THE IMBALANCED CONSUMER

The effect of physical imbalance on brand recall and construal level

Halldór Örn Engilbertsson
NHH Doctoral Student
Research Fellow
University of South-East Norway

Abstract

The role of physical imbalance in consumer behavior is an understudied topic in consumer psychology. This dissertation investigated the effect of physical imbalance on consumers. In a consumer environment, imbalance can be activated in various ways, such as when consumers struggle to walk on wet floors, icy sidewalks, miss a step, travel, or walk in a virtual space. This dissertation hypothesized that momentary loss of physical balance reduces consumers´ capacity to recall brands from memory. The finding extends research on subjects with balance impairments by testing this proposition with young and healthy consumers. Consumers and practitioners should know whether the number of recalled brands decreases when physical imbalance is experienced. Recognizing that imbalance is a source of cognitive load, consumers and marketers can benefit from understanding whether the remaining capacity becomes subject to limitations. According to Construal level theory, consumers perceive available choice alternatives as more viable when proximal sensations are dominant. This dissertation tested the proposition that imbalance reduces cognitive capacity and demands abrupt proximal action, prompting consumers to prefer low construed proximal choice alternatives. The first study suggested that consumers' find their mental performance to be reduced during imbalance. The study found scant evidence for a decrease in the retrieval of brands from memory among young and healthy consumers. Subsequent studies tested whether imbalance could instigate a preference for low construal choice alternatives. The following two studies highlighted the need to improve study design and measurement. The final study found that imbalanced participants were more likely to choose certain smaller monetary rewards in the present over higher, more uncertain future rewards. The finding suggests a small effect of proximal sensation prompting a preference for lower construed alternatives. A single-paper meta-analysis suggested that the evidence for the proximal sensation of imbalance on psychological distance is weak. Alternative explanations about consumers´ certainty, mood, and self-efficacy were also tested. None of the alternative relationships were significant. The findings from this dissertation contribute to the literature by pinpointing the complexities of physical balance as a symphony of sensory interactions rather than a mere conceptual metaphor. This was the first study in consumer psychology to test the effect of physical imbalance on young and healthy adults as a demanding sensory state. The dissertation demonstrated that measuring the effect of proximal sensation of imbalance requires technical skill and resources. It contributes to consumer psychology by concluding that imbalance does not have a significant effect on the retrieval of brands or preference among young consumers. The study of imbalance will continue to be relevant for consumer research as aging populations are more likely to suffer from imbalance impairments while the use of balance-demanding virtual reality is increasing in popularity.

Foreword

It´s a warm summer day in Oslo. I had just sat down at a newly established café located in an old building. As I started enjoying my coffee, I took a mental picture of this relaxing moment. Some people were chatting while others were busy working on their laptop computers.
I heard the espresso machine now and then overpower the soothing background music. Some customers were ordering while others were heading off to new endeavors. The coffee was lovely. Everything was perfect until a man in a dark blue suit and a white shirt entered.
He made his order, coffee and a slice of cake. I hadn´t really noticed him. What happened next could not go unnoticed. Unlike me, the man wanted to enjoy his coffee at one of the coffee tables outside. He turned from the cash register with his cup of coffee and cake on a plate, heading towards the entrance. What he didn´t notice was the small step just in front of the door. Thinking that his foot would touch the ground at the same height as the other, the unavoidable happened. The man lost his balance, throwing the black coffee on his white shirt. The incident was uncomfortable for us, who could not but notice the distressed man.
I thought to myself, why has the Café not done more to avoid such incidents?
What was an ordinary moment of coffee enjoyment, had suddenly started a year's long study about the consequences of physical imbalance for consumers.
I told my spouse about what I had witnessed. As a physical therapist at a psychiatric ward, she would tell me about her patients who needed better physical balance and how many of them became calmer when their balance was improved. At that moment, I knew that my thesis would be about the understudied subject of physical imbalance for consumers.

Halldór Örn Engilbertsson
Asker February, 2023

Acknowledgments

This dissertation was a highly consuming process that required years of determination, diligence, and sacrifices to maintain equilibrium.

My gratitude and thanks go to Monette, my wife, who supported me in the process. She has coped with me being away from family at inconvenient times and has never given up despite unexpected trials. Thanks to Monette and her work as a psychomotor therapist, I have gained interest in the topic of this dissertation. Thank you for your advice and helpful discussions. I would also like to thank my four daughters, Aurora Marí, Selma Marlen, Magnea Isabell, and Dorothea Anabell, for bringing joy and happiness into my life. You all are my life´s most important inspiration.

Furthermore, I would like to thank my supervisor, Leif Hem, and co-supervisor, Luk Warlop, for their insights, guidance, and interest in my research topic. I am genuinely grateful for your advice. You have formed me academically and made me a better researcher.

I must also thank my colleagues at Kristiania University College and University of South-East Norway (USN). My gratitude goes to the Department of Business and IT at USN (previously Telemark University College) for providing me with financial support and guidance. Lastly, several friends and colleagues provided advice and support during my journey, for which I am very grateful.

Dedication

I dedicate this dissertation to my father, who taught me the true value of balance through his patience and endurance. My wish would have been to share the fruits of this work with him rather than having to say goodbye on the way.

My best friend, girlfriend, wife, and mother of our children, with whom I share everything. Thank you for being the loving person you are.

Table of Contents

List of Figures

List of Tables

Definition of Key Constructs

CONSTRUCT	DEFINITION	REFERENCE
Brand recall	Memory-based retrieval of brands from a certain category of brands	Bettman, 1979; Keller, 1993
Cognitive capacity	A limited amount of cognitive resources allocated to the temporary processing of information, also referred to as working memory.	Cowan, 2010; Baddeley, 1992
Cognitive load	The used amount of working memory resources	Baddeley 1992; Chen, et.al., 2018
Confidence	Recognized patterns generated through recurrent episodes, thoughts, and/or feelings	Simintiras, Yeniaras, Oney, & Bahia, 2014
Consideration set	The set of brands brought to mind on a particular choice occasion	Nedungadi, 1990
Construal Level Theory	A theory that describes individual experiences as interpretable at different levels of psychological distance	Trope & Liberman, 2003, 2010
Distal sensation	Sensory signals that are experienced as being physically distant	Elder, Schlosser, Poor, & Xu, 2017
Imbalance	The inability of the postural control system to resist the external force acting upon the body	Horak & Macpherson, 2011; Pollock et al., 2000
Postural control system	A nervous system that regulates sensory information which can position the body in space and maintain its balance	Lacour, Bernard-Demanze & Dumitrescu, 2008

Proximal sensation	Sensory signals that are experienced as being physically close	Elder, Schlosser, Poor, & Xu, 2017
Psychological distance	Subjective experience about something being close or far away from an individual in the here and now regardless of the actual physical distance	Trope & Liberman, 2003
Self-efficacy	The belief one has in one´s own ability to effectively utilize personal resources to achieve certain outcomes	Stajkovic, 2006
Working memory	The system for temporary maintenance and operation of information with limited retrieval capacity	Baddeley, 1992

The reason we shouldn´t pursue balance is that the magic never happens in the middle; magic happens at the extremes.

Gary Keller - philanthropist and investor

Chapter 1

Introduction

Consumers anticipate physical balance in most consumption situations. In doing so, they rely on vital sensory systems to maintain an upright stance and control bodily movement. However, the balance sensory system's function is tested when consumers lose physical stability. Imbalance becomes a state in which the consumer must concentrate on regaining physical equilibrium so that a fall can be avoided. Sudden imbalance will typically occur on slippery surfaces, for example, wet floors or ice outside an entrance. In other instances, uneven surfaces can trigger an imbalanced state, for example, when walking between stores on cobblestones in an old town center or using stairs and escalators in a shopping mall. Additionally, unstable footwear such as high heels can elicit the sensation of imbalance. Low light conditions, such as in some restaurants and museums, can affect imbalance among consumers. Increased use of virtual reality can be a source of imbalance when the consumer body is immersed - in a virtual environment dissociated from the real visual experience.

Other external sources of imbalance during transportation, like traveling by air, sea, or rail, can create a situation where imbalance is unavoidable. In severe cases, motion results in imbalance as well as the demanding consequence of motion sickness for consumers.

Imbalance is also the consequence of bodily dysfunction. Certain medical conditions, such as inner ear infection, vertigo, stroke, head injury, or dizziness, can easily contribute to the experience of imbalance for longer or shorter periods. Similarly, when alcohol or drugs are consumed, the intoxication will eventually reduce the consumers´ ability to keep balance.

When considering the different sources of imbalance among consumers, age-related imbalance needs to be addressed as well. As populations are aging, more consumers experience imbalance due to impaired sensory and neurological function. Therefore, the study of imbalance among consumers is both appropriate and timely.

This dissertation proposed and tested the proposition that physical imbalance is a source of cognitive load and low construal processing for consumers. The findings suggest that the evidence for the proximal sensation of imbalance having a significant effect on memory-based brand retrieval and construal preference is limited. This introduction briefly explains the background to the study of consumers' imbalance, its objective, and theoretical rationale for the empirical studies.

Background to Physical Balance Effects on Consumer Cognition

Consumers' senses are frequently interpreting stimuli intended to change or reinforce their behaviors, which can be of commercial interest. Whether it is the smell of freshly baked muffins lingering outside of a bakery or the glittery appearance of the latest fashions in a store window, our senses are continually at work. Marketers depend on consumers' senses and their role in cognitive processing. The interpretation of stimuli influences consequent behavior and forms attitudes that may be relevant for future transactions (Krishna, 2012). The mind is capable of simultaneously processing several sensory inputs. Sometimes, these favor commercial interests, while at other times, when senses are more attuned to signs of danger, the stimuli interpretation can negatively affect marketers (Lindstrom, 2005). The smell of vomit, for example, might have a very negative effect on patrons visiting a restaurant. A processed stimulus may have been intentionally placed in the consumers' surroundings to reduce the randomness of such processing. Hence, the focus is on generating a stimulus that produces positive buyer responses and eliminating another stimulus that can reduce the resistance to buy (Hultén, 2011). This dissertation studied the effect of imbalance as a sensory response with potentially negative results. The findings can help consumer researchers develop theory about the effect of physical imbalance on consumers and understand the relevance of construal level theory for consumers.

The consumer psychology literature on sensory marketing specifies five senses (scent, sound, sight, taste and touch) as the major sources of perception, emotions, and cognition (Hultén, 2011; Krishna, 2012). The five senses allow us to experience different stimuli in our environment. These five senses are *exteroceptive*, as opposed to *interoceptive senses* occurring inside the body, such as hunger, respiration, and heartbeat. In sensory marketing, consumer research (Hultén, 2015; Krishna, 2011; Spence et al., 2014) has mainly focused on the primary exteroceptive senses. However, few studies in consumer psychology (Biswas et al., 2019a; Larson & Billeter, 2013; Meyers-Levy et al., 2010) have studied the sensation of imbalance and postural control[1]. This dissertation seeks to contribute to the knowledge of the effect of imbalance as a sensory experience.

Our sense of physical balance is orchestrated for the most part by the proprioceptive and vestibular sensory systems along with the visual system (Pollock et al., 2000). Proprioception refers to the body´s ability to perceive its position in space. The vestibular system within the inner ear contributes to the sense of balance and orientation. Vision is the receiver of the sensory information needed to maintain stability (Massion, 1998). Since these three major sensory systems are involved in physical balance, postural control is unquestionably a complex multisensory system. Its function is to detect changes in a specific orientation and provide sensory information about our overall body position, movement, and acceleration. Any changes in environmental factors, such as light conditions and floor surface but also interoceptive changes such as from alcohol, drugs, muscular fatigue, and ear

[1] Though widely used, no universally accepted definition of physical balance exists. This dissertation conceptualized physical balance as sensory information that allows a person to perceive and take action to avoid a fall (Pollock et al., 2000). On the other hand, physical imbalance is conceptualised as the inability of a person to keep balance, potentially leading to a fall. For many researchers, physical balance is interchangeable with postural control (Horak & Macpherson, 2011). Therefore, in the current study, postural control was associated with the maintenance of a given posture, voluntary movement needed to keep balance, as well as sensory and motor reactions to any external disturbance. Since physical balance encapsulates postural control, the terms are sometimes used interchangeably in this dissertation. The main construct of interest in this study – imbalance - is accordingly defined as the inability of the postural control system to resist the external force acting upon the body and includes the sensation and perception of physical imbalance. Furthermore, I hypothesised that the manipulation of balance produces cognitive effects.

infections, can affect postural control and cause physical imbalance (Berrigan et al., 2006; Horslen & Carpenter, 2011; Kandel et al., 2012; Wade & Jones, 1997).

Most research on physical balance has centered on balance impairments due to medical conditions and the effects of different types of rehabilitation training (Segev-Jacubovski et al., 2011; Woollacott & Shumway-Cook, 2002; Zech et al., 2010). This kind of research has primarily focused on the effect of additional tasks (dual-task) on posture as a measure of body sway (Kalron et al., 2010; N. McNevin et al., 2013; McNevin & Wulf, 2002; Stoffregen et al., 2000) and only to a limited degree on cognitive performance during dual tasks (Barra et al., 2006; Gobbo et al., 2013; Rankin et al., 2000; Shumway-Cook et al., 1988). Literature on the effects of physical imbalance on cognitive processing, such as consumer choice and preference during the dual-task, is limited (Larson & Billeter, 2013). However, consumer psychology studies have demonstrated that one or more sensory stimuli can shape cognitive processing, such as product evaluation (Krishna et al., 2017; Meyers-Levy et al., 2010; Spence et al., 2014). Since this body of research has largely excluded imbalance and the postural control system, more research is needed on physical balance in the consumer preference and choice context. This dissertation seeks to fill this gap in the consumer psychology literature. A few studies (Biswas et al., 2019a; Larson & Billeter, 2013; Meyers-Levy et al., 2010) have demonstrated the influence of sensorimotor experiences on consumer behavioral outcomes, although they were limited to smaller movements of limbs and head. These studies tend to be context-sensitive and open to multiple interpretations (Krishna et al., 2017).

The postural control system is a vast source of sensory information that consumers process with varying degrees of conscious awareness (Shumway-Cook & Woollacott, 2000). The senses involved in keeping a relaxed, balanced upright stance require few attentional resources, and the sensation may go unnoticed. On the other hand, when actively avoiding a fall, the sensory systems involved in balance demand considerable cognitive resources to make sense of sensory signals and avoid a fall (Shumway-Cook et al., 1988). The postural control system is continuously alert, even though healthy individuals seldom pay attention to it. However, it has the potential to spontaneously require attentional resources and interfere with any other task we are doing (Horak, 2006). This system is the subject of this dissertation. Due to its multisensory complexities, measuring the effects of physical imbalance on consumers was challenging. Prior consumer psychology research has not embarked on that challenge.

Hypothetically, a shopper walking on an icy sidewalk may experience imbalance, causing abstruse sensory signals that influence cognitive processing (Balasubramaniam & Wing, 2002; Brauer et al., 2001; Rankin et al., 2000; Teasdale & Simoneau, 2001). The processing of imbalance in this case would require cognitive capacity which otherwise would be available for the consumer. Remembering is a cognitive task needed in decision making and choosing between alternatives. The alternatives that do not come to mind will not be considered in their attributes and benefits. Typically, imbalance occurs when consumers are "on the move" and engaging in memory-based decision making. Since imbalance demands cognitive capacity, consumers may be less able to attend to marketing information and recall the available choice alternatives. Their preference for choice alternatives may change when less alternatives can be retrieved from memory. Similarly, imbalance may influence senior consumers as they try to find their way around escalators and flights of stairs. The balancing system may momentarily interrupt a state of mind, potentially influencing consumers' preference. Virtual reality (VR) is another example of a context that can affect physical balance. Virtual shopping environments are unfamiliar to our balancing system and may affect our movements and perceptions of our surroundings. VR may ultimately influence consumer preference and choice, which marketers must consider when designing virtual shopping spaces.

This dissertation explored the effects of our balancing system on consumers' capacity to recall brands and choose proximal vs. distant alternatives. Effects of imbalance were tested empirically according to cognitive theories on capacity and level of construal processing. The following section explains the objective of the dissertation in more detail.

Objective

The consumer psychology literature on the effect of imbalance on consumers is lacking (Larson & Billeter, 2013). This dissertation aimed to extend the knowledge of the physical imbalance in consumer psychology by exploring how imbalance influences consumers' cognitive capacity relating to brand recall and construal processing. Knowledge of the effects of imbalance as a situational constraint on consumer preference and choice is limited (Biswas et al., 2019a). This dissertation sought to fill this gap, and, to some extent, help answer questions, such as, "Will consumers make different choices because they struggle to walk on wet shopping floors, slippery sidewalks or miss a step leading to a near fall? Alternatively, do virtual shopping spaces cause consumers to retrieve less information from memory?"

Without a careful study of physical balance, including the postural control system responsible for the sensation of imbalance, researchers know little about the influence of imbalance on consumers. Such knowledge can potentially result in better-informed consumers and better-designed consumer environments. In consumer research, the sensory stimulus focuses on five primary senses. Other senses, like postural control, are seldom the subject of study. Relevant studies on physical balance have been conducted in the context of physical health and impairments (Segev-Jacubovski et al., 2011). These studies have not focused on the cognitive outcomes of imbalance without relating to consumer situations.

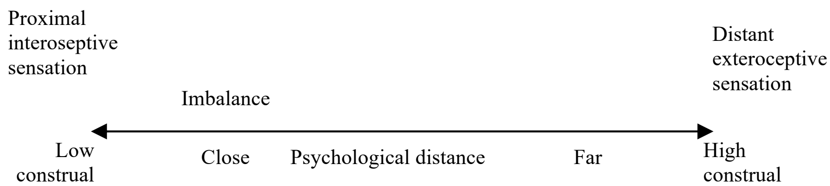
Physical imbalance can be straining, as we need to focus on our body placement and sensory signals that use some of our mental resources. Therefore, cognitive capacity may be reduced, affecting consumers' recall of relevant brands. In addition to reduced capacity, the brain also tries to make the most from the available capacity by applying processing rules to simplify the situation, such as choosing familiar alternatives that require less cognitive effort than unfamiliar alternatives that require more mental effort (Korteling et al., 2018; Pohl et al., 2013).

Construal level theory (CLT) is relevant for physical balance and reduced cognitive capacity. CLT suggests that experiences may be interpreted at different levels of psychological distance (Trope & Liberman, 2003). Psychological distance is the subjective experience of something being close or far away regardless of distance. Consumers may experience thoughts that are in the future. Yet, a person´s reference point is the self here and now. The further detached an event is from the current experience, the higher (more abstract) the level of construal of the event is. Since imbalance requires cognitive resources (Rankin et al., 2000) to focus on the here and now, it may also serve as a cognitive preference for concrete and present benefits (Körner et al., 2015; Trope & Liberman, 2010b).

The changes in the level of construal processing can alter the perception of an event or object. Researchers have argued that high construal processing decreases present bias, resulting in less impatience compared to participants primed with concrete low construal (Pham et al., 2011). Furthermore, CLT suggests that our senses can have proximal or distal features that affect how we experience the directness and proximity of a stimulus (Trope and Liberman, 2010). A person´s present experience of the here and now can be experienced directly. However, their special distance may be mapped according to their typical physical distance required for perception. The closer sensory signals are to an experience, the shorter the perceived psychological distance during the evaluation of the environment. Interoceptive sensations, such as proprioception, are close sensations and therefore mapped at the beginning of a sensory spectrum whereas sight and hearing are at the exteroceptive end (Figure 1). Just as taste is associated with greater physiological proximity than hearing, the conscious sensation of imbalance is believed to result in a lower psychological distance compared to a relaxed, less conscious stable stance. Degrees of physical balance allows us to identify proximal psychological distance when our balancing system is preoccupied with controlling imbalance (low construal) as compared to relaxed stable stance where interoseption is less dominant.

Figure 1

The Relationship Between Imbalance Sensation and Psychological Distance



This dissertation aimed to extend the current knowledge by testing and analyzing the relationship between physical imbalance and consumer preference according to theory on cognitive capacity and construal level. Can the strain of imbalance influence our construal level so that consumer preference can be altered? According to Elder et al. (2017), more proximal sensory signals will be construed as psychologically close when evaluating events and products. This assumption was tested concerning the sense of physical imbalance in this dissertation. From a marketing perspective, imbalance experiences can be relevant because they force attentional resources on the body (Remaud et al., 2013). Doing so may disrupt abstract thinking and reduce attentiveness to long-term goals (Elder et al., 2017). This dissertation addressed this knowledge gap and attempted to explain mechanisms that unfold in empirical findings. The challenge was the limited empirical evidence for the relationship between imbalance and cognitive processing to be found in the consumer psychology literature. This relationship and the conceptual framework are graphically illustrated in Chapter 2.

Research Questions About Physical Balance

This dissertation explored the effect of physical imbalance on consumers from the perspective of cognitive load and construal level theory (CLT). *Cognitive load* refers to the amount of available cognitive resources a consumer has at a given moment (Baddeley, 1992; Chen et al., 2018). Available cognitive resources can be diminished with increased sensory load caused by imbalance. Therefore, the quantity of available cognition can be reduced during imbalance, and the remaining capacity will be constrained. Furthermore, these restraints can have qualitative effects on available capacity when consumers need to apply cognitive processing, such as recalling brands or making a choice. In that case, the consumer needs to filter information for further processing while actively delegating resources to tasks and controlling for possible distractions (Broadbent, 1958; Lachter et al., 2004). Evidence suggests that the construal of a given situation can influence cognitive outcomes under capacity constraints. When consumers interpret a situation as close and concrete, their visual filtering is impaired (Hadar et al., 2019), and cognitive load further increases spontaneous judgments instead of deeper reflection (Körner & Volk, 2014) when the situation is considered to be close.

Construal level theory holds that psychological distance predicts the value of a future object or event as a function of time delay (Trope & Liberman, 2003; Trope & Liberman, 2010; Wakslak et al., 2007). The time delay for experiencing the event or receiving the object increases or decreases the option's attractiveness. According to Construal Level Theory (CLT), thinking more concretely is a low-level construal, emphasizing greater psychological proximity. Sensory signals can steer a person´s thought towards the proximal sensation that may alert you about a headache, hunger, or imbalance. At low levels of construal processing, people's cognition is focused on the present, peripheral, and secondary features of a stimulus, as opposed to the greater overall grasp of the situation gained during high levels of construal processing (Fiedler, 2007). The proposition is that physical imbalance reduces cognitive capacity and shortens the psychological distance.

Previous studies have shown a relationship between imbalance and cognitive control (also referred to as executive function)[2], particularly among older people (Hamacher et al., 2015; Mirelman et al., 2012; Segev-Jacubovski et al., 2011). These findings suggest that sensory systems for balance share limited resources with other motor activities and require separate cognitive processes (Lacour et al., 2008; Siu & Woollacott, 2007). The cognitive consequences of such interference on consumers' cognition are unknown. Such cognitive simplifications can be detected and transferred to consumer preferences within the CLT framework (Hansen & Melzner, 2014; Khan et al., 2011; Wan & Rucker, 2013). For example, Wan and Rucher (2013) demonstrated a relationship between construal level and confidence, revealing that marketing information framed with low construal is considered less relevant when consumer confidence is low. CLT is also well suited to explore the relationship between control of physical balance and cognitive processing. For example, Elder et al. (2017) demonstrated that proximal sensations (touch and taste) are psychologically closer than more distant sensations (hearing and sight), which has consequences for product evaluations and

[2] According to Segev-Jacubovski (2011), executive function (EF) refers to higher order cognitive processes that are necessary for cognitive control of behaviour. These processes control, integrate, organizes, and maintain cognitive abilities. Executive function can be divided into subdomains, such as task planning, problem-solving, sensory integration, judgment, and attention manipulation. Neuroimaging has shown the brain network associated with EF is also related to specific gait features. Furthermore, research has found that reduced executive function correlates negatively with the risk of falls in older individuals and that improvements in EF carry over to reduced fall risk. In the case of physical balance impairment, it is worth noting that training in cognitive processing improves physical stability but even more so when balance and cognitive processing are trained simultaneously (or dual-task intervention). These results and other relevant findings on the relationship between physical balance and cognition are discussed in Chapter 2.1.

interest. Four research questions were derived from the research gap in the field. The arguments behind these questions are described in more detail in Chapter 2 and briefly introduced in the following paragraphs.

RQ 1: How does physical imbalance as a source of cognitive load affect consumers' cognitive capacity?

The *first* and major research question addresses the potential effect of momentary imbalance on cognitive capacity reduction. When consumers experience imbalance, they must use part of their available cognitive capacity to regain balance, which will leave less capacity available to recall brands and process relevant marketing information (Kahnemann, 1973). It is well known that cognitive load reduces the ability to process information, and the first research question seeks to test the claim in the untested field of imbalance and consumer psychology.

RQ 2: How does physical imbalance alter construal levels in the domain of consumer preference?

The *second* research question addresses a possible relationship between physical balance and construal level. When an imbalance occurs, attentional resources will be allotted to highly proximal sensory information (Horak & Macpherson, 2011, p. 943). Cognitive processing might be of lower construal during the processing of those proximal sensory signals (Hadar et al., 2019). In that case, as a strategy to overcome or compensate for the ambiguousness of the sensory experience, cognitive processing will filter away information that does not pertain to proximal outcomes (Trope & Liberman, 2010). Trope and Liberman (2010) suggested that there may be a brain system that maps onto a "distance axis," which is associated with the degree of abstraction (distant) and action (near). As imbalance relies more on interoceptive sensations (proprioception and vestibular sensation), a positive relationship between low construal and imbalance is expected. Hence, an imbalanced condition could facilitate low construal, making closer psychological thoughts more prominent as sensory experiences become more proximal (Elder et al., 2017). The closer sensory signals are sensed, the shorter the psychological distance perceived during the environment's evaluation. Just as taste is associated with greater physiological proximity than hearing, the conscious sensation of imbalance is postulated to result in a lower psychological distance rather than a perfectly stable stance. Research findings have shown that proximity is induced when the smell is added to visual advertising (Ruzeviciute et al., 2020)

RQ 3: What is the subsequent effect of physical imbalance on construal levels for consumer preference?

The *third* research question concerns the duration of the construal processing effect triggered by physical imbalance. Can imbalance influence preference and choice in a subsequent cognitive task? This effect depends on the duration of the construal level effect. When exploring the potential relationship between cognition and physical balance, the physical limitations of imbalance should also be viewed as a boundary effect of imbalance manipulation. The effort needed to maintain balance varies across individuals, and the experience of imbalance does not have the same threshold for everyone. Attempts to stimulate imbalance must, therefore, consider the dynamics of the individual experience and its effect. The effect may fade away quickly or have consequences beyond the time frame within which the imbalance signals are being processed. Construal Level Theory proposes a relationship between proximal versus distal senses and the construal level of psychological distance. This association plausibly occurs during simultaneous sensory activation and decision-making; however, counterevidence supports consecutive effects. Scarpa et al. (2011) demonstrated that less than one hour of posture correction exercise has a consecutive effect on women´s attitudes towards their body image. Furthermore, Briñol et al. (2009) showed that a body posture task (chest out vs. back curved) could influence self-evaluations when measured in a subsequent task. Since a stable stance is a form of body posture, it is necessary to consider the attenuation of construal effects.

RQ 4: How does self-efficacy interact with the relationship between the physical balance, capacity, and construal levels in the domain of consumer preference?

The fourth and last research question acknowledges that other physiological and psychological abilities can moderate the cognitive effects of physical imbalance. These abilities must be accounted for, as they can influence the relationship between imbalance and cognition in a consumer setting. As an example, research has found that exercise can improve self-esteem in young adults (Ekeland et al., 2005) and that physical activity (work, sports, and leisure) can improve balance in healthy men (Cyma et al., 2018) and prevent falls in the elderly (Skelton, 2001). Self-efficacy is the belief one has in one´s ability to effectively utilize physical or cognitive resources to achieve certain outcomes (Stajkovic, 2006). Therefore, it is necessary to examine whether self-efficacy moderates consumers' cognitive outcomes during imbalance. Because the literature has frequently shown that cognitive effects are induced in the context of individuals´ existing traits (Sirgy, 1982), such interactions are expected to be evaluated as appropriate. More specifically, the premise of the Construal Level Theory is that people´s construal starts with themselves (Trope & Liberman, 2003). The shortest psychological distance is to our own physical experience here and now. Therefore, physical balance may be associated with one´s belief about own ability to perform. It is proposed that the moderating effect of self-efficacy can be found at two levels, as context specific belief in one´s fitness and as a genialized personal trait.

The proposed research questions were assessed in four consecutive studies. *RQ 1* was addressed by testing imbalance as a cognitive load affecting cognitive performance when attentional resources must be directed to a volatile bodily state. The effect of imbalance on cognitive processing was studied after testing its effect on cognitive load addressed in *RQ 1*.

In *RQ 2,* the degree of physical imbalance was tested as a source of concrete construal when proximal sensation reduced psychological distance. To follow up on *RQ 2*, another study was designed to emphasize physical imbalance as a demanding physical condition and construal outcomes were limited to one momentary and one consecutive task (*RQ 3*). To further explore the findings from the first three studies, the fourth study was conducted to expand on the results from *RQ 3*. Study 4 incorporated measures that could further explain the effect of physical balance on the interaction of construal levels with self-efficacy (*RQ 4*). The last study also provides insights into future research areas. Subsequent chapters on each study discuss hypotheses and choice of measurement constructs in more detail.

Intended Contribution

Answering the four research questions outlined in the previous section will contribute theoretically and empirically to consumer psychology. Thus far, imbalance and lack of postural control have received limited attention in consumer psychology (Biswas et al., 2019a). This dissertation offers empirical findings that can further develop theory in consumer psychology. Physical balance is a proximal multisensory process when proprioceptive-, vestibular- and visual- systems together contribute to stability and the avoidance of imbalance. More knowledge about how sensory systems, like imbalance, affects capacity and cognitive processing is needed to further enhance theory. More precisely, the intention is to better understand how multisensory processing as a proximal experience can contribute to increased cognitive load and contiguous construal. This knowledge will also help consumers and marketers understand the significance of imbalance and its effects. Hence, the marketer will be better informed about the degree to which consumer environments need to be adapted to prevent physical imbalance. Since sensory signals are so often subtly integrated into our shopping experiences, it is of value for marketers to know what to expect. The implications of the dissertation findings are discussed in Chapter 7.

Overview of the Dissertation

This dissertation is organized into seven chapters. Chapter 1 introduced the thesis objective and four research questions to be answered.

Chapter 2 is subdivided into five sections that present an overview of theoretical perspectives relevant to the phenomenon addressed by the research questions. First, sensory marketing is reviewed as a theoretical perspective that explains sensory stimuli' processing mechanisms and effects on consumer experiences. The review of sensory marketing is followed by a discussion of physical balance as a sensory organ that controls consumers´ physical balance and its relationship with cognitive processing. Before presenting a framework for cognitive outcomes, an overview of prior research connecting physical balance to cognitive outcomes is reviewed.

Finally, Chapter 2 reviews the Construal level theory (CLT) as the best-suited theory to explore the cognitive effects of physical balance during cognitive constraints. Drawing on the literature review of the CLT framework, the imbalance is suggested to have cognitive effects. Throughout the dissertation, hypotheses were tested based on the theoretical model of physical balance as a source of low construal processing. Chapter 2 highlights the connections between the theoretical framework, the research questions, and the hypotheses to be examined.

Chapters 3-6 present four experimental studies that tested the relationship between imbalance, cognitive capacity, and construal level. Each of the four chapters presents the empirical findings, starting by outlining hypotheses derived from the proposed research questions from the literature review. A description of methodological choices and study design follows the hypotheses. Main and moderating effects are discussed, followed by an analysis and discussion of the empirical findings.

In Chapter 7, the findings of the studies are compiled, and their theoretical and managerial contributions are evaluated. Finally, the chapter addresses the limitations of the studies and avenues for further research on the consequences of physical imbalance for consumer preference and decision-making.

Chapter 2

Conceptual Framework

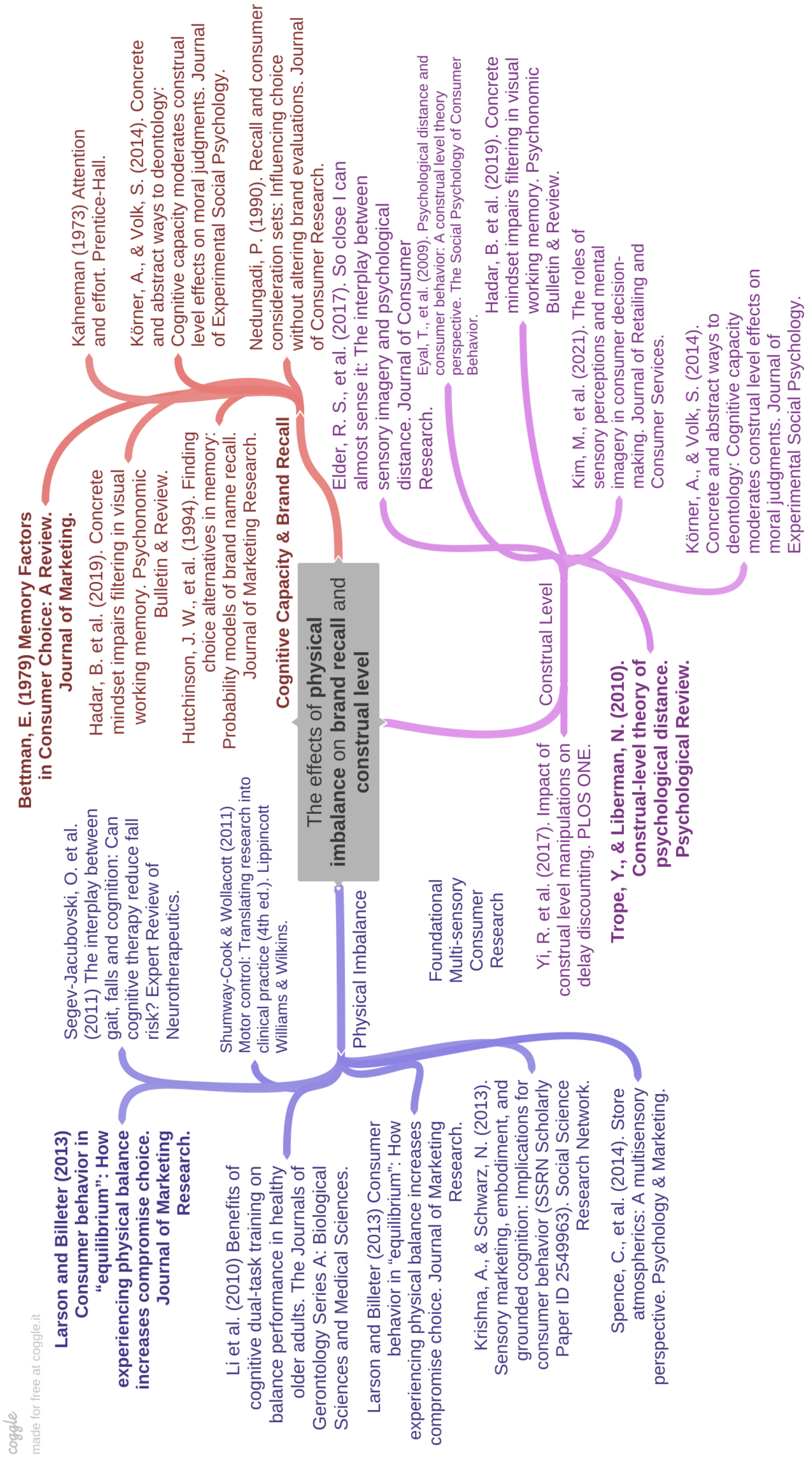
This dissertation aimed to explore the effect of physical imbalance on consumer preference and empirically test the effect of imbalance on cognitive capacity and construal level as it relates to consumer psychology. Chapter 2 presents the literature review that serves as the foundation for this dissertation. This chapter outlines the theoretical domains of the four research questions and the measurement of relevant concepts presented in Chapter 1 and summarized in Chapter 2.

A sensation is a conscious experience when a stimulus affects receptor cells of a sensory organ so that it can be cognitively perceived (Krishna, 2012, Meyers-Levy, et al., 2010). Since physical balance is also considered a sensation, it is necessary to provide an overview of prior research in consumer psychology that focuses on consumers´ sensations as a multisensory experience. A definition of postural control follows the review of multisensory marketing as a sensory system for physical balance. After introducing postural control, an in-depth discussion of the relationship between postural control and cognitive load is presented. Lastly, the construal level theory is reviewed as the theory best suited for exploring the cognitive effects of balance control and imbalance. Based on a conceptual outline, the imbalance is proposed to affect cognitive outcomes within the framework of cognitive capacity and the Construal Level Theory. In the following studies, hypotheses were tested with a theoretical argument suggesting that the sensation of physical imbalance is a source of construal evidence.

The knowledge obtained from the extant literature provides a well-rounded understanding of the many facets of the conceptual framework. It also provides the basis for the specific research questions presented in Chapter 1. This literature review references scholarly resources from international databases and Norwegian libraries. The sources provide confidence about the quality and credibility of the information obtained to conduct this research study.

The literature map illustrated in Figure 2 provides a snapshot of the key articles referenced in support of the conceptual framework of this dissertation. The literature map gives a simple overview of significant research, establishing the basis of the dissertation's research questions and empirical tests.

Figure 2 The Literature Review Map



The left side lists four primary references about imbalance as the subject of study in the thesis. Since imbalance is a sensory phenomenon and the context of this dissertation is the consumer, three references are included in the map which addresses the role of multi-sensory experiences for consumers. The Larson and Billeter (2013) article is listed both as foundational multi-sensory consumer research and as a reference about imbalance since it addresses both the aspect of physical imbalance and the multi-sensory consequences it can have for consumers. On the right-hand side, central references about the dependent variables are listed. Research about brand recall stems from earlier consumer research about cognitive capacity. Therefore, articles about cognitive capacity and brand recall are presented together. Lastly, seven main articles about construal level are listed. Three of the articles (Elder et al., 2017; Hadar et al., 2019; Kim et al., 2021) deal specifically with the relationship between sensory stimuli and construal level effects. The first and the last of these references are found in the consumer research literature. The Hadar et al. (2019) and Körner & Volk (2014) articles appear in both lists of dependent variables as they, like this dissertation, study the relationship between cognitive capacity and construal level.

Consumer research is a synthesis of different sciences. It blends relevant information to help explain the behavior of consumers. For this dissertation, it was essential to reference relevant research from psychology and physiology to emphasize the nature of imbalance and cognitive effects. Relying strictly on consumer research literature would have been insufficient to adequality explain the context of the thesis.

Multisensory Consumer Research

A debate about the number of human senses that exist is ongoing. As stated in Chapter 1, the many senses are frequently categorized as either exteroceptive or interoceptive (Goldstein, 2008). The first category contains senses that perceive the body's state, position, and motion. They include the traditional five senses (taste, touch, smell, hearing, and sight) as well as thermoception (temperature), nociception (pain), equilibrioception (balance), and proprioception (position and movement of body parts) (Damasio & Carvalho, 2013). The interoceptive senses perceive sensations in the internal organs, such as hunger, hirst, urinal urge, swallowing, and balance (Craig, 2003). These sensations frequently relate to consumer needs, such as decisions to buy food and drink and maintain balance when startled by e.g. unexpected displays, floor graphics, announcements and other promotional tactics. The categorization underscores the diversity and scope of sensory information involved in human perception. A neurological process organizes inputs from multiple sensory modalities into functional outputs, such as when vision guides other sensory organs to regain balance (Stein et al., 2009; Stein & Rowland, 2011). This classification is noteworthy since it affects the definition of sensory marketing (e.g., how sight affects taste perceptions). It is believed that multisensory integration is necessary for nearly all our pursuits due to the complementary effect of integrating sensory information from different modalities to better understand the physical world. In odd cases, our perceptions do not match the available sensory information. These instances are sensory illusions or misrepresentations caused by the limited sensory information available to solve the puzzle (Bressler & Menon, 2010; Harrison et al., 2008; Macaluso & Driver, 2005). The brain usually safeguards itself by interpreting sensory information from more than one modality in a simultaneous process. The theoretical consequence of marketing focused on the effect of sensation is that the integrative nature of sensory information processing should be considered. This chapter discusses physical balance, which relies on integrating several sensory signals. Therefore, it should be regarded as a multi-modal sense.

While researchers (Hultén, 2011; Krishna, 2012) like to isolate measured effects from specific sensory stimuli, it is important to consider that such outcomes may be difficult to attribute to a single modality. Those who have studied sensory marketing acknowledge that sensory experiences are multi-modal, involving interaction between one or more senses that become cross-modal correspondences (Hultén, 2015; Krishna, 2011). In other words, consumers perception of the environment depends on combining and integrating several sensory stimulations, including sensory inputs that go beyond the five major senses. However, Hultén (2011) and Krishna (2012) struggled to fully address the synergies and role of cross-modal multisensory processing in consumer behavior. Therefore, Spence et al. (2014) emphasized the opportunities for sensory marketing when senses are considered to operate in concert. In terms of physical balance, the sense of imbalance is the accumulative reaction of sensory stimuli from several senses (Shumway-Cook & Woollacott, 2000). For instance, Larson and Billeter (2013) explored the relationship between the sense of balance and consumer compromise choice. They considered the sense of balance as one modality rather than multi-modal. Biswas et al. (2019) studied multimodal effects of the sense of balance and other senses, testing the interaction between taste perception and standing versus sitting posture. Furthermore, Spence et al. (2014) studied the relationship between the five senses in multi-modal sensory marketing.

