: 10.1037/0022-3514.56.3.354

Pfeifer, R., & Scheier, C. (1999). *Understanding intelligence*. Cambridge, MA: MIT Press.

Pinker, S. (2007). *The stuff of thought*. New York, NY: Basic Books.

Popper, K. (1934/1959). *The logic of scientific discovery*. London, UK: Routledge.

Popper, K. (1963). *Conjectures and refutations*. New York, NY: Basic Books.

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a 'theory of mind'? *Behavioral and Brain Sciences*, *4*, 515-526. doi: 10.1017/S0140525X00076512

Prince, K., Litovsky, A., & Friedman-Wheeler, D. G. (2012). Internet mediated research: Beware of bots. *The Behavior Therapist*, *35*, 85-88. Retrieved from http://www.abct.org/Journals/?m=mJournal&fa=TBT

Pylyshyn, Z. W. (1973). What the mind's eye tells the mind's brain: A critique of mental imagery. *Psychological Bulletin, 80,* 1-24. doi:10.1037/h0034650

Qualtrics (2013) [Computer software]. Provo, UT: Qualtrics.

Radder, H. (1996). *In and about the world: Philosophical studies of science and technology.* Albany, NY: State University of New York Press.

Ranehill, E., Dreber, A., Johannesson, M., Leiberg, S., Sul, S., & Weber, R. A. (2015). Assessing the robustness of power posing: No effect on hormones and risk tolerance in a large sample of men and women. *Psychological Science*, *26*, 653-656. doi: 10.1177/0956797614553946

Ratcliff, R. (1993). Methods for dealing with reaction time outliers. *Psychological Bulletin*, *114*, 510-532. doi:10.1037/0033-2909.114.3.510

Repovs, G. (2004). The mode of response and the Stroop effect: A reaction time analysis. *Horizons of Psychology*, *13*, 105-144. Retrieved from http://psy.ff.uni-lj.si/psiholoska_obzorja/arhiv_clanki/2004_2/repovs2.pdf

Ritchie, L. D. (2003). "ARGUMENT IS WAR"– Or is it a game of chess? Multiple meanings in the analysis of implicit metaphors. *Metaphor and Symbol*, *18*, 125-146. doi: 10.1207/S15327868MS1802_4

Rorty, R. (1979). *Philosophy and the mirror of nature.* Princeton, NJ: Princeton University Press.

Rosenberg, S., Nelson, C., & Vivekananthan, P. S. (1968). A multidimensional approach to the structure of personality impressions. *Journal of Personality and Social Psychology*, *9*, 283-294. doi:10.1037/h0026086

Rosenblatt, F. (1962). *Principles of neurodynamics.* New York, NY: Spartan.

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, *86*, 638-641. doi: 10.1037/0033-2909.86.3.638

Rosenthal, R. (1991). Replication in behavioral research. In J. W. Neuliep (Ed.), *Replication research in the social sciences* (pp. 1-30). Newbury Park, CA: Sage.

Rozin, P., Berman, L., & Royzman, E. (2010). Biases in use of positive and negative words across twenty natural languages. *Cognition and Emotion*, *24*, 536-548. doi: 0.1080/02699930902793462

Rumelhart, D. E., & McClelland, J. L. (1986). *Parallel Distributed Processing: Explorations in the microstructure of cognition. Volume 1: Foundations*. Cambridge, MA: MIT Press.

Ryle, G. (1949). *The concept of mind.* New York: Routledge.

Schmidt, S. (2009). Shall we really do it again? The powerful concept of replication is neglected in the social sciences. *Review of General Psychology*, *13*, 90–100. doi: 10.1037/a0015108

Schnall, S., Benton, J., & Harvey, S. (2008). With a clean conscience: Cleanliness reduces the severity of moral judgments. *Psychological Science, 19*, 1219-1222. doi: 10.1111/j.1467-9280.2008.02227.x

Schneider, D. J., Hastorf, A. H., & Ellsworth, P. (1979). *Person perception*. Reading, MA: Addison-Wesley.

Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-Prime user's guide*. Pittsburgh, PA: Psychology Software Tools, Inc.

Searle, J. R. (1980). Minds, brains, and programs. *The Behavioural and Brain Science, 3*, 417-457. Retrieved from http://www.class.uh.edu/phil/garson/MindsBrainsandPrograms.pdf

Shapiro, L. (2007). The embodied cognition research programme. *Philosophy Compass, 2,* 338-346. doi: 10.1111/j.1747-9991.2007.00064.x

Shapiro, L. (2011). *Embodied cognition.* New York, NY: Routledge.

Shepard, R. N. (1967). Recognition memory for words, sentences, and pictures. *Journal of Verbal Learning and Verbal Behavior*, *6*, 156-163. doi: 10.1016/S0022-5371(67)80067-7

Sherman, G. D., & Clore, G. L. (2009). The color of sin: White and black are perceptual symbols of moral purity and pollution. *Psychological Science, 20,* 1019-1025. doi:10.1111/j.1467-9280.2009.02403.x

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, *22*, 1359-1366. doi: 10.1177/0956797611417632

Slepian, M. L., Young, S. G., Rule, N. O., Weisbuch, M., & Ambady, N. (2012). Embodied impression formation: Social judgments and motor cues to approach and avoidance. *Social Cognition*, *30*, 232-240. Retrieved from http://dx.doi.org.ezproxy.uws.edu.au/101521soco2012302232

Smart, R. G. (1964). The importance of negative results in psychological research. *Canadian Psychologist*, *5*, 225-232. doi: 10.1037/h0083036

Song, F., Parekh, S., Hooper, L., Loke, Y. K., Ryder, J., Sutton, A. J., . . . & Harvey, I. (2010). Dissemination and publication of research findings: An updated review of related biases. *Health Technology Assessment*, *14*, 1-217. doi: 10.3310/hta14080

Spencer, H. (1855/1899). *Principles of psychology: Vols I and II*. London, UK: Williams and Norgate.

Statzner, B., & Resh, V. H. (2010). Negative changes in the scientific publication process in ecology: Potential causes and consequences. *Freshwater Biology*, *55*, 2639-2653. doi: 10.1111/j.1365-2427.2010.02484.x

Sterling, T. D. (1959). Publication decisions and their possible effects on inferences drawn from tests of significance - or vice versa. *Journal of the American Statistical Association, 54*, 30-34. doi:10.2307/2282137

Sterling, T. D., Rosenbaum, W. L., & Weinkam, J. J. (1995). Publication decisions revisited: The effect of the outcome of statistical tests on the decision to publish and vice versa. *The American Statistician*, *49*, 108-112. doi: 10.1080/00031305.1995.10476125

Sternberg, S. (2004). Psychology 600-301 Proseminar in Psychological Methods, Spring Semester: Reaction-time experimentation [Handout]. Retrieved from http://www.psych.upenn.edu/~saul/rt.experimentation.pdf

Stroebe, W., & Strack, F. (2014). The alleged crisis and the illusion of exact replication. *Perspectives on Psychological Science*, *9*, 59-71. doi: 10.1177/1745691613514450

Sturm, T., & Mülberger, A. (2012). Crisis discussions in psychology – New historical and philosophical perspectives. *Studies in History and Philosophy of Science Part C*, *43*, 425-433. doi: 10.1016/j.shpsc.2011.11.001

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics (6th ed)*. Boston, MA: Pearson.

Thornton, G. R. (1944). The effect of wearing glasses upon judgments of personality traits of persons seen briefly. *Journal of Applied Psychology*, *28*, 203-207. doi:10.1037/h0055862

Tolaas, J. (1991). Notes on the origin of some spatialization metaphors. *Metaphor & Symbolic Activity*, *6*, 203–218. Retrieved from http://web.a.ebscohost.com.ezproxy.uws.edu.au

Tsang, E. W., & Kwan, K. M. (1999). Replication and theory development in organizational science: A critical realist perspective. *Academy of Management Review*, *24*, 759-780. doi: 10.5465/AMR.1999.2553252

Tullock, G. (1959). Publication decisions and tests of significance: A comment. *Journal of the American Statistical Association, 54*, 593. doi:10.2307/2282539

Turner, M. (1987). *Death is the mother of beauty: Mind, metaphor, criticism.* Chicago, IL: University of Chicago Press.

