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Beware when You Compare:

The Role of Social Comparison for Human Health

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English Summary

Comparisons with others are an integral part of our daily lives that impacts health in both beneficial and detrimental ways. Predictors and outcomes of social comparisons in the context of health are well-explored. However, factors that correlate either positively or negatively with social comparisons, underlying mechanisms, protective factors, and corrective strategies remain largely undiscovered. The aim of this dissertation was to address these gaps by investigating the contribution of social comparison to human health within the fields of eating and physical activity (PA).

In the domain of eating, one cross-sectional study among women showed that the positive relationship between appearance comparisons and eating pathology and the negative association between appearance comparisons and body appreciation were explained through low levels of body image flexibility. These indirect effects were attenuated when women had high levels of self-compassion. Cultivating a self-compassionate attitude and a flexible approach toward distressing thoughts about the body may allow women to cope with appearance comparisons adaptively and abstain from disordered eating practices.

In the domain of PA, participants were asked in three experimental studies to engage in comparison with either a more or a less physically active person. Subsequently, they reported their self-evaluation, self-efficacy, and intention regarding PA. Perceived similarity to the comparison standard was assessed in Study 4.1 and manipulated in Study 4.2 and Study 4.3. Study 4.3 further measured outcome variables before and after participants reconsidered their initial judgment of whether they felt similar or dissimilar to the comparison standard. The results demonstrated that perceived similarity determined the indirect effect of comparison direction (more vs. less active comparison standard) on intention via self-evaluation and self-efficacy. Specifically, participants

evaluated their PA more positively and felt more efficacious to engage in PA if they focused on similarities with more (vs. less) physically active others (Study 4.1) and dissimilarities with less (vs. more) physically active others (Study 4.1 and Study 4.2). Furthermore, participants' PA self-evaluation, self-efficacy, and intention improved when they considered the opposite of their initial impression that they are dissimilar to a more active or similar to a less active person (Study 4.3). Paying attention to differences with inactive people and similarities with active people could encourage PA, as it may boost self-beliefs about how active one is and how active one can be. Cognitive efforts to consciously steer the focus of comparisons to similarities or differences could generate PA-promoting effects.

The findings of this dissertation are discussed in terms of theoretical implications for social comparison theory and sociocultural models of eating pathology. Practical implications for interventions targeting the prevention and treatment of eating disorders and the promotion of PA are derived.

German Summary

Deutsche Zusammenfassung

Vergleiche mit anderen stellen einen integralen Bestandteil unseres täglichen Lebens dar, der sich sowohl positiv als auch negativ auf die Gesundheit auswirken kann. Prädiktoren und Auswirkungen sozialer Vergleiche im Kontext von Gesundheit sind gut erforscht. Bestimmende Faktoren positiver oder negativer Korrelate und Folgen, zugrunde liegende Mechanismen, Schutzfaktoren und Strategien zur Vermeidung negativer Folgen sind jedoch weitgehend unbekannt. Ziel dieser Dissertation war es, diese Lücken zu schließen, indem der Beitrag sozialer Vergleiche zur menschlichen Gesundheit in den Bereichen Essverhalten und körperliche Aktivität (KA) untersucht wurde.

Im Bereich Essverhalten zeigte eine Querschnittsstudie mit Frauen, dass der positive Zusammenhang zwischen Erscheinungsbildvergleichen und Essstörungen sowie der negative Zusammenhang zwischen Erscheinungsbildvergleichen und der Körperwertschätzung durch ein geringes Maß an Körperbild-Flexibilität erklärt wurde. Diese indirekten Effekte waren abgeschwächt, wenn Frauen über ein hohes Maß an Selbstmitgefühl verfügten. Die Kultivierung einer selbstmitfühlenden Haltung und einer flexiblen Herangehensweise an belastende Gedanken über den Körper könnte Frauen dabei helfen, Erscheinungsbildvergleiche adaptiv zu bewältigen und nicht in gestörte Esspraktiken zu verfallen.