Multi-Modal Sensory Marketing

While much of the research in sensory marketing has focused on a single specific sensory input, evidence supports a multimodal process involved in the perception of a given stimulus (Barsalou, 2008, 2010; Krishna & Schwarz, 2013). Consumer research in sensory marketing has predominantly focused on cognitive effects derived from sensory triggers of the traditionally categorized five senses. Prior consumer research (Hultén, 2011; Krishna et al., 2017) has studied other senses and sensory information involved in physical balance (such as equilibrioception and proprioception). The effects of physical balance on consumers cognitive capacity and choice are underexplored in consumer research. While Larson and

Billiter (2013) showed that balance as an embodied metaphor increases compromise choices, this dissertation proposed that imbalance is not just a metaphor but also a cognitive load, decreasing the capacity recall information and make choices. The challenge is that some sensory experiences, such as balance control, integrate vestibular, visual, haptic and proprioceptive modalities (Horak & Macpherson, 2011). Therefore, the total combined effect of balance sensation should be measured first before studying the effect of every contributing modality.

While research interest in sensory marketing has been increasing over the last two decades, grounded cognition has become a dominant theory to explain the relationship between body and cognition. Grounded cognition (also called embodiment) proposes that many features of cognition are grounded in both the body and the brain rather than the brain alone (Glenberg, 2015).

According to established conceptual metaphors, a stream of grounded cognition research pinpoints the effects of sensory experiences in one domain on cognition in another domain. These metaphors become a unique driver of observed effects so that our thinking about the concept of *purpose* is also grounded in the concept of *destination* and our experience of moving through space (Anderson, 2008; Krishna & Schwarz, 2013; Lakoff, 2014; Lakoff & Johnson, 1980). The metaphoric findings have been inconsistent with the previously dominant information-processing paradigm, a framework that assumes that people acquire information through their senses which is then unified into a single experience. According to the framework, the neurological processes of encoding, storage, and retrieval are the building blocks of knowledge or semantic memory (Krishna & Schwarz, 2013).

The above discussion of the theoretical developments in multi-modal research and cognitive psychology implies that sensory marketing can progress in parallel with a vibrant body of research from different disciplines. A common theoretical framework for newer empirical findings is yet to emerge. In this growing field of research, studies in sensory marketing are active contributors to developing a new definition and scope of sensory influence on cognition. The empirical evidence for sensory information affecting perception, action, cognition and emotion is overwhelming and bound to have widespread consequences for standard models of judgment and decision-making (Krishna & Schwarz, 2013).

The complexity and uncertainties about the mechanisms by which sensory systems operate have hindered empirical data collection. Even though the number of marketing sensory studies is increasing, many questions remain unanswered when explaining the effects and nature of sensory triggers on consumers' behavior. When considering multisensory experiences, the issue of overload emerges as an adverse effect of sensation, causing some burden (overload) on sensory signal processing. In those cases, a sensation becomes overpowering, disrupting cognitive processing. This phenomenon is relevant to studying imbalance as a source of cognitive load in consumer psychology. In the following section, the question of sensory overload is addressed.

Sensory Overload and The Sense of Balance

Sensory overload can be considered an overpowering sensory state resulting in any niceties of the experience being entirely suppressed (Krishna, 2012). The effect of such sensory overload on cognition and consumers' behaviors requires further research. Krishna's (2012) suggestions for research on overload in sensory marketing are conceptually intriguing for the domain of balance control research. Imbalance is a bodily state that requires intense activation of sensory modalities that constitute the total sensation (Biswas et al., 2019a; Goldstein, 2008). The experience may vary in time and intensity and potentially lead to sensory overload, with undetermined cognitive capacity and processing effects. This dissertation explored the effect of imbalance on cognitive capacity and construal processing in consumer psychology. To address research on the cognitive effects of balance, it is first necessary to deepen our understanding of balance as a sensory system responsible for the control and sensation of balance or the lack thereof. Specifically, it is important to review empirical findings that can broaden the reader´s understanding of the relationship between the sense of balance, cognitive capacity, and processing. The next section discusses empirical findings on physical balance and relates them to a feasible theoretical framework for cognitive capacity and processing.

Physical Balance: What Is It and How Does It Work?

For many people, physical balance is a normal condition. While infants struggle with balance, it quickly becomes a routine. Consumers seldom think consciously about the ability to control their posture until something disturbs it like a slipper store floor. In those instances, we momentarily become aware of the uncontrolled state of our body until we regain balance and become more conscious of our balancing system (Carpenter, 2006). In other instances, sickness or injuries can cause long-lasting or permanent damage to the system that regulates sensory information involved in balance, also called the postural control system (Horak, 2006). The system can often compensate for its dysfunction, for example, with greater application of visual or vestibular information, while in other cases, people develop permanent locomotor disabilities. Though the postural control system may appear to have a relatively simple function, it is safe to say that its mechanisms are quite complex.

According to Lacour et al. (2008), the postural control system manages *vestibular* (sensory system in the inner ear), *visual*, *proprioceptive* (sensory organs in muscles and joints), and *somatosensory* or *tactile* (senses of touch) information from the body to position it in space (kinaesthesia) and maintain balance. Its function is to secure posture against gravity so that balance is maintained and to create internal representations of the body with respect to the external world (Horak, 2006). These functions depend on two major mechanisms referred to as *compensatory* and *anticipatory*. The compensatory mechanism is activated by sensory events when desirable posture is lost. Unlike the reactive function of the compensatory mechanism, the anticipatory mechanism predicts balance disturbances and responds to these predictions with pre-programmed adjustments to the musculoskeletal system (Shumway-Cook & Wollacott, 2011). Therefore, the postural control system facilitates a complex motor skill that allows consumers to control their balance by integrating multisensory feedback with responses, resulting in compensatory reflexive movements (Cobb, 1999). This control is like stepping on a moving belt or an escalator that unexpectedly stops moving.

The proprioceptive system is possibly the most mysterious one of the four major sensory systems involved in postural control. It is sometimes even referred to as the *sixth sense* because proprioception allows us to sense the position and movement of our limbs and trunk independently of other sensory systems (Proske & Gandevia, 2012). Proprioception is the sense of one´s body parts relative to the environment and the effort needed for movement. The brain is responsible for interpreting and integrating proprioceptive information with other sensory signals. Vision, for example, helps consumers plan movement ahead of time, and proprioception carries out the movement; in darkness, our movements are entirely dependent upon proprioception. Thus, proprioception gives us a sense of an embodied self, yet it can be subject to illusion; for example, we may believe under certain circumstances that a rubber hand is our own (Costantini & Haggard, 2007). Evidence suggests that proprioception plays a vital role in postural control (Grey, 2001; Proske & Gandevia, 2012). With proprioception and vestibular function, vision plays a significant role in keeping balance. When vision is isolated from the proprioceptive and vestibular systems, it is the most significant contributor to balance, playing a more prominent role than the other two intrinsic mechanisms. However, the visual system depends on the other systems for optimal balance function since it is a vital part of a feedback loop that the brain uses to detect body movement in the environment (Hansson et al., 2010; Wade & Jones, 1997). The interaction between proprioception, the vestibular system, and vision further explains the multi-modal nature of balance, as previously discussed in this chapter.

The somatosensory system, also known as tactile perception, is likewise involved in keeping balance when neural receptors register haptic and proprioceptive information. Standing on a cushion or any other sponge-like surface will reduce somatosensory stimuli, increasing imbalance. Tactile perception is highly automated and plays an important role in selecting postural movement strategies (Fukuoka et al., 2001; Horak et al., 1990). This chapter underscored the complexity of physical balance as a multisensory system responsible for maintaining balance and avoiding falls.

The Relationship Between Physical Balance and Consumer Cognition

Balance depends on the musculature, the processing efficiency of the central nervous system (CNS), and intact neural pathways for motor control (Horak et al., 1989). In a review of research on the interplay between gait, falls, and cognition, Segev-Jacubovski et al. (2011) found that cognitive interventions had transferable positive effects on the motor domain in most studies. For example, in cognitive aging research, central nonspecific process abilities, like the training of executive control processes, have specific target transfer-of-training effects, and they can be broader and operate beyond the targeted domain effects (Karbach & Kray, 2009). This is to say that switching between two cognitive training tasks yields better performance in another unrelated task than training only on one cognitive task. Likewise, training two cognitive tasks improves locomotor performance, supporting the theory that executive control influences motor control (Li et al., 2010).

While the postural control system is automatically activated for any physical activity that requires balance, the system is easily set off balance when unexpected sensory information needs to be processed. A sudden unevenness due to a flight of stairs, dimmed lighting, lack of surface contact, or even an ear infection can contribute to physical imbalance in a store. Hence, when activated from an automatic or low-level state, its primary task is to work as an integrated system to prevent a fall. A problem with proprioception (e.g., infection in the inner ear) or kinaesthesia (e.g., ankle sprain) can precipitate imbalance. The latter focuses on body movement, while the former focuses on body awareness and behavior. This makes kinaesthesia hypothetically more behavioral and proprioception more cognitive in their respective functional roles (Konradsen, 2002). Moreover, a growing body of research has demonstrated that the process of maintaining or regaining postural stability requires considerable cognitive resources that impinge upon ongoing information processing (Brauer et al., 2001; Rankin et al., 2000; Siu & Woollacott, 2007) and is, therefore, likely to have psychological effects.

Without specific balancing tasks, posture can influence attitudes in a low-effort process (Briñol & Petty, 2008). In a study on the effect of erect vs. slumped posture on self-evaluation, sitting posture affected message-relevant thinking, including susceptibility to marketing persuasion and individuals' self-perception (Briñol et al., 2009). Confident posture was associated with more confident self-evaluations. Biswas et al. (2019) found a similar postural effect, showing that standing posture decreased the sensory perception of food.

Cognition also influences imbalance. Horslen and Carpenter (2011) found that emotional arousal contributes to postural control. When subjects stood quietly watching emotionally arousing pictures while their center of pressure and electro-dermal activity were monitored, the frequency of body movement increased solely with arousal, unrelated to valence. The postural effect found in their study can be paralleled with high arousal situations, such as standing at the edge of an elevated platform. The fear of falling off an edge normally results in a less balanced posture and increased movement of limbs.

Another study by Scarpa et al. (2011) incorporated physical balance to examine the effect of postural training on self-perception. The study revealed that women's attitudes towards body image improved after doing low-intensity postural balance exercises compared to women who read a newspaper for the same time (Scarpa et al., 2011). While these results demonstrated a positive effect of body stability on self-evaluations, the opposite effect can also be found when the postural system is out of control.

The lack of postural control in older adults has resulted in temporal anxiety and the fear of falling (Hadjistavropoulos et al., 2012). Older subjects who were conditioned to feel high anxiety by walking on an elevated platform had poorer balance compared to subjects walking on the floor. A less stable gait was also observed among participants in a high-anxiety condition during dual-tasking (Hadjistavropoulos et al., 2012). Huffman et al. (2009) also demonstrated the negative consequence of imbalance, showing that a threat to balance can also modify cognition based on the context of the threat. They proposed that balance threats, such as standing on an elevated surface, influence postural control, affect, and cognition, requiring more conscious control and postural adjustments (Huffman et al., 2009). Individuals' unique resources and system restraints used to keep balance may also moderate this effect. While people may all have the same postural control system at their disposal, some may rely more heavily on certain parts of the system than others. One person may, for example, depend more on vision to maintain balance due to weak knees and ankles (osteoporosis), while another may depend more on proprioception (the relative sense of one´s body parts) due to vision impairment.

On the other hand, an athlete may have trained proprioception and vision to improve cognitive capacity while competing. Therefore, maintaining balance and postural orientation can become context-dependent for individuals. In many cases, various cognitive resources may be available when the postural system increases its level of activation (Horak, 2006) because of the interactions between motor functions and cognitive processing. Cognitive capacity is reduced during imbalance, and consumers may perceive the world and themselves with less confidence (Biswas et al., 2019a; Briñol et al., 2009; Rankin et al., 2000). This dissertation sought to test the proposition that imbalance is a source of cognitive load, simplifying cognitive processing with a preference for proximal low construal choice alternatives. To measure cognitive capacity, brand recall was a proxy for available cognitive resources, while preference for low construal choice alternatives was used as an indicator of how the consumer deploys remaining capacity.

The Influence of self-efficacy on Physical Balance for Consumers

Imbalance is a function of physical abilities. The more easily consumers can move and control their bodies, the less capacity they need to avoid the negative consequences of imbalance. Physical fitness can therefore play a role in consumers' perception of their ability to face a challenge like imbalance. Research has found that better fitness can improve self-esteem in young adults (Ekeland et al., 2005) and that physical activity (work, sports, and leisure) can improve balance in healthy men (Cyma et al., 2018) and prevent falls in the elderly (Skelton, 2001).

Likewise, bodily stress can affect consumers' beliefs about their capabilities, reducing their working memory capacity (Hoffman & Schraw, 2009). When performing physical activities, people may judge their fatigue and precarious balance as signs of physical incapacity (Bandura, 1988). Self-efficacy is the belief in one's ability to effectively utilize physical or cognitive resources to achieve specific outcomes (Stajkovic, 2006). Because the literature (Cyma et al., 2018; Ekeland et al., 2005; Skelton, 2001) has frequently shown that cognitive effects are induced in the context of individuals' self-efficacy, it is necessary to study the interactions of self-efficacy on the relationship between physical imbalance and cognition.

Bandura (2006) regarded self-efficacy as a belief in one's ability to succeed in specific situations, which can easily be affected by bodily stress. Therefore, consumers with low self-efficacy may use more cognitive capacity to interpret their distress compared to those with greater self-efficacy who do not experience cognitive demands of distress (Lopez & Snyder, 2002; Schwarzer, 2014). From Bandura's standpoint, the consumers' perception of personal physical fitness may influence cognitive capacity during imbalance. However, not everyone agrees with Bandura (1988) that self-efficacy is specific to beliefs and would instead consider it an independent personality trait.

According to Judge et al. (2002), self-perception measures, such as self-esteem and general self-efficacy, draw on the same higher-order concept. Perceived physical fitness can be considered a context-specific measure of one's belief in fitness abilities (Bandura, 2006). Others point out that self-efficacy is a measure of a more generalized cognitive trait since it is a higher-order concept of other self-perception constructs, such as self-esteem (Judge et al., 2002).

The moderating effect of self-efficacy on imbalance can therefore be considered at two levels, general or context-specific. Generalized self-efficacy (Judge et al., 2002) posits that a belief in one's ability to perform influences cognitive performance across different kinds of challenging situations. In this way, consumers high in self-efficacy will attribute their ability to handle imbalance to their cognitive performance. At a situation-specific level, consumers will attribute their ability to handle imbalance to their physical performance. This dissertation considered the moderating effect of self-efficacy on imbalance at the level of perceived physical fitness and at the level of a personal trait among consumers.

Conclusions About Physical Balance Research and Cognitive Effects on Consumers

In conclusion, psychological and neurological evidence supports the relationship between cognition and motor control resources. Most research in this field has focused on the consequences of losing balance and preventing such events, focusing on increasing the knowledge of the causes and prevention of falls. Hence, these studies are most frequently found in gerontology and physical therapy. However, the review of available studies suggests that training a locomotor task alone is less effective than dual-task training, where the second task has a cognitive load (Segev-Jacubovski et al., 2011). In other words, consumers have sensory systems that operate concurrently with other bodily and cognitive tasks.

The research findings underline the fundamental function of the postural control system to automatically maintain posture and avoid falls so that consumers can attend to other coinciding tasks while shopping. However, the extent to which changes in physical balance may influence cognition has received little scientific examination (Woollacott & Shumway-Cook, 2002). The few postural studies that have considered psychological effects, such as anxiety among the elderly and self-perceived confidence, have focused mainly on gait and body kinetics. Due to neurological findings pointing toward integrating brain areas responsible for both postural- and cognitive control, it can be proposed that system interference occurs along with imbalance and an unrelated cognitive process (Segev-Jacubovski et al., 2011). The research questions of this dissertation, which pertain to the *degree of cognitive effort and influence prompted by imbalance,* are intended to address the knowledge gap in consumer psychology. While evidence points to imbalance being a cognitive load, it has yet to be tested in a consumer setting. Furthermore, knowledge of the degree to which available cognitive capacity during imbalance shapes a consumer´s preferences is limited.

Physical Balance in Consumer Research

Before reviewing relevant literature on the cognitive outcomes of an imbalanced state, it is useful to inspect the only study that has suggested a causal link between balance and consumer choice. In consumer literature, the balance has been associated conceptually with equilibrium or compromise (Simonson, 1989) rather than physical exertion. Larson and Billeter (2013) published the first research article on the physical balance among consumers. Their study suggested that the mere experience of physical balance, whether cognitively primed or triggered by physical activities, can affect consumers' decisions regarding the available compromise options. The authors proposed that balance is metaphorically linked to parity, as it can be activated through physical activity or semantics. According to Lakoff and Johnson (1999), the conceptual metaphor paradigm suggests that many abstract concepts are structured in the mind through metaphoric association with other, more concrete concepts. Due to these conceptual connections, a target concept associated with a physical concept also becomes accessible and potentially influences behavior or judgment (Larson & Billeter, 2013). As a result of the conceptual associations between physical balance and parity, any activity that activates the concept of physical balance should also increase the accessibility of parity or equilibrium. The findings suggest that both kinaesthesia (i.e., physical stimuli) and proprioception (i.e., semantic brain stimuli) neurologically influence the activation.

However, the weakness of this study was that the consumer choice between computer printer attributes was the only outcome measured. This would usually be considered a high-involvement decision, with little reliance on automatic processing of affective choice alternatives. The authors also assumed that the activation of balance is unrelated to the effort, suggesting that regardless of how demanding the balancing task is, it will always result in metaphorical activation of the balancing concept. While physical imbalance may prompt associations with parity, other possible associations, such as proximity or uncertainty, are yet to be tested. According to Larson and Billeter (2013), mental activation of the balance construct results in metaphorical associations with equilibrium, regardless of whether a person is experiencing physical balance or imbalance. As a modal primer, the accessibility of parity mediated the relationship between the activation of physical balance and compromise choice but whether imbalance, treated as a direct, induced state, can influence other cognitive domains is unknown. According to the physiology literature (Hamacher et al., 2015; Huffman et al., 2009), the most obvious consequence of imbalance is reduced cognitive capacity. The next section offers insights into how physical balance and cognitive capacity are relevant to the study of consumer psychology. The section on cognitive capacity is followed by a discussion of why and how construal level theory can explain a link between physical balance and cognitive processing.

Cognitive Capacity and Physical Imbalance in Consumer Psychology

The triggers of *imbalance* in consumer settings are, in particular, manifested when the ground is slippery, icy, or uneven, such as in steps and escalators in a shopping environment. A sign is often placed on the floor to warn consumers of slippery floors. Instances of imbalance prompt an auto-sensory response when the placement of our body is threatened (Chong et al., 2010). This bodily state instantaneously triggers a sensation of imbalance as our balancing system attempts to read the situation and regain body control (Carpenter, 2006). Consumers are seldom aware of the balancing system effortlessly controlling their body position in space (Larson & Billeter, 2013). They go about daily activities, unaware of continuous sensory processing that maintains physical balance. The eyes read the surroundings to alert them about potential hazards, such as doorsteps and stairs. As individuals approach threats of imbalance, the balancing system uses vestibular, proprioceptive, and tactile information to prepare for an impending change. When the balance system does not manage the adjustment effectively, consumers become aware of their body placement in space and immediately try to assist the balancing system by grabbing something stable and physically seeking a steady body position. At that moment, individuals shift their attention from any other task they might have been handling (Laurence & Michel, 2017).

Consumption often requires attentional resources; therefore, imbalance can interrupt an already demanding process. As consumers in a shopping situation, for example, we attend to internal and external stimuli related to our experience. We actively use our memory to achieve our shopping goals, consider alternatives, and mull over our choices.

Brand Recall as a Measure of Cognitive Capacity

An important part of consumer´ activities is to retrieve information stored in memory. Remembering alternatives is the most basic memory process for consumers. Alternatives that do not come to mind cannot be considered during decision-making. The retrieval of available brand alternatives can influence preference and choice when not all alternatives are remembered. In consumer psychology, this process is commonly referred to as brand recall (Keller, 1993). Consumers must have the cognitive capacity available to retrieve and consider brand alternatives. Limited capacity to retrieve from memory will result in fewer choice alternatives and increase the risk of sub-optimal choice (Chen et al., 2018). Making a choice involves recognizing different options (Bettman, 1979) and having the cognitive capacity to do so. Physical imbalance requires cognitive capacity (Segev-Jacubovski et al., 2011; Siu & Wollacott, 2007) in situations where consumers are "on the move" and often trying to remember what brands are available.

Many purchasing situations provide the consumer with several brand options. It is more effortful to recall a brand from memory than to merely recognize it when displayed. Unaided or *free recall* involves situations where the consumer must recall obtained information. Brand recall is, therefore, a measure of cognitive capacity, defined as consumers' ability to retrieve a brand when prompted with a category cue (Keller, 1993).

How imbalance may influence consumers cognitive capacity

Since both imbalance and memory recall tap into the same cognitive resources (Chong et al., 2010; Halvarsson et al., 2015), consumer research needs to understand how these two tasks may interfere. Thus far, consumer psychology has not studied the effect of simultaneous attention to effortful sensory processing on consumers' ability to recall information stored in memory.

Imbalance is triggered when the sensorimotor system responsible for maintaining a stable stance momentarily needs to rectify involuntary movement. While consumers are, in most circumstances, fully capable of maintaining balance, a shift in our focus of attention often causes imbalance because we unattentively miss an imbalance threat or our sensorimotor system is not functioning optimally. Consumers with balance impairments are especially vulnerable to these triggers. The senses involved in keeping a relaxed, balanced upright stance are unconscious and require few attentional resources. On the other hand, when actively avoiding a fall, the sensory systems involved in balance demand considerable attentional resources and perceptual processes to make meaning of the sensory signals and avoid a fall.

Hypothetically, a shopper walking on wet store floors or an icy sidewalk may experience imbalance alongside ambiguous sensory signals that might influence cognitive processing (Balasubramaniam & Wing, 2002; Brauer et al., 2001; Rankin et al., 2000; Teasdale & Simoneau, 2001). A growing body of research has demonstrated that maintaining or regaining postural stability requires considerable cognitive resources (Brauer et al., 2001; Rankin et al., 2000; Siu & Woollacott, 2007) and is, therefore, likely to have psychological outcomes.

The research findings underline the fundamental function of the postural control system to automatically maintain posture and avoid falls so that consumers can attend to other coinciding tasks. The imbalance negatively affects cognitive capacity, such as memory retrieval. Memory plays a vital role in consumer choice. For example, in consumer behavior, memory retains the content of advertisements. It determines how long it takes to learn from advertisements and how many repetitions are needed to remember a piece of information (Bettman, 1979). It has long been suggested that people's processing power is limited, as only part of the available power can be activated temporarily for processing (Kahneman, 1973). This is not to say that the amount of information stored in the brain is limited but rather that the retrieval process is at fault. It is suggested that forgetting occurs when consumers cannot retrieve information from long-term memory at a certain time. New recovery signals or strategies may remind consumers of information previously thought to be forgotten (Bettman et al., 1991).

Reduced cognitive capacity may have consequences for consumers, for example, when they have difficulty recalling relevant brands from memory. When decisions are based entirely on memory, retrieval of brand alternatives can affect choice because the number of recalled brands is reduced, or the recall of available brands is inhibited. Conversely, the consumer´s brain will try to make the most out of available capacity by applying processing rules for simplification, such as choosing familiar alternatives over unfamiliar ones (Korteling et al., 2018; Pohl et al., 2013). These simplifications will have qualitative effects on consumers' available capacity when applying cognitive processing to achieve an outcome. In that case, the consumer needs to filter information for further processing while actively delegating resources to tasks and controlling for possible distractions (Broadbent, 1958; Lachter et al., 2004). These systematic simplifications are heuristics and may sometimes lead to suboptimal decisional outcomes, such as cognitive biases (Korteling et al., 2018). The construal of a given situation can influence cognitive outcomes under capacity constraints (Pohl et al., 2013). For example, when consumers interpret a situation as close and concrete, their visual filtering becomes impaired (Hadar et al., 2019). Cognitive load further increases spontaneous judgments instead of deeper reflection (Körner & Volk, 2014) when the situation is considered close.

Consumers may perceive some situations as closer or more distant than they are. A retailer may play music from the past, transporting the shopper back in time and providing a sense of nostalgia (Eyal et al., 2009). In other instances, the consumer may absorb a concert experience in the present and become detached from other experiences. A key to these experiences is, in many cases, how it is sensed and the potential for the consumer to get distracted and experience physical imbalance. For example, are touch and taste more proximal sensations than hearing and smell? The same applies to physical imbalance, which activates the sensation of body presence. According to Construal Level Theory, thinking more concretely is a low-level construal, emphasizing greater psychological proximity (Trope & Liberman, 2003, 2010; Wakslak et al., 2007). The theory predicts that the value of an object or event available in the future is a function of time delay and either increases or decreases the attractiveness of an option. The proposition is that physical imbalance reduces cognitive capacity and shortens psychological distance. The following section relates Construal Level Theory of psychological distance to physical imbalance.

Construal Level Theory (CLT) and Proximal Sensation

CLT suggests that time, space, and social distance are forms of subjective experience that constitute different dimensions of *psychological distance* (Trope & Liberman, 2003). The theory postulates that sensory signals perceived as proximal will constitute subjective experiences that are psychologically construed as close (Elder et al., 2017; Hadar et al., 2019; Trope & Liberman, 2010b).

As consumers, we can think about the future, reflect on the past, distinguish between distant and close locations, and consider others´ perspectives. These thoughts are examples of processes that are distant from the present experience of an individual. It is proposed that such thoughts, beyond the present and internal, represent a span of psychological distance from the point of “here and now.” People´s point of reference is the self, which finds itself at a certain place at a certain time. Hence, in the context of construal level theory, variability in the psychological distance has a starting point at zero distance, or the present. Due to the self as a point of reference, the zero-point distance is also sometimes called egocentric (Fujita & Han, 2009; Vess et al., 2011). For experiences to be considered more psychologically distant from the self-absorbed present, a subconscious process occurs, causing consumers to perceive them as more distant. These objects or events can be removed from the present-self experience in time, space, social distance or hypothetically. The more detached an event is from the present experience, the higher (more abstract) the level of construal of the event is.

In contrast to low construal, high construal can make us view objects further away and an event less likely to occur. According to Trope and Liberman (2010), this is how people plan for the distant future, recognize other people´s views, and evaluate hypothetical alternatives. While our experiences are limited to "here and now," we can make predictions and consider what might have been. According to construal theory, we use similar mental construal processes when considering different psychological distances. Research suggests that the construal level is based on a generalizable, bi-directional association. A written text with abstract descriptions of a future event (enjoying a beautiful sunset at a holiday resort) in contrast to a concrete description (putting on suntan lotion in the garden of a holiday resort) can, for example, make people consider the social distance between them and co-workers to be either short (concrete) or long (abstract). When an event is viewed as close or distal on one dimension of psychological distance, it is also judged to be close or distal on another dimension, referred to as the distance-on-distance effect (Dengfeng Yan, 2014). This means that manipulations of construal can affect distance perceptions in the same way that the distance of an event in time can influence its construal (Wakslak et al., 2007).

The changes in the level of construal of an object can, therefore, alter the appraisal of the object. For example, according to the theory, a series of "why" questions will lead to increasingly abstract responses, while “how” questions will lead to increasingly concrete answers. Under high construal levels, objects and activities are more likely to be evaluated in terms of their overall desirability, whereas with lower construal levels, evaluations will be related to the object’s feasibility (Pham et al., 2011). The abstraction of high-level construal reminds people of their overall lifelong values, which can reduce the urge to give in to temptation (Fujita & Han, 2009). Higher construal levels tend to produce evaluations of potential advantages, whereas at lower levels of construal, disadvantages tend to be of greater importance. Liberman et al. (2007) also argued that high construal processing decreases present bias, reducing impatience. The opposite is true for participants primed with concrete low construal. Among many construal outcomes, Pham et al. (2011) demonstrated that states of relaxation increase abstraction and the monetary value of products. Differences in consumers’ relaxed and non-relaxed mental construal of product value probably cause this effect. Relaxed people have a higher level of abstraction, which is reflected in their increased product value perceptions. Maglio and Trope (2012) further showed that contextual bodily states are less likely to influence thinking at a higher level of mental construal. The researchers showed that participants inducted with high construal were less affected by the weight of a backpack when making judgments. Similarly, the physical balance should offer an opportunity to differentiate between high and low construal levels because it relies heavily on sensory information about a person’s bodily experience in the present moment. A balanced, stable stance may, similarly to relaxation, influence the activation of the autonomic nervous system, the level of muscular-skeletal tension, and the degree of pleasure and detachment (Pham et al., 2011).

Presumably, physical balance control allows us to distinguish between proximal psychological distance when our balancing system is preoccupied with controlling imbalance (low construal) or relaxed during stable a stance (high construal). A stable stance as effortless balance control can be considered a relaxed state in which evaluations become more abstract, whereas imbalance with increased present sensory information should encourage less abstract representation. Hence, in an effortless stable stance, subjects would favor abstractly presented products and consider rewards in the future of greater value. Therefore, the physical balance could have a bi-directional relationship with psychological distance on a continuum from an effortless stable stance to an uncontrolled imbalance. Research supports this proposition, suggesting a link between sensory information and CLT. Kardes et al. (2006), for example, demonstrated that consumer judgment processes could depend on the amount of sensory information that is available at a given time. The physical presence of products elicits concrete, low-level construal, whereas verbal brand names alone prompt abstract, high-level construal. Emotions have also been shown to influence construal levels. As emotional intensity increases, perceived psychological distance is reduced (Van Boven, Kane, McGraw & Dale, 2010).

A few studies have focused on the relationship between construal level and delayed discounting (H. Kim et al., 2013; Yi et al., 2017). Delayed discounting refers to a subject's preference to select a large reward delivered at a delayed time compared to the immediate delivery of a small reward. It devalues a future outcome; in other words, future consequences are given less weight relative to more immediate consequences. In terms of the construal level, when individuals are willing to put off immediate rewards in exchange for distant rewards, they prefer high construal outcomes. If imbalance elicits low construal, it should decrease delayed discounting, while the opposite should occur for those in a relaxed, balanced posture. Immediate rewards are low construal alternatives since they are more proximal. Psychological distance is greater at high construal levels, suggesting that low construal level participants have a higher preference for immediate outcomes (Bischoff & Hansen, 2016; Fujita et al., 2006). Distant outcomes, such as future rewards, are also considered less probable, and since they are more unlikely, they are also construed at a higher level compared to outcomes that are considered more probable (Todorov et al., 2007).

In conclusion, several studies have confirmed that construal level theory applies to at least four dimensions of psychological distance (time, space, social distance and hypothetically). Research suggests that individuals rely primarily on high-level information when forming predictions, evaluations, and behavioral intentions for distant events, whereas low-level construal information is incorporated in decision-making about near events. Following Elder et al.´s (2017) research showing that proximal sensations elicit low psychological distance, this dissertation predicted that an increased amount of proximal imbalance sensation would elicit a preference for lower-level construal.

In theory, whatever consumers think about (for example, brand preferences) is construed as near or distant depending on that person's current construal level. That means brand preference is less about specific brand attributes and more about consumers' perceived psychological distance from the brand. That also means that if the psychological distance is altered (e.g., through physical imbalance), consumers may compare the brands based on their balance state at that time. Accordingly, considerations raised during limited cognitive capacity are proximally construed brands. In the following section, I summarize the theoretical findings related to the research questions and propose a conceptual framework for empirical investigation.

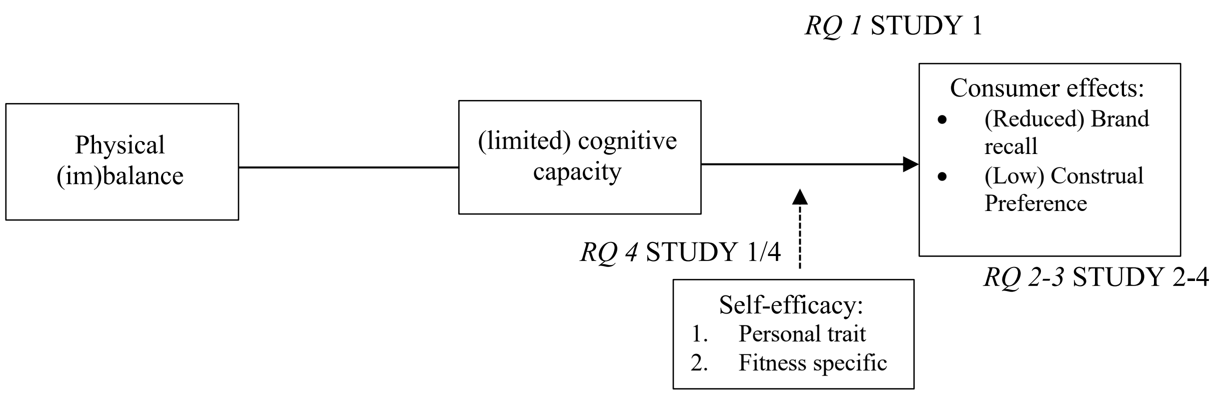
Summary of Conceptual Framework in Relation to Research Questions

This theoretical review concludes that consumers' balance system works on a continuum from physical balance to severe physical imbalance. Activation of the balance system involves a multisensory process that influences cognition. The literature suggests that postural control shares resources with motor activation and other unrelated cognitive processes (Lacour et al., 2008; Siu & Woollacott, 2007). However, little research has been conducted on the cognitive effects of such interference on consumers' evaluations and behavior. This dissertation expands the existing research by studying the relationship between physical imbalance and consumer preference (Figure 3).

The effect of physical imbalance on consumer choice preference is proposed to influence cognitive capacity with the cognitive load it imposes (Baddeley, 1992; Chen et al., 2018). Therefore, the imbalance is expected to reduce consumers' capacity to retrieve information from memory (e.g., recalling brand names) and evaluate choice alternatives (Hadar et al., 2019; Körner & Volk, 2014). When imbalance occurs, simplification rules will likely be applied when using the available capacity. It is proposed that consumers have to filter information for further processing (Broadbent, 1958; Lachter et al., 2004) and that imbalance leads to a simplification bias towards a preference for that which is close, concrete, and secure in the present (Hadar et al., 2019; Körner et al., 2015). It is proposed that this simplification bias is due to greater reliance on proximal sensory signals during imbalance which, according to researchers (Elder et al., 2017; Trope & Liberman, 2010b), decreases construed psychological distance.

Figure 3

Proposed Relationship Between Physical Imbalance, Brand Recall, and Construal Level Preference.



Construal Level Theory can explain how the physical balance system under the constraints of cognitive load intervenes with cognition can be explained. As Trope and Liberman (2010) suggested, our senses can have proximal or distal features that affect how we experience the directness and proximity of a stimulus. The starting point of an experience is anchored at a zero-distance point, referring to what is sensed here and now. Trope and Liberman (2010) propose that our senses are mapped along spatial distance according to the maximum physical distance of the sensed object. For example, objects that can be tasted or need to touch the body will be associated with low-level construal, whereas the distal sense of sound could be associated with high-level construal and psychological distance (Elder et al., 2017; Ruzeviciute et al., 2020). It follows that imbalance activates proximal sensory information.

At low construal levels, consumer cognition focuses on the present, peripheral, and secondary features of a stimulus, as opposed to the abstract, long-term, and wholistic features at a high construal level (Fiedler, 2007). In line with previous studies, I proposed that physical imbalance reduces cognitive capacity and shortens psychological distance (Elder et al., 2017; Hansen & Melzner, 2014; Khan et al., 2011; Wan & Rucker, 2013). An added benefit of applying construal level theory to imbalance is that various dependent variables offer the opportunity to use multiple outcome variables to measure the construct in the context of consumer choice (Wakslak et al., 2007). Based on these theoretical arguments and prior empirical findings, I proposed a model of the relationship between imbalance, cognitive capacity and construal (Figure 3).

The model aligns with Trope and Liberman's (2010) Construal-level Theory of Psychological Distance, which illustrates a relationship between imbalance as a cognitive load that prompts a proximal and low construal sensory experience. The present becomes construed at a lower level, resulting in consumer choices being more limited and geared towards choice alternatives regarded as psychologically close. The proposed model expands upon the original Trop and Liberman proposition in that the relationship between imbalance and construal is viewed as a function of cognitive load. Previous empirical findings have pointed out the relationship between proximal sensation and construal level in the presence of cognitive load (Hadar et al., 2019; Körner & Volk, 2014; Rankin et al., 2000).

In further support of this model, Pohl et al. (2013) found that subjects were more likely to apply cognitive simplifications during high cognitive load and that proximal sensations prompted the construal of psychological distance (Elder et al., 2017). Construal level was also shown to directly affect consumers (Kim et al., 2021). To address the research gap in the field, four research questions emerged, which are presented in Chapter 1 and theoretically supported in Chapter 2.

The first research question (*RQ 1*) aimed to explore the effect of momentary imbalance on the potential cognitive capacity reduction. To answer *RQ 1*, I tested whether imbalance is a source of cognitive load affecting cognitive performance in brand recall when attentional resources are directed to a volatile bodily state. When the effect of imbalance on cognitive capacity is tested, available capacity can be studied further. When consumers experience imbalance, they will have to use part of their available cognitive capacity to regain balance, which will leave less capacity available to retrieve brands from memory and process relevant information. Therefore, the second research question (*RQ 2*) addressed the possible relationship between physical imbalance and construal level as a channel of proximal sensory information (Horak & Macpherson, 2011, p. 943). The degree of physical imbalance is tested as a source of concrete construal when proximal sensation reduces psychological distance.

During the processing of those proximal sensory signals, cognitive processing should be of lower construal (Hadar et al., 2019). In that case, as a strategy to overcome or compensate for the ambiguousness of the sensory experience, cognitive processing will filter away information that does not pertain to proximal outcomes (Trope & Liberman, 2010). When sensory signals are perceived as close, the psychological distance perceived during the environment's evaluation is also perceived as close (Elder et al., 2017), which would be expected to influence consumer preference and choice. A choice task between low or high construal alternatives is therefore used as a proxy for the preference for psychologically close or distant choice alternatives.

The third research question (*RQ 3*) was proposed to assess the duration of the psychological distance effect when triggered by physical imbalance. When exploring the potential relationship between cognition and physical balance, the physical limitations of imbalance should be viewed as a boundary effect of imbalance manipulation. The effort needed to maintain balance varies across individuals, and everyone has a different threshold for experiencing imbalance. Therefore, attempts to stimulate imbalance must consider the dynamics of the individual experience and its impact. The effect may fade away quickly or have consequences beyond the time frame within which the imbalance signals are being processed. Construal Level Theory proposes a relationship between proximal versus distal senses and psychological distance. This plausibly occurs during simultaneous sensory activation and cognition, but evidence from postural control studies suggests that the effect may last beyond the balance activation (Briñol et al., 2009; Scarpa et al., 2011).

The fourth and last research question (*RQ 4*) acknowledged that other physiological and psychological factors, which pertain to one´s beliefs in one own’s ability, commonly referred to as self-efficacy (Stajkovic, 2006), can moderate the cognitive effects of physical imbalance (Cyma et al., 2018; Ekeland et al., 2005; Skelton, 2001). Possible factors influencing the relationship are addressed in the design of each study. For example, exploring self-efficacy's influence on cognitive capacity during imbalance is necessary. Because the literature has frequently shown that individuals´ traits influence cognitive outcomes, self-efficacy would be expected to moderate the relationship between imbalance and cognitive processing (Hoffman & Schraw, 2009). The thesis proposes that self-efficacy can be measured as a general self-perception trait and as situation specific perceived fitness.

The next chapters of this dissertation describe empirical findings to answer the four research questions. Four studies tested hypotheses derived from the research questions. The conceptual background, methods, analysis, and results for each study are described in Chapters 3 to 6, and Table 1 gives an overview of the studies.

Table 1

Overview of Studies

Purpose of study	Conceptual perspective	Method	Findings	Implications
Study 1 examined whether imbalance affects the capacity to retrieve brands (RQ 1) and whether self-efficacy moderates that relationship (RQ 4).	Cognitive capacity and Self-efficacy. (Alba, 1991; Baddeley, 1992; Bettman, 1979; Hutchinson, 1994); Hoffman & Schraw, 2009; Judge et al., 2002).	Within-subject experimental design with balance versus imbalance conditions.	The change in brand retrieval was not significant. However, participants reported decreased mental performance during imbalance. Self-efficacy did not improve recall during imbalance.	Results confirmed that the manipulation induced imbalance and perceived mental performance but the evidence for a reduction in brand retrieval was weak.
Study 2 examined whether imbalance affects construal level processing (RQ 2) and whether the effect is momentary (RQ 3).	Construal level theory (Trope & Liberman, 2010, Hadar et al., 2019, Elder et al., 2017, Kim, M. et al., 2021, Todorov et al., 2007, Yi et al., 2017).	Between subject experimental design with relaxed still stance, imbalance stance, and control normal stance condition.	Evidence for an effect of imbalance on construal level was weak. Low construal alternatives were not significant during imbalance.	Results highlight the need to improve study design in future studies.
Study 3 examined whether imbalance affects construal level processing (RQ 2) and whether the effect is momentary (RQ 3).	Construal level theory (Trope & Liberman, 2010, Hadar et al., 2019, Elder et al., 2017, Kim, M. et al., 2021, Todorov et al., 2007; Yi et al., 2017).	Between subject experimental design with balance versus imbalance conditions.	Data did not confirm a significant relationship between imbalance and construal level was not confirmed.	Results called up on evaluation and methodological improvements.
Study 4 examined whether imbalance affects construal level processing (RQ 2), whether the effect is momentary (RQ 3) and whether self-efficacy moderates the relationship (RQ 4).	Construal level theory (Trope & Liberman, 2010; Hadar et al., 2019; Elder et al., 2017; Kim, M. et al., 2021, Todorov et al., 2007; Yi et al., 2017 Self-efficacy (Hoffman & Schraw, 2009, Judge et al., 2002).	Between subject experimental design with balance versus imbalance conditions.	Evidence for a significant effect of imbalance on construal level was limited. Low construal rewards were favored during imbalance which may suggest a proximal preference. Self-efficacy did not moderate the relationship.	Results suggested that the conceptual framework should be revisited, and the future study of consumer imbalance should consider the empirical evidence.