Turvey, M. T., Shaw, R. E., Reed, E. S., & Mace, W. M. (1981). Ecological laws of perceiving and acting: In reply to Fodor and Pylyshyn (1981). *Cognition, 9*, 237-304. Retrieved from http://www.trincoll.edu/~wmace/publications/fodor_pyl_reply-1.pdf

Uleman, J. S., Rim, S., Saribay, S. A., & Kressel, L. M. (2012). Controversies, questions, and prospects for spontaneous social inferences. *Social and Personality Psychology Compass*, *6*, 657-673. doi: 10.1111/j.1751-9004.2012.00452.x

Unkelbach, C., Fiedler, K., Bayer, M., Stegmuller, M., & Danner, D. (2008). Why positive information is processed faster: The density hypothesis. *Journal of Personality and Social Psychology*, *95*, 36-49. doi: 10.1037/0022-3514.95.1.36

Unkelbach, C., von Hippel, W., Forgas, J. P., Robinson, M. D., Shakarchi, R. J., & Hawkins, C. (2010). Good things come easy: Subjective exposure frequency and the faster processing of positive information. *Social Cognition*, *28*, 538-555. doi: 10.1521/soco.2010.28.4.538

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind*. Cambridge, MA: MIT Press.

Vervaeke, J., & Kennedy, J. M. (1996). Metaphors in language and thought: Falsification and multiple meanings. *Metaphor and Symbolic Activity*, *11*, 273-284.

Retrieved from http://web.a.ebscohost.com.ezproxy.uws.edu.au

Walker, S. F. (1992) A brief history of connectionism and its psychological implications. In A. Clark & R. Lutz (Eds.), *Connectionism in context* (pp. 123-144). Berlin, Germany: Springer-Verlag.

Wapner, S., Werner, H., & Krus, D. M. (1957). The effect of success and failure on space localization. *Journal of Personality, 25*, 752-756. doi: 10.1111/j.1467-6494.1957.tb01563.x

Wheeler, M. (2005). *Reconstructing the cognitive world: The next step.* Cambridge, MA: MIT Press.

Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth influences interpersonal warmth. *Science*, *322*, 606-607. doi: 10.1126/science.1162548

Williams, L. E., Huang, J. Y., & Bargh, J. A. (2009). The scaffolded mind: Higher mental processes are grounded in early experience of the physical world. *European Journal of Social Psychology, 39*, 1257-1267. doi: 10.1002/ejsp.665

Wilson, A. D., & Golonka, S. (2013). Embodied cognition is not what you think it is. *Frontiers in Psychology, 4,* 1-13. doi: 10.3389/fpsyg.2013.00058

Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review, 9,*625-636. doi: 10.3758/BF03196322

Winter, L., & Uleman, J. S. (1984). When are social judgments made? Evidence for the spontaneousness of trait inferences. *Journal of Personality and Social Psychology*, *47*, 237-252. Retrieved from http://web.b.ebscohost.com.ezproxy.uws.edu.au

Zhong, C., & Liljenquist, K. (2006). Washing away your sins: Threatened morality and physical cleansing. *Science, 313*, 1451-1452. doi: 10.1126/science.1130726

Appendix A

Ethics Approval Letter, Amendment Request Approval Letters, Information Sheets, Consent Forms, and Debrief Forms

Ethics Approval Letter

Our Reference: H10044 | 13/001183

HUMAN RESEARCH ETHICS COMMITTEE

15 February 2013

Doctor Rebecca Pinkus
School of Social Sciences and Psychology

Dear Rebecca

I wish to formally advise you that the Human Research Ethics Committee has approved your research proposal **H10044** *“Vertical Space as an Embodied Representation of “Good” and “Bad”: An Investigation of Conceptual Metaphor in Impression Formation and Social Comparison”*, until 25 February 2015 with the provision of a progress report annually and a final report on completion.

Please quote the registration number and titled as indicated above in the subject line on all future correspondence related to this project.

This protocol covers the following researchers:
Rebecca Pinkus, Agnes Petocz, Ryan McMullan

Yours sincerely

Associate Professor Anne Abraham
Chair, Human Researcher Ethics Committee

Amendment Request Approval Letter

Locked Bag 1797
Penrith NSW 2751 Australia
Office of Research Services

University of Western Sydney

ORS Reference: H10044 13/001183

HUMAN RESEARCH ETHICS COMMITTEE

17 December 2013

Doctor Rebecca Pinkus
School of Social Sciences and Psychology

Dear Rebecca,

RE: Amendment Request to H10044

I acknowledge receipt of an email concerning a request to amend your approved research protocol H10044 "Vertical Space as an Embodied Representation of "Good" and "Bad": An Investigation of Conceptual Metaphor in Impression Formation and Social Comparison".

The Office of Research Services has reviewed your amendment request and I am pleased to advise that it has been approved as follows:

1) Recruit additional student participants outside of the SONA pool
2) Changes to participant reimbursement as per the email from Ryan Mcmullan dated 9 December 2013

Please do not hesitate to contact me at humanethics@uws.edu.au if you require any further information.

Regards

Annamarie D'souza
Human Ethics Officer
Office of Research Services

Amendment Request Approval Letter

ORS Reference: H10044

HUMAN RESEARCH ETHICS COMMITTEE

4 February 2015

Doctor Rebecca Pinkus
School of Social Sciences and Psychology

Dear Rebecca,

RE: Amendment Request to H10044

The Office of Research Services has received a request to amend your approved research protocol H10044 “Vertical Space as an Embodied Representation of "Good" and "Bad": An Investigation of Conceptual Metaphor in Impression Formation and Social Comparison“.

The amendment has been reviewed and I am pleased to advise that it has been approved, as follows:

Approval expiry extended for 12month period - 25/02/2016

Please do not hesitate to contact the Human Ethics Officer at humanethics@uws.edu.au, if you require any further information.

Regards

Professor Elizabeth Deane

Presiding Member,
Human Researcher Ethics Committee

Experiment 1 Information Sheet

Human Research Ethics Committee
Office of Research Services

University of Western Sydney

Participant Information Sheet (General)

Project Title: Effects of Distraction on Visual and Auditory Perception

Who is carrying out the study?

Ryan McMullan, PhD candidate
Dr Rebecca Pinkus, PhD (supervisor)
Dr Agnes Petocz, PhD (co-supervisor)

You are invited to participate in a study conducted by Ryan McMullan. This study will form the basis for Ryan's thesis as part of his Doctor of Philosophy degree at the University of Western Sydney under the supervision of Dr Rebecca Pinkus, Lecturer in the School of Social Sciences and Psychology, and Dr Agnes Petocz, Senior Lecturer in the School of Social Sciences and Psychology.

What is the study about?

The purpose of this study is to investigate whether particular forms of distraction can affect visual and auditory perception.

What does the study involve?

You will be asked to view material on a large projector screen and then answer questions about this material on a computer. You will also be asked some questions about your personal characteristics.

How much time will the study take?

The study will take about 30 minutes to complete, and you will receive half an hour of experimental credit from the School of Social Sciences and Psychology for your participation.

Will the study benefit me?

You may benefit from the opportunity to actively participate in the psychological research process.

Will the study involve any discomfort for me?

No. You will be given breaks throughout the experiment. If at any point you do not wish to continue, you may simply inform the experimenter.

How is this study being paid for?

The study is being paid for via a School of Social Sciences and Psychology research stipend to Ryan McMullan.

Will anyone else know the results? How will the results be disseminated?

All aspects of the study, including the results, will be confidential and only the researchers will have access to information on participants. A summary of the final results will be placed on the SONA site for participants to view (accessible by clicking on the study name). The results will also be reported in Ryan McMullan's thesis for a Doctor of Philosophy degree. The research results may also form the basis of an academic manuscript in collaboration with Dr Rebecca Pinkus and Dr Agnes Petocz, to be submitted to a peer-reviewed journal.

Can I withdraw from the study?

Participation is entirely voluntary: you are not obliged to be involved and - if you do participate -you can withdraw at any time without giving any reason and without any penalty of prejudice.

Can I tell other people about the study?

Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

What if I require further information?

When you have read this information, Ryan will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact Dr Rebecca Pinkus, 02 9772 6729.

What if I have a complaint?

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H10044.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0013 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you may be asked to sign the Participant Consent Form.

Experiment 2A and Experiment 2B Information Sheet

Human Research Ethics Committee
Office of Research Services

University of Western Sydney

Participant Information Sheet (General)

Project Title: Effects of Distraction on Visual and Auditory Perception

Who is carrying out the study?

Ryan McMullan, PhD candidate
Dr Rebecca Pinkus, PhD (supervisor)
Dr Agnes Petocz, PhD (co-supervisor)

You are invited to participate in a study conducted by Ryan McMullan. This study will form the basis for Ryan's thesis as part of his Doctor of Philosophy degree at the University of Western Sydney under the supervision of Dr Rebecca Pinkus, Lecturer in the School of Social Sciences and Psychology, and Dr Agnes Petocz, Senior Lecturer in the School of Social Sciences and Psychology.

What is the study about?

The purpose of this study is to investigate whether particular forms of distraction can affect visual and auditory perception.

What does the study involve?

You will be asked to view material on a large projector screen and then answer questions about this material on a computer. You will also be asked some questions about your personal characteristics.

How much time will the study take?

The study will take about 20 minutes to complete, and you will receive 20 minutes of experimental credit from the School of Social Sciences and Psychology for your participation.