Im Bereich KA wurden TeilnehmerInnen in drei experimentellen Studien gebeten, sich entweder mit einer mehr oder einer weniger aktiven Person zu vergleichen. Anschließend gaben sie ihre Selbstevaluation, Selbstwirksamkeit und Intention bezüglich KA an. Die wahrgenommene Ähnlichkeit mit der Zielperson wurde in Studie 4.1 gemessen und in Studie 4.2 und 4.3 manipuliert. In Studie 4.3 wurden die Ergebnisvariablen außerdem gemessen, bevor und nachdem

TeilnehmerInnen ihre ursprüngliche Einschätzung, ob sie der Zielperson ähnlich oder unähnlich sind, überdacht hatten. Die Ergebnisse zeigten, dass die wahrgenommene Ähnlichkeit den indirekten Effekt der Vergleichsrichtung (mehr vs. weniger aktive Zielperson) auf die Intention via Selbstevaluation und Selbstwirksamkeit bestimmte. Insbesondere bewerteten TeilnehmerInnen ihre KA positiver und fühlten sich wirksamer, wenn sie sich auf Ähnlichkeiten mit körperlich mehr (vs. weniger) aktiven Personen (Studie 4.1) und auf Unähnlichkeiten mit körperlich weniger (vs. mehr) aktiven Personen (Studie 4.1 und Studie 4.2) konzentrierten. Des Weiteren verbesserten sich die KA Selbstevaluation, Selbstwirksamkeit und Intention der TeilnehmerInnen, wenn sie das Gegenteil ihrer ursprünglichen Einschätzung, dass sie der mehr aktiven Person unähnlich oder der weniger aktiven Person ähnlich sind, in Betracht zogen (Studie 4.3). Sich auf Unterschiede mit unспортlichen und Ähnlichkeiten mit sportlichen Menschen zu konzentrieren, könnte KA begünstigen, da dies möglicherweise die Einschätzungen, wie aktiv man ist und wie aktiv man sein kann, positiv beeinflusst. Kognitive Bemühungen den Fokus während sozialer Vergleiche bewusst auf Ähnlichkeiten oder Unterschiede zu lenken, könnten KA-fördernde Effekte erzeugen.

Die Ergebnisse dieser Dissertation werden im Hinblick auf theoretische Implikationen für die Theorie des sozialen Vergleichs und soziokulturelle Modelle von Essstörungen diskutiert. Es werden praktische Implikationen für Interventionen zur Prävention und Behandlung von Essstörungen und zur Förderung KA abgeleitet.

1 General Introduction

Comparing the self with others allows individuals to evaluate their own standing in a given domain. For example, to determine whether I can be considered physically active, I could think about how active others in my environment are. *Social comparisons* like these take place frequently in everyday life and have well-established impacts on health and well-being (Buunk & Gibbons, 2013; Wheeler & Miyake, 1992). Empirical evidence shows that comparison tendencies predict physical health outcomes such as smoking (Gerrard et al., 2005) and physical activity (PA) (Luszczynska et al., 2004) as well as mental health conditions, including depression (Swallow & Kuiper, 1988) and eating pathology (Corning et al., 2006). However, a detailed understanding of the relationship between social comparison and health is lacking. In order to effectively harness social comparison as a tool for promoting health behavior, it is crucial to explore factors that determine the specific health correlates and consequences. Further, there is a need to clarify which underlying mechanisms explain these associations and effects. Lastly, efforts should be made to discover protective factors and strategies for preventing negative consequences. This dissertation partly addresses these demands and provides insights into how social comparisons affect human health, considering two domains: eating and exercising.

1.1 Motivation and Research Question

Advances in medicine have yielded effective methods for preventing and treating a multitude of diseases. As a consequence, worldwide life expectancy has increased steadily over the past decades (World Health Organisation [WHO], 2020a). While this progress is remarkable, one should be cautious about interpreting this estimate as an indicator of human health. The WHO (1948) defines health as “a state of complete physical, mental and social well-being and not merely

the absence of disease or infirmity” (p. 1). This holistic conception is in accordance with the biopsychosocial model (Engel, 1977), proposing that physiological (e.g., physical health, genetic vulnerabilities), psychological (e.g., beliefs, emotions, coping skills, behavior), and social (e.g., interpersonal relationships, social supports, culture) factors and their interplay contribute to health. In addition, it has become increasingly recognized that health is not a state but a positive aspiration (WHO, 1986). The achievement and maintenance of health present ongoing processes requiring personal efforts. Lifestyle choices that positively influence a person’s health include limited alcohol consumption, abstinence from smoking, sufficient sleep, regular physical activity (PA), and a balanced diet (Belloc & Breslow, 1972; Wingard et al., 1982). Two of these health-related behaviors, namely eating a healthy diet and being physically active, constitute the areas of focus for this dissertation.

Consuming a balanced diet that provides the body with all essential nutrients to function correctly is crucial for healthy living. While specific dietary recommendations may vary depending on individual characteristics (e.g., age, gender, lifestyle, medical conditions), a healthy diet usually includes fruits, vegetables, legumes, nuts, and whole grains. Adults are further advised not to consume more calories than the body expends (WHO, 2003). Following these principles reduces the risk for chronic diseases such as diabetes, heart disease, stroke, and cancer (National Research Council, 1989; Roberts & Barnard, 2005). However, the increased availability of highly-processed foods, accelerated urbanization, and adapted lifestyles have led to the consumption of less unprocessed foods and more high-calorie foods containing large quantities of fats, free sugars, and salt (Cordain et al., 2005; WHO, 2003). Correspondingly, the WHO (2003, 2020b) considers an unhealthy diet one of the leading global risks to health.