The implications of the findings, along with limitations and possible improvements, are discussed in Chapter 7.

Ethical Considerations

This dissertation expands our knowledge of imbalance in the shopping context, which can help consumers and marketing practitioners alike. For the researcher, a fundamental value has been to acquire knowledge about imbalance with honesty, openness, and critical verification. It was crucial to gain substantial knowledge about the physiology of imbalance to measure it correctly. Training in using measurement devices for imbalance was done at the head office of Ergotest Innovation which provided the MuscleLab™ measurement equipment. The equipment consisted of a force plate and accelerometers, discussed in the methodology section of each study. Trained physical therapists provided practical guidance in developing the stimuli and protocol. Certified technicians at Ergotest ensured guidelines were followed in the use of the equipment.

Honesty, openness, and critical verification have also been important to maintain academic integrity. The researcher did not engage in data fabrication or plagiarism and followed good reference practice.

The dissertation complied with ethical research guidelines by The Norwegian Research Ethics Committees (*General Guidelines | Forskningsetikk*, n.d.). The guidelines follow four guiding principles, respect, good consequences, fairness, and integrity. Operationally, informed consent ensured voluntary participation of subjects, participants' anonymity, and confidentiality of data. All participants were informed about their right to withdraw from the experiment and that their identity would not be revealed. The identity of participants was not recorded in the data, and all data was kept on password-protected computers.

The exact purpose of the research could not be revealed in the recruitment of participants, and the imbalance was formulated in general terms as a physical challenge. Upon completion of the experiment and data collection, participants were debriefed about the research purpose and their right to withdraw from the study. For anyone with balance impairment, the manipulation might have become physically harmful. Participants with impairments were excluded from the study. It was therefore important for the researcher to ensure that each participant was comfortable and aware of any potential side effects associated with executing the manipulation. The Norwegian center for research data approved the research. A research consent form is included in Appendix H.

Chapter 3

Introduction to Study 1: Brand Recall During Imbalance

A vital part of consumers´ daily activities is to make choices based on memory retrieval. As consumers, we need to reactivate information that is stored in memory. Reactivating information in memory is important in marketing as it influences how choices are made. The consumers' retrieval of available brand alternatives influences decision-making. In marketing, this process is commonly referred to as brand recall (Keller, 1993). In addition to available alternatives, the consumer also needs to retrieve the attributes of each alternative and compare them to other alternatives (Chernev, 2005). Therefore, the brand choice depends on retrieval and various situational factors (Alba et al., 1991). One determining factor is the cognitive capacity available to retrieve and consider alternatives. Using limited capacity will retrieve fewer choices, resulting in sub-optimal choices (Chen et al., 2018). Since in Chapter 2, I discussed that physical imbalance demands cognitive resources, it is necessary to consider its effect on consumers.

Study 1 tested the assumption that imbalance reduces the consumers' cognitive capacity to recall brand names due to increased cognitive load. Unsupported brand recall is subject to available cognitive capacity, determining what brands consumers will consider in their decision-making (Cowan, 2010). The study proposed that physical imbalance diminishes the cognitive capacity for other cognitive tasks, such as memory-based brand recall. Imbalance prompts immediate attention and thereby increases cognitive load, leaving less capacity for retrieval from memory. Increased signal processing by the multi-modal sensory system guiding our physical balance prompts the reduction in cognitive capacity needed for brand retrieval. Consequently, consumers have fewer brands to consider when an imbalance occurs. This confirms that considerations are not static but change when sensory processing is demanding.

Conceptual framework of limited retrieval capacity

This study's conceptual framework was built on prior physiology and consumer psychology research, as presented in Chapter 2. On the one hand, the imbalance is considered a physiological phenomenon that functions as a joint sensorimotor process (Andersson et al., 1998; Kandel et al., 2012; Mancini & Horak, 2010; Pollock et al., 2000). On the other hand, the theoretical framework was developed from consumer research on the function of memory in the recall of brands (Alba et al., 1991; Desai & Hoyer, 2000; Lynch & Srull, 1982; Nedungadi, 1990).

Based on evidence from these two seemingly unrelated research streams, I tested the first research question, "*How does physical imbalance as a source of cognitive load affect consumers' cognitive capacity?"* (*RQ 1*) about imbalance as a source of cognitive load. I predicted that imbalance makes it harder for consumers to activate their memory and recall brands. In the context of brand choice, an increase in imbalance will make fewer brands accessible and less likely to be chosen. I elaborate on these themes below.

This limited retrieval capacity is often called *working memory*, indicating that the brain allocates capacity to specific tasks (Cowan, 2010). It is, in other words, the system for temporary maintenance and operation of information (Baddeley, 1992). Working memory limitations can affect consumer decision-making when capacity limitations reduce the reasonable amount of information consumers can process at any time (Hinson et al., 2003). To study working memory, I need to know how memory operates and how storage-specific capacity can be measured in terms of *recall* and processing strategies (Cowan, 2010). In the following section, I will discuss the role of brand recall in consumer behavior and its measurement.

Brand Recall

Differences between recognition and recall are important in memory retrieval in consumer tasks (Gruenewald & Lockhead, 1980). In a purchasing situation, rules must guide the evaluation of product attributes and choice alternatives. In essence, this is a memory recall. On the other hand, making a choice involves recognizing different options (Bettman, 1979). Many shopping situations provide the consumer with several brand options. In this case, the recall may be unnecessary. However, consumers must recognize an item in the consideration set (Alba et al., 1991), also called evoked set, when considering brands in a category. It is much more effortful to recall a brand from memory than identify a brand. This is especially true when the recall is unsupported by any relevant stimuli. Brands familiar to consumers can be recognized more often and faster than unfamiliar items (Baumann et al., 2015).

On the other hand, unaided or *free recall* involves situations in which the subject must recollect obtained information. Therefore, brand recall is defined as consumers' ability to retrieve a brand when prompted with a category cue (Keller, 1993). It is believed to be a two-stage process in which a person must search for a specific item and then check whether the identified item belongs to the specific context (Lynch & Srull, 1982). Options that memory deems relevant in the search process become a part of a *set of items* that will be considered further (Desai & Hoyer, 2000). Items familiar to consumers may be recognized more often and quicker than unfamiliar items. Items familiar to consumers may be recognized more frequently and faster than unfamiliar items (Desai & Hoyer, 2000). Decision input depends on memory, and for any option to be considered, it must first become a part of the evoked set (Nedungadi, 1990). Evoked sets are not fixed but subject to available capacity in any given situation. How easily an evoked set is formed in memory varies across situations and available capacity at the given time. Eventually, after repeated retrieval, such evoked sets become engrained categories in memory. In particular, the contextual cues that prime available memory structures influence the categorical structure of memory. Consumers apply specific strategies to improve their retrieval performance, such as creating mental maps or recalling one category at a time (Alba et al., 1991). For example, when recalling clothing brands, one may imagine walking up a familiar shopping street and visualizing the brands encountered on the way. Others may apply a strategy in which they start by finding a sub-category, such as sports clothing, to retrieve brands before advancing to another sub-category of fashion brands.

When decisions are based entirely on memory, brand recall can affect choice in at least three ways (Nedungadi, 1990). First, the size of the evoked set influences the number of recalled alternatives decreasing the chance of choosing any specific alternative. Second, brands that are recalled first can potentially inhibit the recall of other brands. Third, preferred brands tend to be remembered more frequently and quickly. These brands have a memory-based advantage over competing brands. Memory recall, therefore, plays a significant role in marketing since unrecalled brands cannot be chosen.

In the case of free recall, consumers rely wholly on memory when generating choice alternatives (Hutchinson et al., 1994). An internal need, such as thirst, will stimulate the search for a solution, such as finding a cold drink at a nearby kiosk. In that case, the consumer must recall the location of the nearest convenience store and the available drinks. The alternatives that come to mind form the evoked set. The process continues until individuals obtain viable information. These alternatives become active in memory while others fade away (Alba et al., 1991).

One of the most appropriate ways to measure memory based brand recall in an experimental setting is to apply the category production task (Gruenewald & Lockhead, 1980). In these experiments, participants are instructed to remember as many items from a given category as possible. The result of such a memory exercise in Branding is called Top-of-Mind or Share of mind brand awareness. The number of brands with which the participant is familiar influences the results. Second, the speed at which items are recalled, measured as the rate of items in a given timeframe, affects recall. When time is limited, some consumers recall more brands because they know more alternatives or are quicker at memory recall. Alba et al. (1991) highlighted the need for more research on the personal and situational factors influencing recall. However, most consumer research in this area has focused on the salience of brands in memory rather than recall strategies and factors that may influence recall in consumer settings. Since physical imbalance draws upon the same cognitive capacity as memory recall, it becomes a contextual factor that can potentially influence brand recall. Imbalance has been studied in consumer psychology to a limited extent (Biswas et al., 2019a; Larson & Billeter, 2013). However, the effect of imbalance on brand recall is yet to be studied.

Hypothesis about brand recall as an indicator of cognitive capacity

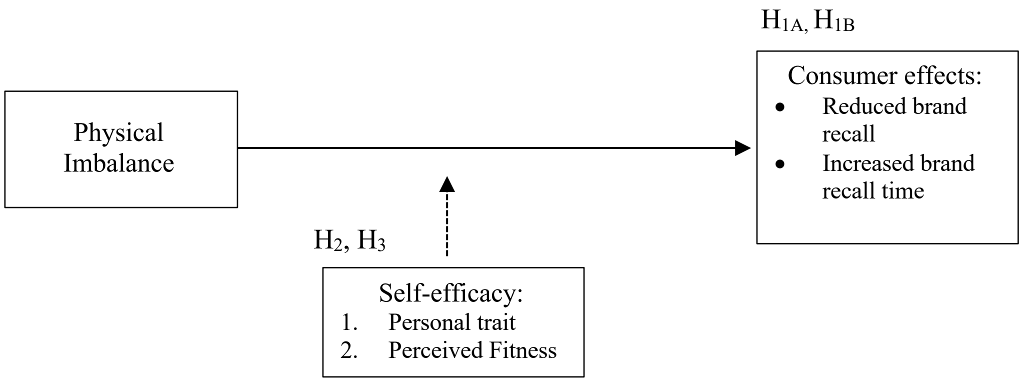
Since both memory retrieval and imbalance require available cognitive resources, it is reasonable to ask whether they affect each other. Based on the literature, one can propose that recall will be negatively affected during a momentary loss of physical balance. If the proposition is true, it will have consequences for both consumers and marketers since the brand recall will reduce the number of choice alternatives. The potential consequence of the interference of imbalance and memory is a cognitive load that depletes working memory (Chen et al., 2018). Cognitive load has wide-ranging consequences for consumers, such as increased impulsive decision-making (Hinson et al., 2003) and a preference for more emotionally stimulating alternatives (Dewitte et al., 2005). Furthermore, cognitive load demands the remaining capacity to be more efficient by filtering or simplifying information. Therefore, limited cognitive capacity will often lead to processing or thinking patterns in which a choice rule (heuristic) will be applied, and a bias towards particular information will be formed (Gigerenzer, 2008; Korteling et al., 2018).

In the context of imbalance, studies have found that imbalance during a secondary task diminishes performance in one or both tasks (Abbud et al., 2012; Andersson et al., 1998). This diminished performance is found in healthy individuals and particularly people with impairments. In these studies, imbalance increased physical movement associated with falls and reduced cognitive capacity during dual-tasking (Alexander & Hausdorff, 2008). Since research suggests that imbalance reduces cognitive capacity, it is valuable to study how it may affect consumers. Because brand recall is a central working memory task for consumers, it is appropriate to start the inquiry with the proposed first research question, "*How does physical imbalance as a source of cognitive load affect consumers' cognitive capacity?"*

It is proposed that imbalance is a source of cognitive load affecting performance when attentional resources need to be directed to a volatile bodily state. Therefore, an imbalanced state will affect cognitive performance when less capacity is available for other cognitive tasks performed simultaneously (Figure 4).

Figure 4

The Relationship Between Imbalance and Brand Recall



In this study, physical imbalance was theorized to affect brand recall negatively as consumers´ cognitive capacity decreases (Figure 4). Based on these assumptions, it was hypothesized that:

H_{1A}: *The state of imbalance reduces brand recall.*

The hypothesis was tested by *measuring the amount of recall* during an imbalanced state. It was expected that during a 30-second-long imbalance state, participants would recall fewer brands compared to recall during a stable physical state. This effect was expected to emerge when the time available for cognition needs to be divided between body control and brand recall. Consequently, less time is dedicated to the recalling task during imbalance. Accordingly, the subsequent hypothesis was proposed:

H_{1B}: *The state of imbalance increases brand recall time.*

This hypothesis can be tested by examining participants' response latency, recall completion, and response intervals. Recalling fewer brands during imbalance can be attributed to a slower initial start of recalling (increased latency) and a slower rate at which brands are recalled (longer intervals). When recall time increases, the consumer´s evoked set is also reduced.

The last two hypotheses pertain to the fourth and last research question (*RQ 4*) about psychological and physiological factors of self-efficacy moderating the cognitive effect of physical imbalance (Stajkovic, 2006). Such moderation has been demonstrated in the relationship between working memory capacity and self-efficacy, for example (Hoffman & Schraw, 2009). Consumers´ physical abilities influence their performance in tasks that require movement and coordination; hence, their self-efficacy should be increased. Therefore, it can be argued that those who perceive themselves as highly fit individuals will have a greater capacity to recall brands during imbalance. The relationship is hypothesized as follows:

H_2: *Physical fitness moderates the effect of imbalance on brand recall.*

During imbalance, a high perception of physical fitness is predicted to improve performance in a memory recall task. Generalized self-efficacy (Judge et al., 2002) as belief in one´s ability to perform may also influence brand recall. Generalized self-efficacy is not limited to fitness perception as in H_2 but rather pertains to the individual belief in mastering new challenges. In that case, participants low in self-efficacy are expected to recall less, especially during imbalance. Since generalized self-efficacy can be considered a personal trait not affected by physical performance (Judge et al., 2002), the following hypothesis was proposed:

H_3: *Self-efficacy moderates the effect of imbalance on brand recall.*

Since the brand recall is expected to be reduced during imbalance, participants high in self-efficacy would be expected to perform better in both conditions compared to participants low in self-efficacy.

These four hypotheses were tested to answer the first (*RQ 1*) and last (*RQ 4*) research questions about the relationship between imbalance and available cognitive capacity for consumers.

Methodology

The following section describes the study's design. A within-subject repeated measure design was adopted to test the hypotheses. Each participant completed two trials, one control condition and one imbalance manipulation, administered with simple unrelated dummy task questions between trials to reduce possible learning and fatigue effect. The order of conditions and the recording of control variables were counterbalanced.

Stimulus Development and Measurement

Table 2 provides an overview of the study design. Translated scales in Norwegian are included in Appendix A.

Table 2

Overview of Study 1: Variables and Measures

Independent variable	Manipulation check	Dependent variable	Covariates	Moderators
Balance condition	Acceleration of balance movement (Acc.) Perception of physical balance Mental Performance	1. Free memory recall of brands in a given category 2. Latency in brand recall time 3. Average time interval between recalls	Category knowledge	Perceived Physical fitness (Abadi, 1988) Self-efficacy (Scholz et al., 2002)

Independent variable

For imbalance to occur in a controlled setting, all sensory systems involved in physical balance must be manipulated because of individual differences in how the balance system compensates for the lack of sensory information needed to maintain balance. Imbalance also had to be objectively measured in terms of body movement. The manipulation involved standing on one foot on a soft cushion with eyes closed (see the picture in Appendix G). The balancing task was performed after participants spun around five times. The protocol ensured that all the manipulation engaged all sensory (visual, vestibular, proprioceptive, and tactile) systems. The control condition involved standing on stable ground with both feet in a normal standing position hip-width apart (approximately 20 cm). Instructions were given to stand still while attending to the brand recall task.

Dependent measure of brand recall

A cognitive system that combines information processing, storage, and retrieval is referred to as working memory (Rosen & Engle, 1997). Limits in cognitive capacity are frequently measured with a working memory span task. Hutchinson et al. (1994) applied such a measure in consumer research on brand name recall of a given product category, using memory-based brand recall as a proxy measure of available cognitive capacity. This study adopted a similar measure. During imbalance, participants are asked to recall as many brand names as possible in each category. Each trial had a different category to avoid learning, automobile brands in the first trial and clothing brands in the second trial. Both categories were pretested for an adequate retrieval of brand names by both genders and age groups. The recalled brand names for each participant were audio recorded for analysis.

Manipulation Checks and Controls

To objectively measure imbalance, accelerometers were used (see materials later in this chapter) to record displacement of balance movement during conditions. The standard deviation of balance movement (sway) acceleration (Acc.) was used as an objective measure of *manipulation effectiveness*. The sensation of balance ("I feel balanced" and the reverse "I feel out of balance") was also recorded as a subjective evaluation of the balancing concept between trials ($\alpha = .90$). To further assess the effect of the manipulation, participants were asked after each trial on a 9-point scale about their perceived mental performance with two items, "how hard was it to retrieve brands" and "how much cognitive effort did the task take" ($\alpha = .74$). To control for brand category knowledge of each category, participants were asked how familiar they were with the category of recalled brands. Variables that could potentially interfere with the results were subjects' knowledge of the tested brand categories, perceived physical fitness, and self-efficacy.

Moderators

Participants were asked about their perceived fitness using nine out of twelve items of the 4-point perceived physical fitness scale (Abadie, 1988). Questions 3, 5, and 7 were omitted because the remaining items loaded on four factors that were of importance to this study without discussing sensitive subjects, such as overweight and physical weakness. The scale was reliable in other studies (Lamb, 1992; Leonardson, 1977; Plante et al., 2000). In previous studies, the internal consistency reliability ranged from .78 to .88, the same as in Study 1 (α = .81).

For self-efficacy, a 5-item version of the Norwegian general perceived self-efficacy scale (GSE) was used (Røysamb, 1997; Scholz et al., 2002), with items measured on a 4-point scale. The scale was a reliable measure of self-efficacy (α = .76). Finally, participants were asked open-ended questions to determine whether manipulations were successful, ensuring that the participants did not guess the purpose of the study (Bargh & Chartrand, 2000), and two screening questions relating to participants' balance impairments and any balance-impairing medication.

Before Study 1, all test items and questions were pre-tested on a small sample of students belonging to the same demographic group as the participants. Minor language adjustments were made. Likewise, a pre-test was conducted with the independent condition of imbalance to assess instructional understanding and physical ability of demographically representative participants, such as in the sample. When analysed, moderators were identified according to the framework of Sharma et al. (1981).

Procedure

Upon arrival, participants were told that the study was about consumer learning abilities and factors that may influence them. Half of the sample started by answering questions about their perceived fitness and self-efficacy before the first trial. The other half started with the first trial and completed questions about fitness and self-efficacy after the second trial. Next, participants were randomly assigned to one of the two conditions. In the control condition, participants were instructed to stand still and recall brand names from a product category. An example category (species of fish) was given to clarify when and how they were expected to respond during the trial to avoid misunderstanding. Furthermore, they were asked to stay still and only look toward a white wall in the lab. A microphone was placed near the subject, and the researcher sat behind to avoid eye contact and disturbance.

During the imbalance trial, participants were also introduced to the imbalance procedure. The procedure involved standing on one foot on a soft cushion with eyes closed after being slowly spun around five times. This manipulation was performed to ensure balance activation while collecting the data for the dependent variable. The manipulation was set for 30 seconds, long enough to manipulate imbalance without severe fatigue (Pollock et al., 2000). Before the first trial, participants were introduced to the accelerometers, which they had to fit around their waist and arms. When the device had been fitted, they were informed that they were about to participate in a physically strenuous but unharmful task. The researcher refrained from using the word balance or imbalance to avoid possible semantic priming effects that could have influenced the results. Before starting each condition, participants were asked to recall as many brands as possible from a given product category as motion sensors were activated.

Participants. The convenience sample comprised fifty-eight college students recruited to participate in the study. Participants were randomly assigned to two experimental conditions in exchange for a 100 NOK token at the college cafeteria. The mean age of participants was 22.9 years, with a standard deviation of 2.8. Out of 58 participants, 23 were male and 35 females. Meeting with students was difficult, as the campus was closed during COVID-19, and it took several weeks to run the experiment with one participant at a time. Participants and the researcher avoided being in close contact to prevent possible contamination. This made the procedure more stringent and time-consuming.

Materials. Accelerometers measuring the movement speed in three dimensions were used to record body imbalance. However, accelerometers are one of many ways to objectively measure imbalance and are found to have good reliability (Whitney et al., 2011). The accelerometers detect orientation automatically; therefore, they can measure tilting and rotation. To quantify imbalance (postural sway), the standard deviation of the root mean square (RMS) was used as a function of movement in time. With accelerometers, every participant received a single balance score independent of test length, facilitating the comparison between subjects.

Accelerometers have become relatively inexpensive, can be easily transported for field testing, and can be operated effortlessly with a cordless user interface. During the imbalance condition, accelerometers measured postural sway during the entire test; therefore, they were not limited to a specific placement of feet on the measurement plate, a force plate. Ergotest Innovation provided the accelerometer as wearable MuscleLab^{TM} sensors, consisting of angular velocity sensors or gyroscopes. The gyroscope detects orientation by itself and can therefore measure movement due to tilting or rotation. The standard deviation of the root means square (RMS) was used as a function of movement in time to quantify postural sway.

Other materials applied in the study were a 5cm wide, 35cm x 40cm Airex Balance-Pad. The Airex pad is a soft cushion that reduces stability and tactile sensory information. Lastly, digital audio recording equipment was used to document brand recall. An external microphone connected to a computer for audio storing was used to record brand recall.

Data Processing and Analysis

The data from accelerometers and a sound recording program were transformed into a decimal format in a spreadsheet before being transferred into a statistical analysis program, SPSS. The primary statistical analysis was repeated measure within-subject design, also known as a paired sample t-test. When covariates were added to the analysis, a linear mixed-effects model (LMM), also referred to as a generalized linear model (GLM), was used. The benefit of LMM over GLM with repeated measures is that it is better at handling correlated data, unequal variances, and an unequal number of repetitions (McCulloch et al., 2008). LMM treats subject responses as a sum (linear) of fixed and random effects, accounting for the effects associated with the population (fixed) and sampling procedure (random). Random effects can introduce correlation between cases, while fixed effects are the focus of the study. It is, therefore, necessary to adjust for case covariance in the data. LMM can be used to make the adjustment without assuming the independence of the data, like GLM-Univariate analysis. It is also based on maximum likelihood (ML) and restricted maximum likelihood (REML) methods rather than the analysis of variance (ANOVA) in GLM. While ANOVA produces an optimum estimator for balanced designs, ML and REML generate asymptotically efficient estimators for balanced and unbalanced designs (Seltman, 2012). Therefore, LMM allows for inferences on the covariance parameters even though the data may be unbalanced. Random effects included a random intercept that accounts for the inter-subject variability and a random slope that considers the inter-subject variability of scores. Such random effects can handle the correlations between measures across different conditions for a given participant. Before analyzing the main effects and covariates with LMM, descriptive data analysis was conducted. In the design of the models, the principle of parsimony was applied with appropriate number of parameters and the Hurvich and Tsai´ information criterion (AICC) for model fit. The AICC was considered as the best criterion to measure the quality of the model, as it corrects for the bias created by small sample size.

The following section presents the sample characteristics, descriptive statistics of the variables under study and the experimental manipulation checks.

Sample Characteristics

Of 58 participants in the repeated measure design, 60% were female, and 40% were men. Participants' average age was nearly 23 years. No participants reported medical drug use, sickness, or severe balance impairments, which would have eliminated them from the study. The sample characteristics are summarized in Table 3.

Table 3

Study 1: Sample characteristics (N=58)

	Min.	Max.	*M*	*SD*	Skewness	Kurtosis
Age	19	30	22.9	2.75	.45	-.49
Auto knowledge	2.00	9.00	5.36	1.94	.16	-.98
Clothing knowledge	1.00	9.00	6.43	2.31	-.83	-.14
Self-efficacy	1.8	4.00	3.08	.47	-.165	.131
Physical fitness	13	34	24.19	4.31	-.08	.19

The study measured memory-based brand recall in the categories of automobiles and clothing, one category for each experimental condition. The mean knowledge about automobiles was 5.4 on a scale from 1 to 9. The mean self-reported knowledge of clothing brands was 6.4. It can be argued that participants' physical fitness and belief in their capacity to execute actions could have interacted with the study results. Therefore, participants self-reported their physical fitness and self-efficacy. Physical fitness had a mean score of 24.2, an accumulated score for nine items assessed on a scale of 1-4, with four items being reverse-coded. The mean score for self-efficacy was 3, which was the average score for five items measured on a four-point scale.

Manipulation Checks

The experimental manipulation was conducted to determine whether there was a significant difference between the two conditions of balance and imbalance. The experimental design aimed to test the effect of a physically balanced condition in contrast to imbalance. Therefore, measuring an actual difference between the conditions of the independent variable was necessary. Two ways were used to measure the difference in this study. First, an objective measure of balance was defined as the standard deviation of balance movement acceleration. Second, participants were asked to report the degree to which they experienced the effect of the manipulation, in this case, the degree to which they felt balanced after completing each condition. A statistically significant difference between these conditions had to emerge before the effect on dependent variables could be analyzed.

Table 4

Study 1 Imbalance Manipulation Check

	Balanced		Imbalanced		*t(57)*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Acc. balance	0.60	0.47	2.59	1.09	-13.79	<.001	1.81
Feeling of balance	3.29	0.64	2.09	0.76	9.40	<.001	1.24
Mental Performance	6.64	1.69	6.07	1.94	2.085	.042	0.274

Table 4 shows the mean difference between the two conditions when measured objectively and subjectively. Participants in the imbalanced condition swayed more and felt more out of balance. This difference in physical balance between balanced (*M*=0.60, *SD*=0.47) and imbalanced (*M*=2.59, *SD*=1.09) conditions was statistically significant when measured by accelerometer; $t(57) = -13.79$, $p= .001$, $d= 1.81$. A significant difference also emerged between balanced (*M*=.3.29, *SD*=2.59) and imbalanced (*M*=2.09, *SD*=.76) conditions for self-reported balance, t(57) = 9.40, $p= .001$, $d= 1.24$. A significant difference in perceived mental performance was observed between conditions $t(57) = 2.085$, $p = .042$, $d = 0.27$. During balance, participants reported significantly higher mental performance (*M*=6.64, *SD*=1.69) than in the imbalanced condition (*M*=6.01, *SD*=1.93). In summary the results of the manipulation checks validate the negative effect of imbalance on both self-reported mental performance and feeling of physical balance.

Results

In this study, brand recall, specifically the number of brands retrieved from memory and the time needed to retrieve recalled brands, was expected to be reduced during a 30-second state of imbalance. Furthermore, it was proposed that imbalance will result in longer retrieval time. The subsequent section provides the results for hypotheses 1A, 1B, 2 and 3.

Hypothesis Testing of Imbalance on Brand Recall

Hypothesis 1A: Imbalance Reduces Brand Recall. A paired samples t-test was conducted to compare the Brand Recall scores between the balanced and imbalanced conditions. Although those in the balance condition recalled more brands (*M* = 9.81, *SD* = 3.96) than the imbalanced condition (*M* = 8.81, *SD* = 2.96), the results of the t-test showed that the difference was not statistically significant, $t(57) = 1.704$, $p = .094$. The effect size was small, with a Cohen's *d* of 0.224. The results can be found in Table 5.

Table 5

Hypothesis 1A: Repeated Measures t-test on Brand Recall

	Balanced		Imbalanced		*t(57)*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Brand Recall	9.81	3.96	8.81	2.96	1.704	.094	0.224

The finding provides limited support for the hypothesis that brand recall is reduced during imbalance.[3]

[3] Knowledge of automobile and clothing brands was considered as possible covariates in the analysis. To assess if knowledge impacted the relationship between imbalance and brand recall, a repeated measure GLM analysis was run, including condition, automobile, and clothing knowledge as predictors. However, the effect of the condition on brand recall remained unchanged and therefore a simple paired sample t-test is presented.

Hypothesis 1B: Imbalance Increases Brand Recall Time. A paired samples t-test was conducted to compare the recall latency between the balanced and imbalanced conditions.

Although those in the balance condition had lower recall latency (*M* = 3.41, *SD* = 2.21) than the imbalanced condition (*M* = 3.72, *SD* = 3.08), the results of the t-test showed that the difference was not statistically significant, $t(57) = -0.531$, $p = .597$. The effect size was negligible, with a Cohen's *d* of 0.070. Table 6 shows the results of the paired samples t-test.

Table 6

Hypothesis 1B: Repeated Measures t-test on Brand Recall Latency

	Balanced		Imbalanced		*t(57)*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Recall latency	3.47	2.21	3.72	3.08	-0.531	.597	0.070

A paired samples t-test was conducted to compare the recall latency between the balanced and imbalanced conditions. Although those in the balance condition had lower mean recall interval (*M* = 2.60, *SD* = 1.75) than the imbalanced condition (*M* = 2.66, *SD* = 0.88), the results of the t-test showed that the difference was not statistically significant, $t(57) = -0.257$, $p = .798$. The effect size was negligible, with a Cohen's *d* of 0.034. Table 7 shows the results of the paired samples t-test.

Table 7

Hypothesis 1B: Repeated Measures t-test on Brand Recall Interval

	Balanced		Imbalanced		*t(57)*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Recall interval	2.60	1.75	2.66	0.88	-0.257	.798	0.034

Hypothesis 1B about brand recall taking longer time was therefore not supported with the data from the study. This may be due to the inability to record the precise millisecond difference in recall between recalled items, undetected recall speed changes during the manipulation or other measurement errors. The possibility of fatigue limited the manipulation to only 30 seconds. The time when participants will stop recalling and give up is therefore unknown.

Hypothesis 2: Perceived Fitness Moderates The Effect of Imbalance on Brand Recall. The second hypothesis proposed that perceived physical fitness moderates the effect of imbalance on brand recall, leading to higher brand recall during imbalance for those who are high in fitness. The main effect of balance condition on both recall interval and latency (hypothesis 1B) were insignificant with negligible effect sizes and were not included in the analysis of hypothesis 2. Perceived fitness should make physical challenges less difficult, leaving more capacity available for other concurrent tasks. A simple main effects model (Model 1) with balance condition and fitness was used to test the main effects. Thus, the final model to be tested for Model 1 was a mixed effects model with randomly varying intercepts, described by $Y_{ij} = \mu + a_j + \beta_{01} Condition_i + \beta_{10} Fitness_j + \varepsilon_{ij}$, where $i = 1, 2$ (balance and imbalance), $j = 1, 2, \ldots, 58$ indexes the subject, Y_{ij} is the response variable (number of brands recalled), μ is the constant for the fixed effect for overall mean, a_j is the random effect for subject j, β_{01} is the slope for condition, β_{10} is the slope for fitness, and ε_{ij} is the residual following N(0, σ^2) (σ^2 is within-subject variance).

The predictors included in each model, information criteria, and coefficients of determination are presented in Appendix F. The moderation model (Model 2) that included the interaction term was subsequently run. The model used to test the moderation effect (Model 2) was a repeated measures generalized linear mixed model with randomly varying intercepts with randomly varying intercepts, described by $Y_{ij} = \mu + a_j + \beta_{01} Condition_i +$

$\beta_{10}Fitness_j + \beta_{11}Condition_i * Fitness_j + \varepsilon_{ij}$, where $i = 1, 2$ (balance and imbalance), $j = 1, 2, \dots, 58$ indexes the subject, Y_{ij} is the response variable (number of brands recalled), μ is the constant for the fixed effect for overall mean, a_j is the random effect for subject j, β_{01} is the slope for condition, β_{10} is the slope for fitness, β_{11} is the slope for the interaction effect and ε_{ij} is the residual following N(0, σ^2) (σ^2 is within-subject variance).

In Model 1, the main effect of the intervention of balance versus imbalance on brand recall was not statistically significant, *B* = 0.897 (95% CI, -0.157 to 1.950), t(57) = 1.70, *p* = .094. The main effect of the moderator, fitness, was also not statistically significant, *B* = 3.523 (95% CI, -0.630 to 7.677), *t*(57.8) = 1.698, *p* = .095. Perceived fitness was identified as a pure moderator since it interacted with the balance condition but had an insignificant main effect on brand recall. The positive effect of fitness on brand recall is stronger for those in the balanced condition than for those in the unbalanced condition *B* = 0.260 (95% CI, 0.021 to 0.500), *t*(56) = 2.180, *p* = .033. The effect size of the model was small with pseudo R^2 Conditional = 0.360.

Table 8 provides the parameter estimates for Model 1 and 2. [4]

[4] A model with category knowledge as an additional predictor was also tested, yielding the same results, and the more parsimonious model was chosen.

Table 8

Hypothesis 2: Repeated Measures Generalized Linear Mixed Model of Perceived Fitness on the Relationship Between Imbalance and Brand Recall

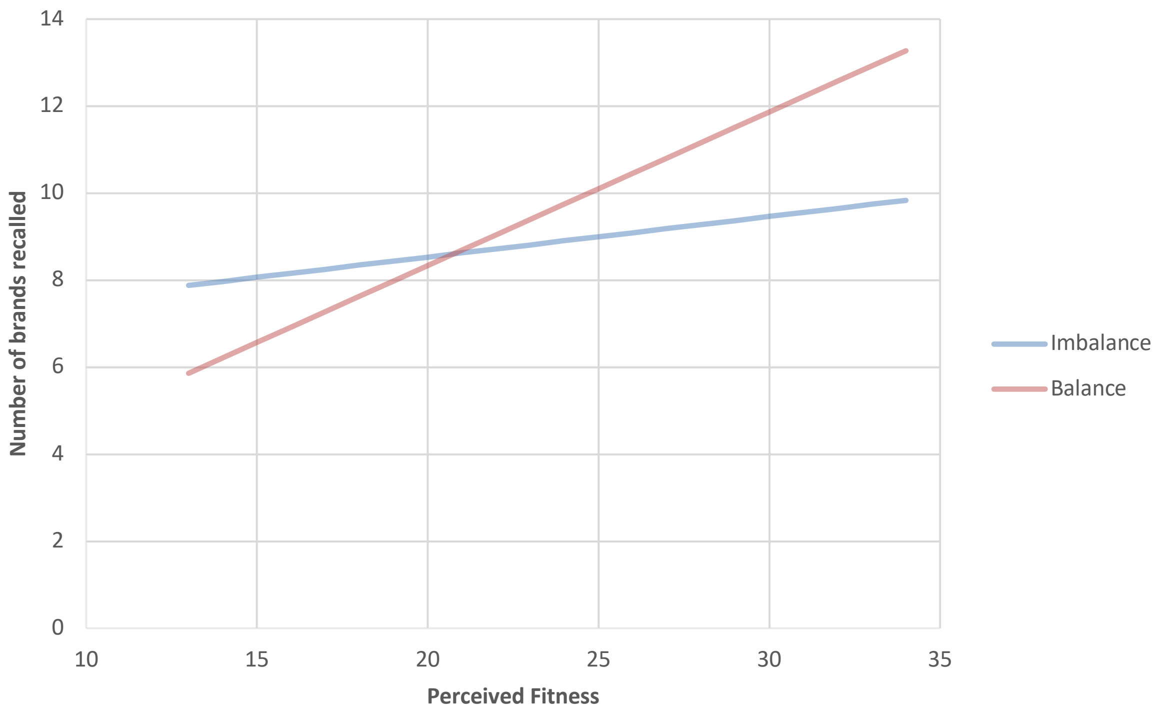
Parameter	*B*	*SE*	df	*t*	*p*	95% CI *LL*	95% CI *UL*
Model 1 (Main Effects)							
Intercept	3.523	2.075	57.831	1.698	0.095	-0.630	7.677
Balance vs Imbalance	0.897	0.526	57.000	1.704	0.094	-0.157	1.950
Fitness	3.523	2.075	57.831	1.698	0.095	-0.630	7.677
Model 2 (Moderation)							
Intercept	6.672	2.527	101.214	2.640	0.010	1.660	11.685
Balance vs Imbalance	-5.401	2.933	56.000	-1.841	0.071	-11.276	0.475
Fitness	0.093	0.103	101.214	0.901	0.370	-0.111	0.297
Bal*Fitness	0.260	0.119	56.000	2.180	0.033	0.021	0.500

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

Figure 5 displays the interaction plot, showing a crossover interaction. A crossover interaction can cause the main effects to be insignificant because it is the interaction that is influencing the outcome, not just the individual main effects. In this case, the main effects of balance condition and fitness are not significant, but the relationship between balance condition and brand recall is different for different fitness levels. This interaction effect indicates that the relationship between balance condition and brand recall depends on the value of fitness. This finding suggests that perceived fitness is not a primary driver but has a more positive effect on recall during the balanced condition.

Figure 5

Perceived Fitness on the Relationship Between Imbalance and Brand Recall



Pairwise comparison of this interaction shows no statistical difference in the marginal means between conditions for participants below the mean score of fitness (24.2). As seen in Table 9, at a fitness level of 0.25 standard deviations above the mean (25), the mean of brand recall during balance (M = 10.10) was statistically greater than the marginal mean of the imbalance condition (M = 9.0).

Table 9

Pairwise Comparison of Interaction with Perceived Fitness

Fitness level	16	20	21	24	25	28	32
Mean Recall bal.	6.94	8.34	8.69	9.74	10.10	11.15	12.55
Mean Recall imbal.	8.17	8.54	8.63	8.90	9.00	9.26	9.62
p	(.267)	(.787)	(.917)	(.102)	(.037)	(.008)	(.008)

The mean difference of 1.1, 95% CI[0.07, 2.147], was statistically significant at p = 0.037. The mean difference between balanced and imbalanced conditions continued to increase with increased fitness. At fitness level = 32, the marginal mean during balance increased to 12.6, while the marginal mean of imbalance was 9.6. The mean difference between conditions of 2.9, 95% CI[0.80, 5.1], was statistically significant at p = 0.008.

Hypothesis 3: Self-Efficacy Moderates the Effect of Brand Recall during Imbalance. Lastly, Hypothesis 3 proposed that self-efficacy positively affects brand recall. As with hypothesis 2, recall interval and latency were not included due to insignificant effect of balance condition and negligible effect sizes.

The effect was expected to be demonstrated even more so in the imbalanced condition. A simple main effects model (Model 1) with balance condition and self-efficacy was used to test the main effects. Thus, the final model to be tested for Model 1 was a repeated measures generalized linear mixed model with randomly varying intercepts, described by $Y_{ij} = \mu + a_j + \beta_{01} Condition_i + \beta_{10} Efficacy_j + \varepsilon_{ij}$, where $i = 1, 2$ (balance and imbalance), $j = 1, 2, \ldots, 58$ indexes the subject, Y_{ij} is the response variable (number of brands recalled), μ is the constant for the fixed effect for overall mean, a_j is the random effect for subject j, β_{01} is the slope for condition, β_{10} is the slope for efficacy, and ε_{ij} is the residual following N(0, σ^2) (σ^2 is within-subject variance).

The moderation model (Model 2) that included the interaction term was subsequently run. Thus, the model used to test the moderation effect (Model 2) was a mixed effects model with randomly varying intercepts, described by $Y_{ij} = \mu + a_j + \beta_{01} Condition_i + \beta_{10} Efficacy_j + \beta_{11} Condition_i * Fitness_j + \varepsilon_{ij}$, where $i = 1, 2$ (balance and imbalance), $j = 1, 2, \ldots, 58$ indexes the subject, Y_{ij} is the response variable (number of brands recalled), μ is the constant for the fixed effect for overall mean, a_j is the random effect for subject j, β_{01} is the slope for condition, β_{10} is the slope for efficacy, β_{11} is the slope for the interaction effect and ε_{ij} is the residual following N(0, σ^2) (σ^2 is within-subject variance).

The main effect of the intervention of balance versus imbalance on brand recall was not statistically significant, *B* = 0.897 (95% CI, -0.156 to 1.950), *t*(57) = 1.70, *p* = .094, and the main effect of efficacy was not significant in Model 1, *B* = 1.309 (95% CI, -0.266 to 2.884), *t*(56) = 1.665, *p* = .101. Self-efficacy was identified as a pure moderator since it interacted with the balance condition but had an insignificant main effect on brand recall. There is a positive effect of efficacy on brand recall for those in the balanced condition but not for those in the unbalanced condition *B* = 0.2771 (95% CI, 0.640 to 4.902), *t*(56) = 2.605, *p* = .012. Pseudo R^2 Conditional = 0.361 suggest that the effect is small. Table 10 provides the parameter estimates for Model 1 and 2.[5]

[5] A model with category knowledge as an additional predictor was also tested, yielding the same results, and the more parsimonious model was chosen.