Will the study benefit me?

You may benefit from the opportunity to actively participate in the psychological research process.

Will the study involve any discomfort for me?

No. You will be given breaks throughout the experiment. If at any point you do not wish to continue, you may simply inform the experimenter.

How is this study being paid for?

The study is being paid for via a School of Social Sciences and Psychology research stipend to Ryan McMullan.

Will anyone else know the results? How will the results be disseminated?

All aspects of the study, including the results, will be confidential and only the researchers will have access to information on participants. A summary of the final results will be placed on the SONA site for participants to view (accessible by clicking on the study name). The results will also be reported in Ryan McMullan's thesis for a Doctor of Philosophy degree. The research results may also form the basis of an academic manuscript in collaboration with Dr Rebecca Pinkus and Dr Agnes Petocz, to be submitted to a peer-reviewed journal.

Can I withdraw from the study?

Participation is entirely voluntary: you are not obliged to be involved and - if you do participate -you can withdraw at any time without giving any reason and without any penalty of prejudice.

Can I tell other people about the study?

Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

What if I require further information?

When you have read this information, Ryan will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact Dr Rebecca Pinkus, 02 9772 6729.

What if I have a complaint?

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H10044.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0013 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you may be asked to sign the Participant Consent Form.

Experiment 2B Draw Information Sheet

Human Research Ethics Committee
Office of Research Services

University of Western Sydney

Participant Information Sheet (General)

Project Title: Effects of Distraction on Visual and Auditory Perception

Who is carrying out the study?

Ryan McMullan, PhD candidate
Dr Rebecca Pinkus, PhD (supervisor)
Dr Agnes Petocz, PhD (co-supervisor)

You are invited to participate in a study conducted by Ryan McMullan. This study will form the basis for Ryan's thesis as part of his Doctor of Philosophy degree at the University of Western Sydney under the supervision of Dr Rebecca Pinkus, Lecturer in the School of Social Sciences and Psychology, and Dr Agnes Petocz, Senior Lecturer in the School of Social Sciences and Psychology.

What is the study about?

The purpose of this study is to investigate whether particular forms of distraction can affect visual and auditory perception.

What does the study involve?

You will be asked to view material on a large projector screen and then answer questions about this material on a computer. You will also be asked some questions about your personal characteristics.

How much time will the study take?

The study will take about 20 minutes to complete. You will subsequently be entered into a draw with the chance to win one of two $50 Coles/Myer gift cards. The odds of winning the drawing depend on the number of participants who take part in the study, but will be no greater than 1 in 50.

Will the study benefit me?

You may benefit from the opportunity to actively participate in the psychological research process.

Will the study involve any discomfort for me?

No. You will be given breaks throughout the experiment. If at any point you do not wish to continue, you may simply inform the experimenter.

How is this study being paid for?

The study is being paid for via a School of Social Sciences and Psychology research stipend to Ryan McMullan.

Will anyone else know the results? How will the results be disseminated?

All aspects of the study, including the results, will be confidential and only the researchers will have access to information on participants. A summary of the final results will be placed on the SONA site for participants to view (accessible by clicking on the study name). The results will also be reported in Ryan McMullan's thesis for a Doctor of Philosophy degree. The research results may also form the basis of an academic manuscript in collaboration with Dr Rebecca Pinkus and Dr Agnes Petocz, to be submitted to a peer-reviewed journal.

Can I withdraw from the study?

Participation is entirely voluntary: you are not obliged to be involved and - if you do participate -you can withdraw at any time without giving any reason and without any penalty of prejudice.

Can I tell other people about the study?

Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

What if I require further information?

When you have read this information, Ryan will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact Dr Rebecca Pinkus, 02 9772 6729.

What if I have a complaint?

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is **H10044**.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0013 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you may be asked to sign the Participant Consent Form.

Experiment 3 Information Sheet

Human Research Ethics Committee
Office of Research Services

University of Western Sydney

Participant Information Sheet (General)

Project Title: Effects of Distraction on Visual Perception

Who is carrying out the study?

Ryan McMullan, PhD candidate
Dr Rebecca Pinkus, PhD (supervisor)
Dr Agnes Petocz, PhD (co-supervisor)

You are invited to participate in a study conducted by Ryan McMullan. This study will form the basis for Ryan's thesis as part of his Doctor of Philosophy degree at the University of Western Sydney under the supervision of Dr Rebecca Pinkus, Lecturer in the School of Social Sciences and Psychology, and Dr Agnes Petocz, Senior Lecturer in the School of Social Sciences and Psychology.

What is the study about?

The purpose of this study is to investigate whether particular forms of distraction can affect visual and auditory perception.

What does the study involve?

You will be asked to view and respond to material on a computer screen. You will also be asked some questions about your personal characteristics.

How much time will the study take?

The study will take about 20 minutes to complete, and you will receive 20 minutes of experimental credit from the School of Social Sciences and Psychology for your participation.

Will the study benefit me?

You may benefit from the opportunity to actively participate in the psychological research process.

Will the study involve any discomfort for me?

No. You will be given breaks throughout the experiment. If at any point you do not wish to continue, you may simply inform the experimenter.

How is this study being paid for?

The study is being paid for via a School of Social Sciences and Psychology research stipend to Ryan McMullan.

Will anyone else know the results? How will the results be disseminated?

All aspects of the study, including the results, will be confidential and only the researchers will have access to information on participants. A summary of the final results will be placed on the SONA site for participants to view (accessible by clicking on the study name). The results will also be reported in Ryan McMullan's thesis for a Doctor of Philosophy degree. The research results may also form the basis of an academic manuscript in collaboration with Dr Rebecca Pinkus and Dr Agnes Petocz, to be submitted to a peer-reviewed journal.

Can I withdraw from the study?

Participation is entirely voluntary: you are not obliged to be involved and - if you do participate -you can withdraw at any time without giving any reason and without any penalty of prejudice.

Can I tell other people about the study?

Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

What if I require further information?

When you have read this information, Ryan will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact Dr Rebecca Pinkus, 02 9772 6729.

What if I have a complaint?

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H10044.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0013 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you may be asked to sign the Participant Consent Form.

Experiment 1, Experiment 2A, and Experiment 2B Consent Form

Human Research Ethics Committee
Office of Research Services

University of Western Sydney

Participant Consent Form

Project Title: Effects of Distraction on Visual and Auditory Perception

I, , consent to participate in the research project titled Effects of Distraction on Visual and Auditory Perception.

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher/s.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to viewing material on a large projector screen and answering questions about this material, as well as answering questionnaires about myself.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me will be used in any way that reveals my identity.

I understand that I can withdraw from the study at any time, without affecting my relationship with the researcher/s now or in the future.

Signed: ______________________________

Name: ______________________________

Date: ______________________________

Return Address:
Dr Rebecca Pinkus
School of Social Sciences and Psychology
University of Western Sydney
Locked Bag 1797
Penrith NSW 2751
Australia

This study has been approved by the University of Western Sydney Human Research Ethics Committee.

The Approval number is: H10044

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0013 or email humanethics@uws.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Experiment 3 Consent Form

Human Research Ethics Committee
Office of Research Services

University of Western Sydney

Participant Consent Form

Project Title: Effects of Distraction on Visual Perception

I, , consent to participate in the research project titled Effects of Distraction on Visual and Auditory Perception.

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher/s.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to viewing and responding to material on a computer screen, as well as answering questionnaires about myself.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me will be used in any way that reveals my identity.

I understand that I can withdraw from the study at any time, without affecting my relationship with the researcher/s now or in the future.

Signed: ______________________

Name: ______________________

Date: ______________________

Return Address:

Dr Rebecca Pinkus
School of Social Sciences and Psychology
University of Western Sydney
Locked Bag 1797
Penrith NSW 2751
Australia

This study has been approved by the University of Western Sydney Human Research Ethics Committee.

The Approval number is: H10044

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0013 or email humanethics@uws.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Experiment 1 Debrief Form

Debrief form
(Effects of Distraction on Visual and Auditory Perception)

- As you may know, scientific methods sometimes require that participants in research studies not be given complete information until after the experiment is finished. Although we can't always tell you everything before you begin your participation, we do want to tell you everything when the research is completed. However, even now we cannot yet tell you *everything*, because we are still in the process of testing participants, and we want to minimise any possible contamination of results. Therefore, a complete explanation of the aims of this research will have to wait until the whole study has finished, at which point I will make available not only the more specific aims of this research, but also a summary of the findings. I can, however, give you a better understanding of what exactly we were doing here today.

- Before I tell you about all of the goals of this study, however, I want to explain why it is necessary in some kinds of research to not tell people all about the purpose of the study before they begin. Discovering how people would naturally feel and react in everyday situations is what we are really trying to find out in psychology experiments. We don't always tell people everything at the beginning of a study because we do not want to influence their responses.