Although *what* and *how much* we eat is crucial to our physical health, healthy eating is not limited to the quality and quantity of foods consumed but also entails a mental component. Unhealthy eating practices of mental origin can, for example, include the use of food as a coping mechanism to deal with difficult emotions or as a way to feel in control. Such dysfunctional ways of thinking can lead to the development of clinical eating disorders (EDs). EDs are mental conditions characterized by disturbances in food- and body-related emotions, cognitions, and behaviors. These can stem from a complex interplay of biological, psychological, and sociocultural influences. Behavioral manifestations include maladaptive eating patterns (i.e., bingeing and restriction), the abuse of pharmaceuticals (i.e., laxatives and diuretics), and compulsive exercise. These behaviors are usually accompanied by destructive thoughts about food, weight, and shape (American Psychiatric Association [APA], 2013).

Several types of EDs are distinguished, namely anorexia nervosa, bulimia nervosa, binge eating disorder, avoidant restrictive food intake disorder, other specified feeding and eating disorder, pica, and rumination disorder. Individuals with EDs often overly base their self-worth on their physical appearance and possess distorted perceptions of their body, causing them to pursue unrealistic and unattainable appearance ideals (APA, 2013; Perey & Cook-Cottone, 2020). The consequences of clinical EDS can be serious and affect physiological (e.g., disturbed bodily functions), psychological (e.g., emotional distress and anxiety), and social (e.g., social isolation and impaired school and work performance) functioning (Smink et al., 2013). In severe cases, these impairments can be life-threatening.

Approximately 5% of the population suffers from some type of ED (APA, 2013). While individuals of any gender and age may be affected, EDs are most common in adolescents and young women living in developed countries (Qian et al., 2021; Smink et al., 2013). Although

evidence-based, effective treatment methods exist, these conditions often remain untreated (Hart et al., 2011; Striegel Weissmana & Rossellib, 2017). Consequently, EDs demonstrate the highest mortality rate of any mental illness (Arcelus et al., 2011). Given that the promotion of a healthy diet and the prevention and treatment of EDs present urgent public health concerns, it is imperative to explore correlates of unhealthy eating practices that could be tackled in order to improve eating behaviors and mental health.

Aside from a wholesome nutrition, good health also requires adequate PA. PA can be defined as any bodily movement that requires energy expenditure (WHO, 2020c). It includes exercise and sport as well as activities undertaken during leisure time, while working, carrying out house and yard work, or traveling. A distinction is made between light (e.g., slow walking, making the bed, preparing food), moderate (e.g., fast walking, easy bicycling, sweeping the floor), and vigorous intensity PA (e.g., running, playing soccer, shoveling). The WHO (2020c) recommends that adults between 18 and 64 years spend at least 150-300 minutes being moderately active or 75-150 minutes being vigorously active a week. Besides, the WHO guidelines emphasize that any time spent physically active instead of sedentary, even if it is light PA, provides health benefits.

There is strong evidence that regular PA reduces the risk for noncommunicable diseases such as cardiovascular diseases, cancer, and diabetes, as well as mental disorders such as depression and anxiety, and improves general well-being (Paluska & Schwenk, 2000; Penedo & Dahn, 2005; Warburton et al., 2006). Conversely, physical inactivity is a major contributor to mortality, causing around four to five million deaths globally each year that could be prevented if people were more active (Lee et al., 2012; Strain et al., 2020). Despite these apparent beneficial effects of sufficient activity and health hazards of inactivity, 27.5% of the world's adult population, that is around 1.4 billion adults, do not meet the above-mentioned WHO recommendations for

sufficient PA (Guthold et al., 2018). Unfortunately, the development of these numbers is concerning rather than providing hope. Global PA levels did not improve since 2001. Worse still, insufficient PA has increased in high-income countries from 31.6% to 36.8% between 2001 and 2016 (Guthold et al., 2018). The decline in PA is, at least partially, attributable to social and environmental changes brought about by industrialization (Eaton & Eaton, 2003). Automation, passive modes of transportation, and the use of electronic devices (e.g., mobile phones, computers, television) have allowed current generations to live sedentarily. While these trends can hardly be stopped or reversed, the examination of factors contributing to physical (in)activity that may be susceptible to change is indispensable. These investigations hold the potential to support the development of strategies for effectively promoting PA and ultimately improving health.