Table 10

Hypothesis 2: Repeated Measures Generalized Linear Mixed Model of Self-efficacy on the Relationship Between Imbalance and Brand Recall

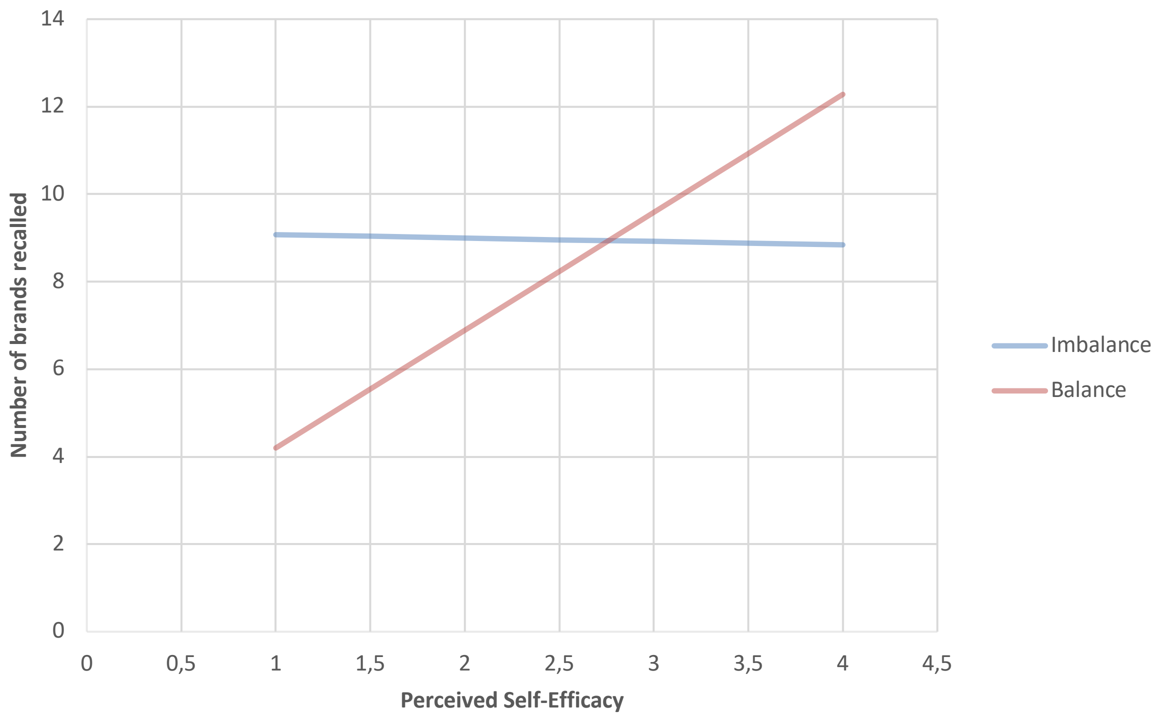
Parameter	*B*	*SE*	df	*t*	*p*	95% CI	
						LL	*UL*
Model 1 (Main Effects)							
Intercept	4.879	2.466	57.290	1.979	0.053	-0.058	9.816
Balance vs Imbalance	0.897	0.526	57.000	1.704	0.094	-0.157	1.950
Efficacy	1.309	0.786	56.000	1.665	0.101	-0.266	2.884
Model 2 (Moderation)							
Intercept	9.150	2.960	98.392	3.091	0.003	3.276	15.024
Balance vs Imbalance	-7.645	3.318	56.000	-2.304	0.025	-14.291	-0.999
Efficacy	-0.077	0.949	98.392	-0.081	0.936	-1.960	1.807
Bal*Efficacy	2.771	1.064	56.000	2.605	0.012	0.640	4.902

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

Figure 6 displays the interaction plot, showing a crossover interaction. As with fitness, the main effects of balance condition and efficacy are not significant, but the relationship between balance condition and brand recall is different for different efficacy levels. This interaction effect indicates that the relationship between balance condition and brand recall depends on the value of efficacy.

Figure 6

Self-efficacy on the Relationship Between Imbalance and Brand Recall



A pairwise comparison of this interaction showed no statistically significant difference in the marginal means between conditions for participants below the mean self-efficacy score (3.08) (Table 11).

Table 11

Pairwise Comparison of Interaction with Self-Efficacy

Self-efficacy level	2,0	2,5	3,5	4,0
Mean Recall bal.	6,93	9,60	10,92	12,25
Mean Recall imbal.	9,03	8,92	8,90	8,82
Sig.	(.100)	(.195)	(.003)	(.003)

When self-efficacy was 0.25 standard deviations above the mean (3.5), the marginal mean during balance (*M* = 10.9) was statistically greater than the marginal mean of the condition of imbalance (*M* = 8.9). Their mean difference of 2.1, 95% CI(3.39, 0.71), was statistically significant at $p = 0.003$. The mean difference between balanced and imbalanced conditions continued to increase with increased self-efficacy. When the self-efficacy level was 4, the marginal mean during balance increased to 12.3, while the marginal mean of imbalance was 8.8. The mean difference between conditions of 3.4, 95% CI(1.2, 5.6) was statistically significant at $p = 0.003$. This is to say that self-efficacy plays a more prominent role in the balanced compared to the imbalanced condition.

Discussion

The study found that participants experienced greater physical and poorer mental performance during imbalance. Still, brand recall was not significantly reduced in a sample of young and healthy participants when experiencing momentary imbalance. The effect was in the predicted direction but not significant. The imbalance stimuli were tested on healthy young subjects who may be better capable of handling the distress than older people. This suggests a small negative interaction between physical imbalance and cognitive resources regardless of physical capabilities. Difference between conditions in recall time was not found to be significantly different and should be further investigated in future studies.

Counterintuitively, recall during imbalance did not improve significantly compared to the balanced condition for participants high in self-efficacy and self-perceived fitness. Though prior research findings (Boisgontier et al., 2013; Hoffman & Schraw, 2009) may suggest perceived fitness and self-efficacy positively affect cognitive processing, Study 1 implied a boundary effect. According to Study 1, the belief in one´s abilities improves brand recall only when balanced.

The results raise the question of whether the experienced mental effort of physical imbalance somehow influences the operation of cognitive processing. It is commonly known that memory retrieval is not random but organized around certain schemas and rules (Langley et al., 2009). The conceptual model suggests that imbalance influences cognitive capacity and processing. For marketers, it is useful to know the rules that guide memory retrieval and the effect of cognitive load on cognitive processing, such as recall. The remaining of this dissertation (Study 2-4) focuses on the effect of imbalance as a source of low construal processing.

Imbalance as a Source of Retrieval Bias

Consumers' retrieval of brands may be biased as they apply learned organizational schemes or rules to select a brand stored in memory (Desai & Hoyer, 2000; Nedungadi, 1990). Applying strategies that simplify information search by disregarding some less relevant information results from limited working memory (Bettman et al., 1991). The outcome may be selective and even wrong when less relevant strategies are selected. Therefore, a customer may accurately retrieve brands, but they may be unrepresentative of all known brands. In that case, can these cognitive strategies possibly interfere with each other when more than one task is being attended to? While memory strategies are learned rules applied in information retrieval, it is also possible for working memory to apply strategies in one domain as rules for other cognitive functions (Sepp et al., 2019; Sörqvist et al., 2012). This is especially true in integrating a sensory-motor domain with another cognitive domain (Dijkstra & Post, 2015). For example, the performance on a visual problem-solving task improved when participants simultaneously memorized a verbal message, whereas performance was reduced when the additional task was another visual task (Thomas, 2013). In Chapter 2, a low construal level was proposed as a cognitive simplification rule for processing during the proximal sensation of imbalance. When cognitive capacity is reduced during proximal sensations, it is proposed that effort of remaining cognitive processing will be simplified (Hadar, et al., 2019). The simplification is ruled by proximal sensation which increasing preference for proximal outcomes.

Implications

According to Study 1, imbalance did not significantly affect recall of brands from memory, as a proxy for cognitive capacity. Data shows limited evidence for young and healthy consumers' reduced capacity to retrieve brands from memory due to the state of imbalance. However, participants experienced their mental performance during imbalance to be reduced when concurrently retrieving brands from memory. Although, the main hypotheses did not provide sufficient evidence to support a significant reduction in brand recall during imbalance, participants experienced significantly reduced self-reported mental performance during imbalance. Therefore, marketers should not disregard the potential negative consequences for their customers. The study did not confirm an effect on brand retrieval, yet the effects on cognition related to imbalance may be undetected. Therefore, it is worthwhile to study the effect of imbalance on consumers. In Study 2, I address the question of whether imbalance prompts a preference for low construal choice alternatives.

Chapter 4

Introduction to Study 2

Limited cognitive capacity negatively affects consumers (Dewitte et al., 2005; Vosgerau et al., 2008). For example, Dewitte et al. (2005) found that consumers become less critical of market information and make poorer judgments when cognitive load is high. The data on healthy subjects in Study 1 did not confirm a significant reduction in brand retrieval due to imbalance even though it was considered more mentally effortful. The finding is contrary to some other studies that reported a negative effect of imbalance on cognitive capacity (Rankin et al., 2000; Siu & Woollacott, 2007), especially in older subjects (Segev-Jacubovski et al., 2011). When attention to imbalance is required, consumers may be prompted to make modifications to simplify their decision-making (Korteling et al., 2018). These simplifications affect cognitive processing and outcomes (Pohl et al., 2013). Evidence points to a relationship between construal processing of psychological distance and sensory processing during capacity constraints, such as impaired visual filtering (Hadar et al., 2019) during a low construal state and more spontaneous judgments (Körner & Volk, 2014). Therefore, it was proposed that cognitive capacity will be reduced during physical imbalance, and the remaining capacity will be simplified around the construal of shorter psychological distance (Hansen & Melzner, 2014; Khan et al., 2011; Wan & Rucker, 2013). Evidence shows that proximal sensations result in a shorter psychological distance (Elder et al., 2017; Ruzeviciute et al., 2020), as suggested by the pioneers of construal level theory (Trope & Liberman, 2010). Trope and Liberman (2010) suggested that the closer sensory signals are sensed, the shorter the psychological distance construed during the environment's evaluation. However, the sensation of imbalance has not been tested within the framework of construal level theory. As imbalance relies more on interoceptive sensations (Kandel et al., 2012), such as proprioception and vestibular sensation, a positive relationship between low construal and imbalance is expected (see Figure 1). To compensate for limited cognitive capacity and the ambiguousness of the sensory proximal imbalance experience, Study 2 proposed that during imbalance, cognitive outcomes will be construed at a closer psychological distance. The results from the study will be relevant from a marketing perspective as they may direct consumers´ focus to the present and away from more distant and abstract outcomes.

The following sections give a detailed description of Study 2, which explores the relationship between physical balance and cognitive processing in the context of construal level theory. A full description of the study design and results are given as they relate to RQs 2 and 3 about the influence of imbalance on construal level processing of consumers.

Conceptual Framework for Physical Balance and Construal Level

Most physical balance research has focused on the role of the postural system in gait and balance performance (Balasubramaniam & Wing, 2002; Kandel et al., 2012; Segev-Jacubovski et al., 2011), specifically on the prevention of falls in older adults and those with vestibular dysfunction. Most studies are clinical and therefore primarily concerned about empirical results rather than theoretical explanations for the mechanisms that might influence balance. The evidence for the relationship between levels of physical balance and cognition (e.g., decision-making, preference and choice) has been explored only to a limited extent (Segev-Jacubovski et al., 2011). However, the relationship between cognition and imbalance is significant when it potentially affects cognition (Chong et al., 2010; Shumway-Cook & Woollacott, 2000).

Study 2 examined the effect of imbalance on consumers' construal levels and the degree to which the postural control system may be responsible for changes in perceived psychological distance. Are our balancing systems able to alter how we construe our environment? The general idea is that psychological distance affects how we think about a concept in abstract or concrete terms. The connection between the postural control system and psychological distance is based on the assumption that the sensation of imbalance is experienced as a proximal activation of the balance system. Since imbalance relies on greater interoceptive sensations and limited cognitive capacity, Study 2 suggested that construal levels will be affected.

Similarly, as the sensation of touch is experienced as closer than smell, it is proposed that the imbalance will lead to greater activation of psychological proximity through vestibular and proprioceptive processing. Prior research on construal levels has shown that psychological distance affects consumer perception and decision-making (Dhar & Kim, 2007; Fiedler, 2007; Kim & John, 2008; Liberman et al., 2007). Therefore, an important question is whether physical balance influences perceived psychological distance in consumer preference and choice making.

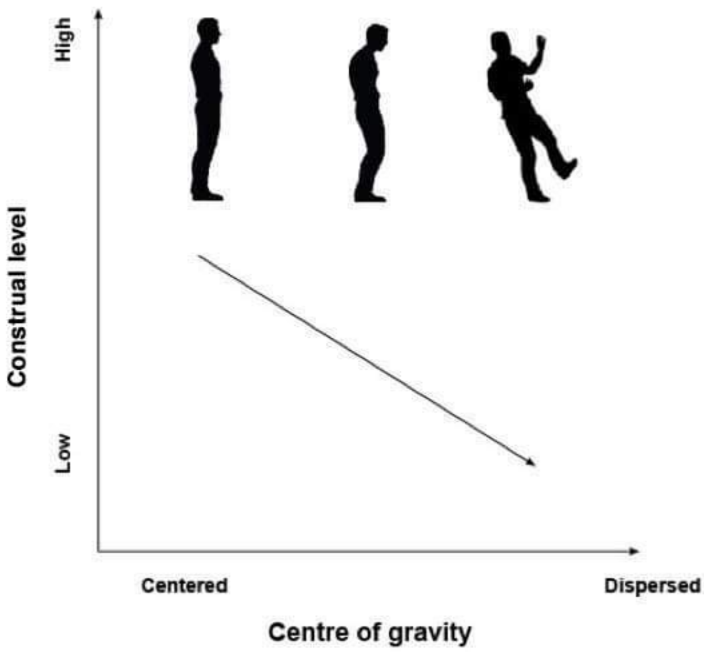
The Postural Control System and Psychological Distance

When described strictly in terms of physiology, perfect balance is a state in which the force of gravitation is concentrated in a straight line from the head, through the body, with the legs providing maximum support for the upper body down to the feet as the base of support (Shepherd, 2001). In this position, the maximum weight rests on the skeleton rather than being compensatively carried by muscles (Thornquist & Bunkan, 1991). Research suggests that as muscular activity decreases, the balancing system has a greater capacity to process proprioceptive and tactile sensory information (Berrigan et al., 2006; Nashner & McCollum, 1985). With decreased capacity required to process sensory information, cognitive capacity is free to process other tasks. A more balanced posture is found to increase cognitive processing speed (Awad et al., 2021), suggesting that a relaxed standing posture can contribute to increased capacity to regulate emotions (Veenstra et al., 2017) and construe future outcomes (Pham et al., 2011).

Conversely, the imbalance is when the force of gravitation is unequally distributed across the body, so corrective movement is needed to shift diagonal position to avoid a fall (see Figure 7). Imbalance affects an individual who has difficulty maintaining upright orientation due to postural sway beyond the limits of the base of support (Paillard et al., 2015; Sturnieks et al., 2008). Imbalance can, therefore, be defined as a momentary state in which the multiple sensory systems strive to compensate for the missing sensory information required for coordination (Shumway-Cook & Woollacott, 2000). For healthy consumers, imbalance occurs when it is brought on by an accident, inattentiveness, or slippery conditions (Proske & Gandevia, 2012). Imbalance is not a constant threat for healthy individuals in daily lives, but poor posture may inhibit consumers from having perfect balance control (Horak, 2006). During a still stance, the head is often tilted forward, and the upper back is slightly bent so that the force of gravitation is not in a straight line to the body's base, causing imbalance and muscle tension.

Figure 7

Proposed Relationship Between Physical Balance and Construal Level



Therefore, physical balance versus imbalance is not a description of two binary states (Figure 7) but rather a continuum from perfect balance control to so little control that a person is at risk of falling (Thornquist & Bunkan, 1991). For example, Hackford et al. (2019) have found that an upright walking posture, as opposed to slumped posture, can improve negative affect and general psychological state, which suggests a relaxed posture for greater construal. Pham et al. (2011) have demonstrated that relaxed affective states contribute to higher construal levels, causing a product's monetary perceived value to increase.

Study 2 is designed for research questions two and three of this dissertation, pertaining to the effect of imbalance on construal levels and their duration. Having demonstrated in Study 1 that imbalance reduces the capacity to retrieve brands, Study 2 tested the proposition (*RQ 2*) that imbalance, as a proximal sensory experience (Elder et al., 2017; Trope &

Liberman, 2010b), will influence cognition by increasing preference for low construed outcomes whereas a relaxed standing posture will decrease the preference for proximally low construed alternatives. The third research question (*RQ* 3) followed up on research question two by exploring the duration of construal processing after an imbalance. The following section presents the hypothesis derived from these research questions.

The sense of balance involves an integrated body of sensory organs that prevent us from falling over when standing or moving (St George & Fitzpatrick, 2011). People manifest a stable stance without balance impartments; it is largely an effortless state, even though it may require small perturbations within the body, such as breathing (Davidson et al., 2004).

Hypothesis About Balance in the Context of Construal Level Theory

As discussed in Chapter 2, the balancing system, which comprises several interrelated neurological processes, governs the experience of balance. An imbalanced condition is expected to be proximal due to increased interoceptive sensation (see Figure 1) and, as a simplification strategy, leads to cognitive processing with less psychological distance. The proposition is based on construal level theory (Trope & Liberman, 2010b) and empirical findings on the relationship between sensation and construal level (Elder et al., 2017; Ruzeviciute et al., 2020). Since balance is a continuum from effortless standing posture to an imbalanced fall, it was hypothesized that CLT explains a bi-directional relationship between balance and imbalance (Figure 7). Accordingly, the following hypothesis was proposed:

H_{1A}: Imbalance induces low-level construal processing.

The state of imbalance is present in a low construal, with a preference for the present. The first hypothesis sought to test the relationship between imbalance and low-level construal (Figure 8), where the imbalance is a cognitive load leading to simplified low construal processing.

Figure 8

Hypothesis About the Relationship Between Imbalance and Low Construal

It can be postulated that increased frequency of interoceptive sensory stimuli during an imbalance state will result in low construal, making closer psychological thoughts more prominent as the sensation becomes more proximal (Trope & Liberman, 2010). With closer sensation, the psychological distance should be perceived as shorter during the evaluation of outcomes.

On the other hand, effortless balance is considered more distant since it is less dependent on interoceptive sensory signals and allows for greater exteroceptive sensation through eyesight. A balanced and effortless posture is proposed to have greater exteroceptive processing without a cognitive load leading to more high construal processing.

To test this proposition, a condition of minimal balance effort (relaxed, stable stance) must be compared to a non-manipulated balance control condition. The proposition is that activation of a proximal sensory experience will be perceived with a closer psychological distance, whereas effortless balance (minimum muscular strain) will prompt greater psychological distance. Hence the following hypothesis was proposed:

H_{1B}: An effortless balance condition induces high-level construal processing.

Prior findings suggest that when balance increases, the postural control system has a greater capacity to process sensory information (Berrigan, Simoneau, Martin, & Teasdale, 2006). When the postural system works at a lower rate, there will be a greater cognitive capacity to interpret outcomes as psychologically distant. Being relaxed allows for an increased sensation of tranquillity and detachment, resulting in a higher construal level and a greater desire for future outcomes (Pham et al., 2011). In this relaxed condition, participants must maintain an effortless standing posture with minimum muscular strain (e.g., neck, shoulders, and lower back). This is to say that someone´s posture is not necessarily perfectly balanced but effortful due to muscular strain when body segments are not in line.

The last question is whether the construal effect emerges only during the manipulated sensations of balance/imbalance or whether the effect attenuates when the manipulation is stopped. While most construal level studies have measured psychological distance immediately after stimuli, testing construal effects prompted by balance or imbalance will have to start as a dual task before it can be measured after the balance intervention. Since the proximal experience of imbalance is expected to influence psychological distance, it was predicted that the effect would attenuate immediately or soon after the sensory stimulation of imbalance stops. Construal level theory proposes a relationship between proximal versus distal senses and psychological distance. For the relationship to be established, sensory stimulation is likely to be concurrent with balance. However, evidence supports consecutive cognitive outcomes in studies on body posture control, which requires a hypothetical test of the attenuation of construal effects (Briñol et al., 2009; Scarpa et al., 2011). Hence, it is necessary to consider the construal effects during and immediately after the physical balance manipulations. Accordingly, the following hypothesis was proposed:

H_2: Balance-induced construal level effect is momentary.

In summary, the aim of Study 2 was to investigate whether changes in physical balance temporarily influence people´s perceived psychological distance from cognitive outcomes. This is to say that effortless balance is proposed to facilitate more abstract thinking and preference for distant rewards, while imbalance is suspected to increase preference for concrete thinking and immediate rewards (see illustration in Figure 7). The following section describes the methodology of Study 2.

Methodology

Several methodological factors must be considered when exploring the relationship between physical balance and cognitive responses. Study 2 was a between-subject design with participants randomly assigned to one of three conditions.

Since Study 2 tested the relationship between physical balance and construal level, it is necessary to design a procedure that will affect participants' balance control while adequately representing the mechanisms hypothesized to affect construal. A balanced bodily state must be induced so participants have as stable a posture as possible; an imbalanced bodily state must also be generated.

Physical balance is generally defined as the ability to control the body mass or center of gravity relative to the base of support (area of ground surface between and beneath the feet covered by the body silhouette) with minimal postural sway (Mooney, 2009; Shumway-Cook et al., 1988). Since balance emerges from a complex interaction of the vestibular, visual, and somatosensory systems, integrated and modified within the central nervous system (Horak et al., 1989; Prieto et al., 1996; Shumway-Cook & Woollacott, 2000), these systems should be incorporated in the manipulation. For the body to achieve optimal balance, the various body segments must be controlled, and body alignment must be at the center of gravity relative to the environment at any given time (Shepherd, 2001). In the state of balanced standing (quiet stance), the body alignment is optimal in relation to the base of support; therefore, little muscle activity is needed to control body segments. The skeleton becomes better balanced, with increased joint approximation and minimum support from muscles and ligaments (Thornquist & Bunkan, 1991).

Conversely, muscular activity intensifies when the body has an imbalanced posture, and a dynamic interaction within the segmental linkage comes into play. Therefore, I adopted three experimental conditions, stable postural balance, imbalance, and a control group without balance manipulation. Participants were randomly assigned to one of these conditions. Group 1 was a balanced postural group whose members were instructed to maintain an effortless posture as if they had an imaginary line that kept their bodies in a comfortable position. Group 2 was a control group that did not receive postural instructions. Group 3 was an imbalanced group, instructed to stand on one foot while tilting the upper body forward and away from the knee, which was kept upright.

Stimulus Development and Measurement

Postural balance conditions were used as an independent variable to test the proposed hypotheses and measure construal levels as a dependent variable. Table 12 provides an overview of the study design for Study 1. Translated scales in Norwegian are included in Appendix B.

Table 12

Overview of Study 2: Variables and Measures

Independent variable	Manipulation check	Dependent variables	Control variables
Balance condition: Stable stance, imbalance, and control condition	Center of pressure (std. from center of down force mm/t) Perception of physical balance	Dual-task construal level measures: 1. Navon visual task of global precedence 2. Construal frame (Wan & Rucker) Consecutive construal level outcome: 1. Discounting task (area under the curve)	1. Rosenberg self-esteem scale 2. Abadie perceived physical fitness scale 3. Current feeling scale (Pham et al.)

The following sections explain the development of the stimulus and outcome variables.

Independent Variable: Imbalance and Balance Manipulations. Two experimental conditions needed to be designed to test the hypothesis about physical balance influencing construal level. In one condition, participants were put out of balance in a controlled manner, and in another condition, effortless and relaxed posture was maintained. A control condition that received instructions about postural balance was included to examine the contrast effect. A condition of imbalance was used on the one end of the physical balance continuum. On the opposite side of the continuum was a condition in which participants had an effortless, stable stance. The effortless condition was intended to test the second hypothesis about effortless balance increasing psychological distance. A control condition without instructions or mentioning balance was used to compare the two experimental conditions. The conditions described in the following section are designed to quantify the degree of postural control as both static and dynamic balance. Balance was measured with a force plate on which the participants stood, while postural sway was measured by the downforce they applied during the manipulation. In addition to an objective measure of imbalance, specific questions were posed about the sensation of balance ("I feel balanced") and imbalance ("I feel out of balance") to check for cognitive evaluation of the balancing concept.

Balanced Still Stance Condition as a High-Level Construal Manipulation. As the participants entered the room, they were instructed to take off their shoes and stand with their feet hip-width apart on a force plate that monitored the center of pressure (CoP) during the trial. The CoP is dependent on the body's position with respect to the supporting surface and is, therefore, an expression of physical balance (Horak & Macpherson, 2011). The CoP is regarded as an indirect measure of balance, as it records the shift in the center of pressure on the force plate caused by postural sway while an individual strives to maintain an upright position (Gribble & Hertel, 2004).

The participants were then asked to put their arms and shoulders in a relaxed position while stretching the body as if an imaginary string attached to the back of the head pulled the body up towards the ceiling. They were told to stretch as high as possible for 5-10 seconds until instructed to imagine the string being slightly loosened so that the body would return to a more normal posture. Physical therapists commonly use this procedure to increase body alignment, thus moving the body mass closer to the center of gravity and minimizing the pressure on the body´s center during a stable stance (Schafer, 1983). The participants were asked to keep this posture for one minute before orally answering a set of two separate construal level items displayed before them or read to them. The items are described in the section on dependent measures. After the device testing, the participants immediately moved to a table and chair next to the device to perform the monetary discounting task with pen and paper. In this task, participants indicated how much money they would need to receive the equivalent of 200 NOK today. The participants were then moved to a separate room from the lab to answer background questions (control variables), followed by a debriefing and a small monetary reward.

Imbalanced Stance Condition As a Low-Level Construal Manipulation. Participants entered a room individually, and they were asked to take off their shoes while being introduced to the measurement procedure. The cover story for the participants specified that the study focused on the sensitivity of the device used to record body movement. The procedure is a modified form of the functional reach test (Duncan et al., 1990), emphasizing the displacement of the CoP. Standing with one foot on the CoP measurement device, the participants were asked to lean the head and upper body diagonally forward as far as possible without losing full contact with the device. Falling was allowed, but in such cases, the participants were asked to begin again, starting on the other foot. They were asked to try to hold their position for at least twenty seconds or until fatigue prompted them to change legs.

The trial's purpose was to increase the displacement of body segments, which causes body mass to move away from the center of gravity, often leading to a physical fall. The participants held this posture for one minute before being asked to respond orally to a set of two construal-level items that either appeared in front of them or were read to them. After the device testing, the participants immediately moved to a table and chair next to the device and, with pen and paper, answered questions on discounting of future rewards. When participants were finished, they moved to a separate room to answer background questions (control variables). Lastly, they were debriefed before collecting a small monetary reward.

Control Condition. Participants assigned to the control group were not given any instructions regarding their physical stance on the CoP platform. They were told they needed to stand still on the force plate for two minutes and that their position was unimportant. Apart from the absence of instructions for physical posture, the same procedure was followed as with the other two groups. Participants answered the dependent variable items orally after one minute of standing. After the device testing, participants immediately moved to a table and chair next to the device and answered written questions about discounting future monetary rewards. When participants had finished, they moved to a separate room to answer some background questions. They were then debriefed and given a small monetary reward.

Dependent Variable. Suitable dependent measures of construal level had to be selected for the different balancing conditions so that participants could execute them. The psychological distance can be manipulated, and construal levels can be measured in various ways (Adler & Sarstedt, 2021; Burgoon et al., 2013; Fiedler, 2007; Soderberg et al., 2015; Trope & Liberman, 2010b), but not all are fit for the short experimental dual task. The objective of Study 1 was to determine the level of preference for high or low construal using a choice task between construal level alternatives.

During imbalance, the participants must be able to simultaneously attend to the postural and construal-level choice tasks. The timing of the outcome variable measures can also be important, as the duration of the manipulation effect is unknown. In Study 2, two construal level measures were conducted simultaneously with the balancing task (also referred to as the dual-task paradigm), one presented visually and a second one presented verbally. The measures were done to test Hypotheses 1 and 2. Following the balance condition, a construal level measure in a delayed discounting task (also referred to as an intertemporal choice task) was completed to test Hypothesis 2.

Global Visual Perception and Ad Slogan Frames as Concurrent Measure of Construal Level. In Study 2, the state of balance was the subject of study and the main independent variable. I predicted that balance instructions would influence cognitive focus. Hence, variations in physical balance states serve as construal modifiers. After participants had been given the necessary instructions to perform the postural balance tasks as a construal level manipulation, they were presented with two separate questions to check their construal level. First, participants were presented with a variation of the Navon task (Navon, 1977), in which two identical letters had been constructed out of many small letters.

Figure 9

Example of Navon Visual Task of Global Perception

XXXXXXXX	XXXXXXXX
XXXXXXXX	XXXXXXXX
XX	XX
XX	XX
XX	XX
XX	XX
XX	XX

The letters were shown to participants for approximately two seconds (see Figure 9). The two bigger letters (T) measured 20 cm x 15 cm, and the small letters (x) measured 2.5 cm x 2 cm. The researcher presented the stimuli side-by-side on a piece of cardboard at eye level, approximately 1.5 m from the participant. During the exposure to the letters, participants were asked, "What letters do you see?" The first answer was recorded, and the researcher moved on to the second question. The influence of global/local perception on the construal level has previously been demonstrated by Trope and Liberman (2010), where construal levels have influenced estimates of temporal, spatial, and social distance. As soon as the participants answered these questions, each was presented with a choice of two different slogans. The researcher presented the cover story that a health club in the area was considering a new slogan and asking for help choosing between two. The participant was asked to indicate which of the two slogans was preferred: "Enjoy day-to-day health" (concrete frame) vs. "Enjoy lifelong health" (abstract frame). This construal framing was applied as a construal outcome in an earlier study by Wan and Rucker (2013). The order of the slogans alternated so that half of the participants in each group were exposed to the high-level frame first.

Discounting of Monetary Rewards as a Consecutive Measure of Construal Level. The last dependent variable was the construal preference for proximal or distant outcomes (Todorov et al., 2007; Yi et al., 2017). After answering the first construal level questions, the participants stepped off the force plate and sat down at a nearby table to answer questions about the value that future gains should have to be equal to present gains. The questions were related to a scenario in which the participants were asked to imagine winning 200 NOK and to write down the amount needed if the prize could not be collected until a week or a month later. This part of the study was called the delayed discounting task, in which a discounting function was calculated for each participant as an area under a curve. The steeper the curve, the less area under it on a graph, representing less value on future rewards. The area under the curve represents the empirical discounting function as a measure of delayed discounting (Myerson et al., 2001). The area can range from 0.0 (steepest possible discounting) to 1.0 (no discounting) and offers a simple statistic for comparative purposes between groups (Green & Myerson, 2004). If individuals are willing to put off immediate monetary rewards in exchange for later but higher rewards, their preference reflects a high construal option. In such a case, they discount the future less, and the area under the curve becomes greater (higher number) than those who prefer immediate rewards. Though an actual monetary reward would offer more realism, evidence indicates that hypothetical rewards are regarded as real rewards (Matusiewicz et al., 2013; Van den Bergh et al., 2008).

This study proposed that participants in a low construal (imbalanced) condition would discount future rewards more abruptly than those in a high construal (balanced) condition. An imbalanced low construal mindset is predicted to have a heightened preference for immediately available rewards over larger and delayed monetary rewards. Psychological distance is greater with high construal levels, suggesting that low-level participants have a higher preference for immediate outcomes (Bischoff & Hansen, 2016; Fujita, Trope, et al., 2006). Previous studies have used construal level manipulations to measure the effects of delayed discounting (H. Kim et al., 2013; Yi et al., 2017). Study 2 used physical balance as a construal level manipulation to measure the effects of delayed discounting as well as other forms of construal level measures.

Control Variables. Finally, variables that can interfere with the results of between-group comparisons had to be selected, in addition to manipulation check measures of the independent variable. I controlled for subjects´ age, gender, perceived physical fitness, and self-esteem in the protocol. Participants who reported medical drug use, sickness, or balance impairments were excluded from the study.

After completing the two tasks, participants were presented with several background questions, which they answered using paper and pencil. In addition to demographic questions (age and gender), participants were asked about their self-esteem using the Rosenberg scale, often referred to as RSES (Schmitt & Allik, 2005), current feelings items adapted from Pham et al. (Pham et al., 2011), and perceived physical fitness (PPF), based on a modified version of the PPF scale (Abadie, 1988). All items were answered on a four-point scale (strongly agree/agree/disagree/strongly disagree). The 10-item RSES self-esteem scale (Rosenberg, 1965) was found to have good reliability and correlate with a range of criteria, such as social desirability, personality, psychological and physical health, and academic outcomes (Greenberger et al., 2003; Robins et al., 2001). Hence, the RSES scale was a fitting way to check for underlying psychological efficacy differences between participant groups. A translated version of the RSES scale has been validated (Von Soest, 2005) in Norwegian with acceptable reliability ($\alpha = .86$). In Study 2, internal consistency reliability was at the lower end of the acceptable range ($\alpha = .62$).

Mood (or current feeling) was assessed using five items, “I feel relaxed,” “I feel calm,” “I feel peaceful,” “I feel pleasant,” and “I feel good,” as in Pham et al. (2011), measured on a four-point scale from 1 (“strongly disagree”) to 4 (“strongly agree”). These measures analyzed participants’ mood as a covariate of the preference for construal outcomes. If the experience of being in perfect balance is also experienced as relaxing, the manipulation’s effect on participants´ moods is worth measuring. The translated scale had acceptable internal consistency reliability, which was in the same range ($\alpha = .88$) as in previous studies (Gorn et al., 1997).

Participants were asked about their perceived fitness using nine out of twelve items on the perceived physical fitness scale (Abadie, 1988), as in Study 1. One participant did not provide their answer to this part of the questionnaire. Finally, participants were asked three open-ended questions adopted from Bargh and Chartrand (2000) that probed for suspicion regarding the experimental manipulations and two screening questions relating to participants' balance impairments and any balance-impairing medication.

Before conducting Study 2, all test items and questions were pre-tested on a small sample of students belonging to the same demographic group as the participants. Minor language adjustments were made. Likewise, a pre-test was executed on the independent condition of imbalance to check for instructional understanding and physical.

Procedure

Participants were told that they would be participating in two independent studies, the first of which was about the response sensitivity of a bio-physical measurement device that was being considered by the Physical Education department of the college. The device was, in reality, a force plate that measured participants´ center of gravity. The second study was presented as a marketing research project in which some alternative offers were evaluated. Participants were told that, due to time constraints, the two studies would partially overlap so that the first questions would be asked during the measurement device test. This manipulation was performed to ensure that the balance activation effect was firmly at work while data for the dependent variable (construal) was collected during and after the manipulation. Most balance control studies incorporating a cognitive task do so concurrently (i.e., with a dual-task paradigm) rather than sequentially. To establish the main effect, consistent with the literature, it is appropriate to start the study with a dual-task paradigm to simultaneously activate balance sensation and unrelated cognitive processing.

In all conditions, the instructor never used the word balance, and it was not included in any of the measurements. Phrases such as the *center of pressure* (CoP) and *downforce* were used instead. This was done to avoid any possible semantic priming effect influencing the results. The procedure ensured the independence of observations, as responses in each experimental group were independent, and participants were assigned to conditions in random order.

Participants. Sixty-seven undergraduate students at Telemark University College were recruited for a NOK 100 cash reward (28 males and 39 females, ages 20-44 years; *M*=23; *SD* = 4,58). Participants were randomly assigned to three conditions: relaxed still stance, imbalanced stance, and a control group without specific balance instructions. A screening procedure considered below-waist injuries, vestibular dysfunction, and the use of medication that could have influenced the balancing system. Eight participants who had been assigned to the imbalance group reported having a balance impairment. However, their balance score did not deviate from the other participants, so they were not excluded from the analysis.

Materials. A measurement device from MuscleLab™ was used to capture data about the independent variable of balance. A MuscleLab™ force-plate (800mm x 600mm) was connected to a PC with the latest MuscleLab™ software to measure vertical downforce, commonly referred to as the center of pressure (CoP). The CoP represents the weighted average of all pressures or reaction forces on the surface of the area in contact with the ground. These reaction forces can be used to calculate the instantaneous location of the vertical ground reaction force vector picked up by a computerized force platform at a high sampling rate (Armour, 2014). A force platform gathers data in the anterior-posterior direction (x-axis, forward and backward), the medial-lateral direction (y-axis, side-to-side), and the vertical direction (z-axis), as well as movements about all three axes. Together, these can be used to calculate the position of the center of pressure relative to the origin of the force platform. Computer software developed by MuscleLab was used to capture the CoP data.

Unfortunately, the software malfunctioned during some trials, resulting in balance measurement error for a substantial portion of participants[6].

The CoP measurements are commonly gathered through the use of a force plate. Instead of measuring the velocity of the downforce, alternative balance measures that measure the movement of body segments, also referred to as postural sway, are available. For this study, measuring the center of pressure was considered most appropriate due to the device´s capability to capture small velocity changes between the control and relaxed stance groups. All paper-and-pencil questionnaires were self-administered, except for the construal level measures. Data analysis was performed using the SPSS statistical analysis software.

Data Processing and Analysis

Hypotheses concerning the main effects of balance activation and construal levels were tested using Person´s chi-square test for When relationships and multivariate analysis of variance for continuous variables. Where Levene's test for homogeneity of variances was violated, a modified t-test, Welch t-test, or Welch's robust test for equality of means was used. However, the significance of the results remained unchanged; therefore, the results of the standard independent samples t-test and one-way ANOVAs are reported.

The MuscleLab software allows measuring balance using several methods. These include the mean and root-mean-square (RMS), mean amplitude (MA), mean velocity (MV) and center of pressure (CoP) of the displacement. RMS represents the standard deviation of the CoP displacement, and MA is the average distance of the CoP displacement from its mean. The MV represents the amount of activity required to maintain stability. These measures provide a global measure of overall postural control (Olivier et al., 2010; Palmieri et al., 2002). The displacement of balance, measured as the standard deviation from the mean center of pressure, was chosen as an outcome measure of balance in this study. The output

[6] A sensor stopped sending data for a period during the trials without the program detecting the error. This resulted in balance data missing for 29 cases spread across all three conditions.

unit measure from the force plate is measured in Newton (N), defined as the force needed to accelerate one kilogram of mass at the rate of one meter per second squared in the direction of the applied force (Hosch, 2006). The measure of N was used as a variation coefficient by dividing the standard deviation of mean force (Stdv/Mean) applied during each test (Ruhe et al., 2010).

Introduction to Results

Data were collected and analyzed in the Physical Lab at Telemark University College. The following sections summarize the main findings.

The independent balance variable was analyzed as a continuous measure ranging from a stable stance to a constant imbalance. The independent measures of global perception and construal frames were categorical while discounting was also a continuous measure. Hence, two out of three independent variables were analyzed with Pearson´s chi-square tests, while ANOVA was applied in all other statistical analyses. All continuously measured variables were satisfactorily distributed, apart from the balance measure. When the balance variable was transformed from relative (log-scale) to absolute change, kurtosis and skewness were significantly reduced, with a standard deviation of .27. In this case, it is considered appropriate to transform the variable, as its purpose was to assess changes in imbalance.

Control Variables

The variables presented in Table 13 were included in the study to check if they were related to the outcome and therefore needed to be controlled for in the hypothesis tests.

Table 13

Study 2 Control Variables

	N	*Min.*	*Max.*	*M*	*SD.*	*F(2,64)*	*p*
Physical fitness	66	15	35	24.36	4.51	0.062[a]	.94
Self-esteem	67	1.90	3.50	2.78	0.37	1.11	.34
Mood	67	1.80	4.00	2.99	0.51	0.394	.68

[a]Degrees of freedom were *F(2,63)*

The ten-item Rosenberg Self-Esteem Scale measured participants´ self-esteem (n = 67, M = 2.78, SD = .37) with aggregated reliability of α = .743. As predicted, between-group difference was not significant (F (2, 64) = 1.11; p = .34, ω^2 = 0.003). Another five items measured participants' mood pleasantness (Gorn et al., 1997; Pham et al., 2011) to test whether it was adversely affected by the induced balance state (n = 67, M = 2.99, SD = .51). When aggregated, the scale had a reliability of α = .842. Between-group difference was not significant (F (2, 64) = .394; p = .68, ω^2 = 0.018). Nine items measured participants' perceived physical fitness (α = .803) to analyze variance within the sample. The mean of 24.36 (SD = 4.51) indicated a fairly good perception of physical fitness among participants, and no significant differences emerged between groups (F (2, 63) = .062; p = .94, ω^2 = 0.029).

When tested for homogeneity of variance, the assumptions were met for all measures except the balance measure. Non-parametric tests were therefore conducted to supplement the analysis. The mechanical problem with the measurement device was considered minimal since the groups were approximately equal in size (Balance n = 24, Control n = 21, Imbalance n = 22). Hair and colleagues (Hair et al., 2006) suggested that equal size can be determined as follows: largest group size/smallest group size < 1.5.

Manipulation Checks

Out of sixty-seven participants, the vast majority completed the manipulation task and answered all questions. As discussed in the measurement section, the missing twenty-three balance measures were due to a technical measurement error. The missing data was spread across all three groups, and the procedure did not change for any condition (Table 14). Hence, the effect of the missing data on hypothesis testing was considered minimal. The balance displacement was measured as standard deviation from each group's mean center of pressure (CoP score).

Table 14

Study 2 Imbalance Manipulation

Physical Balance	*M*	*SD*	*F(2,41)*	*p*	ω^2
Balance	4.20	0.26	12.47	<.001	0.34
Control	8.29	3.63			
Imbalance	16.11	11.22			
Semantic reflection	*M*	*SD*	*F(2,64)*	*p*	ω^2
Balance	2.37	0.48	0.11	.99	0.03
Control	2.38	0.27			
Imbalance	2.36	0.41			

The balance conditions to which participants were assigned significantly affected physical balance $F(2,41) = 12.47$, $p < .001$, $\omega^2=0.34$. As expected, the balanced group that was instructed to keep a relaxed stance performed best on the objective measure of balance (M = 4.20), while the group that was instructed to keep an imbalanced stance did worse (M = 16.11) than the control group (M = 8.29). Tukey´s HSD test for multiple comparisons found that the mean value of conditions was significantly different between Imbalance and Balance (p = .001, 95% C.I. = 7.05,16.77) and between Imbalance and the Control condition (*p* = .008, 95% C.I. = -13.87, -1.77). There was no statistically significant difference between the Balance and Control conditions (*p* = .22, 95% C.I. = -9.94,1.76).