- Today, as you are aware, we asked you to read about several people. The target person descriptions were presented at various locations on the large projector screen. After exposure to the target you completed a free recall task, multiple choice task, and target evaluations.

- We are trying to assess whether differences in the location of the target person descriptions affect how people process the information.

- Because other participants in this experiment may experience different conditions from those you just had, we ask that you do not discuss your participation with other potential participants. If participants expect certain conditions but experience something which they are not expecting, or even if they get exactly what they are expecting, their responses may be less valid than if they had no forewarning at all, and the research results may be biased. Therefore, it is very important that people's responses are natural and not biased by expectations provided by others who have already participated. We would really appreciate your cooperation in this.

- I hope you enjoyed your experience and I hope that you learned some things today. If you have any questions later please feel free to contact either me or my supervisor – our contact details are on the information sheet.

- Thank you again for your participation. It is very much appreciated.

Experiment 2A Debrief Form

Debrief form
(Effects of Distraction on Visual and Auditory Perception)

- As you may know, scientific methods sometimes require that participants in research studies not be given complete information until after the experiment is finished. Although we can't always tell you everything before you begin your participation, we do want to tell you everything when the research is completed. However, even now we cannot yet tell you *everything*, because we are still in the process of testing participants, and we want to minimise any possible contamination of results. Therefore, a complete explanation of the aims of this research will have to wait until the whole study has finished, at which point I will make available not only the more specific aims of this research, but also a summary of the findings. I can, however, give you a better understanding of what exactly we were doing here today.

- Before I tell you about all of the goals of this study, however, I want to explain why it is necessary in some kinds of research to not tell people all about the purpose of the study before they begin. Discovering how people would naturally feel and react in everyday situations is what we are really trying to find out in psychology experiments. We don't always tell people everything at the beginning of a study because we do not want to influence their responses.

- Today, as you are aware, we asked you to read and respond to a number of words. These words were presented at various locations on the large projector screen. After exposure to the target you completed a demographics questionnaire.

- We are trying to assess whether differences in the location of the target person descriptions affect how people process the information.

- Because other participants in this experiment may experience different conditions from those you just had, we ask that you do not discuss your participation with other potential participants. If participants expect certain conditions but experience something which they are not expecting, or even if they get exactly what they are expecting, their responses may be less valid than if they had no forewarning at all, and the research results may be biased. Therefore, it is very important that people's responses are natural and not biased by expectations provided by others who have already participated. We would really appreciate your cooperation in this.

- I hope you enjoyed your experience and I hope that you learned some things today. If you have any questions later please feel free to contact either me or my supervisor – our contact details are on the information sheet.

- Thank you again for your participation. It is very much appreciated.

Experiment 2B Debrief Form

Debrief form
(Effects of Distraction on Visual and Auditory Perception)

- As you may know, scientific methods sometimes require that participants in research studies not be given complete information until after the experiment is finished. Although we can't always tell you everything before you begin your participation, we do want to tell you everything when the research is completed. However, even now we cannot yet tell you *everything*, because we are still in the process of testing participants, and we want to minimise any possible contamination of results. Therefore, a complete explanation of the aims of this research will have to wait until the whole study has finished, at which point I will make available not only the more specific aims of this research, but also a summary of the findings. I can, however, give you a better understanding of what exactly we were doing here today.

- Before I tell you about all of the goals of this study, however, I want to explain why it is necessary in some kinds of research to not tell people all about the purpose of the study before they begin. Discovering how people would naturally feel and react in everyday situations is what we are really trying to find out in psychology experiments. We don't always tell people everything at the beginning of a study because we do not want to influence their responses.

- Today, as you are aware, we asked you to read about a person. The target person descriptions were were presented at the top or the bottom of the large projector screen. After exposure to the target you completed a free recall task, a sliding scale recognition task, and target evaluations.

- We are trying to assess whether differences in the location of the target person descriptions affect how people process the information.

- Because other participants in this experiment may experience different conditions from those you just had, we ask that you do not discuss your participation with other potential participants. If participants expect certain conditions but experience something which they are not expecting, or even if they get exactly what they are expecting, their responses may be less valid than if they had no forewarning at all, and the research results may be biased. Therefore, it is very important that people's responses are natural and not biased by expectations provided by others who have already participated. We would really appreciate your cooperation in this.

- I hope you enjoyed your experience and I hope that you learned some things today. If you have any questions later please feel free to contact either me or my supervisor – our contact details are on the information sheet.

- Thank you again for your participation. It is very much appreciated.

Experiment 3 Debrief Form

Debrief form
(Effects of Distraction on Visual and Auditory Perception)

- As you may know, scientific methods sometimes require that participants in research studies not be given complete information until after the experiment is finished. Although we can't always tell you everything before you begin your participation, we do want to tell you everything when the research is completed. However, even now we cannot yet tell you *everything*, because we are still in the process of testing participants, and we want to minimise any possible contamination of results. Therefore, a complete explanation of the aims of this research will have to wait until the whole study has finished, at which point I will make available not only the more specific aims of this research, but also a summary of the findings. I can, however, give you a better understanding of what exactly we were doing here today.

- Before I tell you about all of the goals of this study, however, I want to explain why it is necessary in some kinds of research to not tell people all about the purpose of the study before they begin. Discovering how people would naturally feel and react in everyday situations is what we are really trying to find out in psychology experiments. We don't always tell people everything at the beginning of a study because we do not want to influence their responses.

- Today, as you are aware, we asked you to read and respond to a number of words. These words were presented at various locations on the computer screen. After exposure to the words you completed a demographics questionnaire.

- We are trying to assess whether differences in the location of the target person descriptions affect how people process the information.

- Because other participants in this experiment may experience different conditions from those you just had, we ask that you do not discuss your participation with other potential participants. If participants expect certain conditions but experience something which they are not expecting, or even if they get exactly what they are expecting, their responses may be less valid than if they had no forewarning at all, and the research results may be biased. Therefore, it is very important that people's responses are natural and not biased by expectations provided by others who have already participated. We would really appreciate your cooperation in this.

- I hope you enjoyed your experience and I hope that you learned some things today. If you have any questions later please feel free to contact either me or my supervisor – our contact details are on the information sheet.

- Thank you again for your participation. It is very much appreciated.

Appendix B

Pilot Study 1 Instructions and Behavioural Descriptions

Instructions

Please rate how positive or negative each of the following behaviors and actions are on the corresponding scale.

Extremely Negative				Neutral				Extremely Positive
1	2	3	4	5	6	7	8	9

Positive Behavioural Descriptions

Alex has been successful at motivating students all year.
Alex is employed at an inner city primary school.
Alex has been described by the principal as a talented teacher.
Alex has conquered difficult challenges with enthusiasm.
Alex successfully taught students how to use a new math computer program.
Alex was awarded an Outstanding Young Teachers Award.
Alex is engaged to be married.
Alex coached the school's basketball team to the finals.
Alex proposed an environmental management program to be undertaken at the school.
Jamie had two psychology papers published in 6 months.
Jamie obtained a research position at a top university.
Jamie sticks by colleagues, even when they make mistakes.
Jamie relates well to colleagues.
Jamie was invited to give a lecture on vision in Switzerland.
Jamie is a reviewer for several psychology journals.
Jamie moved into a new two bedroom apartment.
Jamie purchased a new car.
Jamie won a department tennis tournament despite having played only a few times in the past.
Sam travelled to England to visit relatives.
Sam travelled to various destinations in Europe whilst taking a year off.
Sam volunteered at a holiday camp for 100 children with disabilities in Belarus.
Sam had several small jobs in Europe to pay for living and travel expenses.
Sam made several new friends at a Swiss hostel.
Sam was offered a job at a leading marketing agency in Sydney.
Sam learnt to speak French during time spent in Paris.
Sam sailed a yacht to various islands in the Mediterranean Sea.
Sam travelled through Romania alone for 20 days.
Sam witnessed the running of the bulls in Spain.

Negative Behavioural Descriptions

Casey hasn't been able to find a good job.
Casey is unsure about the future.

Casey has attended nine unsuccessful job interviews.
Casey has admitted to fabricating resume details.
Casey has found the search for a job overwhelming.
Casey can't afford to go back to university.
Casey's partner of 3 years ended their relationship.
Casey has difficulty sleeping at night due to stress.
Casey constantly argues with other family members.
Ashley finds it difficult to understand other people's opinions in the workplace.
Ashley has difficulty in explaining various concepts to colleagues.
Ashley has a credit card debt due to a desire for expensive clothing.
Ashley could not understand the instructions for a new computer program.
Ashley has been warned by a supervisor about conflicts with colleagues.
Ashley used a colleague's work laptop without their permission.
Ashley rarely goes out with friends.
Ashley has been warned by a supervisor about arriving late to work.
Ashley rarely attends meetings because they are boring.
Charlie treats co-workers very dismissively.
Charlie once hit a co-worker in anger.
Charlie's drivers licence was suspended due to an outstanding fine.
Charlie makes no effort to deliver important messages to co-workers.
Charlie stacks shelves at a local Walmart.
Charlie is often rude to customers.
Charlie relies on roommates to pay the rent.
Charlie on average loses $200 a week due to gambling.
Charlie lost control of a forklift and damaged a number of goods.
Charlie wears a digital wrist watch.