How individuals think about and whether and how frequently they engage in health-related behaviors may be strongly influenced by the opinions and habits of others. Social influences are important determinants of health behaviors, including PA and eating (e.g., Carron et al., 1996; Cruwys et al., 2015; Hamilton & White, 2008; McFerran et al., 2010). One specific social influence that has been useful for explaining health correlates and consequences is the comparison with others (Buunk & Gibbons, 2013; Litt et al., 2020). To provide a more vivid example of how social comparison is linked to health-related thoughts and behaviors, please imagine the following scenario:

You have recently spotted your neighbor leaving his house early in the morning to go for a run before he heads to work. When he and his wife come over for dinner one night, he talks about how good his morning run makes him feel and that he has already noticed improvements in his performance. A few weeks later, the two of you meet at a grocery store and your neighbor tells you he has just signed up for a half-marathon. While carrying your groceries to your car, you

notice how out of breath you are. Compared to your neighbor, you feel like the epitome of a couch potato. When lying in bed that night, you cannot stop thinking about how bad your physical fitness is. Thinking about your neighbor, you realize that if he is active, you can be so too! You get up, dig out your running shoes from the bottom of your closet, and set an early alarm. Tomorrow is going to be the day. The day you will become an active person.

The scenario described above illustrates that, under certain circumstances, comparisons with others present a source of inspiration and motivation to improve. They can, however, also evoke frustration and discouragement (Buunk et al., 1990; Lockwood & Kunda, 1997, 2000). Thus, both beneficial and destructive health outcomes may arise. As opportunities for comparison are abundant in our everyday lives, triggering even subconscious comparison (Blanton & Stapel, 2008; Stapel & Blanton, 2004), it is of great importance to unravel the effects of this inevitable process. Accordingly, the overall research goal of this dissertation is to investigate the role of social comparison for human health. For this purpose, two interrelated health fields, namely eating pathology and PA, are contemplated. The following specific research questions are targeted within the field of eating pathology. They refer to key constructs that may present mechanisms and boundary conditions in the associations of social comparisons with relevant ED-related outcomes and will be described in more detail in what follows: body image flexibility, body appreciation, and self-compassion.

Research Question 1: *Are appearance comparison tendencies associated with eating disorder psychopathology?*

Research Question 2: *Do body image flexibility and body appreciation mediate the association between appearance comparisons and eating disorder psychopathology?*

Research Question 3: *Does self-compassion moderate the association of appearance comparisons with body image flexibility and body appreciation?*

In the field of PA, the research questions below are addressed. Again, they refer to key constructs that may constitute mechanisms and boundary conditions in the associations of social comparisons with relevant PA-related outcomes and will be outlined in the subsequent paragraphs: self-evaluation, self-efficacy, and the level of critical thinking in one's judgments.

Research Question 4: *What are the effects of comparisons with more and less physically active others on PA self-evaluation and self-efficacy, and what are their downstream associations on PA intention?*

Research Question 5: *Do PA self-evaluation and self-efficacy mediate the association between comparisons with more and less physically active others and PA intention?*

Research Question 6: *Does perceived similarity moderate the effects of comparisons with more and less physically active others on PA self-evaluation and self-efficacy?*

Research Question 7: *To what extent can the effects and downstream associations of comparisons with more and less physically active others be influenced by considering the opposite of one's initial judgment of similarity or dissimilarity?*

Several contributions are made by addressing these research questions. First, by unraveling potential moderating and mediating factors of the relationship between social comparison and health, this dissertation expands existing theoretical frameworks of social comparison. These insights provide researchers with a better comprehension of when, why, and how comparisons lead to reduced or improved health outcomes. From a practical perspective, this dissertation sheds light on factors that could protect against the detrimental health consequences related to heightened comparison tendencies. Further, it clarifies whether and how biased comparison may be corrected,

thereby improving health. Collectively, this work enriches the understanding of approaches aiming to minimize harmful comparison effects and use social comparison as a means to generate health benefits. Specifically, this dissertation informs the development and refinement of interventions reducing poor body image and eating pathology and promoting PA.

1.2 Structure of the Dissertation and Research Approach

This dissertation is structured in five chapters. Chapter 1 introduces the topic of interest, describes the motivation and aim of this work, and presents the structure of this dissertation as well as the research approach employed.

Chapter 2 outlines the theoretical concepts relevant to this work. It provides explanations for why, with whom, and with what effects individuals engage in social comparisons. It further highlights the relevance of social comparison for health, particularly in the realms of eating pathology and PA.