To estimate the degree of semantic associations of the manipulations, participants were asked towards the end of the study to rate the extent to which they felt "being in balance" (two items $\alpha = .71$). The items were considered a between-groups measurement, and the hypothesis proposed that an in-balance state should be reflected by a higher perceived balance state (N = 23, *M* = 2.37, SD = .48) as opposed to the control group (*n* = 17, *M* = 2.38, SD = .27). The results showed no lasting effects of semantic reflection that could be attributed to any of the treatments $F(2,64) = .11$, $p = .99$, $\omega = .17$. It should also be considered that none of the participants were semantically primed with balance during the trial.

Results

Hypothesis Testing of Balance on Construal Level

Three separate measures of the dependent variable, Navon task, ad slogans, and discounting, were used to test construal levels between groups. When testing Hypotheses 1A and 1B about the effect of imbalance and balance on construal levels, a visual Navon task and construal framed ad slogans were used during the manipulations. In the Navon task, global precedence served as a construal level measure. Navon (1977) concluded that people are generally faster at identifying global (high construal) than local (low construal) features. In this study, 61.9% of participants in the control group preferred global features, whereas the opposite occurred for the imbalance group. While 59% of those in imbalance preferred local features, the balanced group did not show a preference for either of the features. A graphical representation is presented in Figure 10 and results in Table 15.

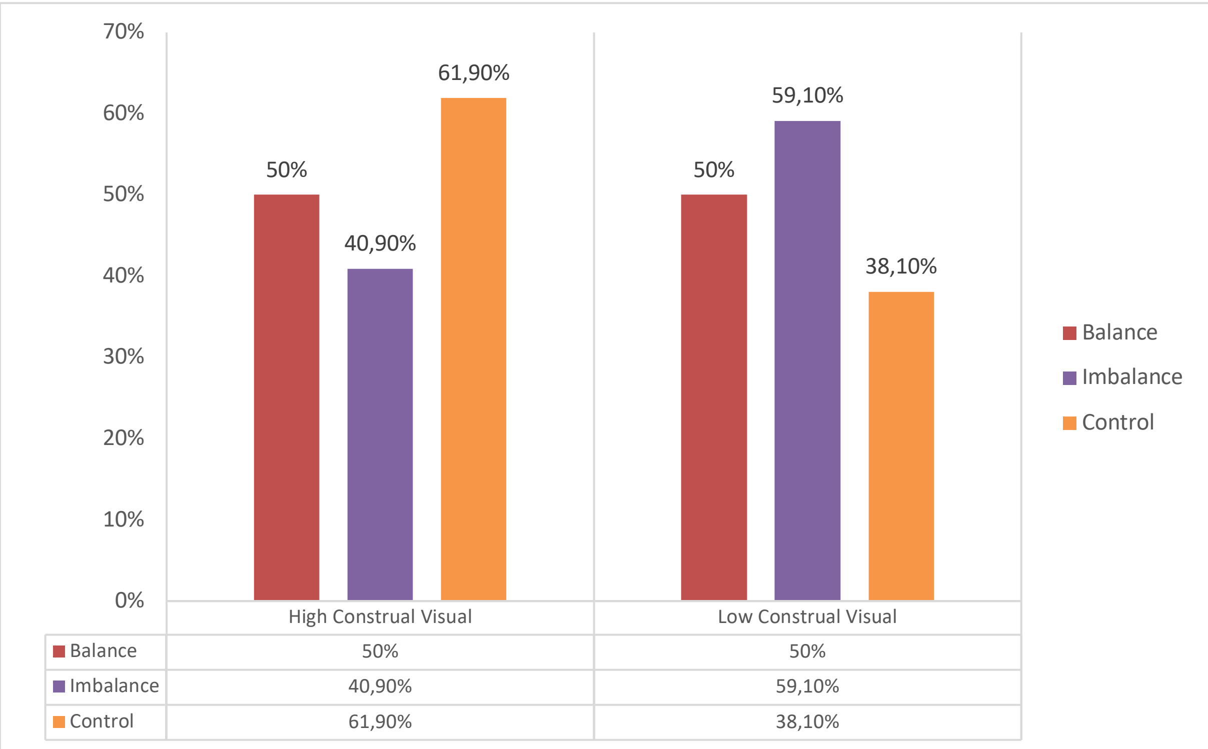
Table 15

Study 2 Preference for Visual Construal Level

	Balance	Control	Imbalance	$\chi^2(2)$	*p*	*V*
T Global Image	12 (50%)	13 (61.9%)	9 (40.9%)	1.90	.39	0.169
X Local Image	12 (50%)	8 (38.1%)	13 (59.1%)			

Figure 10

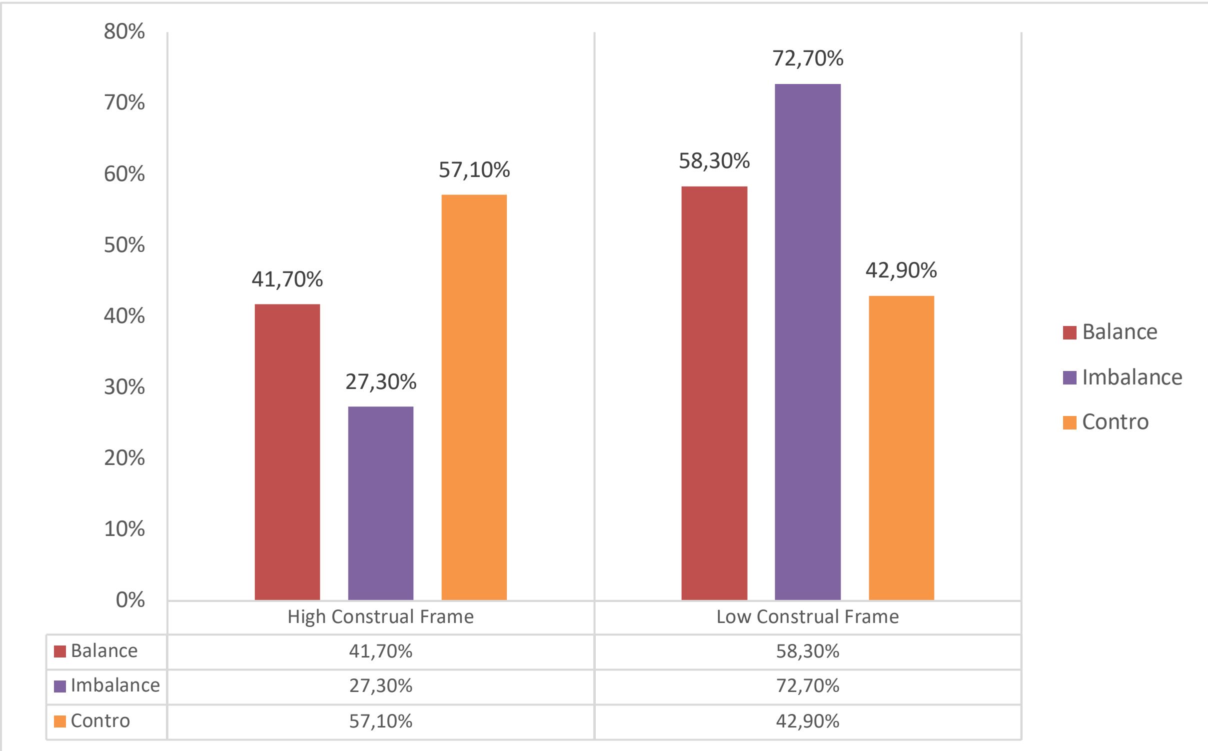
Study 2 Preference for Visual Construal Level



These differences between conditions were not significant ($\chi^2 = 1.9$, df = 2, $p = .39$, $V = 0.169$) and, therefore, the effect of balance on construal levels was not significant, as expressed in visual features. The relationship between CoP, as a continuous variable, and Navon task choices was tested in a regression model without yielding a statistically significant result.

Figure 11

Study 2 Preference for Framed Construal Level



The effect of balance on construal levels was further tested with framed advertising slogans during manipulations (Figure 11). Fifty-seven percent of participants in the control group preferred a higher construal frame (Table 16). The results indicated that 58.3% of the balance group and 72.7% of the imbalance group preferred the high construal frame.

Table 16

Study 2 Preference for Framed Construal Level

	Balance	Control	Imbalance	$\chi^2(2)$	*p*	*V*
Enjoy life-long health	10 (41.7%)	12 (57.1%)	6 (27.3%)	3.94	.14	0.24
Enjoy day-to-day health	14 (58.3%)	9 (42.9%)	16 (72.7%)			

The association between balance manipulations and construal frame was not significant ($\chi^2 = 3.94$, df = 2, $p = .14$, $V = 0.24$).

Next, the second hypothesis tested concerned the duration of the balance-induced construal effect. Immediately after completing the balancing task, participants specified their present monetary value of time in a discounting task (intertemporal choice) to test whether balance sensation affected construal levels beyond the dual-task paradigm (H_3). The control group had the highest mean value, closely followed by the imbalance and balanced group (Table 17).

Table 17

Study 2: Discounting As a Consecutive Measure of Construal Level

Discounting	*M*	*SD*	*F(2,64)*	*p*	ω^2
Balance	0.65	0.14	1.28	0.29	0.009
Control	0.72	0.16			
Imbalance	0.70	0.14			

A between-groups ANOVA was performed to test the hypothesis that imbalance consecutively induces low construal and balance for high construal. The effect of balance activation on discounting was not statistically significant, $F(2, 64) = 1.28$, $p = .29$, $\omega^2 = 0.009$ suggesting that the construal level effect is momentary. The pattern of results was the same for all three dependent construal level variables; hence, the hypothesis of the directional effect of balance on construal levels was not supported.

Discussion

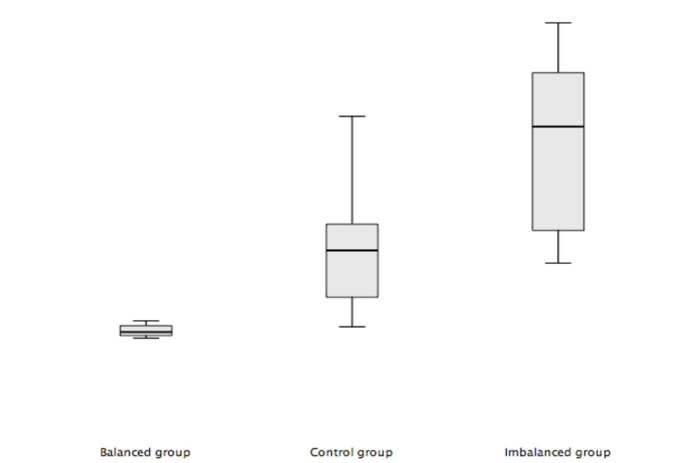
The aim of Study 2 was to test hypotheses about physical balance as a source of cognitive simplification in which differences in construal levels would be detected. The results do not provide significant evidence for rejecting the null hypothesis, as tested with three dependent construal level measures. Participants in the imbalanced group showed a greater bias towards low construal visual features and advertising frames than the balanced and control groups. The trend from balance to imbalance was linear, though not statistically significant. As balance movements increased, the preference for low construal choices increased. The results for the consecutive discounting task as a construal level measure were not linear. The imbalanced group discounted immediate monetary rewards marginally less than the control group; however, the balanced group discounted them even more steeply.

The results raise methodological and theoretical questions that need to be considered in further investigation of the proposed research questions in this dissertation. First, finding the right design for imbalance as an independent variable is a delicate, fine-tuning, and resource-demanding process. It should be noted that imbalance has not been manipulated before in a consumer research setting, and no protocol is readily available. In contrast to Study 1, Study 2 applied a milder imbalance stimulus. In the imbalance condition, all balance sensory systems were manipulated similarly to a physiological balance test rather than maximizing imbalance. The results indicated that the sensation needs to be definite and sustainable to measure the effect of imbalance. While objective measures of balance showed a significant difference between conditions, participants did not report a greater feeling of imbalance.

This may be because the time elapsed from the manipulation to the reporting of imbalance feeling reduced the sustainability of the effect or because the manipulation did not yield a definitive imbalance sensation. A simple box-plot of the measure of the imbalance (CoP) showed that the lower quartile for the imbalance group was slightly below the upper quartile of the control group, while the balanced group´s scores fell closely around the mean (Figure 12). The top whisker for the control group was also above the imbalance median, implying that some participants in the control group had more imbalance than the average participant in the imbalance group. The distribution around the mean for the imbalanced group was large relative to the other groups, particularly the lower quartile.

Figure 12

Study 2 Box-Plot for Measure of Imbalance Between Groups



The results indicated that the imbalance manipulation was not distinctly different from the control condition in applied balance effort, and the forms of manipulation should be given more consideration. The underlying proposition of Study 2 was that physical balance works on a continuum from a perfectly stable stance with minimal physical effort to uncontrollable physical balance movements, resulting in an inevitable fall. As the box-plot shows, the applied conditions did not capture distinct sections of the continuum but overlapped when movement increased. This challenged the interpretation of the results and a possible cause for the lack of statistical significance. Therefore, it is better to operationalize the concept of balance as two separate binary states. In that case, the control condition represents a balanced state, with normal balance effort applied to a still stance without specific instructions on minimizing the effort. On the opposite side is the imbalanced state, representing a condition of maximal effort applied to avoid a fall. Study 2 suggested that participants in the imbalance condition interpreted the task as a manageable challenge they could physically control. Indeed, most participants did not lose their balance or seek external stability. The condition would not have triggered the same mental and neurological activation as harder imbalance tasks. Since Study 1 was more conclusive, stimuli with the most sustainable imbalance effect should be proposed for further research.

Duration of construal effect

Interestingly, imbalanced participants preferred low construal options measured as a concurrent task during imbalance. The last dependent variable that was not measured as a dual-task but as a consecutive measure did not show the same trend. The difference in delayed discounting between those who preferred low or high construal in the first two tasks was not significant. Considering that the imbalanced group favored low construal in the first two measures, it can be suggested that a significant effect of balancing diminishes quickly. However, whether the physical balance is only limited to momentary cognitive influence remains unclear. Future study designs should therefore consider these results.

Limitations

With sixty-seven cases randomly assigned to three experimental conditions, the number in each cell for each construal level was at the lower end of reliable medium-sized effects. The recruitment of participants to Study 2 was limited to what could easily be accessed at a mid-sized college during one academic year. However, the sample size was greater than commonly found in studies of physical imbalance and construal level[7].

Further limitations concern the experimental setting at a Physical Education lab. Completing an experiment in a setting with gym equipment may have caused some participants to focus unduly on their performance, leading to response bias. Finally, the measurement error of dependent variables had to be acknowledged due to a limited number of trials. This was done to minimize physical fatigue stemming from the imbalance of tasks.

[7] In a summary article by Segev-Jacubovski et al. (2011), the number of cases in balance/cognition dual-task studies ranged from 6 to 40. A review of construal level studies referenced in this dissertation revealed an average sample size of 55 (M = 51; Range: 30-87) for studies with up to 4 conditions.

However, analysis of the independent variables showed that the imbalance condition was not as effortful as intended.

Suggestions for Study 3

Based on the Study 2 results and its limitations, it was necessary to design a new study to retest the same hypotheses developed to answer research questions 2-4 about the effect of imbalance on the construal level. The experimental conditions should focus on the distinguishable imbalance effect to make comparing physically separate states easier. Greater emphasis can also be placed on the momentary cognitive effects imposed by physical imbalance. While the effect may be detected in consecutive tasks, it is logical to detect instantaneous effects first. Likewise, the construal measurements applied in Study 2 were easy to execute and therefore unlikely to cause fatigue. However, it is possible to measure construal levels differently, as discussed in Chapter 2 (Adler & Sarstedt, 2021; Fiedler, 2007; Trope & Liberman, 2010b). The selected measurements had a limited number of trials, potentially leading to measurement error.

The interaction effects found in Study 2 and Study 1 results provide a foundation for hypotheses related to *RQ 4* and the relationship between imbalance, construal level, and self-efficacy. Finally, Study 2 uncovered the importance of paying close attention to possible measurement errors due to the experimental settings. The following section discusses how Study 3 accommodated these design improvements.

Chapter 5

Introduction to Study 3

Study 3 continued to test the hypotheses articulated in Study 2 in relation to research questions 2 and 3 about the relationship between imbalance and construal level. To this point, empirical findings do not support rejecting the null hypotheses, and further testing is necessary to answer the proposed research questions. Adjustments were made to the design and methodology of Study 3 according to the discussion in Study 2. To overcome previous limitations, the experimental design was modified. The following section describes the research design, methodological adjustments, and possible implications.

Conceptual Development of Study 3

Study 3 also explored the effect of physical imbalance on construal level as in Study 2 and research questions two and three. The questions were, "How does physical imbalance alter construal levels in the domain of consumer choice?" and "What is the subsequent effect of physical imbalance on construal levels in consumer choice?" The same hypothesis about the relationship between imbalance and construal levels was tested. However, some changes were made to the study design. First, instead of treating balance as a continuous variable from effortless stable posture to near fall imbalance, the balance was regarded as a binary state of balance versus imbalance, as in Study 1. In Study 2, a variation of a functional balance test normally used to balance problems was adopted as an imbalance condition (Horak, 1997). In light of Studies 1 and 2, it was proposed that the imbalance condition must challenge static balance performance to the degree that a functional balance test does not. In Study 3, conditions that may overlap were eliminated.

Second, the construal level was measured with variables that could be appropriately executed during imbalance. As discussed in Chapter 2, several options are available to measure the construal level as a dependent variable (Adler & Sarstedt, 2021; Burgoon et al., 2013; Fiedler, 2007) with a reliable medium-sized effect across studies (Soderberg et al., 2015). In Study 2, the use of construal frames from Wan and Rucker (Wan & Rucker, 2013) combined with the visual Navon task (Trope & Liberman, 2010) resulted in a non-significant preference for low construal alternatives. The discounting task showed a non-significant trend in the data towards a greater preference for immediate rewards after imbalance as a consecutive measure. The visual Navon and discounting tasks proved to be the easiest to administer during imbalance. These measures also supported the hypothesis about imbalance inciting low construal, although without a significant difference between conditions. This led to the elimination of the construal frame task and an adaptation of a more advanced variation of the visual Navon task, commonly referred to as the Kimchi task (Dale & Arnell, 2013; Kimchi & Palmer, 1982). The discounting task remained a concurrent task as a part of testing hypothesis one about imbalance promoting low construal. As a consecutive measure, a behavioral identification task was adapted (Fujita, Henderson, et al., 2006; Vallacher & Wegner, 1989) to further test the duration of the construal effect. The next section briefly describes the hypotheses before reviewing the methodology.

Study 3 Hypotheses

Study 3 continued with the same two hypotheses employed in Study 2.

H_1: Imbalanced induces low-level construal processing.

According to research question two, the state of imbalance is proposed to increase low construal because it activates a proximal sensory experience. The control condition is therefore expected to elicit higher-level construal than imbalance. In line with research question 3, the primary hypothesis H_2 sought to test the duration of the effect.

H_2: Imbalance-induced construal level effect is momentary.

H_2 proposed that a low construal level is momentary during imbalance when the proximal sensation attenuates. A few studies have found consecutive cognitive effects of postural manipulations (Briñol et al., 2009; Scarpa et al., 2011); therefore, it is necessary to consider the construal effects during and immediately after imbalance. The following section describes the design of the Study.

Methodology

Stimulus Development and Measurement

Table 18 provides an overview of the between-subjects design of Study 3. The scales that were translated to Norwegian were added to Study 3, and they are included in Appendix C.

Table 18

Overview of Study 3 Variables and Measures

Independent variable	Manipulation check	Dependent variables	Control variables
Balance condition	Acceleration of balance movement (Acc.) Center of Pressure (std. from center mm/t) Perception of physical balance Task performance confidence Task difficulty	Dual-task construal level measures: 1. Discounting function (area under the curve) 2. Kimchi global/local visual task Consecutive construal level outcome: 1. Behavioral identification form	PANAS mood scale Abadie perceived physical fitness scale

The following sections describe the variables used in Study 3.

Independent Variable. In Study 3, a highly effortful balancing task was manipulated in the same manner as in Study 1. The imbalance condition was contrasted with a control condition involving no movement instructions. The manipulation required participants to stand on one foot on a soft cushion after being spun around ten times. Instructions were given to keep eyes closed during the body rotation. In this way, all physiological systems associated with imbalance would be negatively affected. The manipulation made it very difficult for participants to maintain balance, and a controlled fall was unavoidable for many participants. A controlled fall caused participants to step on the concrete floor around the cushion on which they stood. In case of a fall, subjects were instructed to return to the balancing task as soon as possible. On average, the balancing task took approximately two minutes to complete.

As in previous studies, the control group was not instructed to perform a specific balancing task. The control condition comprised a stable stand with both feet in a normal standing position with feet hip-width apart (approximately 20 cm). Instructions were given to keep a relaxed body alignment with minimum postural movement. The instructions for the control group purposely focused on bringing subjects as close as possible to a perfect stable stance without semantic priming of balance.

In Study 3, accelerometers (also called gyroscopes) and Centre of Pressure (CoP) on a force plate were used to improve the reliability of the manipulation check. The reliability of the two most common ways to measure balance could thus be tested (Whitney et al., 2011). The accelerometers can detect orientation and measure tilting and rotation.

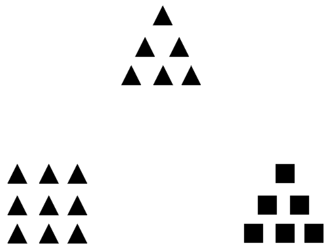
Accelerometers measured relative acceleration and orientation of the pelvis since postural sway approximates the movements of the center of mass more closely than CoP (Whitney et al., 2011). To quantify imbalance (postural sway), the standard deviation of the root mean square (RMS) as a movement function in time was used. In this way, each participant received a single balance score independent of test length, facilitating the comparison between subjects. Questions assessing task-specific confidence were adapted from Gasper (2004) and used to determine whether confidence of task performance was different between conditions.

Additionally, specific questions measured the sensation of balance (“I feel balanced”) and imbalance (“I feel out of balance”) to check for cognitive evaluation of the balancing concept ($\alpha = .75$).

Dependent Measures. In Study 3, the first dependent variable was the discounting task, which had been used as a consecutive task after balancing in Study 2. According to Hypothesis 1, the imbalance will decrease preference for less certain future rewards in a discounting task. The discounting task is simple to perform during balancing; therefore, it was adopted as the first construal level measure during balance manipulation (dual-task) in Study 3. Participants attended a visual task called Kimchi after questions on discounting the value of present rewards over future rewards. According to Hypothesis 2, it is proposed that imbalance will lead to a reduced preference for global images. The Kimchi task was built on the same principle as the Navon task from Study 2, except the participants were less likely to be familiar with geometrical figures than letter formations. This eliminated the potential bias caused by familiarity and the challenges of calibrating visual angle, exposure duration, and the number of elements in shape. A set of geometrical Kimchi shapes (see Figure 13) was adapted from Gasper (2004) to eliminate these problems. When testing the three most commonly used global/local processing measures, Dale and Arnell (2013) found the Kimchi measure more reliable than the Navon task.

Figure 13

Sample Test Triad from The Global/Local Shape Task



The Kimchi procedure was adapted from Gasper and Clore (2002). Participants were asked to select one of the bottom two figures in the triad that best matched the top figure. Twenty-four trials displayed figures that could be viewed from a global or a local perspective. The figures were either a square or a triangle (global form) made of smaller squares or triangles (local forms). After pretesting, figures of different sizes in relation to distance from the display, the global forms were fitted into 35-mm squares and the local forms into a 9-mm square. The forms were arranged into 12 combinations that were presented twice so that half of the local matches appeared on the right and the other half on the left. Discounting and the visual Kimchi task were both measured to test Hypothesis 1.

To test Hypothesis 2, the Behaviour Identification Form (BIF) was used as a consecutive general measure of construal level administered after the manipulation. It was hypothesized no significant difference in preference between concrete and abstract concepts. The benefit of the BIF scale is that it has proven to be an accurate measure of construal in various settings with consistent results, whereas construal frames can be considered more situation-specific in their interpretation (Vallacher & Wegner, 1989). The BIF scale lists 25 behaviors, and the respondents must choose between two answer alternatives. In each case, respondents can identify either low or high construal behavior. For example, voting in elections was described as “influencing the election” at a high level or “marking a ballot” at a low level. Vallacher and Wegner (1989) reported good internal and external validity of the BIF scale. Since the BIF scale contains 25 questions, the task was unsuitable for the dual-task and was used following the balance condition to test H_2.

Control variables. Participants were asked questions about their mood, fitness, motivation, and exercise habits. The questions were used to check possible differences between groups. The first measure was the Positive and Negative Affect Schedule, a well-established 5 point, 10-item mood scale. The instrument is often referred to as the PANAS scale (Watson et al., 1988), for Study 2, t1, $\alpha = .79$.

The second instrument measured subjects´ perceived physical fitness based on the modified version of the PPF scale (Abadie, 1988) employed in Study 1 ($\alpha = .76$) and Study 2. After measuring the dependent variables, participants again answered a questionnaire that started with the PANAS scale to check for differences in the mood before and after manipulation (t2, $\alpha = .84$).

Finally, participants were asked three open-ended questions adapted from Bargh and Chartrand (2000) that probed for suspicion regarding the experimental manipulations and two screening questions relating to participants' possible balance impairments and use of balance-impairing medication. All test items and questions which had not been previously tested were pre-tested on a small sample of students belonging to the same demographic group as the assigned participants. Minor language adjustments were made. Likewise, a pre-test was executed on the independent variable of imbalance to check for instructional understanding and physical ability among participants demographically representative of the entire study sample.

Procedure

The setup for Study 3 was adapted from Study 2. As participants entered the lab, they believed they were participating in two independent studies. The first study concerned college students´ perception of physical fitness abilities (as measured by the Abadie Perceived Physical Fitness Scale) and mood. The fictitious second study was described as a trial study for a start-up firm developing new types of motion sensors. The subjects were told these devices needed to be calibrated to accurately measure minimal and large movements. Before presenting the cover story, participants answered ten questions on the PANAS (Positive and Negative Affect Schedule) scale (Watson et al., 1988).

In the manipulated condition, participants were asked to stand with one foot on a soft balance pad with eyes closed after being spun around 10 times. Before the task began, four accelerometers were attached to participants´ arms, waist, and chest. In the control condition, participants stood still with both feet in a normal standing position during the measure of static posturography. Posture can never be entirely static, but in this case, the aim was to quantify postural sway with the same measurements as in the intervention while the subject stood as still as possible.

Participants were asked to keep their eyes closed in both conditions as they placed themselves on the balance pad under the dual-task paradigm. First, participants were asked to orally respond to the discounting task in which they were asked how much money they would need one week or one month later if they discounted 200 NOK today. After giving their answers, subjects were asked to watch the screen that displayed the global/local figures. Once all trials were completed, the imbalance task was stopped, and participants moved to a separate room to complete the questionnaire assessing variables that were controlled. Next, participants answered the 25-item behavioral identification form and the PANAS scale. The perceived physical fitness scale was presented, followed by questions about exercise habits, physical condition and motivation to do the imbalance and global/local task. Participants were debriefed after completing the questionnaire and given a cafeteria token as a reward for their participation.

A similar procedure was used as in Study 2 but with some fundamental changes in the order of dependent variables. As participants could answer the discounting questions quickly and with minimum use of visuals, the decision was made to include them as the first task in the procedure rather than administering them after the balancing task as was done in Study 2. Next, the participants did the Kimchi global/local visual task, a relatively easy construal task to complete during imbalance. To check for the duration of the construal effect, the BIF was administered after the imbalance manipulation. Finally, the difference in mood was evaluated before and after the manipulation for possible confounding. Physical fitness, age, gender, and training habits were measured as control variables between conditions. Control variables were collected in a randomized order to minimize order effects.

Participants. In Study 3, 59 college students in Telemark were randomly assigned to two experimental conditions in exchange for a 100 NOK token at the college cafeteria. The mean age of participants was 23.4 years, with a standard deviation of 3.9. Out of 59 participants, 23 were male and 36 females.

Materials. In Study 3, the same equipment as in Study 1 and Study 2 was used. Both accelerometers (gyroscopes) and Centre of Pressure (CoP) on a force plate were used to check the reliability of both balance measurement methods. The reliability of the two most common ways to measure balance was tested (Whitney et al., 2011). The accelerometers detect orientation; thus, they can measure tilting and rotation.

A computer projector was used to display the Kimchi global/local images. According to standard procedure (Gasper & Clore, 2002), the images were scaled to the right dimension on a white screen 2 meters away from the subjects. The researcher's computer-controlled displaying of the images. Other materials applied in the study were a 5cm wide, 35cm x 40cm Airex Balance-Pad on which the participants stood during the imbalance condition.

Data Processing and Analysis

Data were entered into a spreadsheet, and questionnaires and balance data were combined into one file. Hypotheses concerning main effects were analyzed with t-test statistics to assess mean differences between conditions.

Introduction to Results

All continuously measured variables were satisfactorily distributed, apart from the CoP imbalance measure, visual construal (Global/local figures), and change in a negative mood. Non-normal distribution was not a severe threat in the analysis of variance (Schmider et al., 2010).

Control Variables

Table 19 presents mean differences of control variables between conditions. As in the previous studies, groups did not differ in self-perceived physical fitness between the balanced control condition (*M* = 24.48; *SD* = 4.77) and the imbalance condition (*M* = 24.36; *SD* = 3.71). The difference was not significant $t(57) = .113$; $p = .91$). The mean fitness score of 24.4 (*SD* = 4.27) indicated similar perception of physical fitness among participants compared to Study 1 (*M* = 24.36; *SD* = 4.51).

Positive and negative mood was measured before and after the manipulation to detect possible change in mood. As presented in Table 19, the change was not significant between conditions for neither positive $t(57) = .0.50$, $p = .62$, $d = 0.129$ or negative $t(57) = .0.20$, $p = .84$, $d = 0.052$ mood.

Table 19

Study 3 Control Variables

Variable	Imbalance (n=28)		Control (n=31)		*t(57)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Physical fitness	24.36	3.71	24.48	4.77	0.11	.91	0.029
Positive mood Δ	-1.29	4.40	-0.81	2.95	0.50	.62	0.129
Negative mood Δ	-1.29	2.11	-1.16	2.62	0.20	.84	0.052

The assumptions for homogeneity of variance were met in all cases, except in the case of imbalance measures and perceived balance. The test violation was considered to have a minimal effect since the groups were of approximately equal size (Control *n* = 31, Imbalance *n* = 28). Study 3 met Hair et al.´s (2006) criteria for the equal size of groups which specify that equal size exists when the difference between the largest and smallest group is < 1.5. A Welch t-test was used to test the equality of means. The results of the independent t-test were unchanged.

Manipulations Checks

Out of 59 participants, all completed the manipulation task and answered all questions, except for two who missed the last questions asking about their motivation for doing the task. These two participants were kept in the analysis. A screening procedure consisting of an evaluation of self-reported imbalance impairment, medication, and eyesight indicated that none of the participants had to be excluded.

Groups differed significantly in the displacement of balance, measured as a standard deviation from the mean center of pressure (CoP) and sway acceleration. The results are presented in Table 20.

Table 20

Study 3 Manipulation Checks

Variable	Imbalance (n=28)		Control (n=31)		*t(57)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Acc.	1.6	0.6	0.1	0.6	-14.57	<.001	3.8
CoP	113.7	75.9	5.2	1.3	-7.97	<.001	2.1
Feeling	2.7	0.7	3.0	0.5	2.25	.029	0.59
Task difficulty	7.0	2.2	2.5	2.5	-7.56	<.001	1.97
Task confidence	6.6	2.4	7.5	2.5	3.31	.002	0.86

The imbalance condition (CoP *M* = 113.7 Acc. *M* = 1.6) negatively affected physical balancing while the control condition did not affect physical balancing (CoP *M* = 5.2 Acc. *M* = 0.1). A t-test statistic showed that mean differences between conditions were significant for both manipulation checks, t(57) = -7.97, $p < .001$, $d = 2.1$ for CoP and t(57) = -14.57, $p < .001$, $d = 3.80$, for sway acceleration. The results imply that the manipulation was successful and that the CoP and sway acceleration were, as expected, highly correlated ($r = 0.81$, $p < .001$), 95% CI 0,07, 0,011, t = 10,295, $p < .001$).

Towards the end of the study, when asked about the extent to which the participants had the feeling of "being in balance," the imbalance group (*M* = 2.7, *SD* = .7) scored significantly lower than the control group (*M* = 3.0, *SD* = 0.5) on a two-item four-point scale t(57) = 2.25, $p = .029$, $d = 0.59$. The same applied to task intensity and experienced confidence. Imbalanced participants felt the task was harder (*M* = 7.0, *SD* = 2.2) than did the control group (*M* = 2.5, *SD* = 2.5) and the difference was significant t(57) = -7.56, $p < .001$, $d = 1.97$. The imbalance group was also significantly $t(57) = 3.31$, $p = .002$, $d = 0.86$) less confident in performing the balancing task (*M* = 5.7, *SD* = 2.8) than the control group (*M* = 8.0, *SD* = 2.0).

Results

Hypothesis Testing of Balance on Construal Level

In Study 3, the hypothesis testing of Hypothesis 1 was not statistically significant (Table 21). During the imbalance manipulation, participants did discount differently.

Table 21

Study 3 Mean Differences of Discounting and Global Figures Between Conditions

	Control		Imbalanced		*t(57)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Discounting	0.56	0.15	0.54	0.19	0.58	.56	0.152
Global figures	12.87	7.42	13.93	6.84	-0.57	.57	0.148

Those in imbalance discounted marginally less (*M* = .54 , *SD* = .19) than those in the control group (*M* = .56 , *SD* = .15). The difference was not significant $t(57) = .58$, $p = .56$, d = 0.152). After the discounting task, participants did not show a preference for global or local figures in the visual Kimchi task. The imbalanced group chose, on average, 13.93 global figures (*SD* = 6.84) compared to 12.87 (*SD* = 7.42) for the control group. The difference between the groups was however not significant $t(57) = -.57$, $p = .57$, $d = 0.148$).

As anticipated, testing of Hypothesis 2 resulted in nonsignificant findings. After completing the balancing task, participants moved to the last construal level measurement, behavioral identification (Table 22).

Table 22

Study 3 Mean Differences of Behavioral identification Between Conditions

	Control		Imbalanced		*t(57)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Behavioral identification	15.94	3.97	15.75	5.28	0.15	.88	0.040

Neither condition had a specific preference for concrete or abstract behavior descriptions. The imbalanced group had an average score almost identical (*M* = 15.75 , *SD* = 5.28) to the control group (*M* = 15.94 , *SD* = 3.97), hence the difference was not significant *t*(57) = .15, *p* = .88, *d* = 0.040).

Based on these results, Study 3 demonstrates limited support for the propositions about the link between imbalance and construal during imbalance. The null hypothesis for H_1 can therefore not be rejected.

Discussion of Study 3 Findings

It can be concluded that testing the effect of imbalance demands a stimulus that distinctly influences the participant's sensory experience. Compared to Study 2, the strenuousness of the manipulation improved significantly, and self-reported reflections about the manipulation altered participants' perception of the task. After being imbalanced, participants said they felt less balanced, found the task more difficult, and had less confidence in doing it than the control group. Noteworthy, prior consumer research on imbalance (Larson & Billeter, 2013) has not accounted for the physical effect of applied manipulations. This dissertation demonstrated that not all manipulations of physical imbalance result in the feeling of imbalance or other cognitive effects.

In Study 3, a continuous attempt was made to test the relationship between physical imbalance and construal levels. The first hypothesis was that imbalance would lower construal so that participants would have reduced preference for future monetary rewards and global images. The second hypothesis proposed that the proximal sensation of imbalance would stop influencing construal when participants returned to a stable state. Preference for abstract behavior identification should thus not differ across conditions. The first two dependent measures were administered subsequently during a simultaneous balancing task to test Hypothesis 1. The third dependent measure was introduced immediately after the balancing task to test Hypothesis 2, which questioned whether the effect attenuated immediately or had a more lasting effect.

Study 3 showed a vague nonsignificant relationship between physical balance and construal level processing. Discounting resulted in a marginal difference, favoring lower construal during imbalance. The Kimchi visual task resulted in a marginal difference in the direction of increased preference for global figures during imbalance. Therefore, the main effect of imbalance on construal level processing was not confirmed. As anticipated, the difference between conditions after the imbalance manipulation when participants were asked to identify behaviors as concrete or abstract was not significant.

Chapter 6

Introduction to Study 4

Study 4 extended the two previous studies to seek an answer to research question 2 about the relationship between imbalance and construal level. Discounting as a downstream cognitive was again used to measure construal level. In addition to discounts, a brand familiarity task (brand novelty) was also used as a visual measure of construal level, as proposed by Eyal et al. (2009, pages 68-69). In Study 4, it was hypothesized that imbalance prompts a preference for more familiar brands, as they are considered psychologically closer.

Second, Study 4 addressed research question 4 about the moderating effect of self-efficacy on the relationship between imbalance and construal level. In Study 1, the brand recall did not improve during imbalance for participants high in self-efficacy. Interaction analysis in Studies 2 and 3 suggested that self-efficacy may moderate the relationship between imbalance and construal level. Hence, Study 4 tested the proposition that self-efficacy will reduce the influence of imbalance on low construal processing. The following section briefly describes the theoretical concepts in Study 4 before reviewing the hypotheses and methods.

Conceptual Development

Based on construal level theory, Study 4 argues that the experience of imbalance influences construal level. A greater preference for low construal choice alternatives was mostly noted during imbalance in Studies 2 and 3, although it was not statistically significant. In these studies, discounting, advertising slogans, global/local figures, and behavior identification have all been applied to measure perceived psychological distance (construal level). The rationale is that imbalance is a proximal experience that occurs in the present moment with a psychological effect on construed distance (Elder et al., 2017). The more proximal a sensory experience is, the closer the distance is construed. This would lead consumers to apply a lower construal level in their decisions. According to Eyal et al. (2009,

p. 68-69), sensory experiences should have features that predict a relationship between physical and psychological distance. Therefore, the research question has focused on the effect of imbalance on the construal level. Construal level theory asserts that people can perceive events on different dimensions of psychological distance. The proposition is that distant events have less value than proximal ones. Thus, construal level theory predicts that the preference for psychologically close events will be higher than those attributed to distant events. This is to say that the value placed on the event or outcome affects discounting rates.

This study supported the hypothesized direction of lower construal, although the results were not statistically significant. Since the null hypothesis was not yet supported, it is reasonable to test the hypothesis again with a larger sample (n > 90) than in previous studies. Due to high resource demands, studies on imbalance usually have no more than 40 cases per experiment (Segev-Jacubovski et al., 2011). Therefore, the same hypotheses as in Studies 2 and 3 were tested to address research question 2 about the relationship between imbalance and construal level.

Self-Efficacy in Relation to Imbalance

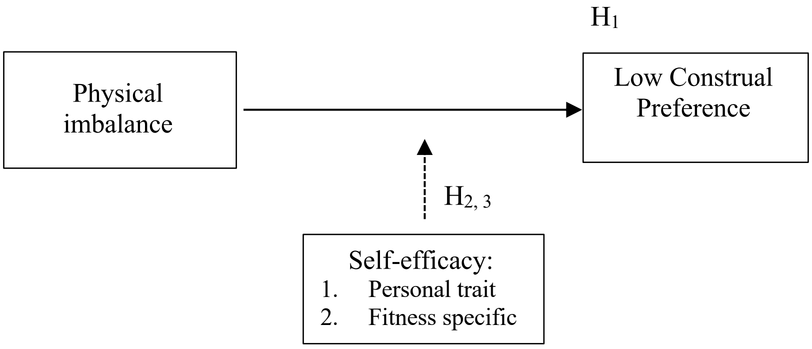
Study 4 also addressed research question 4 about the moderating effect of self-efficacy on the relationship between imbalance and construal level. In Study 1, self-efficacy was proposed to positively affect cognitive capacity, but the hypothesis was not supported. The construct of self-efficacy does, in an enclosed manner, refer to one's belief in his or her ability to effectively utilize personal resources to achieve certain outcomes (Stajkovic, 2006). Self-efficacy in Study 4 was built on the premise that it is a higher-order concept of other self-perception constructs, such as self-esteem and perceived fitness (Judge et al., 2002).

People´s bodily stress can affect their beliefs about their capabilities. Individuals low in self-efficacy may read their emotional arousal as a sign of vulnerability. In activities of bodily performance, people may judge their fatigue and unstable balance as signs of physical incapacity (Bandura, 1988). On the other hand, those high in self-efficacy may interpret fatigue and unstable balance as less harmful. Consistent with this notion, Bandura (2006) suggested that individuals with robust self-efficacy see themselves as able to handle stressful situations, whereas individuals with weak self-efficacy have greater doubts about their abilities. In Study 4, self-efficacy was measured with a psychological scale (Jerusalem & Schwarzer, 1992). The sensory information influences people´s perception of the environment and themselves; thus, the sensation of imbalance becomes a way to manipulate physical incapacity. Therefore, it is logical to test whether imbalance influences our preference for less or more distant outcomes and whether self-efficacy moderates the relationship as a personal trait or a perception of one´s fitness. Since high self-efficacy represents greater faith in one´s abilities, it is conceivable that high construal will be more dominant during imbalance. Lastly, an alternative explanation for the negative effect of imbalance on cognitive processing is the element of uncertainty. It can be postulated that those who experience imbalance as an uncertain physical state also regard other simultaneous tasks as uncertain. If that is the case, the preference for more certain, familiar and proximal outcomes should be manifested as the lack of certainty about oneself. This opposing explanation was also addressed in Study 4.