Neutral Behavioural Descriptions

Alex has breakfast at 7am every morning.
Alex has a 19 inch plasma television.
Casey buys the newspaper on the way to work.
Jamie's favorite television show is on every Tuesday night.
Ashley checks the mailbox after arriving home from work each day.
Ashley drives a white car.
Charlie waits for the bus at the bus stop each morning.
Alex catches the train each morning.
Jamie buys groceries at the local supermarket each Thursday.
Casey cooks dinner each night.
Alex uses a cell phone to call friends.
Sam takes photographs of birds.
Sam occasionally listens to the radio.
Ashley purchased a 12 month subscription to a football magazine.
Jamie stores data and files on a mobile phone.
Charlie supports the local football team.
Alex wears black shoes to work.
Casey eats two sandwiches for lunch each day.
Charlie gets a haircut each month.

Appendix C

Experiment 1 Practice Phase and Experimental Phase Behavioural Descriptions

Practice Phase Behavioural Descriptions

Ronald Weasley broke his leg after crashing his broomstick.
Bugs Bunny was captured by Elma Fudd.
Superman lifted a semi-trailer to save a mother and child.
Sherlock Holmes solved three murder cases in one day.
Fred Flintstone took his pet dinosaur Dino for a walk.

Experimental Phase Behavioural Descriptions

Positive Target Behavioural Descriptions

Alex has been successful at motivating students all year.
Alex is employed at one of the top primary schools in Sydney.
Alex has been described by the principal as a talented teacher.
Alex has conquered difficult challenges with enthusiasm.
Alex was awarded an Outstanding Young Teachers Award.
Alex coached the school's basketball team to the finals.
Alex's favourite television show is on every Tuesday night.
Alex checks the mailbox after arriving home from work each day.

Jamie had two psychology papers published in 6 months.
Jamie obtained a research position at a top university.
Jamie provides support for a colleague who has depression.
Jamie works effectively with colleagues.
Jamie was invited to be the main speaker at an international conference in Switzerland.
Jamie saved enough money to buy a new car.
Jamie waits for the bus at the bus stop each morning.
Jamie purchased a 12 month subscription to a magazine.

Sam volunteered at a holiday camp for 100 children with disabilities.
Sam made many new friends when travelling through Europe.
Sam was offered a job at a leading marketing agency.
Sam successfully sailed a yacht to a number of islands in the Mediterranean Sea.
Sam can afford to travel to Milan due to careful budgeting.
Sam administered first aid to a person involved in a car crash.
Sam drives a white car.
Sam wears a digital watch.

Negative Target Behavioural Descriptions

Casey hasn't been able to find a good job.
Casey has attended nine unsuccessful job interviews.
Casey has repeatedly fabricated resume details.
Casey gave up looking for a job because it was overwhelming.
Casey's partner of 3 years ended their relationship.
Casey constantly argues with other family members.
Casey stores data and files on a mobile phone.
Casey buys groceries at the local supermarket each Thursday.

Ashley failed to listen to important instructions.
Ashley never assists colleagues when asked for help.
Ashley has a credit card debt due to a desire for expensive clothing.
Ashley has been warned by a supervisor about conflicts with colleagues.
Ashley used a colleague's work laptop without their permission.
Ashley arrives late to work everyday.
Ashley occasionally listens to the radio.
Ashley gets a haircut every month.

Charlie treats co-workers very dismissively.
Charlie once hit a co-worker in anger.
Charlie’s drivers licence was suspended due to an outstanding fine.
Charlie makes no effort to deliver important messages to co-workers.
Charlie is often rude to customers.
Charlie loses $200 a week on average in gambling debt.
Charlie buys the newspaper on the way to work.
Charlie eats a sandwich for lunch everyday.

Appendix D

Experiment 1 and Experiment 2B Filler Task

INSTRUCTIONS:

Please read this text and cross off all instances of the letter *e*.

Nearly all eucalyptus are evergreen but some tropical species lose their leaves at the end of the dry season. As in other members of the myrtle family, eucalyptus leaves are covered with oil glands. The copious oils produced are an important feature of the genus. Although mature Eucalyptus trees are usually towering and fully leafed, their shade is characteristically patchy because the leaves usually hang downwards.

The leaves on a mature eucalyptus plant are commonly lanceolate, petiolate, apparently alternate and waxy or glossy green. In contrast, the leaves of seedlings are often opposite, sessile and glaucous. But there are many exceptions to this pattern. Many species such as E. melanophloia and E. setosa retain the juvenile leaf form even when the plant is reproductively mature. Some species, such as E. macrocarpa, E. rhodantha and E. crucis, are sought-after ornamentals due to this lifelong juvenile leaf form. A few species, such as E. petraea, E. dundasii and E. lansdowneana, have shiny green leaves throughout their life cycle. E. caesia exhibits the opposite pattern of leaf development to most eucalyptus, with shiny green leaves in the seedling stage and dull, glaucous leaves in mature crowns. The contrast between juvenile and adult leaf phases is valuable in field identification.

Four leaf phases are recognised in the development of a eucalyptus plant: the ‘seedling’, ‘juvenile’, ‘intermediate’ and ‘adult’ phases. However there is no definite transitional point between the phases. The intermediate phase, when the largest leaves are often formed, links the juvenile and adult phases.

In all except a few species, the leaves form in pairs on opposite sides of a square stem, consecutive pairs being at right angles to each other (decussate). In some narrow-leaved species, for example E. oleosa, the seedling leaves after the second leaf pair are often clustered in a detectable spiral arrangement about a five-sided stem. After the spiral phase, which may last from several to many nodes, the arrangement reverts to decussate by the absorption of some of the leaf-bearing faces of the stem. In those species with opposite adult foliage the leaf pairs, which have been formed opposite at the stem apex, become separated at their bases by unequal elongation of the stem to produce the apparently alternate adult leaves.

The most readily recognisable characteristics of eucalyptus species are the distinctive flowers and fruit (capsules or "gumnuts"). Flowers have numerous fluffy stamens which may be white, cream, yellow, pink or red; in bud, the stamens are enclosed in a cap known as an operculum which is composed of the fused sepals or petals or both. Thus flowers have no petals, but instead decorate themselves with the many showy stamens. As the stamens expand, the operculum is forced off, splitting away from the cup-like base of the flower; this is one of the features that unites the genus. The name Eucalyptus, from the Greek words eu-, well, and kaluptos, cover, meaning "well-covered", describes the operculum. The woody fruits or capsules are roughly cone-shaped and have valves at the end which open to release the seeds, which are waxy, rod-shaped, about 1mm in length, and yellow-brown in colour. Most species do not flower until adult foliage starts to appear; Eucalyptus cinerea and Eucalyptus perriniana are notable exceptions.

The appearance of eucalyptus bark varies with the age of the plant, the manner of bark shed, the length of the bark fibres, the degree of furrowing, the thickness, the hardness and the colour. All mature eucalypts put on an annual layer of bark, which contributes to the increasing diameter of the stems. In some species, the outermost layer dies and is annually deciduous, either in long strips (as in Eucalyptus sheathiana) or in variably sized flakes (E. diversicolor, E. cosmophylla or E. cladocalyx). These are the gums or smooth-barked species. The gum bark may be dull, shiny or satiny (as in E. ornata) or matte (E. cosmophylla). In many species, the dead bark is retained. Its outermost layer gradually fragments with weathering and sheds without altering the essentially rough-barked nature of the trunks or stems — for example E. marginata, E. jacksonii, E. obliqua and E. porosa.

Many species are ‘half-barks’ or ‘blackbutts’ in which the dead bark is retained in the lower half of the trunks or stems — for example, E. brachycalyx, E. ochrophloia and E. occidentalis — or only in a thick, black accumulation at the base, as in E. clelandii. In some species in this category, for example E. youngiana and E. viminalis, the rough basal bark is very ribbony at the top, where it gives way to the smooth upper stems. The smooth upper bark of the half-barks and that of the completely smooth-barked trees and mallees can produce remarkable colour and interest, for example E. deglupta.

Eucalypts originated between 35 and 50 million years ago, not long after Australia-New Guinea separated from Gondwana, their rise coinciding with an increase in fossil charcoal deposits (suggesting that fire was a factor even then), but they remained a minor component of the Tertiary rainforest until about 20 million years ago, when the gradual drying of the continent and depletion of soil nutrients led to the development of a more open forest type, predominantly Casuarina and Acacia species.