Chapter 3 and 4 present empirical evidence linking social comparison and human health. A combination of correlational and experimental research designs is employed to answer the research questions proposed in chapter 1. Both methods are considered important approaches in health research (Curtis et al., 2016). Correlational research offers the opportunity to explore relationships and is especially useful when randomization is not feasible (Mark & Reichardt, 2004). Correlational research may further generate valuable insights for the development of experiments (Curtis et al., 2016). In what follows, I will give a brief overview of the two chapters. Table 1 provides an overview of the study characteristics for the four empirical studies outlined in chapter 3 and 4.

Chapter 3 examines the relationship of a specific variant of social comparison, that is, appearance comparison, with body image and eating-related cognitions and behaviors. One correlational study investigates whether heightened appearance comparison tendencies would be associated with greater eating disorder psychopathology. The study further tests whether this association may be explained through reduced levels of two positive body image facets, namely body image flexibility (i.e., the ability to experience and accept unwanted thoughts and emotions about the body; Sandoz et al., 2013) and body appreciation (i.e., accepting and respecting one's own body; Avalos et al., 2005; Tylka & Wood-Barcalow, 2015). Lastly, this study examines self-compassion as a potential protective factor against the negative correlates associated with the tendency to compare one's body against the bodies of others. In order to investigate these associations, 250 women completed a range of self-report questionnaires. The sample was restricted to females because women tend to compare their bodies to a greater extent and experience stronger body image effects of these comparisons than men do (Halliwell, 2012; Myers & Crowther, 2009). A moderated serial mediation model, including appearance comparisons (predictor), self-compassion (moderator), body image flexibility (first mediator), body appreciation (second mediator), and eating disorder psychopathology (outcome), was quantified via maximum likelihood path analysis (Muthén et al., 2017).

Chapter 4 focuses on the outcomes of social comparison in the domain of PA. It comprises three experimental studies that examine whether perceived similarity determines the effects of comparisons with more and less physically active others on how individuals evaluate their PA (i.e., PA self-evaluation), how efficacious they feel (i.e., PA self-efficacy), and how willing they are to be physically active (i.e., PA intention). All studies involved the same comparison direction manipulation, during which participants were instructed to compare themselves to either someone

more (i.e., upward standard) or someone less physically active (i.e., downward standard). In Study 4.1 ($N = 240$), perceived similarity to the comparison standard was assessed by means of self-report. Study 4.2 ($N = 248$) involved a perceived similarity manipulation, asking participants to focus on similarities or differences while comparing. Study 4.1 and Study 4.2 tested moderated mediation models, using comparison direction (predictor), perceived similarity (moderator), and PA self-evaluation and self-efficacy (mediators) to predict PA intention (outcome). Perceived similarity presents a continuous variable for Study 4.1 and a categorical variable (similarity vs. dissimilarity) for Study 4.2. Separate moderated mediation models were analyzed using ordinary least squares regression.

Study 4.3 ($N = 244$) tests whether PA-related comparison outcomes can be influenced by considering the opposite of one's initial judgment of similarity or dissimilarity. For that purpose, PA self-evaluation, self-efficacy, and intention were assessed before and after participants apply the consider-the-opposite strategy (COS; Lord et al., 1984; Mussweiler et al., 2000), which involves thinking about information that contradicts a previously considered standard. Separate mixed ANOVAs were utilized to investigate potential three-way interaction effects between comparison direction (upward vs. downward), perceived similarity COS (initial similarity vs. initial dissimilarity), and time (T1 vs. T2) on PA self-evaluation, self-efficacy, and intention.

Chapter 5 summarizes the findings, gives theoretical and practical implications, describes limitations, and indicates future research directions.

Table 1 *Overview of Study Characteristics*

	Chapter 3		Chapter 4	
	Study 3.1	Study 4.1	Study 4.2	Study 4.3
Main goal	Determine whether heightened appearance comparison tendencies are related to lower positive body image and higher eating pathology.	Test whether perceived similarity determines the effects of comparisons with more and less physically active others.	Test whether perceived similarity to comparison standards can be manipulated.	Test whether PA comparison outcomes can be influenced by considering the opposite of one's initial perceived similarity to a comparison standard.
Design	Correlational	Experimental	Experimental	Experimental
Sample	Female U.S. citizens (<i>N</i> = 250)	Male and female U.S. citizens (<i>N</i> = 240)	Male and female U.S. citizens (<i>N</i> = 248)	Male and female U.S. citizens (<i>N</i> = 244)
Independent variables	Appearance Comparisons (assessed via self-report)	Comparison Direction (upward vs. downward; manipulation)	Comparison Direction (upward vs. downward; manipulation)	- Comparison Direction (upward vs. downward; manipulation) - Perceived Similarity COS (initial similarity vs. initial dissimilarity; manipulation)
Moderators	Self-Compassion (assessed via self-report)	Perceived Similarity (assessed via self-report)	Perceived Similarity (similarity vs. dissimilarity; manipulation)	
Mediators	- Body Image Flexibility - Body Appreciation	- PA Self-Evaluation - PA Self-Efficacy	- PA Self-Evaluation - PA Self-Efficacy	