Study 4 Hypotheses

As in previous studies, study 4 focused on the effect of imbalance on construal levels. In particular, it explored the extent to which imbalance may alter people´s consumer construal processing measured in terms of discounting future gains and preference for unfamiliar brands. The proposition is that imbalance elicits a preference for low construal, in other words, rewards and products that are certain and familiar. Therefore, Study 4 proposed the same main hypothesis as in Studies 2 and 3, including the moderating effect of self-efficacy (Figure 14).

Figure 14
Study 4 Modeled Hypotheses



H_1: *Imbalance induces low-level construal processing*

An imbalance was proposed to increase low construal due to increased interoceptive sensation, which intensifies the proximity of the experience. On the other hand, construal processing is expected to be higher during a stable stance.

Studies 2 and 3 tested the hypothesis that construal level is a momentary effect. It was proposed that the proximal sensation is attenuated, and the construal level is unaffected when the balance is restored. As predicted, the results indicated no difference in construal level after imbalance. This hypothesis was therefore no longer tested, and more focus was given to the hypothesis pertaining to research question four about the moderation of self-efficacy on the relationship between imbalance and construal level.

It was proposed that imbalance will elicit lower-level construal outcomes. However, the level of participant self-efficacy is predicted to moderate the relationship.

Those high in self-efficacy were predicted to have higher construal processing when physically imbalanced than those low in self-efficacy due to their strong faith in their abilities. As high self-efficacy participants sense imbalance, they will interpret the situation as dependent on their abilities and mastery. Accordingly, high self-efficacy was proposed to reduce the effect of imbalance on the construal level.

H_2: Imbalance has less effect on low construal levels among those high in self-efficacy.

Self-efficacy is a belief in one´s ability to succeed in specific situations, regardless of whether they are familiar, and it can be affected through levels of bodily stress (Bandura, 2006), such as physical imbalance. Individuals with low self-efficacy may interpret their emotional arousal as a sign of vulnerability, whereas greater self-efficacy may boost confidence in other domains (Lopez & Snyder, 2002; Schwarzer, 2014). Having little faith in our abilities will make us less focused during imbalance. Operationally, that would increase participants' self-efficacy and their value for future rewards over smaller immediate rewards during physical imbalance. Likewise, it was anticipated that they would make more unfamiliar brand choices during imbalance than those in a stable condition.

Study 1 showed that self-efficacy during balance positively affected brand recall; yet, whether imbalance will elicit higher construal among those high in self-efficacy is unknown. Since perceived physical fitness can be considered as a context-specific measure of one´s belief in fitness abilities (Bandura, 2006), the following hypothesis is also proposed:

H_3: Imbalance has less effect on low construal levels among those high in perceived physical fitness.

Regarding the construal level, the analysis suggested that imbalance increases the preference for proximal rewards among consumers who perceive themselves as capable of handling physical or mental challenges. These results are not in line with the theoretical assumptions of self-efficacy and need to be considered in the context of consumer psychology.

Methodology

Stimulus Development and Measurement

An overview of the between-subjects study design can be seen in Table 23. The table provides an overview of the study design for Study 4. Translated Norwegian scales that were added to Study 4 are found in Appendix D.

Table 23

Overview of Study 4: Variables and Measures

Independent variable	Manipulation check	Dependent variables	Control variables	Moderators
Balance condition	Acceleration of balance movement (Acc.)	Dual-task construal level measures: 1. Discounting function (area under the curve) 2. Brand novelty task (familiar vs. unfamiliar brand choice)	1. Confidence level 2. Uncertainty tolerance 3. BMI	1. Perceived physical fitness 2. Self-efficacy

Following are descriptions of the variables used in Study 4.

Independent Variable. In Study 4, accelerometers were used to measure the manipulation. Compared with force-plate measurement of downforce movement, the accelerometers in Study 3 proved to be a reliable and flexible way of measuring balance movement. Three accelerometer sensors were placed on both arms and around the waist to measure the acceleration of postural sway.

A highly effortful balancing task for the imbalance manipulation was contrasted with a control condition without balance instructions. As in previous studies, the manipulation required participants to stand on one foot placed on a soft cushion (5cm thick Airex Balance-Pad) with eyes closed. Subjects performed the task after having been spun around ten times. Instructions were given to keep eyes closed while performing and attending to the first cognitive task. The manipulation made it hard for participants to maintain balance, and many participants had to touch the ground with both feet in the beginning. In case of a controlled fall, subjects were instructed to resume the balancing task until the task was over. On average, the balancing task took approximately two minutes to complete.

The control group was not instructed to do a specific balancing task. The control condition comprised a stable stand on a soft cushion (Airex Balance-Pad) with both feet in a normal standing position hip-width apart (approximately 20 cm). Instructions were given to keep a relaxed body alignment with minimum postural movement. The instructions for the control group purposely focused on bringing subjects as close as possible to perfect still stance without semantic priming of balance.

Dependent variables. Hypothesis 1 aimed to use discounting as a measure of one´s construal level when faced with choice alternatives that involve either certain immediate rewards or more uncertain rewards in the distant future. Study 4 used discounting as a dependent variable to measure construal level. In previous studies, discounting has proven to be a verbal measure of construal, which is easy to execute and supervise. Participants were asked to indicate how much money they needed if they had to wait one week or month for a reward instead of accepting an immediate reward of 200 Norwegian Kr. (approximately 20 dollars).

The second construal measure was a choice task, which required participants to choose between familiar and unfamiliar (novel) brands. The measure was executed similarly to the Navon and Kimchi visual tasks in Studies 2 and 3. The difference between the brand familiarity task and the previous task was that participants were shown pictures of brand logos rather than graphic figures. The task consisted of 15 binary choices, of which 10 choice sets were between familiar and unfamiliar brands (see Appendix E for examples of binary brand choices). The remaining five sets showed two familiar brands, which were intended to hide the purpose of the task. Each trial depicted two brands belonging to the same category of products or services, half of which were hedonic. Each logo was pretested on 86 college students with satisfactory results for familiarity and preference[8].

The rationale for this construal measure comes from Eyal et al. (2009, pages 68-69), who regarded novelty as abstract and more psychologically distant than familiar concepts. Most consumers prefer to make familiar choices rather than explore new alternatives (Laroche et al., 1996), especially if the stakes are high (Park & Lessig, 1981). In line with the argument that imbalance reduces construal level, it is predicted that participants will prefer more familiar brands when physically imbalanced. Self-efficacy and perceived physical fitness possibly moderated the relationship between imbalance and construal level, as conceptualized in the introduction of Study 4. The following sections introduce the moderating and control variables before describing the procedure.

Moderating variables. Hypothesis two proposed that the effect of imbalance on low construal processing will be reduced among those with strong beliefs about their abilities (self-efficacy). Those high in self-efficacy are predicted to have higher construal processing when physically imbalanced than those low in self-efficacy. Hence, self-efficacy will be used as a moderator to test Hypothesis 2. In Study 4, self-efficacy was measured as a stable personal trait (general self-efficacy or GSE for short). General self-efficacy is a belief in one´s ability to perform across various situations. It is, therefore, a situation-independent belief. The Norwegian general self-efficacy scale (GSE) (Røysamb, 1997; Scholz et al., 2002) used in this study contained 5 items measured on a 4-point scale. The scale was a reliable measure of self-efficacy in the study ($\alpha = .79$).

---

[8] In the pre-test, participants rated the familiarity of each brand on a scale from 1-4. The mean score for the brands was 2.26 (SD = 1.29). When categorized into familiar and unfamiliar brands, the mean scores were significantly ($p = .00$) different from each other (familiar = 3.40, SD = .88; unfamiliar = 1.40, SD = .77). As expected, participants showed a preference for familiar brands over unfamiliar ones when presented in sets of two. On average, the unfamiliar brand was preferred only in 20% of the choice sets. Walker vs. Maarud was the choice set with the highest novel preference (37%) while All vs. Neutral had the lowest (0%).

A specific belief in one´s physical ability is also relevant in Study 4. Self-perceived physical fitness draws on the same construct as self-efficacy but is limited to the beliefs about physical ability. The self-reported physical fitness scale is reliable (α = .82).

Control Variables. Study 4 tested the differences between participants in demographic characteristics and their effects on the results. Participants reported their body mass (BMI), uncertainty tolerance, and confidence level. As an alternative explanation for the main effect of imbalance on cognitive processing, imbalance might alter consumers´ confidence. Uncertainty will therefore reduce performance and make participants less confident in their choices. Gao et al. (2009) suggested that subtle features of an unfamiliar situation may trigger metacognitive signals that are incongruent with the present self-view and personal confidence (Arkin et al., 2013). Therefore, it was necessary to test whether imbalance alters confidence and whether tolerance of uncertainty is influenced by imbalance.

In Study 4, the balancing task was followed by a questionnaire containing 10 items measuring confidence estimates. Participants were asked to answer ten questions about various subjects, including the population of Spain and the height of the Oslo City Hall. For each answer, participants were asked to rate the perceived correctness of their answer on a seven-point scale (α = .90). The questionnaire was previously used in a study by Teigen and Jørgensen (2005) on subjective confidence as a confidence estimate measure. The questions´ difficulty level was rather high, making the reporting of confidence possible for all participants, including the most confident.

The shortened 12-item intolerance of uncertainty scale (Buhr & Dugas, 2002) was used, with items measured on a 5-point scale. It is a standardized scale used to measure insecurity, which is believed to play a key role in maintaining worry and anxiety (Buhr & Dugas, 2002). The shorter scale is just as valid as the original 27-item scale (Carleton et al., 2007; Khawaja & Yu, 2010; Sexton & Dugas, 2009), and it proved to be a reliable measure of uncertainty in Study 4 (α = .80). Participants´ body mass was also calculated from their self-reported weight and height.

Procedure

Participants were randomly assigned to the manipulated imbalance or control conditions. Before manipulating and measuring dependent measures, participants answered a few psychographic questions. Upon completing the questionnaire, participants in each condition were given instructions on how to perform the task. When they started working on the task, they had to attend monetary discounting tasks simultaneously. After answering how much a financial reward was worth to them now or in the future, participants were shown a set of fifteen binary brand choices, ten of which involved selecting either a familiar brand or an unfamiliar brand in the same category. Therefore, this task aimed to examine the relationship between imbalance and selecting non-novel choices representing a low construal. After completing the manipulation, participants answered the confidence level task comprising twenty general knowledge questions. For each answer, participants had to indicate how confident they were in the correctness of their answer on a scale from 1 to 7. Before participants were debriefed, they answered psychographic questions, the tolerance for uncertainty, and the self-efficacy scale.

Participants. Participants were recruited from the Kristiania University College student body. Students earned a cafeteria token for participating in the surveys and the tasks that took about 30-45 minutes to complete. Out of 98 participants, one was excluded from the study due to severe balancing impairment. The mean age of the participants was 23.5 years, with a standard deviation of 3.5. Out of 97 participants, 34 were males, and 63 were females. For the experiment, 15 men and 32 women were assigned to the control condition, and 19 men and 31 women were assigned to the experimental condition.

Materials. Study 4 used the same equipment as in Study 3. The accelerometers could detect orientation by themselves and therefore measure tilting and rotation.

To display the brand logos for novelty binary choice, the supervisor used color-printed A2-sized cardboards. Other materials applied in the study were a 5cm wide, 35cm x 40cm Airex Balance-Pad on which the participants stood during the imbalance condition.

Data Processing and Analysis

Hypotheses concerning the main effects were analyzed with t-test statistics to assess the mean differences between conditions. Where Levene's test for homogeneity of variances was violated, a modified t-test, Welch t-test or Welch's robust test for equality of means were used. However, the significance of the results remained unchanged; therefore, the results of the standard independent samples t-test and one-way ANOVAs are reported. The PROCESS statistical techniques of Hayes (2014) were applied to test moderation effects. The techniques use ordinary least-squares regression models to analyze combinations of direct and total effects driven by simultaneous mediating and moderating effects (Hayes & Preacher, 2014). The objective of the process analysis was to empirically quantify and test hypotheses about the contingent nature of the mechanisms by which X exerts its influence on Y. In the analysis, a simple moderation model 1 was used.

Introduction to Results

All continuously measured variables were distributed satisfactorily, apart from the accelerometers measuring balance. Non-normal distribution is not a serious threat in analyzing variance between groups (Schmider et al., 2010).

Control Variables

No significant differences between the experimental groups were found in any control variables (see Tables 24).

Table 24

Study 4 Mean Manipulation Differences Between Conditions

	Control (n=47)		Imbalance (n=50)		*t(95)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Fitness	24.79	4.15	24.68	4.24	0.13	.90	0.026
Efficacy	3.15	.50	3.04	.55	1.03	.31	0.209
Confidence Level	2.36	1.01	2.47	1.01	-0.50	.63	0.099
Uncertainty	2.82	.58	2.83	.64	-0.05	.96	0.010
BMI	22.54	3.21	23.28	3.01	1.16	.25	0.236

Participants completed the confidence level measurement scale after the manipulation with a marginal difference between conditions (M_i = 2.47, *SD* = 1.01 vs. M_c = 2.36, *SD* = 1.01), *t*(95), -0.50, *p* = .63, *d* = 0.01. Participants' level of uncertainty tolerance was not significantly different between conditions *t*(95), -0.05, *p* = .96, *d* = 0.01 (M_i = 2.83, *SD* = .64 vs. M_c = 2.82, *SD* = .58). Hence, the alternative explanation that imbalance has a negative effect on confidence was not supported. Additionally, self-reported height and weight did not yield a significant difference in BMI between the groups *t*(95) = 1.16, *p* = .25, *d* = 0.24. In the control group, mean BMI was 22.54 (*SD* = 3.21) and 23.28 (*SD* = 3.01) in the imbalanced group.

Manipulation Checks

The displacement of balance measured as the standard deviation of sway acceleration (Acc.) was significantly different between groups. Out of 97 participants included in the analysis, data about the balance movement of one of the participants was missing due to a technical error.

The imbalance condition negatively affected physical balance (*M* = 1.588, *SD* = 0.912) compared to the control condition (*M* = 0.118, *SD* = 0.179). An independent samples t-test revealed a statistically significant effect, *t*(94) = -10.86, *p* < .001. Cohen´s d was 2.217 for the accelerometer (Table 25).

Table 25

Study 4 Mean Manipulation Acc. Differences Between Conditions

	Control (n=47)		Imbalance (n=49)		*t(94)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Acc. Balance	0.118	0.179	1.588	0.912	-10.86	<.001	2.217

Results

Hypothesis Testing of Imbalance on Construal Level

Testing Hypothesis 1: Imbalance Effect on Construal Level. Hypothesis 1 aimed to test whether imbalance lowers construal level. The results showed a significant effect of physical imbalance on discounting at a .05 significance level for the two conditions. An independent samples t-test revealed a statistically significant effect, t(95) = 2.05, *p* = .04, *d* = 0.4 of imbalance on discounting (Table 26).

Table 26

Study 4 Mean Differences of Discounting Between Conditions

	Control (n=47)		Imbalance (n=49)		*t(95)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Discounting	0.508	0.162	0.437	0.177	2.050	.043	0.416

Participants in the control group had a mean discounting rate of 0.51 (*SD* = .16), while those in a state of imbalance had a discounting rate of 0.44 (*SD* =.18).

Brand familiarity as a measure of construal level was not significantly different between conditions, *t*(95), .85, *p* = .400, *d* = .172 (Table 27).

Table 27

Study 4 Mean Differences of Brand Familiarity Between Conditions

	Control		Imbalance		*t(95)*	*p*	*d*
	M	*SD*	*M*	*SD*			
Brand familiarity	0.234	0.189	0.268	0.205	0.845	.400	0.172

The marginal difference was found between conditions in the number of unfamiliar brand choices made. In the imbalanced condition, participants chose, on average, slightly more unfamiliar brands (M = .27, SD = .21) than the control group (M = .23, SD = .19). H_1, proposing that imbalance decreases construal level as participant´s preference for familiar brands increases, was not supported.

Testing Hypothesis 2: The Moderating Effect of Self-Efficacy on the Relationship Between Imbalance and Construal Level. Hypothesis 2 tested the moderating effect of self-efficacy, as a personal trait, on the relationship between imbalance and construal level. To test the hypothesis, two models were estimated, one with discounting (Table 28) and the other with brand familiarity (Table 29). Hayes and Preacher's (2014) regression Model 1 of direct and total effects driven by simultaneous moderating effects was used for the analysis. The results showed that the moderation effect was not statistically significant (B = -0.052, SE = 0.067, t = -0.770, p = .443, 95% CI [-0.186, 0.082]). The effect size was small, R^2 = .036.

Table 28

Study 4 Moderation of Self-efficacy on the Relationship Between Imbalance and Discounting

Parameter	*B*	*SE*	*t*	*p*	95% CI	
					LL	*UL*
Intercept	0.525	0.161	3.255	.0016	0.205	0.845
Control vs Imbalance	0.087	0.212	0.409	0.683	-0.334	0.508
Efficacy	-0.006	0.051	-0.109	.914	-0.106	0.095
Bal*Efficacy	-0.052	0.067	-0.770	.443	-0.186	0.082

The moderating effect of self-efficacy on unfamiliar brands had the same negative results *(B = 0.118, SE = 0.078, t = 1.503, p = .136, 95% CI [-0.038, 0.273])*. The effect size was small, $R^2 = .03$. Hence, H_2 about generalized self-efficacy moderating the relationship between imbalance and construal level was not supported.

Table 29

Study 4 Moderation of Self-efficacy on the Relationship Between Imbalance and Novelty

Parameter	*B*	*SE*	*t*	*p*	95% CI	
					LL	*UL*
Intercept	0.464	0.187	2.477	.015	0.092	0.837
Control vs Imbalance	-0.332	0.246	-1.348	.181	-0.821	0.157
Efficacy	-0.073	0.059	-1.243	.217	-0.190	0.044
Bal*Efficacy	0.118	0.078	1.503	.136	-0.038	0.273

Testing Hypothesis 3: The Moderating Effect of Self-Perceived Fitness on the Relationship Between Imbalance and Construal Level. Hypothesis 3 proposed that perceived fitness moderates the relationship between imbalance and the construal level. The results showed that the moderation effect of perceived fitness on the relationship between imbalance and discounting was not statistically significant (B = 0.014, SE = 0.008, t = 1.758, p = .08, 95% CI [-0.002, -0.030]). The effect size was moderate, R^2 = .13.

Table 30

Study 4 Moderation of Perceived Fitness on the Relationship Between Imbalance and Discounting

Parameter	*B*	*SE*	*t*	*p*	95% CI	
					LL	*UL*
Intercept	0.436	0.145	3.000	.004	0.147	0.725
Control vs Imbalance	-0.417	0.200	-2.081	.040	-0.814	-0.019
Fitness	0.003	0.006	0.498	.620	-0.009	0.014
Bal*Fitness	0.014	0.008	1.758	.082	-0.002	0.030

When perceived fitness was assessed as a moderator of the relationship between unfamiliar brands and imbalance (Table 31), the results were not significant *(B = -0.066, SE = 0.245, t = -2.269, p = .79, 95% CI [-0.553, 0.421])*. The effect size was small, R^2 = .01. Hence, H_3 about self-perceived fitness moderating the relationship between imbalance and construal level was not supported.

Table 31

Study 4 Moderation of Perceived Fitness on the Relationship Between Imbalance and Novelty

Parameter	*B*	*SE*	*t*	*p*	95% CI	
					LL	*UL*
Intercept	0.292	0.178	1.641	.104	-0.062	0.646
Control vs Imbalance	-0.066	0.245	-0.269	.789	-0.553	0.421
Fitness	-0.002	0.007	-0.331	.742	-0.016	0.012
Bal*Fitness	0.004	0.010	0.413	.681	-0.015	0.023

Discussion

Study 4 supported H_1 when construal level was measured as discounting of future rewards. When imbalanced, participants did discount delayed rewards more than immediate rewards. The finding suggests that greater value is placed on the current moment during imbalance. Imbalance appears to prompt a preference for less distant choice alternatives.

When construal level was measured as a choice between familiar and unfamiliar brands, confidence interval around the result was smaller since the difference between conditions was not significant.

The finding that the main effect was significant for discounting but not for brand choices is ambiguous. A logical explanation is that imbalance as a sensory state is sensitive to construal measures that require visual attention. As discussed in Chapter 1 and illustrated in Figure 1, sight is an exteroceptive sensation that requires more focus on distance than other interoceptive sensations associated with imbalance. When participants were required to focus on visual figures, they may have experienced less proximal sensation from imbalance because it competed with sight for more distant sensation. It can alternatively be postulated that participants considered the task of choosing between brands as more abstract compared to choosing a specific amount as a future reward. The risk or cost-benefit associated with discounting is, to a great extent, a function of an uncertain distant future. On the other hand, the choice between a familiar and unfamiliar brand may be associated with not just the distant risk but also other preferences, such as a need for exploration and new experiences (novelty and sensation seeking). Further research could examine the influence of visual stimuli on construal level processing during imbalance.

No significant difference between conditions could be detected when the confidence level was measured immediately after the manipulation. Therefore, the evidence for imbalance imposing a threat to personal confidence was not supported. It suggests that momentary imbalance does not threaten physical or mental performance.

The second hypothesis in Study 4 proposed that self-efficacy could moderate the relationship between imbalance and construal level. Participants high in self-efficacy were expected to be less influenced by the capacity strains imbalance imposes, showing a preference for high construal options. The findings did not support the moderating role of self-efficacy in the relationship between imbalance and construal level. Therefore, the null H_2 about the moderation of self-efficacy could not be rejected. This result is noteworthy considering Studies 1 findings and the self-efficacy literature. Intuitively, believing in one´s ability should improve performance when times get tough. In the case of imbalance, self-efficacy as a personal trait and perceived physical ability does not appear to have a major effect on cognitive processing during imbalance.

In conclusion, Study 4 findings suggest that imbalance should be considered in the design and management of stores and services. The unpleasantness of losing balance should be avoided, as it shifts focus from shopping surroundings to inner physical control. When consumer decision-making requires focusing on distant results, avoiding anything that can result in physical imbalance may be even more relevant.

Chapter 7

Single Study Meta-Analysis

More information can be gained from multiple studies than from any single one. Some degree of error in measuring the common phenomenon is inevitable in every study. A single-paper meta-analysis (SPM) can pool the results from studies via a weighted average and yield an estimate that is on average more accurate than that of any individual study (Mcshane & Böckenholt, 2017). Studies use different methodologies (also called method factors), such as the operationalization of dependent measure, manipulation, and unaccounted-for moderators. Differences in methods reflect between-study variation called heterogeneity, which can be accounted for by decomposing the variation in observed effects.

Introduction

An SPM was conducted for Study 2-4 to further investigate the robustness of the joint findings pertaining to the relationship between physical imbalance and preference for low construal alternatives, like discounting of future rewards. The analysis determines the degree of between-study variation and yields an estimate of the effect as well as uncertainty in the estimate. A statistical measure known as I^2 (Higgins and Thompson, 2002) is used to give a percentage of the variation in the observations due to heterogeneity, beyond what is attributable to the experimental manipulations.

The estimates of interest are collected in one dataset that is used as input for the meta-analysis. Table 32 shows the dataset that includes the discounting dependent variable for the balance control and imbalance groups across studies 2 through 4.

Table 32

Summary of Study Results for Discounting by Condition

Study	Condition	y	sd	n
2	Control	0.72	0.16	21.00
2	Imbalance	0.70	0.14	22.00
3	Control	0.56	0.15	31.00
3	Imbalance	0.54	0.19	28.00
4	Control	0.51	0.16	47.00
4	Imbalance	0.44	0.18	49.00

Table 33 displays the estimates and standard errors for the two conditions (control and imbalance). Control had an estimated discounting mean of 0.598 and a standard error of 0.071, while imbalance had an estimated mean of 0.555 and a standard error of 0.072.

Table 33

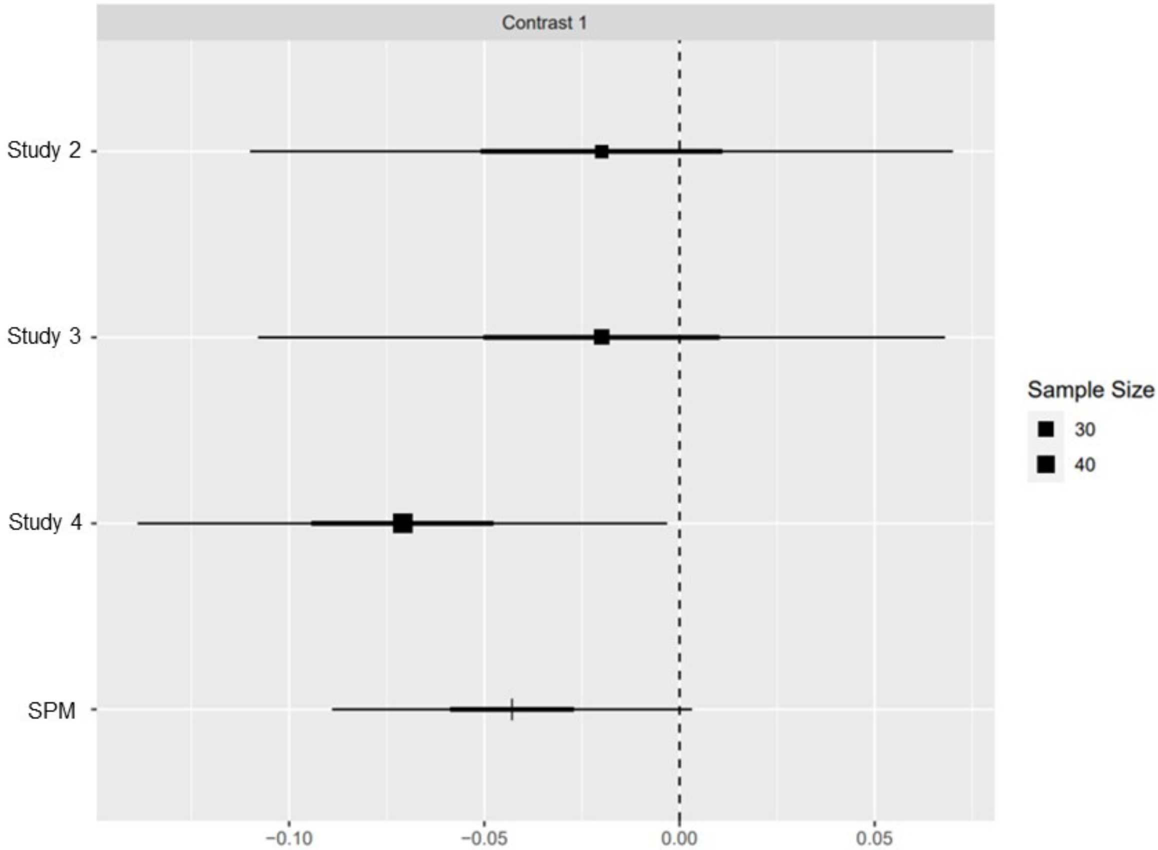
Summary of Condition and Contrast Estimates for Discounting

Condition	**Estimate**	**SE**
Control	0.60	0.07
Imbalance	0.56	0.07
Contrast	**Estimate**	**SE**
Contrast 1	-0.04	0.02

The contrast estimate, a summary statistic that compares the mean difference between two groups, was -0.04 (95% CI: -0.089 to 0.003), p = .067. The negative value in Table 33 indicates that the imbalance group had a lower mean of discounting than the balance group, although this difference was not significant. This indicates that imbalance affects discounting as a construal level measure only to a limited degree. I^2 was 94.34% (95% CI: 89.6%-96.9%), suggesting that heterogeneity was rather high, with method factors accounting for majority of the variation in the observations beyond that attributable to the experimental manipulations. According to Higgins and colleagues (2003), heterogeneity (I^2) is low if I^2 is between .25 and .50, moderate if it is between .50 and .75, and high if it above .75. The results of this analysis are presented graphically in Figure 15.

Figure 15

Forest Plot Displaying Meta-Analysis Results of Imbalance on Discounting



Since the confidence interval includes zero, it is not possible to conclude that there is a significant difference between the two conditions. However, method factors or a more homogeneous set of studies could yield a significant result.

Therefore, based on this contrast output from the meta-analysis, it is not possible to make a definite conclusion about the effect of imbalance on discounting as preference for low construal alternatives. The data suggest a trend towards preference for present rewards for the imbalance condition, although the effect size is relatively small and imprecise. More data is needed to determine the nature and significance of this contrast.

Further SPM analysis was not considered since adding other similar measurement scales for the dependent measure would increase heterogeneity.

Chapter 8

General Discussion

This section concludes the dissertation by summarizing the key findings to achieve the research aims and answer the proposed questions. It discusses the value and contribution of the study to both theory and practice. Moreover, limitations are reviewed, and directions for future research are proposed.

Introduction

This dissertation extends current knowledge about the effect of physical imbalance on consumers' cognitive capacity and processing in the context of choice making. It is, to my knowledge, the first and only research in consumer psychology that empirically tested the effect of physical imbalance as a physiological phenomenon affecting consumers. Four experiments yielded suggested a limited and non-significant reduction in consumer´s brand retrieval and preference for low construed rewards. It may seem unusual that physical imbalance has any relation to consumer preference and choice beyond other bodily movements. As consumers approach and move around business facilities, they often must walk on wet floors, icy sidewalks, staircases, escalators, and poorly marked steps that can easily contribute to momentary imbalance, not to mention falls, injuries, and subsequent lawsuits. Therefore, this dissertation is a timely effort to increase knowledge about the cognitive consequences of imbalance on consumers.

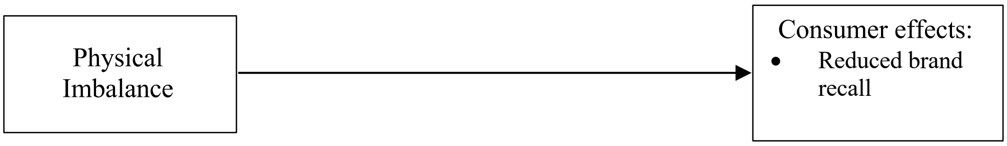
Summary of main findings

The dissertation aimed to answer four research questions about the effect of imbalance on consumers. In the following section, answers to these questions are structured according to Figure 3 (Chapter 2) about the relationship between physical balance, cognitive capacity, and construal level. Empirical findings in Study 1-4 are discussed accordingly.

The first research question was, "*How does physical imbalance as a source of cognitive load affect consumers' cognitive capacity?*" The relationship is illustrated in Figure 16. The question was answered in Study 1.

Figure 16

The Relationship Between Physical Imbalance and Brand Recall

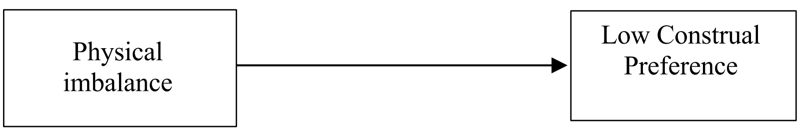


Study 1 found a non-significant reduction in memory-based brand recall among young and healthy participants. When imbalanced participants were asked to recall brands from memory, they did not recall significantly fewer brands than when they were stable and did not regard the task as significantly more effortful. The finding is inconsistent with current consumer research that reported a negative effect of cognitive load on free brand recall (Vyvey et al., 2018).

The second research question was, "*How does physical imbalance alter construal levels in the domain of consumer preference?*" This association is illustrated in Figure 17. The figure exchanges brand recall with construal level preference during an increase in proximal sensation prompted by imbalance (see Chapters 1 and 2 for more details).

Figure 17

The Relationship Between Physical Imbalance and Construal Level

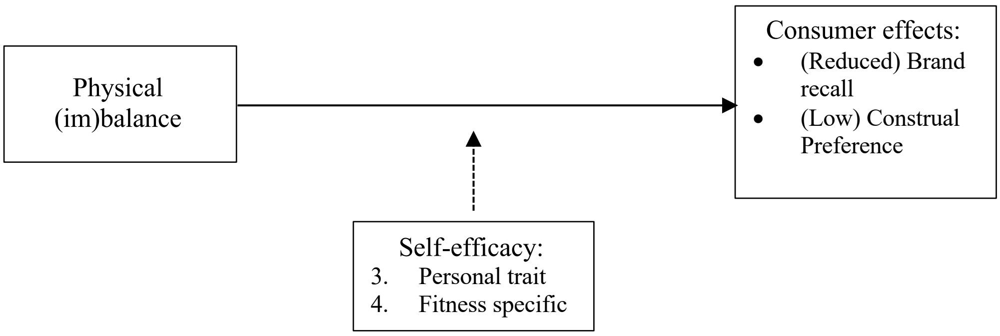


Studies 2 to 4 sought to answer whether imbalance affects consumers´ construal of available options. The question is derived from the theoretical framework presented in Chapters 1 and 2, where the proximal sensation of imbalance was proposed to increase preference for lower construed outcomes. The findings of Studies 2 and 3 did not yield significant results. In some of the observations, participants preferred a low construed choice alternative, but the results were not significant. In the larger sample in Study 4, participants had a statistically significant preference for smaller but less distant rewards. The finding suggests that imbalance may reduce consumers' preference for distant outcomes, which is in line with current consumer research about the proximal sensory effect on the construal level outcomes (Elder et al., 2017).

The third research question was, *"What is the subsequent effect of physical imbalance on construal levels in consumer preference?"* The question was based on the premise that proximal sensory signals determine the effect of change on the duration of construal level preference. Therefore, regaining balance was expected to attenuate low construal processing, unlike prior research findings where postural control was found to have consecutive effects after stimuli (Briñol et al., 2009; Scarpa et al., 2011). As proposed, differences in construal level between conditions in Studies 2 and 3 were not significant. Therefore, the imbalance was unlikely to have a subsequent effect on the construal level processing of consumers. The fourth and last question was, "*How does self-efficacy interact with the relationship between the physical balance, capacity, and construal level in consumer preference?*" This relationship is illustrated in Figure 18. The figure ads the moderation effect of self-efficacy with cognitive load and cognitive capacity limit on the relationship between imbalance and cognitive processing, both capacity and construal.

Figure 18

Proposed Moderation of Self-Efficacy on The Relationship Between Imbalance and Consumer Effects



Since individual traits can induce cognitive effects, e.g. believe in good fitness having improvements on physical performance, it can be postulated that imbalance may influence belief in their ability (Hoffman & Schraw, 2009; Judge et al., 2002; Stajkovic, 2006; Vess et al., 2011). Therefore, it was hypothesized in Study 1 that imbalance would have less effect on the cognitive capacity of those high in self-efficacy. Findings did not support the hypothesis, as recall was the same in the balance and imbalance conditions for those high in self-efficacy. Following Study 1, moderating effect of self-efficacy on the relationship between imbalance and construal level was analyzed. Based on the analysis and prior research, Study 4 proposed that imbalance would not reduce construal level to the same degree for participants high in self-efficacy. The finding revealed that participants in the two conditions did not differ in construal. The imbalance was no less of a threat to those who had a high self-efficacy in their ability.

In conclusion, the hypothesis about imbalance inducing a decrease in brand retrieval and an increase in preference for proximal rewards was not confidently supported. The findings provided limited evidence for imbalance decreasing consumers' ability to process information and increase their tendency to opt for low construed alternatives. The hypothesis about the positive effect of self-efficacy was not supported, indicating that imbalance has the same negative effect on consumers regardless of how positive a consumer´s self-image may be. Accordingly, cognitive demands imbalance imposed on consumers appeared to have consequences beyond personal traits and physical ability. Given the limited evidence, it is noteworthy that none of the control variables, such as mood or uncertainty, differed significantly across conditions in the studies. The contributions and limitations of these findings are discussed in the following sections.

Contributions

The answers to the four research questions outlined in the previous section provide theoretical and empirical contributions to the field of consumer psychology. While other consumer researchers have conducted studies to examine the effect of physical balance on metaphoric associations, this dissertation research is one of the few studies conducted in consumer psychology to investigate the cognitive effect of proper imbalance manipulation. Previous consumer psychology research has manipulated sensory systems involved in balance to a limited extent (Biswas et al., 2019b; Larson & Billeter, 2013). Due to unclear manipulation checks in previous research, conclusions about the effect of genuine physical imbalance have not been available. Therefore, this dissertation provides new knowledge about the effect of imbalance on consumers´ cognitive processing. Until now, consumer researchers have had to look for methods to manipulate imbalance and test its effects on cognition in other research fields, such as gerontology and neurology. Unquestionably, manipulating physical balance in a controlled setting demands careful planning and fine-tuning of the sensory experience. The studies in this dissertation used young adults as subjects, forming a baseline for cognitive effects on consumers. Future studies can now compare results with older or more physically challenged populations.

Second, this dissertation contributes to the consumer psychology literature on memory-based brand retrieval. It has been suggested that cognitive load, such as information overflow, negatively affects brand retrieval (Baumann et al., 2015; Hutchinson et al., 1994; Nedungadi, 1990). Study 1 of this dissertation did not provide sufficient evidence for imbalance, as a proximal sensorimotor process, to reduce brand retrieval. The result is noteworthy since participants considered the manipulation effortful. Future consumer research can draw from this finding when considering what constitutes a significant load. Based on the data in Study 1, the evidence for interoceptive sensory processing contributing to consumer´s negative cognitive outcomes is limited.

Third, this dissertation contributes to the consumer psychology literature on brand recall and consumer preference. Findings of Study 4 offer limited evidence suggesting that imbalance increases preference for proximal outcomes. When imbalanced, consumers may choose alternatives with short rather than long-term benefits, although only one study supported this proposition. The finding adds to the literature on the relevance of construal level theory in consumer psychology (Dhar & Kim, 2007; Eyal et al., 2009; Fiedler, 2007; Liberman et al., 2007). By testing the degree to which the proximal sensation of imbalance can alter construal processing, this dissertation increases consumers' knowledge about possible sensory cues of construal processing (Hadar et al., 2019).

Lastly, this dissertation contributes to the consumer psychology literature on multisensory experiences, which has focused mainly on one sense in isolation from other sensory inputs (Krishna, 2012). This is because of the belief that consumers´ senses can be conveniently studied independently of each other. However, more researchers have recognized that the consumer´s experience is embodied as a multisensory perception (Hultén, 2011; Krishna & Schwarz, 2013; Spence et al., 2014). The embodiment of experiences includes interoceptive and exteroceptive sensations, acting together to form the experience.

This dissertation built on the embodiment hypothesis and illustrated that the sensation of imbalance is the sum of four sensory inputs. Previous consumer research on the effect of physical imbalance had a smaller scope, leaving the underlaying sensory dynamics of the experience of imbalance untouched (Biswas et al., 2019b; Larson & Billeter, 2013).

In sum, this dissertation utilized the conceptual and methodological approach to bring forth more knowledge about the consequence of imbalance on consumers, representing a noteworthy contribution. The following section discusses the implications of this research contribution.

Implications

The findings of this dissertation have some practical and theoretical implications for consumers and marketers. First, consumer and marketing researchers now have more knowledge about the consequences of physical imbalance. Imbalance appears to have limited effect on consumer cognitive capacity experienced as effortful. Maintaining balance is still important for preventing the physical consequences of a fall. Being stable allows consumers to retrieve and process relevant information. As consumers, we rely on balance. However, some consumers know they are fragile. With age and physical impairments comes the potential risk of losing balance. The findings of this dissertation suggest that regaining balance is important for consumers because of physical outcomes and psychological consequences to a limited degree. While many consumers are more cautious on wet floors, escalators, and stairs because of potential physical consequences, this dissertation indicates that young consumers do not need to worry about extensive cognitive effects of imbalance. This study tested imbalance among young and healthy subjects who did not experience severe cognitive impairments. Results may have been different in a sample of older and less physically fit participants.

Second, store owners and designers of consumer environments can benefit from knowing that imbalance is unlikely to reduce cognitive capacity and propensity to consider future rewards among young and healthy consumers. Sensory signals are a subtle part of consumers' perception of in-store atmosphere and marketing offers (Spence et al., 2014) and with age, our sensory systems become less responsive to these signals. Therefore, knowing how imbalance, as a sensory experience, influences consumers is of value for marketers. Young and healthy consumers experiencing imbalance seem to be able to recall unknown brands almost as effectively as known brands. Point of purchase advertising is therefore of equal importance when disturbances such as imbalance occur (Sigurdsson et al., 2010). Momentary imbalance can make it more difficult for young consumers to retrieve relevant information during decision-making. The importance of having well-trained sales and service personnel who can help customers retrieve relevant information during decision-making (Jung et al., 2021) is therefore still relevant. Since sensory signals are so often subtly integrated into our shopping experiences, it is valuable to know what role interoceptive and exteroceptive sensation may have.

Furthermore, the designers of new technology that incorporates virtual reality (VR) may also draw some useful conclusions from this dissertation. The findings of this dissertation suggest that physical imbalance experienced using VR technology has, in a limited way, cognitive effects on young consumers. While VR is mostly accommodated for visual and audio stimuli, developers should not underestimate the imbalance effect in virtual experiences (Weech et al., 2019). Cybersickness refers to symptoms of nausea and dizziness during VR experiences (Caserman et al., 2021). The discomfort of cybersickness should be avoided, and researchers need a better understanding of how VR influences consumers´ multi-sensory experiences. This dissertation points towards a challenge when virtual VR unintentionally manipulates the sensory systems responsible for the balance. Due to the visual-vestibular conflict in VR, research has established that current VR technology induces postural instability (Hollman et al., 2007; Horlings et al., 2009). Vestibular, proprioceptive, tactile, and visual information must be synchronized to provide minimum stability (Cobb, 1999) and provide an experience that is in sync with bodily sensations. VR technology should thus not be applied to products or services that require physical balance and high involvement. Future VR technology will likely incorporate sensory information that can better convey the experience of moving around open spaces (Caserman et al., 2021). The technology should be studied further, especially with older consumers in mind.