The aridification of Australia during the mid-tertiary period (25-40 million years ago), combined with the annual penetration of tropical convection storms, and associated lightning, deep into the continental interior stimulated the gradual evolution, diversification and geographic expansion of the flammable biota. The absence of great rivers or mountain chains meant that there were no geographic barriers to check the spread of fires. From the monsoonal 'cradle', fire-promoting species expanded into higher rainfall environments, where lightning was less frequent, gradually displacing the Gondwanan rainforest from all but the most fire-sheltered habitats.[15]

The two valuable timber trees, alpine ash E. delegatensis and Australian mountain ash E. regnans, are killed by fire and only regenerate from seed. The same 2003 bushfire that had little impact on forests around Canberra resulted in thousands of hectares of dead ash forests. However, a small amount of ash survived and put out new ash trees as well. There has been some debate as to whether to leave the stands or attempt to harvest the mostly undamaged timber, which is increasingly recognised as a damaging practice.

Appendix E

Experiment 1 Memory Measure (free recall task)

Take a minute to think back about the people you read about. In the spaces provided list as many of each person’s behaviours as possible. Please don't spend longer than 1 minute on each person.

Alex

Jamie

Sam

Reese

Kelly

Charlie

Appendix F

Experiment 1 Recognition Memory Measure (multiple choice task)

Take a minute to think back about the people you read about in the descriptions. Which of the 6 people that you learned about performed each of these behaviours? Please select the name of the person that corresponds to each behaviour.

Alex	Charlie	Jamie	Kelly	Reese	Sam	None

_____ has been successful at motivating students all year.
_____ is employed at one of the top primary schools in Sydney.
_____ has been described by the principal as a talented teacher.
_____ has conquered difficult challenges with enthusiasm.
_____ was awarded an Outstanding Young Teachers Award.
_____ coached the school's basketball team to the final.
_____ checks the mailbox after arriving home from work each day.
_____ favourite television show is on every Tuesday night.
_____ had two psychology papers published in 6 months.
_____ obtained a research position at a top university.
_____ provides support for a colleague who has depression.
_____ works effectively with colleagues.
_____ was invited to be the main speaker at an international conference in Switzerland.
_____ saved enough money to buy a new car.
_____ waits for the bus at the bus stop each morning.
_____ purchased a 12 month subscription to a magazine.
_____ volunteered at a holiday camp for 100 children with disabilities.
_____ made many friends when travelling through Europe.
_____ was offered a job at a leading marketing agency.
_____ successfully navigated a yacht to a number of islands in the Mediterranean Sea.
_____ can afford to fly to Milan due to careful budgeting.
_____ administered first aid to a person involved in a car crash.
_____ wears a digital watch.
_____ drives a white car.
_____ hasn't been able to find a good job.
_____ has had nine unsuccessful job interviews.
_____ has repeatedly fabricated resume details.
_____ gave up looking for a job because it was overwhelming.
_____ partner of 3 years ended their relationship.
_____ constantly argues with other family members.
_____ stores data and files on a mobile phone.
_____ buys groceries at the local supermarket each Thursday.
_____ failed to listen to important instructions.
_____ never assists colleagues when asked for help.
_____ has a credit card debt due to a desire for expensive clothing.
_____ has been warned by a supervisor about having conflicts with colleagues.
_____ took a colleagues work laptop home without their permission.

______ arrives late to work every day.
______ occasionally listens to the radio.
______ gets a haircut each month.
______ treats co-workers very dismissively.
______ once hit a co-worker in anger.
______ driver's licence was suspended due to an outstanding fine.
______ makes no effort to deliver important messages to co-workers.
______ is often rude to customers.
______ loses $200 a week on average in gambling debt.
______ buys the newspaper on the way to work.
______ eats a sandwich for lunch each day.

Appendix G

Experiment 1 Target Evaluations Measure

Take a minute to think back about the people you read about in the descriptions. We would like to ask you about your perceptions of these people. Using the corresponding scale, please rate what you think each person is like on the traits that follow.

Not at all						Very much
1	2	3	4	5	6	7

[*Target name*]

[*Target name*] is: successful
[*Target name*] is: ambitious
[*Target name*] is: bright
[*Target name*] is: argumentative
[*Target name*] is: insecure
[*Target name*] is: skillful
[*Target name*] is: lazy
[*Target name*] is: self-doubting
[*Target name*] is: accomplished
[*Target name*] is: effective
[*Target name*] is: flexible
[*Target name*] is: selfish
[*Target name*] is: career-oriented
[*Target name*] is: a strong leader
[*Target name*] is: incompetent
[*Target name*] is: inferior
[*Target name*] is: capable
[*Target name*] is: inefficient
[*Target name*] is: organised
[*Target name*] is: unintelligent
[*Target name*] is: fearful about future
[*Target name*] is: helpful

Appendix H

Verbal Instructions for Experiment 1, Experiment 2A, Experiment 2B, and Experiment 3

Experiment 1 Verbal Instructions

- "Thanks for coming in. If you have a mobile phone or mp3 player, please turn it off at this time. Just so you know, I'll be reading the instructions so they are exactly the same for everyone who participates.

- Today you will be participating in a study about the effects of distraction on visual and auditory perception. You will be asked to view descriptions that will be presented on the wall and then answer questions about these descriptions, and you will also be asked to complete several questionnaires. This study will be completed firstly by viewing and responding to the projected descriptions and then by answering questions on the computer."

- "Before you begin, I'll have you read over the information sheet and sign two copies of the consent form. One of these copies is yours to keep. Please take as much time as you need to think about participating before signing the consent form."

- "Thanks. Now I'm going to get you started on the study. You will be seated in the chair and you will be facing the wall. You will then read through some information and instructions. You will complete a practice phase and then an experimental phase. To complete each phase you will use a keyboard. On this, there are clearly marked keys that indicate 'positive', 'neutral', and 'negative'.

- Once you finish both phases please let me know and I will the direct you to the laptop. On the laptop, you'll be asked to answer questions about the description and then you will complete several questionnaires about what you read."

- "You'll read some instructions before beginning each questionnaire. It's important that you read these instructions carefully. Please be sure of your answer before you click on it and continue."

- "Many of the questions may seem similar to one another, but there are subtle differences between them, so please read each question carefully before responding to it."

- "If at any time the instructions are unclear or you have any questions, please let me know and I'll be happy to help you. You are free to skip questions you do not want to answer, and you are free to withdraw at any time without penalty."

- "After you've finished the study, let me know so that I can explain what the study was about in more detail. Do you have any questions so far?"

- “Alright, let’s get started.”

DEBRIEF

- “Was there anything about the study that seemed unusual or unexpected?”
- “Was there anything about the study that surprised you?”
- “Do you have any questions about the study?”

Experiment 2A Verbal Instructions

- "Thanks for coming in. If you have a mobile phone or mp3 player, please turn it off at this time. Just so you know, I'll be reading the instructions so they are exactly the same for everyone who participates.

- Today you will be participating in a study about the effects of distraction on visual and auditory perception. You will be asked to view descriptions that will be presented on the wall and then answer questions about these descriptions. This study will be completed firstly by viewing and responding to the projected descriptions and then by answering questions on the laptop."

- "Before you begin, I'll have you read over the information sheet and sign two copies of the consent form. One of these copies is yours to keep. Please take as much time as you need to think about participating before signing the consent form."

- "Thanks. Now I'm going to get you started on the study. You will be seated in this chair and you will be facing the wall. You will then read through some information and instructions. You will complete a practice phase and then an experimental phase. To complete each phase you will respond verbally. The microphone will be placed onto your shirt, close to your mouth and will capture your responses.

- In this experiment a fixation cross will be presented in the centre of the screen, which will then be followed by the presentation of a name and a description. The presentation of a fixation cross followed by a name and description will be repeated throughout this experiment. Each description will be individually presented. Please read each name and description at your own pace.

- Your task is to indicate whether the description is positive, neutral, or negative.

- To indicate that the description is POSITIVE please verbally respond by saying "GOOD"
- To indicate that the description is NEUTRAL please verbally respond by saying "NEUTRAL"
- To indicate that the description is NEGATIVE please verbally respond by saying "BAD"

- First, you will begin by completing a practice phase so you can familiarise yourself with the display and how to respond. And then you will complete the experimental phase.

- Once you finish both phases I will then direct you to the laptop. On the laptop, you'll be asked to answer questions about the descriptions and then you will complete several questionnaires"

- "If at any time the instructions are unclear or you have any questions, please let me know and I'll be happy to help you. You are free to skip questions you do not want to answer, and you are free to withdraw at any time without penalty."

- "After you've finished the study, let me know so that I can explain what the study was about in more detail. Do you have any questions so far?"

- "Alright, let's get started."

DEBRIEF

- "Was there anything about the study that seemed unusual or unexpected?"
- "Was there anything about the study that surprised you?"
- "Do you have any questions about the study?"