	Chapter 3		Chapter 4	
	Study 3.1	Study 4.1	Study 4.2	Study 4.3
Dependent variables	Eating Disorder Psychopathology	PA Intention	PA Intention	- PA Self-Evaluation (T1 vs. T2) - PA Self-Efficacy (T1 vs. T2) - PA Intention (T1 vs. T2)
Statistical analysis	Maximum likelihood path analysis	Regression-based moderated mediation analysis	Regression-based moderated mediation analysis	Mixed analysis of variance

Note. COS = consider-the-opposite strategy; PA = physical activity; T = time.

2 Theoretical Background

Social comparison theory was initially formulated by Leon Festinger in 1954. It is based on nine hypotheses (see Table 2) that explain why (Hypotheses I-II) and how (Hypotheses III-IX) individuals compare their opinions and abilities with those of other people. Since this original conception, the theory has undergone many modifications and extensions. An extensive field of research has emerged. At present, social comparison can best be defined as “any process in which individuals relate their own characteristics to those of others” (Buunk & Gibbons, 2000, p. 491). The following paragraphs will cover the most relevant theoretical principles for the current work, outlining *why* (paragraph 2.1), *with whom* (paragraph 2.2), and *with what effect* (paragraph 2.3) we engage in comparison. Paragraph 2.4 will illustrate social comparison theory’s application to the context of health and provide an overview of the current research linking social comparison with eating pathology and physical activity.

Table 2 Festinger's Nine Hypotheses Forming Social Comparison Theory

No.	Hypothesis
I	There exists, in the human organism, a drive to evaluate his opinions and his abilities.
II	To the extent that objective, nonsocial means are not available, people evaluate their opinions and abilities by comparison respectively with the opinions and abilities of others.
III	The tendency to compare oneself with some other specific person decreases as the difference between his opinion or ability and one's own increases.
IV	There is a unidirectional drive upward in the case of abilities which is largely absent in opinions.
V	There are nonsocial restraints which make it difficult or even impossible to change one's ability. These nonsocial restraints are largely absent for opinions.
VI	The cessation of comparison with others is accompanied by hostility or derogation to the extent that continued comparison with those persons implies unpleasant consequences.
VII	Any factors which increase the importance of some particular group as a comparison group for some particular opinion or ability will increase the pressure toward uniformity concerning that ability or opinion within that group.
VIII	If persons who are very divergent from ones own opinion or ability are perceived as different from oneself on attributes consistent with the divergence, the tendency to narrow the range of comparability becomes stronger.
IX	When there is a range of opinion or ability in a group, the relative strength of the three manifestations of pressures toward uniformity will be different for those who are close to the mode of the group than those who are distant from the mode. Specifically, those close to the mode of the group will have stronger tendencies to change the positions of others, relatively weaker tendencies to narrow the range of comparison, and much weaker tendencies to change their position compared to those who are distant from the mode of the group.

Note. From "A Theory of Social Comparison Processes" by L. Festinger, 1954, *Human Relations*, 7(2), pp. 117-140. (<https://doi.org/10.1177/001872675400700202>). Copyright 1954 by the SAGE Social Science Collections.

2.1 Why Do We Engage in Comparison? The Relevance of Comparison Motives

The superordinate goal of social comparison is to acquire knowledge about the self. Nevertheless, comparisons with others may serve various more specific purposes. Three main motives are commonly differentiated in the literature: self-evaluation, self-enhancement, and self-improvement (Corcoran et al., 2011; Suls et al., 2002). The *self-evaluation* motive can be traced

back to Festinger's (1954) assumption that humans have an innate drive to obtain accurate self-views. He suggests that individuals typically rely on objective standards to determine their standing on a given domain. In case no such objective standard is given, comparisons with others provide an opportunity to evaluate the own opinions and abilities. Researchers subsequently added that not solely opinions and abilities but any imaginable attribute of the self (e.g., possessions, appearance, accomplishments, performances) can be the basis of comparison (Gibbons & Buunk, 1999). Social comparisons are thus used when seeking answers to questions such as: "Am I smart?", "Am I successful?", "Am I attractive?"