Lastly, this dissertation has theoretical implications for research in consumer psychology. The research presented here contributes to a growing body of multi-sensory consumer research. It demonstrates that interoceptive and exteroceptive sensations seldom amount to a noteworthy sensory load in young consumers. The current research on sensory overload in shopping environments (Doucé & Adams, 2020) supports the significance of cognitive effects. This dissertation revealed that imbalance with its interoceptive sensation is effortful even for young consumers, whereas the literature has primarily focused on the role of exteroceptive sensation (Spence et al., 2014). Therefore, researchers might consider carefully controlling for interoceptive sensations that are less overt than exteroceptive sensations. Sensations like hunger, thirst, pain, and heat can all contribute to the measurement of sensory experiences even when they are not the object of study. The fine-tuned imbalance manipulation in this study stresses the importance of examining the interaction of several senses rather than treating them independently of each other. The cognitive consequences should also be considered with care.

Unlike Larson and Billeter (2013), this dissertation treated physical balance independently of conceptual metaphors and viewed it as a sensation dependent on physiological and cognitive resources. As discussed in Chapter 2, physical balance is a complex sensory processing system with several neurological pathways and potential consequences for consumers. The effect of imbalance on cognitive processing can be contrasted to the only consumer psychology article published on physical balance. In this article, Larson and Billeter (2013) proposed that the sensory experience of balance is stimulated through the semantic activation of the balancing concept, which also increases the accessibility of the equilibrium/parity concept (or compromise choice, as it is also referred to in decision-making research). Larson and Billeter (2013) demonstrated that physical balance could be treated as a metaphorical concept that is both bodily grounded and cognitively stimulated. Participants primed with balance had a higher preference for the compromise option in the middle of two opposites (price vs. quality). Larson and Billeter opted for the balanced (equilibrium) alternative.

In an earlier grounded embodiment study, Lee and Schwarz (2014) explored the metaphoric concept of balance as an expression meaning "weighing the evidence." The bodily assimilation of the expression "on the one hand and the other" is often expressed as an alternating hand movement, with palms moving up and down. When participants were asked to move their hands this way, there was a perceived increase in the importance of balance between work and leisure. These results tell us that metaphors can exert their influence in multiple pathways. Consequently, bodily activation can have different cognitive responses across the setting, with multiple metaphorical associations unfolding in the embodiment paradigm (Krishna & Schwarz, 2013). This dissertation pinpointed the challenge of using conceptual metaphors because the intensity of the multisensory manipulation may alter the semantic interpretation. Imbalance may trigger a semantic relationship, yet the experimental results in this dissertation demonstrated that the cognitive consequences for healthy consumer are small and difficult to detect. The cognitive effect of imbalance can also be attributed to the amount of sensory load it imposes. Hence, how embodiment can be studied beyond mental representations and conceptual metaphors needs to be clarified. This dissertation illustrated conceptual metaphors' limitations as a framework for understanding consumers' responses to sensory activation, like imbalance.

Research Limitations

The studies presented in this dissertation have several limitations. First, they offer limited the evidence for the tested hypotheses. In many cases where data collection is very resource-demanding, the sample size is often a question of cost versus benefit. Collecting data for the study of imbalance demands great resources. In this dissertation, the sample size was estimated from the number of participants in previous research on physical imbalance and construal levels. The number of cases in imbalance studies ranged from 6 to 40 (Segev-Jacubovski et al., 2011). A review of construal level studies referenced in this dissertation indicated the average sample size of 55 (*M* = 51; Range: 30-87) with up to 4 conditions. A post-hoc analysis of Studies 3 and 4 for two independent, two-tailed tests reached statistical power of 61% (www.stat.ubc.ca). With a Cohen´s d effect size of .33, it is advised that the findings be interpreted with caution. As Greenland et al. (2016) pointed out, "The outcome of any statistical procedure is but one of many considerations that must be evaluated when examining the totality of evidence…statistical significance is neither necessary nor sufficient for determining the significance of a set of observations" (347). The statistical analysis of the hypothesis proposed in this dissertation offered limited evidence of an effect.

Second, the studies were conducted in a laboratory rather than a real shopping area. In the laboratory, it is easier to manipulate imbalance without causing injury. It would make the findings more reliable if they could be tested in a real-life consumer setting. Some participants may interpret the sensory experience differently in an uncontrolled situation.

Third, the possibility of bias in the experiments was unavoidable. In particular, interviewer and response bias could have been an issue (Hair et al., 2006). While the participants were engaged in a dual-task, being physically occupied while retrieving the brands from their memory, the researcher had to write down participants´ responses, which might have resulted in interviewer bias due to the observer-expectancy effect. Conversely, even though participants were presented with a cover story to conceal the true intention of the study, they still could have responded that they thought the researcher wanted to hear.

The theoretical foundation underlying the relationship between imbalance and cognitive processing has been considered strong (Segev-Jacubovski et al., 2011). Prior research on the effect of imbalance on cognition has provided some evidence of a causal relationship and theories on cognitive load and construal level also offer evidence that our senses influence our processing. However, recent concerns about publication bias in research on construal level theory have called up on stronger manipulations and more high-power studies (Maier et al., 2022).

According to Maier et al. (2022), construal level effects can be hard to detect due to the variability in effective measures of the construct. Maier et al. (2022) continue by stating that "due to the large variability of true effects, some CLT methods are likely still effective" (p. 17). Based on the findings of this dissertation, further research could test the reliability of discounting as a construal measure in a high-power study. It can be argued that the variability in measurement in prior studies had a spillover effect on Studies 2-4 in this dissertation. Identifying valid CLT measurements was a great challenge. This dissertation reveals the importance of finding better standardized construal measures. Future CLT studies will likely focus on the issue of measurement validity.

In this dissertation, alternative factors, such as mood and uncertainty, did not yield significant results. However, future research should look for possible covariates in the relationship between imbalance and cognitive processing. For example, consumers' need for optimal stimulation (Steenkamp & Baumgartner, 1992) differs from person to person. For some, the sensory experience of imbalance may be more exciting than for others. Consumers also differ in the accuracy of perceived bodily signals, as their attentional resources may be shifting between inward and outward stimuli. Therefore, using a body consciousness scale, such as the Body Consciousness Questionnaire (Miller et al., 1981), might increase our understanding of sensory experiences and consumers' reactions to internal and external stimulation.

Future Research

Much of research in disciplines other than consumer research has focused on people with balance impairments. This is likely because their quality of life will improve with greater knowledge and because their imbalance is more extreme and therefore easier to compare to a healthy control condition. It is therefore suggested that further studies on imbalance include a sample of balance impaired consumers. As the use of virtual reality is on the increase in consumer settings, it is likely that the effect of imbalance will continue to be of interest for consumer researchers. Following are two suggestions for future research.

Field Research to Study Imbalance in Consumer Settings

To further test the real-life application of this dissertation´s findings, it would be logical to consider how the results transfer to a consumer setting where imbalance can be a major factor. Consumption behavior can be studied in less stable settings, such as cruise ships, ferries, trains, and airplanes. Furthermore, advancements in virtual reality offer ample opportunities to test the relationship between sensory perception and consumer behavior. New sensor technology, such as eye scanners and galvanic measures, can increase our knowledge of the effect of imbalance as a multisensory experience.

Improvements in Balance Mastery as a Contributor to Consumers Decision-making

The theory of cognitive adaptation (Taylor, 1983) discusses how a sense of mastery can be achieved through believing that one can take control of a problem by actively taking steps that are perceived as directly controlling the situation. This process is referred to as mastery and relates to personal adjustment. As Taylor (1983) discussed in the context of adjustment to threatening events, mastery is regarded as a manipulation of feelings of control that enhances personal coping with short-term aversive events. From this perspective, it would be valuable to study the effects of balance improvement for consumers. Consumers´ fitness level differs with age; many can strengthen their physical balance capabilities with training. Studying how physical balance improvements over time might influence consumers decision-making would be informative. Being able to recall brands and make optimal choices will be imperative as consumers become dependent on the retailers' offerings to meet their physical and mental needs. In this respect, it will be important to have comprehensive knowledge about the cognitive influence of imbalance and other multisensory experiences.

References

Abadie, B. R. (1988). Construction and validation of a perceived physical fitness scale. *Perceptual and Motor Skills*, *67*(3), 887–892.

Abbud, G. A., Fraser, S. A., DeMont, R. G., & Li, K. Z. H. (2012). Successful adaptation of gait in healthy older adults during dual-task treadmill walking. *Aging, Neuropsychology, and Cognition*, *19*(1–2), 150–167. https://doi.org/10.1080/13825585.2011.628375

Adler, S., & Sarstedt, M. (2021). Mapping the jungle: A bibliometric analysis of research into construal level theory. *Psychology & Marketing*, *38*(9), 1367–1383. https://doi.org/10.1002/mar.21537

Alba, J. W., Lynch, J. G., & Hutchinson, J. W. (1991). Memory and Decision Making. In *Handbook Of Consumer Behavior* (p. 52). Prentice-Hall.

Alexander, N. B., & Hausdorff, J. M. (2008). Guest editorial: Linking thinking, walking, and falling. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *63*(12), 1325–1328. https://doi.org/10.1093/gerona/63.12.1325

Anderson, M. L. (2008). On the grounds of (X)-grounded cognition. In *In perspectives on cognitive science: The handbook of cognitive science* (pp. 423–435). Elsevier.

Andersson, G., Yardley, L., & Luxon, L. (1998). A dual-task study of interference between mental activity and control of balance. *The American Journal of Otology*, *19*(5), 632–637.

Arkin, R. M., Oleson, K. C., & Carroll, P. J. (2013). *Handbook of the uncertain self*. Psychology Press.

Armour, K. (2014). *Pedagogical cases in physical education and youth sport*. Taylor & Francis. http://books.google.no/books?id=8FWkAgAAQBAJ

Awad, S., Debatin, T., & Ziegler, A. (2021). Embodiment: I sat, I felt, I performed – Posture effects on mood and cognitive performance. *Acta Psychologica*, *218*, 103353. https://doi.org/10.1016/j.actpsy.2021.103353

Baddeley, A. (1992). Working memory: The interface between memory and cognition. *Journal of Cognitive Neuroscience*, *4*(3), 281–288. https://doi.org/10.1162/jocn.1992.4.3.281

Balasubramaniam, R., & Wing, A. M. (2002). The dynamics of standing balance. *Trends in Cognitive Sciences*, *6*(12), 531–536. https://doi.org/10.1016/S1364-6613(02)02021-1

Bandura, A. (1988). Organisational applications of Social Cognitive Theory. *Australian Journal of Management*, *13*(2), 275–302. https://doi.org/10.1177/031289628801300210

Bandura, A. (2006). Guide for constructing self-efficacy scales. In *Self-efficacy beliefs of adolescents* (Vol. 5, pp. 307–337). Information Age Publishing.

Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In *Handbook of research methods in social and personality psychology* (pp. 253–285). Cambridge University Press. http://www2.psych.ubc.ca/~schaller/528Readings/BarghChartrand2000.pdf

Barra, J., Bray, A., Sahni, V., Golding, J. F., & Gresty, M. A. (2006). Increasing cognitive load with increasing balance challenge: Recipe for catastrophe. *Experimental Brain Research*, *174*(4), 734–745.

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, *59*(1), 617–645. https://doi.org/10.1146/annurev.psych.59.103006.093639

Barsalou, L. W. (2010). Grounded cognition: Past, present, and future. *Topics in Cognitive Science*, *2*(4), 716–724. https://doi.org/10.1111/j.1756-8765.2010.01115.x

Baumann, C., Hamin, H., & Chong, A. (2015). The role of brand exposure and experience on brand recall—Product durables vis-à-vis FMCG. *Journal of Retailing and Consumer Services*, *23*, 21–31. https://doi.org/10.1016/j.jretconser.2014.11.003

Berrigan, F., Simoneau, M., Martin, O., & Teasdale, N. (2006). Coordination between posture and movement: Interaction between postural and accuracy constraints. *Experimental Brain Research*, *170*(2), 255–264.

Bettman, J. R. (1979). Memory factors in consumer choice: A review. *Journal of Marketing*, *43*(2), 37–53. https://doi.org/10.1177/002224297904300205

Bettman, J. R., Johnson, E. J., & Payne, J. W. (1991). Consumer decision making. In *Handbook of consumer behavior*. Prentice-Hall.

Bischoff, C., & Hansen, J. (2016). Influencing support of charitable objectives in the near and distant future: Delay discounting and the moderating influence of construal level. *Social Influence*, *11*(4), 217–229. https://doi.org/10.1080/15534510.2016.1232204

Biswas, D., Szocs, C., & Abell, A. (2019). Extending the boundaries of sensory marketing and examining the sixth sensory system: Effects of vestibular sensations for sitting versus standing postures on food taste perception. *Journal of Consumer Research*, *46*(4), 708–724. https://doi.org/10.1093/jcr/ucz018

Boisgontier, M. P., Beets, I. A. M., Duysens, J., Nieuwboer, A., Krampe, R. T., & Swinnen, S. P. (2013). Age-related differences in attentional cost associated with postural dual tasks: Increased recruitment of generic cognitive resources in older adults. *Neuroscience & Biobehavioral Reviews*, *37*(8), 1824–1837. https://doi.org/10.1016/j.neubiorev.2013.07.014

Brauer, S. G., Woollacott, M., & Shumway-Cook, A. (2001). The interacting effects of cognitive demand and recovery of postural stability in balance-impaired elderly persons. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *56*(8), M489–M496.

Bressler, S. L., & Menon, V. (2010). Large-scale brain networks in cognition: Emerging methods and principles. *Trends in Cognitive Sciences*, *14*(6), 277–290. https://doi.org/10.1016/j.tics.2010.04.004

Briñol, P., & Petty, R. E. (2008). Embodied persuasion: Fundamental processes by which bodily responses can impact attitudes. In *Embodiment grounding: Social, cognitive, affective, and neuroscientific approaches* (pp. 184–207). Cambridge University Press. http://research.chicagobooth.edu/cdr/workshop/brinol.pdf

Briñol, P., Petty, R. E., & Wagner, B. (2009). Body posture effects on self-evaluation: A self-validation approach. *European Journal of Social Psychology*, *39*(6), 1053–1064. https://doi.org/10.1002/ejsp.607

Broadbent, D. E. (1958). *Perception and communication*. Pergamon Press. https://doi.org/10.1037/10037-000

Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: Psychometric properties of the English version. *Behaviour Research and Therapy*, *40*(8), 931–945. https://doi.org/10.1016/S0005-7967(01)00092-4

Burgoon, E. M., Henderson, M. D., & Markman, A. B. (2013). There are many ways to see the forest for the trees: A tour guide for abstraction. *Perspectives on Psychological Science*, *8*(5), 501–520. https://doi.org/10.1177/1745691613497964

Carleton, R. N., Norton, M. A. P. J., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of Anxiety Disorders*, *21*(1), 105–117. https://doi.org/10.1016/j.janxdis.2006.03.014

Carpenter, M. G. (2006). Postural, physiological and psychological reactions to challenging balance: Does age make a difference? *Age and Ageing*, *35*(3), 298–303. https://doi.org/10.1093/ageing/afl002

Caserman, P., Garcia-Agundez, A., Gámez Zerban, A., & Göbel, S. (2021). Cybersickness in current-generation virtual reality head-mounted displays: Systematic review and outlook. *Virtual Reality*, *25*(4), 1153–1170. https://doi.org/10.1007/s10055-021-00513-6

Chen, O., Castro-Alonso, J. C., Paas, F., & Sweller, J. (2018). Extending Cognitive Load Theory to incorporate working memory resource depletion: Evidence from the spacing effect. *Educational Psychology Review*, *30*(2), 483–501. https://doi.org/10.1007/s10648-017-9426-2

Chernev, A. (2005). Context effects without a context: Attribute balance as a reason for choice. *Journal of Consumer Research*, *32*(2), 213–223.

Chong, R. K. Y., Mills, B., Dailey, L., Lane, E., Smith, S., & Lee, K.-H. (2010). Specific interference between a cognitive task and sensory organization for stance balance control in healthy young adults: Visuospatial effects. *Neuropsychologia*, *48*(9), 2709–2718. https://doi.org/10.1016/j.neuropsychologia.2010.05.018

Cobb, S. V. G. (1999). Measurement of postural stability before and after immersion in a virtual environment. *Applied Ergonomics*, *30*(1), 47–57.

Costantini, M., & Haggard, P. (2007). The rubber hand illusion: Sensitivity and reference frame for body ownership. *Consciousness and Cognition*, *16*(2), 229–240. https://doi.org/10.1016/j.concog.2007.01.001

Cowan, N. (2010). The Magical Mystery Four: How is working memory capacity limited, and why? *Current Directions in Psychological Science*, *19*(1), 51–57. https://doi.org/10.1177/0963721409359277

Craig, A. D. (2003). Interoception: The sense of the physiological condition of the body. *Current Opinion in Neurobiology*, *13*(4), 500–505.

Cyma, M., Marciniak, K., Tomczak, M., & Stemplewski, R. (2018). Postural stability and physical activity of workers working at height. *American Journal of Men's Health*, *12*(4), 1068–1073. https://doi.org/10.1177/1557988318774996

Dale, G., & Arnell, K. M. (2013). Investigating the stability of and relationships among global/local processing measures. *Attention, Perception, & Psychophysics*, *75*(3), 394–406. https://doi.org/10.3758/s13414-012-0416-7

Damasio, A., & Carvalho, G. B. (2013). The nature of feelings: Evolutionary and neurobiological origins. *Nature Reviews. Neuroscience*, *14*(2), 143–152. http://dx.doi.org/10.1038/nrn3403

Davidson, B. S., Madigan, M. L., & Nussbaum, M. A. (2004). Effects of lumbar extensor fatigue and fatigue rate on postural sway. *European Journal of Applied Physiology*, *93*(1–2), 183–189. https://doi.org/10.1007/s00421-004-1195-1

Dengfeng Yan. (2014). Future events are far away: Exploring the distance-on-distance effect. *Journal of Personality & Social Psychology*, *106*(4), 514–525.

Desai, K. K., & Hoyer, W. D. (2000). Descriptive characteristics of memory-based consideration sets: Influence of usage occasion frequency and usage location familiarity. *Journal of Consumer Research*, *27*(3), 309–323. https://doi.org/10.1086/317587

Dewitte, S., Pandelaere, M., Briers, B., & Warlop, L. (2005). *Cognitive load has negative after effects on consumer decision making* (SSRN Scholarly Paper ID 813684). Social Science Research Network. https://papers.ssrn.com/abstract=813684

Dhar, R., & Kim, E. Y. (2007). Seeing the forest or the trees: Implications of construal level theory for consumer choice. *Journal of Consumer Psychology*, *17*(2), 96–100.

Dijkstra, K., & Post, L. (2015). Mechanisms of embodiment. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.01525

Doucé, L., & Adams, C. (2020). Sensory overload in a shopping environment: Not every sensory modality leads to too much stimulation. *Journal of Retailing and Consumer Services*, *57*, 102154. https://doi.org/10.1016/j.jretconser.2020.102154

Duncan, P. W., Weiner, D. K., Chandler, J., & Studenski, S. (1990). Functional reach: A new clinical measure of balance. *Journal of Gerontology*, *45*(6), M192–M197.

Ekeland, E., Heian, F., & Hagen, K. B. (2005). Can exercise improve self esteem in children and young people? A systematic review of randomised controlled trials. *British Journal of Sports Medicine*, *39*(11), 792–798. https://doi.org/10.1136/bjsm.2004.017707

Elder, R. S., Schlosser, A. E., Poor, M., & Xu, L. (2017). So close I can almost sense it: The interplay between sensory imagery and psychological distance. *Journal of Consumer Research*, *44*(4), 877–894. https://doi.org/10.1093/jcr/ucx070

Eyal, T., Liberman, N., & Trope, Y. (2009). Psychological distance and consumer behavior: A construal level theory perspective. *The Social Psychology of Consumer Behavior*, 65–87.

Fiedler, K. (2007). Construal level theory as an integrative framework for behavioral decision-making research and consumer psychology. *Journal of Consumer Psychology*, *17*(2), 101–106. https://doi.org/10.1016/S1057-7408(07)70015-3

Fujita, K., & Han, H. A. (2009). Moving beyond deliberative control of impulses: The effect of construal levels on evaluative associations in self-control conflicts. *Psychological Science*, *20*(7), 799–804. https://doi.org/10.1111/j.1467-9280.2009.02372.x

Fujita, K., Henderson, M. D., Eng, J., Trope, Y., & Liberman, N. (2006). Spatial distance and mental construal of social events. *Psychological Science*, *17*(4), 278–282.

Fujita, K., Trope, Y., Liberman, N., & Levin-Sagi, M. (2006). Construal levels and self-control. *Journal of Personality and Social Psychology*, *90*(3), 351–367. https://doi.org/10.1037/0022-3514.90.3.351

Fukuoka, Y., Nagata, T., Ishida, A., & Minamitani, H. (2001). Characteristics of somatosensory feedback in postural control during standing. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, *9*(2), 145–153. https://doi.org/10.1109/7333.928574

Gasper, & Clore. (2002). Attending to the big picture: Mood and global versus local processing of visual information. *Psychological Science*, *13*(1), 34–40. https://doi.org/10.1111/1467-9280.00406

Gasper, K. (2004). Do you see what I see? Affect and visual information processing. *Cognition & Emotion*, *18*(3), 405–421. https://doi.org/10.1080/02699930341000068

Gigerenzer, G. (2008). Why heuristics work. *Perspectives on Psychological Science*, *3*(1), 20–29. https://doi.org/10.1111/j.1745-6916.2008.00058.x

Glenberg, A. M. (2015). Few believe the world is flat: How embodiment is changing the scientific understanding of cognition/response to Glenberg: Conceptual content does not constrain the representational format of concepts. *Canadian Journal of Experimental Psychology*, *69*(2), 165-171,179-180.

Gobbo, S., Bergamin, M., Sieverdes, J. C., Ermolao, A., & Zaccaria, M. (2014). Effects of exercise on dual-task ability and balance in older adults: A systematic review. *Archives of Gerontology and Geriatrics*, *58*(2), 177–187. https://doi.org/10.1016/j.archger.2013.10.001

Goldstein, E. B. (2008). *Blackwell handbook of sensation and perception*. John Wiley & Sons.

Gorn, G. J., Chattopadhyay, A., Yi, T., & Dahl, D. W. (1997). Effects of color as an executional cue in advertising: They're in the shade. *Management Science*, *43*(10), 1387–1400.

Green, L., & Myerson, J. (2004). A discounting framework for choice with delayed and probabilistic rewards. *Psychological Bulletin*, *130*(5), 769.

Greenberger, E., Chen, C., Dmitrieva, J., & Farruggia, S. P. (2003). Item-wording and the dimensionality of the Rosenberg Self-Esteem Scale: Do they matter? *Personality and Individual Differences*, *35*(6), 1241–1254.

Greenland, S., Senn, S. J., Rothman, K. J., Carlin, J. B., Poole, C., Goodman, S. N., & Altman, D. G. (2016). Statistical tests, p values, confidence intervals, and power: A guide to misinterpretations. *European Journal of Epidemiology*, *31*(4), 337–350. PubMed. https://doi.org/10.1007/s10654-016-0149-3

Grey, M. (2001). Proprioceptive sensory feedback. In *ELS*. John Wiley & Sons, Ltd. http://onlinelibrary.wiley.com/doi/10.1002/9780470015902.a0000071.pub2/abstract

Gribble, P. A., & Hertel, J. (2004). Effect of lower-extremity muscle fatigue on postural control. *Archives of Physical Medicine and Rehabilitation*, *85*(4), 589–592. https://doi.org/10.1016/j.apmr.2003.06.031

Gruenewald, P. J., & Lockhead, G. R. (1980). The free recall of category examples. *Journal of Experimental Psychology: Human Learning and Memory*, *6*(3), 225–240. https://doi.org/10.1037/0278-7393.6.3.225

Hackford, J., Mackey, A., & Broadbent, E. (2019). The effects of walking posture on affective and physiological states during stress. *Journal of Behavior Therapy and Experimental Psychiatry*, *62*, 80–87. https://doi.org/10.1016/j.jbtep.2018.09.004

Hadar, B., Luria, R., & Liberman, N. (2019). Concrete mindset impairs filtering in visual working memory. *Psychonomic Bulletin & Review*, *26*(6), 1917–1924. https://doi.org/10.3758/s13423-019-01625-6

Hadjistavropoulos, T., Carleton, R. N., Delbaere, K., Barden, J., Zwakhalen, S., Fitzgerald, B., Ghandehari, O. O., & Hadjistavropoulos, H. (2012). The relationship of fear of falling and balance confidence with balance and dual tasking performance. *Psychology and Aging*, *27*(1), 1–13.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Titham, R. L. (2006). *Multivariate data analysis*. Prentice-Hall.

Halvarsson, A., Franzén, E., & Ståhle, A. (2015). Balance training with multi-task exercises improves fall-related self-efficacy, gait, balance performance and physical function in older adults with osteoporosis: A randomized controlled trial. *Clinical Rehabilitation*, *29*(4), 365–375. https://doi.org/10.1177/0269215514544983

Hamacher, D., Herold, F., Wiegel, P., Hamacher, D., & Schega, L. (2015). Brain activity during walking: A systematic review. *Neuroscience & Biobehavioral Reviews*, *57*, 310–327. https://doi.org/10.1016/j.neubiorev.2015.08.002

Hansen, J., & Melzner, J. (2014). What you hear shapes how you think: Sound patterns change level of construal. *Journal of Experimental Social Psychology*, *54*(0), 131–138. https://doi.org/10.1016/j.jesp.2014.05.002

Hansson, E. E., Beckman, A., & Håkansson, A. (2010). Effect of vision, proprioception, and the position of the vestibular organ on postural sway. *Acta Oto-Laryngologica*, *130*(12), 1358–1363. https://doi.org/10.3109/00016489.2010.498024

Harrison, B. J., Pujol, J., López-Solà, M., Hernández-Ribas, R., Deus, J., Ortiz, H., Soriano-Mas, C., Yücel, M., Pantelis, C., & Cardoner, N. (2008). Consistency and functional specialization in the default mode brain network. *Proceedings of the National Academy of Sciences of the United States of America*, *105*(28), 9781–9786. https://doi.org/10.1073/pnas.0711791105

Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*, *67*(3), 451–470. https://doi.org/10.1111/bmsp.12028

Higgins, J. P., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in medicine*, 21(11), 1539-1558.

Hinson, J. M., Jameson, T. L., & Whitney, P. (2003). Impulsive decision making and working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(2), 298–306. https://doi.org/10.1037/0278-7393.29.2.298

Hoaglin, D. C., Iglewicz, B., & Tukey, J. W. (1986). Performance of some resistant rules for outlier labeling. *Journal of the American Statistical Association*, *81*(396), 991–999.

Hoffman, B., & Schraw, G. (2009). The influence of self-efficacy and working memory capacity on problem-solving efficiency. *Learning and Individual Differences*, *19*(1), 91–100. https://doi.org/10.1016/j.lindif.2008.08.001

Hollman, J. H., Brey, R. H., Bang, T. J., & Kaufman, K. R. (2007). Does walking in a virtual environment induce unstable gait?: An examination of vertical ground reaction forces. *Gait & Posture*, *26*(2), 289–294. https://doi.org/10.1016/j.gaitpost.2006.09.075

Horak, F. B. (1997). Clinical assessment of balance disorders. *Gait & Posture*, *6*(1), 76–84. https://doi.org/10.1016/S0966-6362(97)00018-0

Horak, F. B. (2006). Postural orientation and equilibrium: What do we need to know about neural control of balance to prevent falls? *Age and Ageing*, *35*(Supplement 2), ii7–ii11. https://doi.org/10.1093/ageing/afl077

Horak, F. B., Diener, H. C., & Nashner, L. M. (1989). Influence of central set on human postural responses. *Journal of Neurophysiology*, *62*(4), 841–853.

Horak, F. B., & Macpherson, J. M. (2011). Postural orientation and equilibrium. In R. Terjung (Ed.), *Comprehensive physiology* (pp. 935–959). John Wiley & Sons, Inc. http://doi.wiley.com/10.1002/cphy.cp120107

Horak, F. B., Nashner, L. M., & Diener, H. C. (1990). Postural strategies associated with somatosensory and vestibular loss. *Experimental Brain Research*, *82*(1), 167–177. https://doi.org/10.1007/BF00230848

Horak, F. B., Shupert, C. L., & Mirka, A. (1989). Components of postural dyscontrol in the elderly: A review. *Neurobiology of Aging*, *10*(6), 727–738.

Horlings, C. G. C., Carpenter, M. G., Küng, U. M., Honegger, F., Wiederhold, B., & Allum, J. H. J. (2009). Influence of virtual reality on postural stability during movements of quiet stance. *Neuroscience Letters*, *451*(3), 227–231. https://doi.org/10.1016/j.neulet.2008.12.057

Horslen, B. C., & Carpenter, M. G. (2011). Arousal, valence and their relative effects on postural control. *Experimental Brain Research*, *215*(1), 27–34.

Hosch, W. L. (2006). Newton unit of measurement. In *Encyclopædia Britannica*. Encyclopædia Britannica, Inc. https://www.britannica.com/science/newton-unit-of-measurement

Huffman, J. L., Horslen, B. C., Carpenter, M. G., & Adkin, A. L. (2009). Does increased postural threat lead to more conscious control of posture? *Gait & Posture*, *30*(4), 528–532. https://doi.org/10.1016/j.gaitpost.2009.08.001

Hultén, B. (2011). Sensory marketing: The multi-sensory brand-experience concept. *European Business Review*, *23*(3), 256–273. https://doi.org/10.1108/09555341111130245

Hultén, B. (2015). *Sensory marketing: Theoretical and empirical grounds*. Routledge.

Hutchinson, J. W., Raman, K., & Mantrala, M. K. (1994). Finding choice alternatives in memory: Probability models of brand name recall. *Journal of Marketing Research*, *31*(4), 441–461. https://doi.org/10.1177/002224379403100401

Jerusalem, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal processes. In *Self-efficacy: Thought control of action* (pp. 195–213). Hemisphere Publishing Corp.

Judge, T. A., Erez, A., Bono, J. E., & Thoresen, C. J. (2002). Are measures of self-esteem, neuroticism, locus of control, and generalized self-efficacy indicators of a common core construct? *Journal of Personality and Social Psychology*, *83*(3), 693–710. https://doi.org/10.1037//0022-3514.83.3.693

Jung, J. H., Yoo, J. J., & Arnold, T. J. (2021). The influence of a retail store manager in developing frontline employee brand relationship, service performance and customer loyalty. *Journal of Business Research*, *122*, 362–372. https://doi.org/10.1016/j.jbusres.2020.09.010

Kahneman, D. (1973). *Attention and effort*. Prentice-Hall.

Kalron, A., Dvir, Z., & Achiron, A. (2010). Walking while talking—Difficulties incurred during the initial stages of multiple sclerosis disease process. *Gait & Posture*, *32*(3), 332–335. https://doi.org/10.1016/j.gaitpost.2010.06.002

Kandel, E. R., Schwartz, J. H., Jessell, T. M., Siegelbaum, S. A., & Hudspeth, A. J. (Eds.). (2012). Posture. In *Principles of neural science* (5th ed.). McGraw-Hill Education. http://mhmedical.com/content.aspx?aid=1101681813

Karbach, J., & Kray, J. (2009). How useful is executive control training? Age differences in near and far transfer of task-switching training. *Developmental Science*, *12*(6), 978–990.

Kardes, F. R., Cronley, M. L., & Kim, J. (2006). Construal-level effects on preference stability, preference-behavior correspondence, and the suppression of competing brands. *Journal of Consumer Psychology*, *16*(2), 135–144. https://doi.org/10.1207/s15327663jcp1602_4

Keller, K. L. (1993). Conceptualizing, measuring, managing customer-based brand equity. *Journal of Marketing*, *57*(1), 1–22. Communication & Mass Media Complete.

Khan, U., Zhu, M., & Kalra, A. (2011). When trade-offs matter: The effect of choice construal on context effects. *Journal of Marketing Research (JMR)*, *48*(1), 62–71.

Khawaja, N. G., & Yu, L. N. H. (2010). A comparison of the 27-item and 12-item intolerance of uncertainty scales. *Clinical Psychologist*, *14*(3), 97–106.

Kim, H., & John, D. R. (2008). Consumer response to brand extensions: Construal level as a moderator of the importance of perceived fit. *Journal of Consumer Psychology*, *18*(2), 116–126. https://doi.org/10.1016/j.jcps.2008.01.006

Kim, H., Schnall, S., & White, M. P. (2013). Similar psychological distance reduces temporal discounting. *Personality and Social Psychology Bulletin*, *39*(8), 1005–1016. https://doi.org/10.1177/0146167213488214

Kim, M., Kim, J.-H., Park, M., & Yoo, J. (2021). The roles of sensory perceptions and mental imagery in consumer decision-making. *Journal of Retailing and Consumer Services*, *61*, 102517. https://doi.org/10.1016/j.jretconser.2021.102517

Kimchi, R., & Palmer, S. E. (1982). Form and texture in hierarchically constructed patterns. *Journal of Experimental Psychology: Human Perception and Performance*, *8*(4), 521.

Konradsen, L. (2002). Factors contributing to chronic ankle instability: Kinesthesia and joint position sense. *Journal of Athletic Training*, *37*(4), 381.

Körner, A., Topolinski, S., & Strack, F. (2015). Routes to embodiment. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00940

Körner, A., & Volk, S. (2014). Concrete and abstract ways to deontology: Cognitive capacity moderates construal level effects on moral judgments. *Journal of Experimental Social Psychology*, *55*, 139–145. https://doi.org/10.1016/j.jesp.2014.07.002

Korteling, J. E., Brouwer, A.-M., & Toet, A. (2018). A neural network framework for cognitive bias. *Frontiers in Psychology*, *9*. https://www.frontiersin.org/article/10.3389/fpsyg.2018.01561

Krishna, A. (2011). *Sensory marketing: Research on the sensuality of products*. Routledge.

Krishna, A. (2012). An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior. *Journal of Consumer Psychology*, *22*(3), 332–351.

https://doi.org/10.1016/j.jcps.2011.08.003

Krishna, A., Lee, S. W. S., Li, X., & Schwarz, N. (2017). Embodied cognition, sensory marketing, and the conceptualization of consumers' judgment and decision processes: Introduction to the issue. *Journal of the Association for Consumer Research*, *2*(4), 377–381. https://doi.org/10.1086/694453

Krishna, A., & Schwarz, N. (2013). *Sensory marketing, embodiment, and grounded cognition: Implications for consumer behavior* (SSRN Scholarly Paper ID 2549963). Social Science Research Network. http://papers.ssrn.com/abstract=2549963

Lachter, J., Forster, K. I., & Ruthruff, E. (2004). Forty-five years after Broadbent (1958): Still no identification without attention. *Psychological Review*, *111*(4), 880.

Lacour, M., Bernard-Demanze, L., & Dumitrescu, M. (2008). Posture control, aging, and attention resources: Models and posture-analysis methods. *Neurophysiologie Clinique/Clinical Neurophysiology*, *38*(6), 411–421.

Lakoff, G. (2014). Mapping the brain's metaphor circuitry: Metaphorical thought in everyday life. *Frontiers in Human Neuroscience*, *8*. http://escholarship.org/uc/item/2tk5z34q

Lakoff, G., & Johnson, M. (1980). The metaphorical structure of the human conceptual system. *Cognitive Science*, *4*(2), 195–208.

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

Lamb, K. L. (1992). Correlates of self-perceived fitness. *Perceptual and Motor Skills*, *74*(3), 907–914.

Langley, P., Laird, J. E., & Rogers, S. (2009). Cognitive architectures: Research issues and challenges. *Cognitive Systems Research*, *10*(2), 141–160. https://doi.org/10.1016/j.cogsys.2006.07.004

Laroche, M., Kim, C., & Zhou, L. (1996). Brand familiarity and confidence as determinants of purchase intention: An empirical test in a multiple brand context. *Journal of Business Research*, *37*(2), 115–120. https://doi.org/10.1016/0148-2963(96)00056-2

Larson, J. S., & Billeter, D. M. (2013). Consumer behavior in "equilibrium": How experiencing physical balance increases compromise choice. *Journal of Marketing Research*, *JA*, 1–45.

Laurence, B. D., & Michel, L. (2017). The Fall in Older Adults: Physical and Cognitive Problems. *Current Aging Science*, *10*(3), 185–200. https://doi.org/10.2174/1874609809666160630124552

Leonardson, G. R. (1977). Relationship between self-concept and perceived physical fitness. *Perceptual and Motor Skills*, *44*(1), 62–62.

Li, K. Z. H., Roudaia, E., Lussier, M., Bherer, L., Leroux, A., & McKinley, P. A. (2010). Benefits of cognitive dual-task training on balance performance in healthy older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *65A*(12), 1344–1352. https://doi.org/10.1093/gerona/glq151

Liberman, N., Trope, Y., & Wakslak, C. (2007). Construal level theory and consumer behavior. *Journal of Consumer Psychology*, *17*(2), 113–117.

Lindstrom, M. (2005). Broad sensory branding. *Journal of Product & Brand Management*, *14*(2), 84–87. https://doi.org/10.1108/10610420510592554

Lopez, S. J., & Snyder, C. R. (2002). *Handbook of positive psychology*. Oxford University Press. http://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=140528&site=ehost-live&scope=site

Lynch, J. G., Jr., & Srull, T. K. (1982). Memory and attentional factors in consumer choice: Concepts and research methods. *Journal of Consumer Research*, *9*(1), 18–37. https://doi.org/10.1086/208893

Macaluso, E., & Driver, J. (2005). Multisensory spatial interactions: A window onto functional integration in the human brain. *Trends in Neurosciences*, *28*(5), 264–271.

https://doi.org/10.1016/j.tins.2005.03.008

Maglio, S. J., & Trope, Y. (2012). Disembodiment: Abstract construal attenuates the influence of contextual bodily state in judgment. *Journal of Experimental Psychology. General*, *141*(2), 211–216. PubMed. https://doi.org/10.1037/a0024520

Maier, M., Bartos, F., Oh, M., Wagenmakers, E., Shanks, D., Harris, A. (2022). Publication Bias in Research on Construal Level Theory. https://doi.org/10.31234/osf.io/r8nyu

Mancini, M., & Horak, F. B. (2010). The relevance of clinical balance assessment tools to differentiate balance deficits. *European Journal of Physical and Rehabilitation Medicine*, *46*(2), 239–248.

Massion, J. (1998). Postural Control System in Developmental Perspective. *Neuroscience & Biobehavioral Reviews,* 22(4), 465-472.

Matusiewicz, A. K., Carter, A. E., Landes, R. D., & Yi, R. (2013). Statistical equivalence and test–retest reliability of delay and probability discounting using real and hypothetical rewards. *Behavioural Processes*, *100*, 116–122. https://doi.org/10.1016/j.beproc.2013.07.019

McCulloch, C. E., Searle, S. R., & Neuhaus, J. M. (2008). *Generalized, linear, and mixed models* (2nd ed.). John Wiley & Sons, Ltd. https://www.wiley.com/en-us/Generalized%2C+Linear%2C+and+Mixed+Models%2C+2nd+Edition-p-9780470073711

McNevin, N. H., & Wulf, G. (2002). Attentional focus on supra-postural tasks affects postural control. *Human Movement Science*, *21*(2), 187–202. https://doi.org/10.1016/S0167-9457(02)00095-7

McNevin, N., Weir, P., & Quinn, T. (2013). Effects of attentional focus and age on suprapostural task performance and postural control. *Research Quarterly for Exercise and Sport*, *84*(1), 96–103. https://doi.org/10.1080/02701367.2013.762321

McShane, B. B., & Böckenholt, U. (2017). Single-paper meta-analysis: Benefits for study summary, theory testing, and replicability. *Journal of Consumer Research*, 43(6), 1048-1063.

Meyers-Levy, J., Zhu, R., & Jiang, L. (2010). Context effects from bodily sensations: Examining bodily sensations induced by flooring and the moderating role of product viewing distance. *Journal of Consumer Research*, *37*(1), 1–14.

Meyers-Levy, J., Zhu, R. (Juliet), & Jiang, L. (2010). Context effects from bodily sensations: examining bodily sensations induced by flooring and the moderating role of product viewing distance. *Journal of Consumer Research*, *37*(1), 1–14. https://doi.org/10.1086/649028

Miller, L. C., Murphy, R., & Buss, A. H. (1981). Consciousness of body: Private and public. *Journal of Personality and Social Psychology*, *41*(2), 397–406. https://doi.org/10.1037/0022-3514.41.2.397

Mirelman, A., Herman, T., Brozgol, M., Dorfman, M., Sprecher, E., Schweiger, A., Giladi, N., & Hausdorff, J. M. (2012). Executive function and falls in older adults: New findings from a five-year prospective study link fall risk to cognition. *PLoS ONE*, *7*(6), e40297. https://doi.org/10.1371/journal.pone.0040297

Mooney, J. (2009). *Illustrated dictionary of podiatry and foot science*. Elsevier Health Sciences UK.

Myerson, J., Green, L., & Warusawitharana, M. (2001). Area under the curve as a measure of discounting. *Journal of the Experimental Analysis of Behavior*, *76*(2), 235–243.

Nashner, L. M., & McCollum, G. (1985). The organization of human postural movements: A formal basis and experimental synthesis. *Behavioral and Brain Sciences*, *8*(01), 135–150.

Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology*, *9*(3), 353–383. https://doi.org/10.1016/0010-0285(77)90012-3

Nedungadi, P. (1990). Recall and consumer consideration sets: Influencing choice without altering brand evaluations. *Journal of Consumer Research*, *17*(3), 263–276. https://doi.org/10.1086/208556

Olivier, I., Cuisinier, R., Vaugoyeau, M., Nougier, V., & Assaiante, C. (2010). Age-related differences in cognitive and postural dual-task performance. *Gait & Posture*, *32*(4), 494–499.

Paillard, T., Pau, M., Noé, F., & González, L.-M. (2015). Rehabilitation and improvement of the postural function. *BioMed Research International*, *2015*. https://doi.org/10.1155/2015/703679

Palmieri, R. M., Ingersoll, C. D., Stone, M. B., & Krause, B. A. (2002). Center-of-pressure parameters used in the assessment of postural control. *Journal of Sport Rehabilitation*, *11*(1), 51–66. s3h.

Park, C. W., & Lessig, V. P. (1981). Familiarity and its impact on consumer decision biases and heuristics. *Journal of Consumer Research*, *8*(2), 223–230. https://doi.org/10.1086/208859

Pham, M. T., Hung, I. W., & Gorn, G. J. (2011). Relaxation increases monetary valuations. *Journal of Marketing Research*, *48*(5), 814–826. https://doi.org/10.1509/jmkr.48.5.814

Plante, T. G., LeCaptain, S. E., & McLain, H. C. (2000). Perceived fitness predicts daily coping better than physical activity. *Journal of Applied Biobehavioral Research*, *5*(1), 66–79.

Pohl, R. F., Erdfelder, E., Hilbig, B. E., Liebke, L., & Stahlberg, D. (2013). Effort reduction after self-control depletion: The role of cognitive resources in use of simple heuristics. *Journal of Cognitive Psychology*, *25*(3), 267–276. https://doi.org/10.1080/20445911.2012.758101

Pollock, A. S., Durward, B. R., Rowe, P. J., & Paul, J. P. (2000). What is balance? *Clinical Rehabilitation*, *14*(4), 402–406. https://doi.org/10.1191/0269215500cr342oa

Prieto, T. E., Myklebust, J. B., Hoffmann, R. G., Lovett, E. G., & Myklebust, B. M. (1996). Measures of postural steadiness: Differences between healthy young and elderly adults. *IEEE Transactions on Biomedical Engineering*, *43*(9), 956–966. https://doi.org/10.1109/10.532130

Proske, U., & Gandevia, S. C. (2012). The proprioceptive senses: Their roles in signaling body shape, body position and movement, and muscle force. *Physiological Reviews*, *92*(4), 1651–1697. https://doi.org/10.1152/physrev.00048.2011

Rankin, J. K., Woollacott, M. H., Shumway-Cook, A., & Brown, L. A. (2000). Cognitive influence on postural stability: A neuromuscular analysis in young and older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *55*(3), M112–M119.

Remaud, A., Boyas, S., Lajoie, Y., & Bilodeau, M. (2013). Attentional focus influences postural control and reaction time performances only during challenging dual-task conditions in healthy young adults. *Experimental Brain Research*, *231*(2), 219–229. https://doi.org/10.1007/s00221-013-3684-0

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin*, *27*(2), 151–161.

Rosen, V. M., & Engle, R. W. (1997). The role of working memory capacity in retrieval. *Journal of Experimental Psychology: General*, *126*(3), 211–227. https://doi.org/10.1037/0096-3445.126.3.211

Rosenberg, M. (1965). Rosenberg Self-Esteem Scale (RSE). *Acceptance and Commitment Therapy. Measures Package*, *61*.

Røysamb, E. (1997). *Adolescent risk making: Behaviour patterns and the role of emotions and cognitions*. Department of Psychology, University of Oslo.

Ruhe, A., Fejer, R., & Walker, B. (2010). The test–retest reliability of centre of pressure measures in bipedal static task conditions – A systematic review of the literature. *Gait & Posture*, *32*(4), 436–445. https://doi.org/10.1016/j.gaitpost.2010.09.012

Ruzeviciute, R., Kamleitner, B., & Biswas, D. (2020). Designed to s(m)ell: When scented advertising induces proximity and enhances appeal. *Journal of Marketing Research*, *57*(2), 315–331. https://doi.org/10.1177/0022243719888474

Scarpa, S., Nart, A., Gobbi, E., & Carraro, A. (2011). Does women's attitudinal state body image improve after one session of posture correction exercises? *Social Behavior and Personality: An International Journal*, *39*(8), 1045–1052.

Schafer, R. C. (1983). *Clinical biomechanics: Musculoskeletal actions and reactions*. Williams & Wilkins.

Schmider, E., Ziegler, M., Danay, E., Beyer, L., & Bühner, M. (2010). Is it really robust? *Methodology*, *6*(4), 147–151. https://doi.org/10.1027/1614-2241/a000016

Schmitt, D. P., & Allik, J. (2005). Simultaneous administration of the Rosenberg Self-Esteem Scale in 53 nations: Exploring the universal and culture-specific features of global self-esteem. *Journal of Personality and Social Psychology*, *89*(4), 623–642.

Scholz, U., Gutiérrez Doña, B., Sud, S., & Schwarzer, R. (2002). Is general self-efficacy a universal construct? *European Journal of Psychological Assessment*, *18*(3), 242–251. https://doi.org/10.1027//1015-5759.18.3.242

Schwarzer, R. (2014). *Self-efficacy: Thought control of action*. Taylor & Francis.

Segev-Jacubovski, O., Herman, T., Yogev-Seligmann, G., Mirelman, A., Giladi, N., & Hausdorff, J. M. (2011). The interplay between gait, falls and cognition: Can cognitive therapy reduce fall risk? *Expert Review of Neurotherapeutics*, *11*(7), 1057–1075. https://doi.org/10.1586/ern.11.69

Seltman, H. J. (2012). *Experimental design and analysis*. Carnegie Mellon University. https://www.stat.cmu.edu/~hseltman/309/Book/Book.pdf

Sepp, S., Howard, S. J., Tindall-Ford, S., Agostinho, S., & Paas, F. (2019). Cognitive load theory and human movement: Towards an integrated model of working memory. *Educational Psychology Review*, *31*(2), 293–317. https://doi.org/10.1007/s10648-019-09461-9

Sexton, K. A., & Dugas, M. J. (2009). Defining distinct negative beliefs about uncertainty: Validating the factor structure of the Intolerance of Uncertainty Scale. *Psychological Assessment*, *21*(2), 176–186. https://doi.org/10.1037/a0015827

Sharma, S., Durand, R.M., Gur-Arie, O. (1981). Identification and analysis of moderator variables. *Journal of Marketing Research*, 18(3), 291-300.

Shepherd, R. B. (2001). Exercise and training to optimize functional motor performance in stroke: Driving neural reorganization? *Neural Plasticity*, *8*(1–2), 121–129.

Shumway-Cook, A., Anson, D., & Haller, S. (1988). Postural sway biofeedback: Its effect on reestablishing stance stability in hemiplegic patients. *Archives of Physical Medicine and Rehabilitation*, *69*(6), 395–400.

Shumway-Cook, A., & Wollacott, M. H. (2011). *Motor control: Translating research into clinical practice* (4th ed.). Lippincott Williams & Wilkins.

Shumway-Cook, & Woollacott. (2000). Attentional demands and postural control: The effect of sensory context. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *55*(1), M10-16.

Sigurdsson, V., Engilbertsson, H., & Foxall, G. (2010). The effects of a point-of-purchase display on relative sales: An in-store experimental evaluation. *Journal of Organizational Behavior Management*, *30*(3), 222–233. https://doi.org/10.1080/01608061.2010.499028

Simonson, I. (1989). Choice based on reasons: The case of attraction and compromise effects. *Journal of Consumer Research*, *16*(2), 158–174.

Sirgy, M. J. (1982). Self-Concept in Consumer Behavior: A Critical Review. *Journal of Consumer Research*, 9(3), 287-300.

Siu, K., & Woollacott, M. H. (2007). Attentional demands of postural control: The ability to selectively allocate information-processing resources. *Gait & Posture*, *25*(1), 121–126.

Skelton, D. A. (2001). Effects of physical activity on postural stability. *Age and Ageing*, *30 Suppl 4*, 33–39.

Soderberg, C. K., Callahan, S. P., Kochersberger, A. O., Amit, E., & Ledgerwood, A. (2015). The effects of psychological distance on abstraction: Two meta-analyses. *Psychological Bulletin*, *141*(3). https://doi.org/10.1037/bul0000005

Sörqvist, P., Stenfelt, S., & Rönnberg, J. (2012). Working memory capacity and visual–verbal cognitive load modulate auditory–sensory gating in the brainstem: Toward a unified view of attention. *Journal of Cognitive Neuroscience*, *24*(11), 2147–2154.

https://doi.org/10.1162/jocn_a_00275

Spence, C., Puccinelli, N. M., Grewal, D., & Roggeveen, A. L. (2014). Store atmospherics: A multisensory perspective. *Psychology & Marketing*, *31*(7), 472–488. https://doi.org/10.1002/mar.20709

Spike, L., & Schwarz, N. (2014). Metaphor in judgment and decision making. In M. Landau, M. D. Robinson, & B. P. Meier (Eds.), *The power of metaphor: Examining its influence on social life* (pp. 85–108). American Psychological Association.

St George, R. J., & Fitzpatrick, R. C. (2011). The sense of self-motion, orientation and balance explored by vestibular stimulation. *The Journal of Physiology*, *589*(4), 807–813. https://doi.org/10.1113/jphysiol.2010.197665

Stajkovic, A. D. (2006). Development of a core confidence-higher order construct. *Journal of Applied Psychology*, *91*(6), 1208–1224. https://doi.org/10.1037/0021-9010.91.6.1208

Steenkamp, J. E. M., & Baumgartner, H. (1992). The role of optimum stimulation level in exploratory consumer behavior. *Journal of Consumer Research*, *19*(3), 434–448. https://doi.org/10.1086/209313

Stein, B. E., & Rowland, B. A. (2011). Organization and plasticity in multisensory integration: Early and late experience affects its governing principles. *Progress in Brain Research*, *191*, 145–163. https://doi.org/10.1016/B978-0-444-53752-2.00007-2

Stein, B. E., Stanford, T. R., & Rowland, B. A. (2009). The neural basis of multisensory integration in the midbrain: Its organization and maturation. *Hearing Research*, *258*(1–2), 4–15. https://doi.org/10.1016/j.heares.2009.03.012

Stoffregen, T. A., Pagulayan, R. J., Bardy, B. G., & Hettinger, L. J. (2000). Modulating postural control to facilitate visual performance. *Human Movement Science*, *19*(2), 203–220. https://doi.org/10.1016/S0167-9457(00)00009-9

Sturnieks, D. L., St George, R., & Lord, S. R. (2008). Balance disorders in the elderly.

Neurophysiologie Clinique = Clinical Neurophysiology, *38*(6), 467–478. https://doi.org/10.1016/j.neucli.2008.09.001

Teasdale, N., & Simoneau, M. (2001). Attentional demands for postural control: The effects of aging and sensory reintegration. *Gait & Posture*, *14*(3), 203–210. https://doi.org/10.1016/S0966-6362(01)00134-5

Thomas, L. E. (2013). Spatial working memory is necessary for actions to guide thought. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *39*(6), 1974–1981. https://doi.org/10.1037/a0033089

Thornquist, E., & Bunkan, B. H. (1991). *What is psychomotor therapy?* Norwegian University Press.

Todorov, A., Goren, A., & Trope, Y. (2007). Probability as a psychological distance: Construal and preferences. *Journal of Experimental Social Psychology*, *43*(3), 473–482. https://doi.org/10.1016/j.jesp.2006.04.002

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review*, *110*(3), 403–421. https://doi.org/10.1037/0033-295X.110.3.403

Trope, Y., & Liberman, N. (2010a). Construal-level theory of psychological distance. *Psychological Review*, *117*(2), 440–463. https://doi.org/10.1037/a0018963

Trope, Y., & Liberman, N. (2010b). Construal-level theory of psychological distance. *Psychological Review*, *117*(2), 440–463. https://doi.org/10.1037/a0018963

Vallacher, R. R., & Wegner, D. M. (1989). Levels of personal agency: Individual variation in action identification. *Journal of Personality and Social Psychology*, *57*(4), 660.

Van Boven, L., Kane, J., Peter, A., & Dale, J. (2010). Feeling close: Emotional intensity reduces perceived psychological distance. *Journal of Personality and Social Psychology*, *98*(6), 872–885. https://doi.org/10.1037/a0019262

Van den Bergh, B., Dewitte, S., & Warlop, L. (2008). Bikinis instigate generalized impatience in intertemporal choice. *Journal of Consumer Research*, *35*(1), 85–97.

Veenstra, L., Schneider, I. K., & Koole, S. L. (2017). Embodied mood regulation: The impact of body posture on mood recovery, negative thoughts, and mood-congruent recall. *Cognition and Emotion*, *31*(7), 1361–1376. https://doi.org/10.1080/02699931.2016.1225003

Vess, M., Arndt, J., & Schlegel, R. J. (2011). Abstract construal levels attenuate state self-esteem reactivity. *Journal of Experimental Social Psychology*, *47*(4), 861–864. https://doi.org/10.1016/j.jesp.2011.02.014

Von Soest, T. (2005). Rosenbergs selvfølelsesskala: Validering av en norsk oversettelse. *Tidsskrift for Norsk Psykologforening*, *2*(42), 226–228.

Vosgerau, J., Bruyneel, S., Dhar, R., & Wertenbroch, K. (2008). Ego depletion and cognitive load: Same or different constructs? *Advances in Consumer Research*, *35*, 217–220.

Vyvey, T., Castellar, E. N., & Looy, J. V. (2018). Loaded with fun? The impact of enjoyment and cognitive load on brand retention in digital games. *Journal of Interactive Advertising*, *18*(1), 72–82. https://doi.org/10.1080/15252019.2018.1446370

Wade, M. G., & Jones, G. (1997). The role of vision and spatial orientation in the maintenance of posture. *Physical Therapy*, *77*(6), 619–628.

Wakslak, C., Liberman, N., & Trope, Y. (2007). Construal levels and psychological distance: Effects on representation, prediction, evaluation, and behavior. *Journal of Consumer Psychology*, *17*(2), 83–95. https://doi.org/10.1016/S1057-7408(07)70013-X

Wan, E. W., & Rucker, D. D. (2013). Confidence and construal framing: When confidence increases versus decreases information processing. *Journal of Consumer Research*, *39*(5), 977–992.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Weech, S., Kenny, S., & Barnett-Cowan, M. (2019). Presence and cybersickness in virtual reality are negatively related: A review. *Frontiers in Psychology*, *10*.

https://doi.org/10.3389/fpsyg.2019.00158

Whitney, S. L., Roche, J. L., Marchetti, G. F., Lin, C.-C., Steed, D. P., Furman, G. R., Musolino, M. C., & Redfern, M. S. (2011). A comparison of accelerometry and center of pressure measures during computerized dynamic posturography: A measure of balance. *Gait & Posture*, *33*(4), 594–599. https://doi.org/10.1016/j.gaitpost.2011.01.015

Woollacott, M., & Shumway-Cook, A. (2002). Attention and the control of posture and gait: A review of an emerging area of research. *Gait & Posture*, *16*(1), 1–14.

Yi, R., Stuppy-Sullivan, A., Pickover, A., & Landes, R. D. (2017). Impact of construal level manipulations on delay discounting. *PLOS ONE*, *12*(5), e0177240. https://doi.org/10.1371/journal.pone.0177240

Zech, A., Hübscher, M., Vogt, L., Banzer, W., Hänsel, F., & Pfeifer, K. (2010). Balance training for neuromuscular control and performance enhancement: A systematic review. *Journal of Athletic Training*, *45*(4), 392.

Appendices

Appendix A: Scales in Study 1

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor
Jeg føler at jeg er i fysisk balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg føler meg ut av fysisk balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor
På skala 1-9 (hvor 1 betyr ingen innsats og 9 betyr veldig stor innsats), hvor mye mental innsats brukte du på å huske merkevarer i kategorien?

1 2 3 4 5 6 7 8 9

På skala 1-9 (hvor 1 betyr veldig lett og 9 betyr veldig vanskelig), hvor vanskelig eller lett syntes du det var å huske merkevarene i kategorien?

1 2 3 4 5 6 7 8 9

På skala 1-9 (hvor 1 betyr ikke kjent og 9 betyr veldig godt kjent), hvor godt kjent er du med denne kategorien av merkevarer

1 2 3 4 5 6 7 8 9

På skala 1-9 (hvor 1 betyr ikke interessert og 9 betyr veldig interessert), hvor interessert er du i denne kategorien av merkevarer

1 2 3 4 5 6 7 8 9

Av merkevarene du nevnte, hvilke er relevant for deg nå og i nær fremtid?

____

____

DU ER NÅ FERDIG MED FØRSTE DEL AV UNDERSØKELSEN.
GI BESKJED TIL FORSKEREN AT DU ER FERDIG OG KLAR FOR NESTE DEL.
Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

Jeg føler at jeg er i fysisk balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg føler meg ut av fysisk balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

På skala 1-9 (hvor 1 betyr ingen innsats og 9 betyr veldig stor innsats), hvor mye mental innsats brukte du på å huske merkevarer i kategorien?

1 2 3 4 5 6 7 8 9

På skala 1-9 (hvor 1 betyr veldig lett og 9 betyr veldig vanskelig), hvor vanskelig eller lett syntes du det var å huske merkevarene i kategorien?

1 2 3 4 5 6 7 8 9

På skala 1-9 (hvor 1 betyr ikke kjent og 9 betyr veldig godt kjent), hvor godt kjent er du med denne kategorien av merkevarer

1 2 3 4 5 6 7 8 9

På skala 1-9 (hvor 1 betyr ikke interessert og 9 betyr veldig interessert), hvor interessert er du i denne kategorien av merkevarer

1 2 3 4 5 6 7 8 9

Av merkevarene du nevnte, hvilke er relevant for deg nå og i nær fremtid?

____

____

Hvor godt passer følgende påstander om deg?
Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

1. Jeg er i god fysisk form
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
2. Jeg må forandre hvor mye jeg veier for å forbedre min fysiske form
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
3. Jeg har den fysiske styrken som jeg trenger
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
4. Jeg har mer muskulær fleksibilitet en andre på min alder
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
5. Jeg blir fort sliten når jeg trener
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
6. Jeg er i bedre fysisk form en fleste andre på min alder
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
7. Jeg er et veldig fleksibelt individ
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
8. Jeg har mindre muskelstyrke en andre på min alder
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*
9. Jeg trenger å forbedre min nåværende fysiske tilstand
   Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Hvor godt passer følgende påstander om deg?
Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

Jeg klarer alltid å løse vanskelige problemer hvis jeg prøver hardt nok . . . .
Ikke riktig Litt riktig Nokså riktig Helt riktig
Hvis noen motarbeider meg, finner jeg en måte å oppnå det jeg vil på . . . .
Ikke riktig Litt riktig Nokså riktig Helt riktig
Jeg er sikker på at jeg kan mestre uventede hendelser . . . .
Ikke riktig Litt riktig Nokså riktig Helt riktig
Jeg er rolig når jeg møter vanskeligheter, fordi jeg stoler min evne til å klare meg
Ikke riktig Litt riktig Nokså riktig Helt riktig
Dersom jeg er i en knipe, finner jeg vanligvis en løsning . . . .
Ikke riktig Litt riktig Nokså riktig Helt riktig

Kjønn:
- ☐ Mann
- ☐ Kvinne

Fødselsår: 19______ Høyde: ______ Vekt: ______

Har du brukt medisiner med varseltrekant i de siste 24 timene?

- ☐ Ja
- ☐ Nei

Har du fysiske skader eller sykdom som påvirker din balanseevne?

- ☐ Ja, jeg har:___________________________________
- ☐ Nei

Hva tror du denne forskningen handler om?

____

____

Appendix B: Scales in Study 2

ROSENBERG SELVFØLELSE SKALA

INSTRUKSJON: Sett sirkel rundt det passende tallet for hvert av de 10 utsagnene nedenfor, avhengig om du er: helt enig (1), enig (2), uenig (3) eller sterkt uenig (4)

Helt enig			**Sterkt uenig**
1	**2**	**3**	**4**

1.	Jeg er stort sett fornøyd med meg selv.	1 2 3 4
2.	Noen ganger synes jeg at jeg ikke er god for noen ting.	1 2 3 4
3.	Jeg synes at jeg har flere gode kvaliteter.	1 2 3 4
4.	Jeg er i stand til å gjøre ting like godt som folk flest.	1 2 3 4
5.	Jeg føler at jeg ikke har mye å være stolt av.	1 2 3 4
6.	Til tider føler jeg med ubrukelig.	1 2 3 4
7.	Jeg føler at jeg er en verdifull person, i det minste på samme nivå som andre.	1 2 3 4
8.	Jeg skulle ønske at jeg hadde mer respekt for meg selv.	1 2 3 4
9.	Alt i alt er jeg tilbøyelig til å føle meg mislykket.	1 2 3 4
10.	Jeg har en positiv innstilling til meg selv.	1 2 3 4

Hvor godt passer følgende påstander om deg?

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

1. Jeg er i god fysisk form
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

2. Jeg må forandre hvor mye jeg veier for å forbedre min fysiske form
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

3. Jeg har den fysiske styrken som jeg trenger
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

4. Jeg har mer muskulær fleksibilitet en andre på min alder
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

5. Jeg blir fort sliten når jeg trener
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

6. Jeg er i bedre fysisk form en fleste andre på min alder
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

7. Jeg er et veldig fleksibelt individ
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

8. Jeg har mindre muskelstyrke en andre på min alder
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

9. Jeg trenger å forbedre min nåværende fysiske tilstand
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

10. Jeg føler at jeg er i balanse
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

11. Jeg føler meg avslappet
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

12. Jeg føler meg rolig
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

13. Jeg føler meg fredelig
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

14. Jeg føler meg behagelig
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

15. Jeg føler meg bra
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

16. Jeg føler meg ut av balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Driver du med fysiske aktiviteter (f.eks. trening eller sport) regelmessig?

☐ Nei ☐ Ja, hva:____

Hvis ja, hvor ofte driver du med disse aktivitetene:

☐ 1-2 ganger i måneden ☐ 3-5 ganger i måneden ☐ 6-7 ganger i måneden ☐ 8-10 ganger i måneden ☐ 11-13 ganger i måneden ☐ 14 eller flere ganger i måneden

Hva tror du alt dette handler om?
____
____
____

Kjønn:

- ☐ Mann
- ☐ Kvinne

Fødselsår:

19______

Har du brukt medisiner med varseltrekant i de siste 24 timene?

- ☐ Ja
- ☐ Nei

Har du fysiske skader eller sykdom som påvirker din balanseevne?

- ☐ Ja, jeg har:____________________________________
- ☐ Nei

Takk for hjelpen!

Appendix C: Scales in Study 3

PANAS (positive and negative affect schedule, Watson et al., 1988)

Listen nedenfor består av en rekke ord som beskriver ulike følelser. Les hvert ord og deretter skriv nummeret fra skalaen nedenfor ved siden av hvert ord. Indiker i hvilken grad du føler det slik akkurat nå.

1	2	3	4	5
Veldig lite / Ikke i det heletatt	Lite	Moderat	Ganske mye	Ekstremt

___________ Interessert (interested)
___________ 2. Bekymret (distressed)
___________ 3. Begeistret (excited)
___________ 4. Opprørt (upset)
___________ 5. Sterk (strong)
___________ 6. Skyldig (guilty)
___________ 7. Skremt (scared)
___________ 8. Fientlig (hostile)
___________ 9. Entusiastisk (enthusiastic)
___________ 10. Stolt (proud)
___________ 11. Irritabel (irritable)
___________ 12. Våken (alert)
___________ 13. Skamfull (ashamed)
___________ 14. Inspirert (inspired)
___________ 15. Nervøs (nervous)
___________ 16. Bestemt (determined)
___________ 17. Oppmerksom (attentive)
___________ 18. Urolig (jittery)
___________ 19. Aktiv (active)
___________ 20. Redd (afraid)

Atferd kan beskrives på mange forskjellige måter. Nedenfor er en liste av 25 ulike handlinger. Etter hver av disse handlingene kommer to alternative måter å beskrive den. Din oppgave er å velge en av disse to alternativene med å merke X foran beskrivelsen som passer best. Pass på å svare alle svare 25 spørsmål. Kun et kryss per handling. Velg beskrivelsen som du personlig mener er mer hensiktsmessig for hvert par

1. Å lage en liste

    - □ Bli organisert
    - □ Skrive ned ting

2. Lese

    - □ Følge linjer av bokstaver
    - □ Tilegne meg kunnskap

3. Bli med i militæret

    - □ Hjelpe nasjonens forsvar
    - □ Melde meg inn

4. Vaske klær

    - □ Fjerne lukt fra klær

- Putte klærne i maskinen

5. Plukke ett eple

    - Få noe å spise
    - Plukke et eple fra grenen

6. Hugge ned et tre

    - Svinge en øks
    - Få ved

7. Måle opp et rom for teppelegging

    - Gjøre klart for oppussing
    - Bruke tommestokk

8. Vaske huset

    - Vise hvor renslig en er
    - Støvsuge gulvet

9. Male et rom

    - Legge på strøk med pensel
    - Få rommet til å se nytt ut

10. Betale husleien

    - Beholde et sted å bo
    - Overføre penger

11. Tar vare på husplantene

    - Vanne plantene
    - Få rommet til å se pent ut

12. Låse en dør

    - Putte nøkkelen i låsen
    - Sikre huset

13. Stemme

    - Påvirke valget
    - Merke en stemmeseddel

14. Klatre i et tre

    - Få fin utsikt

- Holde fast i grenene
-

15. Fylle ut en personlighetstest

- Svarer på spørsmål
- Avsløre hvordan jeg er

16. Pusse tennene

- Forebygge tannråte
- Bevege en børste rundt i munnen sin

17. Ta en prøve

- Svare på spørsmål
- Vise kunnskap

18. Hilse på noen

- Si «hei»
- Vise vennlighet

19. Motstå fristelse

- Si «nei»
- Vise moralsk mot

20. Spise

- Få næring
- Tygge og svelge

21. Lage en hage

- Plante frø
- Få ferske grønnsaker

22. Reise med bil

- Følge et kart
- Se landsbygda

23. Få fylt hull i tennene

- Beskytte tennene sine
- Gå til tannlegen

24. Snakke til et barn

- Lære et barn noe
- Bruke enkle ord

25. Trykke på en ringeklokke

- Flytte en finger
- Se om noen er hjemme

Spørsmål om gjennomføringen av bevegelsestesten og visuelltesten.
Hva var din første refleksjon når du var ferdig med begge testene (tanker om testene og deg selv)?

____
____

I hvilken grad er du enig i følgende påstander om de gjennomførte testene?
Bruk skalaen her nedenfor (0-10) ved å skrive tallet du mener passer best til hver påstand på svarlinjen foran hvert spørsmål.

Helt galt										Helt riktig
0	1	2	3	4	5	6	7	8	9	10

1. ___________Jeg syntes bevegelsestesten var lett.

2. ___________Jeg syntes bevegelsestesten var vanskelig.

3. ___________Jeg syntes bevegelsestesten var morsom.

4. ___________Jeg syntes bevegelsestesten var kjedelig.

5. ___________Jeg var høyt motivert for å gjennomføre bevegelsestesten.

6. ___________Jeg var lite motivert for å gjennomføre bevegelsestesten.

7. ___________Jeg var veldig trygg på gjennomføringen av bevegelsestesten.

8. ___________Jeg var veldig utrygg på bevegelsestesten.

9. ___________Når du gjennomførte visuelltesten, i hvilken grad ville du sagt at figurene sammenlignes ut i fra den overordnede formen bilde hadde (f.eks. en firkant laget av små trekanter sammenlignes med en firkant laget av små firkanter)?

10. __________Når du gjennomført visuelltesten, i hvilken grad ville du sagt at du matchet figurene basert på enkelt elementene de var laget av (f.eks. En firkant laget av små trekanter sammenlignes med trekant laget av små trekanter)?

11. __________Jeg syntes visuelltesten var lett.

12. __________Jeg syntes visuelltesten var vanskelig.

13. __________Jeg syntes visuelltesten var morsom.

14. __________Jeg syntes visuelltesten var kjedelig.

15. __________Jeg var høyt motivert for å gjennomføre visuelltesten.

16. __________Jeg var lite motivert for å gjennomføre visuelltesten.

17. __________Jeg var veldig trygg på gjennomføringen av visuelltesten.

18. __________Jeg var veldig utrygg på visuelltesten.

Appendix D: Scales in Study 4

PART I

Hvor godt passer følgende påstander om deg?

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

1. Jeg er i god fysisk form
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

2. Jeg må forandre hvor mye jeg veier for å forbedre min fysiske form
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

3. Jeg har den fysiske styrken som jeg trenger
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

4. Jeg har mer muskulær fleksibilitet en andre på min alder
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

5. Jeg blir fort sliten når jeg trener
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

6. Jeg er i bedre fysisk form en fleste andre på min alder
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

7. Jeg er et veldig fleksibelt individ
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

8. Jeg har mindre muskelstyrke en andre på min alder
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

9. Jeg trenger å forbedre min nåværende fysiske tilstand
Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

10. Driver du med fysiske aktiviteter (f.eks. trening eller sport) regelmessig?

☐ Nei ☐ Ja, hva:____

Hvis ja, hvor ofte driver du med disse aktivitetene:

☐ 1-2 ganger i måneden ☐ 3-5 ganger i måneden ☐ 6-7 ganger i måneden ☐ 8-10 ganger i måneden ☐ 11-13 ganger i måneden ☐ 14 eller flere ganger i måneden

Kjønn:

☐ Mann

☐ Kvinne

Fødselsår: Høyde: Vekt:

19______ ______ ______

Skriv ned ditt svar på linjen etter hvert spørsmål og sett sirkel rundt hvor sikker/usikker du er på svaret . Det er kun lov å skrive et konkret svar (årstall, meter, Km, antall)
(1 = Veldig usikker 7 = Helt sikker).

1: Hvor mange mennesker bor i Spania?

SVAR:___________________Mennesker
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

2: Hvor høyt er Oslo Rådhus i meter?
SVAR:___________________M
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

3: Hvor langt er det mellom Oslo og Ålesund i Km?

SVAR:_________________KM
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

4: Hvor langt er det mellom Askim og Oslo i Km?

SVAR:_________________KM
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

5: Når ble Mozart født?
SVAR: Året_____________
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

6: Når døde Einstein?
SVAR: Året_____________
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

7: Hvor mange mennesker bor i Berlin?

SVAR:____________________Mennesker
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

8: Hvor mange mennesker bor i Oslo?
SVAR:____________________Mennesker
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7
9: Hvor mye koster den dyreste BMW bilen som er solgt i Norge?

SVAR:_________________________Kr.
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

10: Hvor mye sukker konsumerer en nordmann i gjennomsnitt i løpet av et år?

SVAR:_________________________Kg
Hvor usikker/sikker er du på ditt svar?

1 2 3 4 5 6 7

SCALES IN STUDY 4, PART II

Jeg klarer alltid å løse vanskelige problemer hvis jeg prøver hardt nok . . . .

Ikke riktig Litt riktig Nokså riktig Helt riktig

Hvis noen motarbeider meg, finner jeg en måte å oppnå det jeg vil på . . . .

Ikke riktig Litt riktig Nokså riktig Helt riktig

Jeg er sikker på at jeg kan mestre uventede hendelser . . . .

Ikke riktig Litt riktig Nokså riktig Helt riktig

Jeg er rolig når jeg møter vanskeligheter, fordi jeg stoler min evne til å klare meg

Ikke riktig Litt riktig Nokså riktig Helt riktig

Dersom jeg er i en knipe, finner jeg vanligvis en løsning . . . .

Ikke riktig Litt riktig Nokså riktig Helt riktig

Hvor godt passer følgende påstander om deg?

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor
(1 = Helt galt 5 = Helt riktig)

Uforutsette hendelser opprørt meg sterkt. (Unforeseen events upset me greatly)

1 2 3 4 5

Det frustrerer meg ikke å ha all informasjonen jeg trenger. (It frustrates me not having all the information I need.)

1 2 3 4 5

Usikkerhet holder meg fra å leve et fullverdig liv. (Uncertainty keeps me from living a full life)

1 2 3 4 5

Man bør alltid se fremover for å unngå overraskelser. (One should always look ahead so as to avoid surprises)

1 2 3 4 5

En liten uforutsett hendelse kan ødelegge alt, selv med det beste av planlegging. (A small unforeseen event can spoil everything, even with the best of planning)

1 2 3 4 5

Når det er på tide å handle, lammer usikkerhet meg. (When it's time to act, uncertainty paralyses me)

1 2 3 4 5

Når jeg er usikker fungerer jeg ikke veldig godt. (When I am uncertain I can't function very well)

1 2 3 4 5

Jeg ønsker alltid å vite hva fremtiden har i vente for meg. (I always want to know what the future has in store for me)

1 2 3 4 5

Jeg tåler ikke å bli tatt på senga. (I can't stand being taken by surprise)

1 2 3 4 5

Den minste tvil kan stoppe meg fra å handle. (The smallest doubt can stop me from acting)

1 2 3 4 5

Jeg burde være i stand til å organisere alt på forhånd. (I should be able to organize everything in advance)

1 2 3 4 5

Jeg må komme vekk fra alle usikre situasjoner. (I must get away from all uncertain situations)

1 2 3 4 5

Hvor godt passer følgende påstander om deg?

Sett sirkel rundt det passende svaret for hvert av utsagnene nedenfor

Jeg føler at jeg er i balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Selv om noe dårlig er i ferd med å skje med meg opplever jeg sjelden frykt eller nervøsitet.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg strekker meg langt for å få tak i ting jeg ønsker. (I go out of my ways to get things I want)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Når jeg har blitt god i noe elsker jeg å forsette med det. (when I am doing well at something I love keeping at it)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg er alltid villig til å prøve noe nytt hvis jeg tror det blir gøy.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Når jeg får noe jeg ønsker, føler jeg meg spent og energisk.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Kritikk eller kjeft sårer meg ganske mye.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Når jeg vil ha noe pleier jeg å gjøre alt jeg kan for å få det (when I want something I usually og all-out to get it)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg vil ofte gjøre ting for ingen annen grunn enn at de kan bli gøy.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Hvis jeg ser en sjanse til å få noe jeg ønsker så hopper jeg på med en gang. (If I see a chance to get something I want I move on it right away)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg føler meg ganske bekymret eller urolig når jeg tenker eller vet at noen er sint på meg.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Når jeg ser en mulighet for noe jeg liker blir jeg begeistret med en gang.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg handler ofte i momentet. (I often act on the spur of the moment)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Hvis jeg tror noe ubehagelig kommer til å skje blir jeg vanligvis ganske opphisset. (If I think something unpleasant is going to happen I usually get pretty "worked up")

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Det påvirker meg sterkt når gode ting skje med meg. (When good things happen to me, it affects me strongly)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg føler meg bekymret når jeg tror jeg har gjort det dårlig på noe viktig. (I feel worried when I think I have done poorly at something important)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg begjærer spenning og nye opplevelser. (I crave excitment and new sensations)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Når jeg er ute etter noe bruker jeg en «grenseløs» tilnærming. (When I go after something I use a "no holds barred" approach)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg frykter lite i forhold til mine venner.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg ville blitt veldig spent eller affektert (jålet) hvis jeg vant en konkurranse. (It would excite me to win a contest)

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg er bekymret for å gjøre feil.

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Jeg føler meg ut av balanse

Helt galt *Nokså galt* *Nokså riktig* *Helt riktig*

Spørsmål om bruk av MuscleLab bevegelsessensorer

Hva var din første refleksjon når du var ferdig med å bruke bevegelsesutstyret (tanker om testene og deg selv)?

Appendix E: Brand Choice task Study 4

Examples of brand choices used in Study 4


SNO
ICELAND
GLACIER WATER


IMSDAL


Sunkist


Fanta
ORANGE


#1
Recommended
by Dermatologists
and Allergists
all
stainlifters
free
clear


Neutral
HVID/HVIT VASK
%


Freia
Kjekssjokolade
KVIKK
LUNSJ
KVIKK LUNSJ


OLZA
PRINCE POLO
od 1955 roku
CLASSIC
CLASSIC


WALKERS
READY SALTED
CRISPS
SUNSEED


MAARUD
POTETGULL
Classic Salt


Norgesplaster
Universal Strips


Microplast
Sterile Plasters
Fabric

Appendix F: Statistical analysis

Study 1

Hypothesis 2

H2: Physical fitness has positive effect on brand recall during state of imbalance

Table 01: Information criteria: Number of brands recalled (main effects)

-2 Restricted Log Likelihood	606.232
Akaike's Information Criterion (AIC)	610.232
Hurvich and Tsai's Criterion (AICC)	610.341
Bozdogan's Criterion (CAIC)	617.687
Schwarz's Bayesian Criterion (BIC)	615.687
Pseudo R2 Conditional	0.360

Table 02: Type III Tests of Fixed Effects: Number of brands recalled (main effects)

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	56.000	3.725	.059
Balance vs Imbalance	1	57.000	2.903	.094
Fitness	1	56.000	7.075	.010

Table 03: Information criteria: Number of brands recalled (interaction effect)

-2 Restricted Log Likelihood	604.010
Akaike's Information Criterion (AIC)	608.010
Hurvich and Tsai's Criterion (AICC)	608.120
Bozdogan's Criterion (CAIC)	615.447
Schwarz's Bayesian Criterion (BIC)	613.447
Pseudo R2 Conditional	0.403

Table 04: Type III Tests of Fixed Effects: Number of brands recalled (interaction effect)

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	56.000	3.725	0.059
Balance vs Imbalance	1	56.000	3.391	0.071
Fitness	1	56.000	7.075	0.010
Balance*Fitness	1	56.000	4.754	0.033

Hypothesis 3

H3: Self-efficacy has positive effect on brand recall during state of imbalance

Table 05: Information criteria: Number of brands recalled (main effects)

-2 Restricted Log Likelihood	605.7816
Akaike's Information Criterion (AIC)	609.7816
Hurvich and Tsai's Criterion (AICC)	609.8907
Bozdogan's Criterion (CAIC)	617.2364
Schwarz's Bayesian Criterion (BIC)	615.2364
Pseudo R2 Conditional	0.361

Table 06: Type III Tests of Fixed Effects: Number of brands recalled (main effects)

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	56.000	4.722	.034
Balance vs Imbalance	1	57.000	2.903	.094
Efficacy	1	56.000	2.772	.101

Table 07: Information criteria: Number of brands recalled (interaction effect)

-2 Restricted Log Likelihood	597.311
Akaike's Information Criterion (AIC)	601.311
Hurvich and Tsai's Criterion (AICC)	601.421
Bozdogan's Criterion (CAIC)	608.748
Schwarz's Bayesian Criterion (BIC)	606.748
Pseudo R2 Conditional	0.422

Table 08: Type III Tests of Fixed Effects: Number of brands recalled (interaction effect)

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	56.000	4.722	.034
Balance vs Imbalance	1	56.000	5.311	.025
Efficacy	1	56.000	2.772	.101
Balance*Efficacy	1	56.000	6.784	.012

Appendix G: Stimuli – Experimental setting

The experimental imbalance condition

Appendix H: Research Consent Form

Vil du delta i forskningsprosjektet

Hukommelse hos studenter?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å finne ut hvor godt studenter husker informasjon. I dette skrivet for du informasjon om målene for prosjektet og hva deltakelse vil innebære.

Formål
Studenter har mye informasjon å forholde seg til i ulike situasjoner. Dette prosjektet har som formål å undersøke hvordan omstendighetene kan påvirke hukommelsen.
Resultatene av prosjektet kan gi forskere bedre forståelse av begrensningene som hukommelsen påvirkes av. Prosjektet er den del av en doktorgradsstudie.

Det er ingen andre en prosjektansvarlig som skal behandle opplysningene som blir samlet i forbindelse med prosjektet.

Hvem er ansvarlig for forskningsprosjektet?
Institutt for Markedsføring, Høyskolen Kristiania er ansvarlig for prosjektet.

Prosjektet veiledes av Professor Leif Hem på NHH og Luk Warlop på BI.

Hvorfor får du spørsmål om å delta?
Utvalget er trukket av frivillige deltakere blant studenter på Høyskolen Kristiania som har respondert til en epost fra prosjektleder.

Hva innebærer det for deg å delta?
Du kommer til å svare på noen spørsmål på et spørreskjema. I tillegg blir dine bevegelser registrert og lydopptak gjort av hva du husker.
Hvis du velger å delta i prosjektet, innebærer det at du fyller ut et spørreskjema. Det vil ta deg ca. 10 minutter. Spørreskjemaet inneholder spørsmål om dine holdninger og fysisk form. Dine svar fra spørreskjemaet blir registrert elektronisk.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.
Det er kun prosjektleder som behandler opplysningene.

Navnet og kontaktopplysningene dine vil jeg erstatte med en kode som lagres på egen navneliste adskilt fra øvrige data.
Deltakerne vil ikke kunne gjenkjennes i publikasjoner.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Opplysningene anonymiseres når prosjektet avsluttes/oppgaven er godkjent, noe som etter planen er ca. September 2020.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:
innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,
å få rettet personopplysninger om deg,
å få slettet personopplysninger om deg, og
å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra *Institutt for Markedsføring på Høyskolen Kristiania* har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:
Prosjektansvarlig, Halldor Engilbertsson: halldor.engilbertsson@kristiania.no tlf. 41231289
Vårt personvernombud: personvernombud@kristiania.no

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:
NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 55 58 21 17.

Med vennlig hilsen

Halldor Engilbertsson
(Forsker/veileder)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *Hukommelse hos studenter*, og har fått anledning til å stille spørsmål. Jeg samtykker til:

å delta i et forsøk med spørreskjema og lydopptak.

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

----
(Signert av prosjektdeltaker, dato)