Experiment 2B Verbal Instructions

- "Thanks for coming in. If you have a mobile phone or mp3 player, please turn it off at this time. Just so you know, I'll be reading the instructions so they are exactly the same for everyone who participates.
- Today you will be participating in a study about the effects of distraction on visual and auditory perception. You will be asked to view descriptions that will be presented on the wall and then answer questions about these descriptions. This study will be completed firstly by viewing the projected descriptions and then by answering questions on the laptop."
- "Before you begin, I'll have you read over the information sheet and sign two copies of the consent form. One of these copies is yours to keep. Please take as much time as you need to think about participating before signing the consent form."
- "Thanks. Now I'm going to get you started on the study. You will be seated in this chair and you will be facing the wall. You will then read through some information and instructions."
- In this experiment a fixation cross will be presented in the centre of the screen, which will then be followed by the presentation of a name and a description. The presentation of a fixation cross followed by a name and description will be repeated throughout this experiment. Each description will be individually presented. Please read each name and description carefully and at your own pace, so you can form an impression of the person that you read about.
- Each name and description will be presented for a fixed time. Please maintain focus on the name and description for the time it is displayed. You DO NOT have to respond.
- Once you finish viewing the descriptions I will then direct you to the laptop. On the laptop, you'll be asked to answer questions about the descriptions and then you will complete several questionnaires"
- "If at any time the instructions are unclear or you have any questions, please let me know and I'll be happy to help you. You are free to skip questions you do not want to answer, and you are free to withdraw at any time without penalty."
- "After you've finished the study, let me know so that I can explain what the study was about in more detail. Do you have any questions so far?"
- "Alright, let's get started."
- (FILLER TASK) – Okay, just before you go onto the laptop I'll have you complete this task. Past research suggests that impressions of people become solidified after several minutes. Okay, so I'll get you to work through this task for 5 minutes.

DEBRIEF

- "Was there anything about the study that seemed unusual or unexpected?"
- "Was there anything about the study that surprised you?"
- "Do you have any questions about the study?"

Experiment 3 Verbal Instructions

- “Thanks for coming in. If you have a mobile phone or mp3 player, please turn it off at this time. Just so you know, I’ll be reading the instructions so they are exactly the same for everyone who participates.

- Today you will be participating in a study about the effects of distraction on visual perception. You will be asked to complete a computerised task, and you will also be asked to complete several questionnaires.

- “Before you begin, I’ll have you read over the information sheet and sign two copies of the consent form. One of these copies is yours to keep. Please take as much time as you need to think about participating before signing the consent form.”

- “Thanks. Now I’m going to get you started on the study. You will be using this computer. You will first read through some instructions. You will complete a practice phase to familiarise yourself with the task and then you will complete the experimental phase. To complete each phase you will use the keyboard.

- Once you finish both phases please let me know and I will then open the questionnaires for you to complete.”

- You’ll read some instructions before beginning each questionnaire. It’s important that you read these instructions carefully. Please be sure of your answer before you click on it and continue.”

- If at any time the instructions are unclear or you have any questions, please let me know and I’ll be happy to help you. You are free to skip questions you do not want to answer, and you are free to withdraw at any time without penalty.”

- After you’ve finished the study, let me know so that I can explain what the study was about in more detail. Do you have any questions so far?

- “Alright, let’s get started.”

DEBRIEF

- “Was there anything about the study that seemed unusual or unexpected?”
- “Was there anything about the study that surprised you?”
- “Do you have any questions about the study?”

Appendix I

Demographic Information[11]

What is your age (in years)?

What is your gender?

❍ Male
❍ Female

Please indicate your ethnic origin by selecting one of the 10 categories listed below.

❍ Caucasian
❍ East and Southeast Asian (e.g., China, Japan, Korea, Vietnam)
❍ South Asian (e.g., India, Pakistan, Bangladesh, Sri Lanka)
❍ Middle Eastern
❍ African
❍ Latin, Central, and South American
❍ Caribbean
❍ Pacific Islands
❍ Indigenous Australian (i.e., Aboriginal, Torres Strait Islander)
❍ Another Group (please specify): ____________________

Please indicate your current employment status:

❍ not currently employed
❍ casual employment
❍ part-time employment
❍ full-time employment

Please indicate your current student status:

❍ not a student
❍ full-time student
❍ part-time student

Please indicate your highest obtained educational level:

❍ high school
❍ TAFE
❍ tertiary level undergraduate
❍ tertiary level postgraduate
❍ other (please specify): ____________________

[11] These demographic information questions were included in all of the experiments.

Appendix J

Suspicion probe[12]

Is English your native language?

- ❍ Yes
- ❍ No

Answer If Is English your native language? No Is Selected
How long (in years) have you been speaking English?

Answer If Is English your native language? No Is Selected
How would you describe your fluency in the English language?

- ❍ poor
- ❍ 2
- ❍ adequate
- ❍ 4
- ❍ superior

Had you heard anything about the study before today?

- ❍ Yes
- ❍ No

Answer If Had you heard anything about the study before today? Yes Is Selected
What did you hear?

Was there anything about the study that seemed unusual or unexpected?

- ❍ Yes
- ❍ No

Answer If Was there anything about the study that seemed unusual ... Yes Is Selected
What seemed unusual?

Was there anything about the study that surprised you?

- ❍ Yes
- ❍ No

Answer If Was there anything about the study that surprised you? Yes Is Selected
What surprised you?

What do you think this study is about?

[12] These suspicion probe questions were included in all of the experiments.

Appendix K

Pilot Study 2 Instructions and Trait Words

Instructions

You will now read some traits about several recent university graduates. Please rate how positive or negative each of the following traits are on the corresponding scale. At the same time please form an overall impression of each person that you read about.

Extremely Negative				Neutral				Extremely Positive
1	2	3	4	5	6	7	8	9

For the next two questions, we'd like you to consider your overall impression of (*Target name*).

How likeable do you consider (*Target name*)?

not at all likeable			neither likeable nor unlikeable			extremely likeable
1	2	3	4	5	6	7

How much would you like to spend time with (*Target name*)?

not at all			neutral			very much
1	2	3	4	5	6	7

Trait words

Positive Trait Words	Negative Trait Words
determined	inefficient
skillful	irresponsible
practical	incompetent
intelligent	wasteful
persistent	impulsive
industrious	foolish
helpful	pessimistic
sincere	dominating
sociable	moody
tolerant	unpopular
warm	critical
humorous	irritable

Appendix L

Experiment 2A Practice Trait Words and Experiment 2A and Experiment 2B Targets and Trait Words

Experiment 2A Practice Trait Words

Fred Flintstone: silly
Superman: strong
Ronald Weasley: obsessive
Sherlock Holmes: eccentric
Bugs Bunny: witty

Experiment 2A and Experiment 2B Targets and Trait Words

Positive targets

Competent (Alex)	Warm (Jamie)
determined	helpful
skillful	sincere
practical	sociable
intelligent	tolerant
persistent	warm
industrious	humorous

Negative targets

Incompetent (Reese)	Cold (Charlie)
inefficient	pessimistic
irresponsible	dominating
incompetent	moody
wasteful	unpopular
impulsive	critical
foolish	irritable

Appendix M

Word Frequency for Experiment 2A Trait Words

Word frequency norms were obtained from the English Lexicon Project (see Balota et al., 2007).

Competent (Alex)

Trait	Frequency
determined	16292
skillful	494
practical	18212
intelligent	20769
persistent	2736
industrious	193

Warm (Jamie)

Trait	Frequency
helpful	26425
sincere	4659
sociable	231
tolerant	2573
warm	21018
humorous	2866

Incompetent (Reese)

Trait	Frequency
inefficient	2315
irresponsible	3036
incompetent	2224
wasteful	1059
impulsive	282
foolish	5757

Cold (Charlie)

Trait	Frequency
pessimistic	742
dominating	843
moody	1563
unpopular	1496
critical	20425
irritable	364