Yet, people do not always aim to gain accurate self-evaluation but instead frequently process comparative information in a biased manner. In line with this notion, it was observed that comparisons can also be used to enhance or maintain a positive self-image, thereby serving the *self-enhancement* motive. According to Wills (1981), individuals may purposefully engage in comparisons with others performing worse to feel better about themselves. Doing so allows them to even interpret failures and weaknesses as successes and strengths. This strategy can ultimately elicit a more positive self-concept and boost self-esteem. Evidence for this motive comes from research on breast cancer patients who were found to primarily compare themselves to other patients suffering from more severe conditions (Wood et al., 1985). Utilizing social comparison as a means for self-enhancement made them reflect upon their own health and view their current state in a more positive light.

A third motive for comparison is the *self-improvement* motive, which involves gathering information about how to advance and do better (Wood, 1989). Comparing the self with others performing better offers the prospect to learn about and improve the own abilities. For example,

role models can provide hope, inspiration, and motivation if their success seems attainable (Lockwood & Kunda, 1997).

Social comparisons were thus typically seen as effortful and deliberative processes carried out to fulfill specific goals (Corcoran et al., 2011). It was only later recognized that the ubiquity of comparisons has been underestimated in early work. The idea that comparisons with others can also be spontaneous and automatic, taking place without conscious awareness, evolved. Gilbert et al. (1995) were the first to suggest that comparisons are not deliberate choices but rather “natural, effortless, or even inevitable reactions to the behavior of others” (p. 228). Taking a socio-cognitive approach, they proposed that social comparison can be seen as a two-step process. The first step involves automatic comparison, no matter if we intend to do so or not. The second step allows for correction of the conclusions reached. As the second step requires high cognitive capacity, individuals frequently disregard factors that contribute to the comparison standard’s performance (e.g., he/she had more practice) and end up making spontaneous comparisons that are logically inappropriate (Gilbert et al., 1995).

The role of automatic processes in social comparison was substantiated by Mussweiler et al. (2004a), who found that subliminally presented comparison standards impact how comparers evaluate themselves. Mussweiler and Epstude (2009) further showed that comparative thinking reduces the amount of information people have to take into account when making judgments and is, therefore, more efficient than absolute information processing. Accordingly, and in addition to the motives outlined above, social comparison can also function as a mental shortcut that generates fast conclusions.

One final aspect to consider when contemplating why people engage in social comparison is the personal inclination to do so. The extent or frequency with which individuals compare

themselves to others differs from one person to the next and constitutes a trait variable termed social comparison orientation (SCO) (Gibbons & Buunk, 1999). Individuals high in SCO are not only particularly aware of and sensitive to others but also possess heightened uncertainty about their self-concepts (Buunk & Gibbons, 2006; Gibbons & Buunk, 1999). Specifically, personality factors such as high self-consciousness and conformity beliefs as well as low self-esteem and neuroticism contribute to the tendency to engage in social comparison (see Buunk & Gibbons, 2006, for an overview). Interestingly, those high in SCO do not only make more comparisons, but they also experience greater impacts on health outcomes, including well-being and depression (Gibbons & Buunk, 1999; Lee, 2020). Apart from the general tendency to engage in social comparison, additional individual differences that impact whether one assesses the own abilities vis-à-vis that of other people are, among others, gender, age, and personal values (see Gerber, 2020, for an overview).

Taken together, several reasons for why we engage in social comparison exist. First, we might deliberately strive for specific goals, such as self-evaluation, self-enhancement, and self-improvement. Secondly, we might automatically apply comparison as a strategy to save time and cognitive resources. Lastly, we might simply be inclined to do so.

2.2 Whom Do We Compare with? The Relevance of Comparison Standard Selection

We can choose from a wide variety of comparison standards (i.e., persons to whom a comparison is made): celebrities, social media influencers, coworkers, members of sports teams, family members, or friends. To evaluate your physical appearance, for instance, you could compare yourself to your mother, your grandmother, a girlfriend of the same age, the former

German Chancellor Angela Merkel, or the model Naomi Campbell. A number of theoretical concepts help classify and understand whom we compare with.

One of these concepts is the *comparison direction*. A comparison standard can either be better than oneself (*upward comparison*), worse than oneself (*downward comparison*), or more or less equal to oneself (*lateral comparison*) on the dimension in question (Alicke, 2000). Festinger (1954) initially assumed that individuals mainly compare themselves with standards that are similar (see Hypothesis III in Table 2) or slightly better (see Hypothesis IV in Table 2). He argued that comparisons with similar others would generate the most accurate appraisals of the own standing. Comparisons with others whose abilities are too divergent, in contrast, would provide only little valuable information for self-evaluation. For example, noticing that you are less physically active than the famous footballer player Cristiano Ronaldo does not say much about your level of PA.