Appendix N

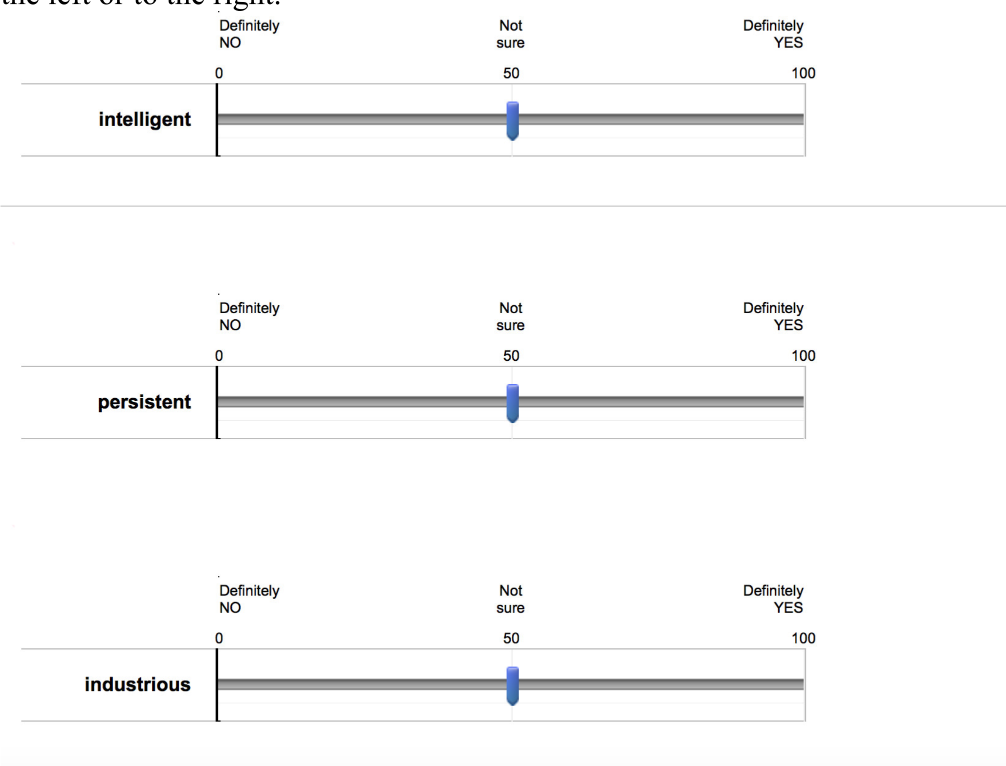
Experiment 2B Memory (free recall) Measure

Take a minute to think back about [*Target name*]. In the space provided list as many of [*Target name*]'s descriptors as possible.

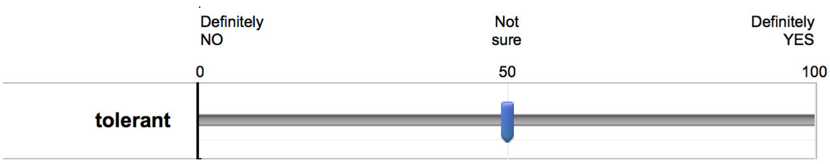
Appendix O

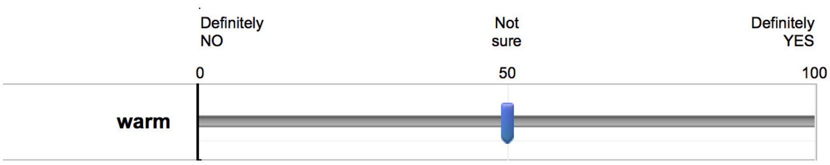
Experiment 2B Recognition Memory Measure

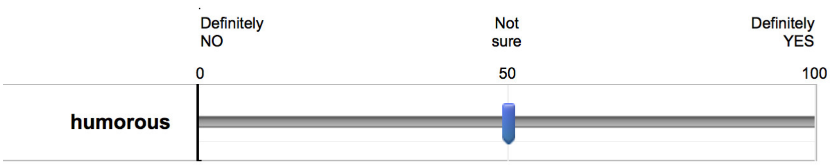
Take a minute to think back about [*Target name*]. Do you remember seeing each of these descriptors earlier? To make your response click your mouse over the blue line and drag it to the left or to the right.[13]



[13] This list of traits appeared for participants who read about Alex or Jamie (i.e., the positive targets). Participants who read about either Reese or Charlie viewed a list that consisted of the 12 negative traits (i.e., incompetent and socially cold traits)


Definitely NO
Not sure
Definitely YES
0
50
100
tolerant

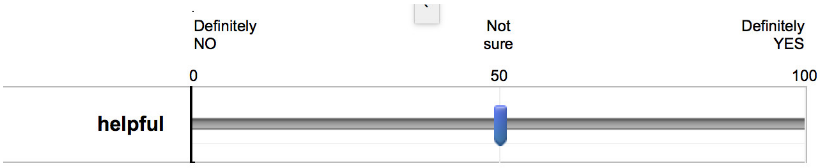

Definitely NO
Not sure
Definitely YES
0
50
100
warm

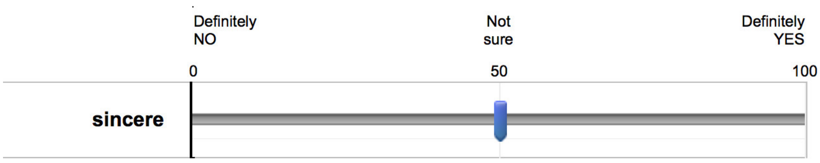

Definitely NO
Not sure
Definitely YES
0
50
100
humorous

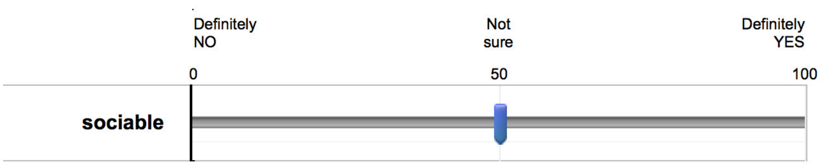

Definitely NO
Not sure
Definitely YES
0
50
100
determined


Definitely NO
Not sure
Definitely YES
0
50
100
skilful


Definitely NO
Not sure
Definitely YES
0
50
100
practical


Definitely NO
Not sure
Definitely YES
0
50
100
helpful


Definitely NO
Not sure
Definitely YES
0
50
100
sincere


Definitely NO
Not sure
Definitely YES
0
50
100
sociable

Appendix P

Experiment 3 Practice Phase Words and Experimental Phase Words

Practice Phase Words

Fail
Calm
Respect
Cheery
Rotten
Brilliant
Boring
Hurtful
Inventive
Stinky
Success
Distress

Experimental Phase Words

Positive Words	Negative Words
active	aimless
agile	argue
ambitious	beggar
baby	bitter
brave	cancer
candy	cheat
champion	clumsy
clean	crime
cordially	critical
devotion	crooked
dream	crude
earnest	cruel
ethical	danger
faith	dead
festival	defeat
garden	delay
generous	devil
genius	diseased
gentle	divorce
gracious	enemy
heaven	fickle
hero	foolish
justice	fraud
kiss	greedy
leisure	hostile
love	insane
loyal	insolent
mature	liar
mercy	mediocre
neat	mosquito
nurse	nasty
polite	neurotic
power	obnoxious
pretty	poison
prompt	pompous
radiant	profane
reliable	rude
righteous	sarcastic
satisfying	shallow
sensible	sloppy
sincere	sour
sleep	spider
studious	steal
sweet	stingy

talented	theft
trust	touchy
truthful	ugly
victory	unfair
wise	vain
witty	vulgar

Appendix Q

Word Frequency for Experiment 3 Words

Word frequency norms were obtained from the English Lexicon Project (see Balota et al., 2007).

Positive words

Word	Frequency
Active	35565
Agile	631
Ambitious	1803
Baby	35810
Brave	5524
Candy	4887
Champion	8243
Clean	36257
Cordially	NA
Devotion	2010
Dream	32423
Earnest	1435
Ethical	5840
Faith	29740
Festival	9122
Garden	11220
Generous	4648
Genius	6437
Gentle	6694
Gracious	1146
Heaven	16257
Hero	15998
Justice	31679
Kiss	12848
Leisure	2555
Love	165830
Loyal	3861
Mature	6245
Mercy	5983
Neat	11901
Nurse	6640
Polite	5981
Power	187656
Pretty	129994
Prompt	14839
Radiant	623
Reliable	16975

Righteous	4143
Satisfying	2767
Sensible	4936
Sincere	4659
Sleep	25606
Studious	114
Sweet	15494
Talented	5612
Trust	29358
Truthful	1203
Victory	11304
Wise	13444
Witty	2411

Negative words

Word	Frequency
Aimless	148
Argue	20857
Beggar	682
Bitter	5910
Cancer	18210
Cheat	6137
Clumsy	1382
Crime	33496
Critical	20425
Crooked	1452
Crude	3351
Cruel	5177
Danger	12703
Dead	72864
Defeat	7657
Delay	13068
Devil	8234
Diseased	464
Divorce	5809
Enemy	16802
Fickle	291
Foolish	5757
Fraud	7665
Greedy	3000
Hostile	4648
Insane	6598
Insolent	118
Liar	6138
Mediocre	2673
Mosquito	812
Nasty	14007
Neurotic	666
Obnoxious	2903
Poison	5095
Pompous	1043
Profane	426
Rude	7346
Sarcastic	2826
Shallow	3761
Sloppy	2425
Sour	2340
Spider	6953

Steal	11268
Stingy	320
Theft	4875
Touchy	810
Ugly	11466
Unfair	6396
Vain	2677
Vulgar	1098