Instead of the similarity concerning the comparison dimension itself, Goethals and Darley (1977) considered similarity in terms of attributes related to this dimension as the determining factor for whom we choose to compare with. Their related attributes hypothesis, which was grounded in attribution theory, suggests that we select a standard by first assessing characteristics related to or predictive of the relevant comparison. A woman who wants to know whether she is a good swimmer could, for instance, select another woman of the same age for comparison. Comparisons with others who lack similar attributes should be less informative because the performance disparity could result from the difference in the attribute rather than the difference in ability or skill.

Festinger (1954) and Goethals and Darley (1977) hence agree that the aim to reach accurate self-evaluation would lead to the selection of a similar (i.e., lateral) comparison standard.

However, in line with the reasoning outlined in paragraph 2.1, individuals seeking self-enhancement should select a downward standard for comparison because someone performing worse will make them appear favorable (Wills, 1981). On the contrary, individuals pursuing self-improvement should choose to compare against an upward standard as someone more skilled or competent can provide motivation and direction as to how respective accomplishments may be achieved (Wood, 1989). The same motives that explain why people engage in comparison in the first place thus also guide our decisions with regard to whom the comparison is made with. Table 3 summarizes how comparison motives guide the selection of a specific comparison standard.

Table 3 *Comparison Motives and Corresponding Choices of Comparison Standards*

Comparison motive	Comparison standard
Self-evaluation	Lateral
Self-improvement	Upward
Self-enhancement	Downward

Note. Informed by “Social Comparison: Motives, Standards, and Mechanisms” by K. Corcoran, J. Crusius and T. Mussweiler, in D. Chadee (Ed.), *Theories in social psychology* (pp. 119-139). Wiley Blackwell.

Empirical methods for assessing which comparison standard people choose include diary or questionnaire-based studies prompting participants to document their everyday life comparisons (e.g., Wheeler & Miyake, 1992). In addition, experimental studies that prompt participants to select either an upward, a downward, or a lateral comparison standard, are frequently applied. Lateral comparisons are, however, often disregarded in empirical research. This may be because lateral comparisons are made less frequently than upward and downward comparisons, and neither have uplifting nor threatening effects on the comparer’s self-view (Gerber et al., 2018). In addition, the

manipulation of lateral comparisons presents a practical issue as it is challenging to design same-level standards for each given participant.

A meta-analysis of social comparison research over the past 60 years (Gerber et al., 2018) revealed that people generally choose to compare upward rather than downward or lateral. The preference for comparisons with superior others was shown to persist even in the presence of threat, when an upward comparison will most likely impact the self-image negatively. The authors speculate that this tendency may be due to people's wish to confirm that they are among the better ones. The meta-analytic results align with Festinger's (1954) notion of a unidirectional drive upward (see Hypothesis IV in Table 2) and accentuate the irrationality underlying many comparisons that people engage in.

In summary, we can compare ourselves to others performing better (upward comparison), worse (downward comparison), or at approximately the same level (lateral comparison). When using comparison to evaluate the own standing, it is best to engage in comparison with others similar (i.e., lateral comparison) in terms of the dimension itself or attributes related to this dimension. When we strive for self-enhancement, we ideally select downward standards, and when we aim for self-improvement, we optimally choose upward standards. Nevertheless, we do not always follow these patterns but are generally inclined to compare ourselves against superior others.

2.3 What Are the Effects of Comparison? The Consideration of Comparison

Consequences

A large body of research has explored the impacts of social comparison on diverse consequences such as self-beliefs, emotions, motivational reactions, and behaviors. It promptly

became apparent that comparisons can have positive but also adverse effects. Disentangling which types of comparison hold benefits and which ones bear risks remains challenging until this day.

2.3.1 The Ups and Downs of Upward and Downward Comparison

Historically, it was assumed that downward comparison would lead to positive and upward comparison to negative effects (Wills, 1981). However, subsequent investigations showed that both comparison directions can elicit favorable and unfavorable consequences. On the one hand, upward comparisons can be hurtful and discouraging because they point to the fact that one is relatively disadvantaged (Buunk et al., 1990; Suls et al., 2002). Such effects can, for example, often be observed for comparisons made via social media (e.g., Facebook, Instagram). In a recent review, Verduyn et al. (2020) conclude that online social comparisons are detrimental to mental health and subjective well-being. They reason that this is due to the fact that users selectively present favorable aspects of themselves, which causes comparisons on these platforms to be mainly upward in nature.

On the other hand, upward comparisons can elevate self-views (Collins, 1996, 2000). This may be because people seek to confirm their similarity with an upward standard and infer that “they are among the better ones” (Collins, 2000, p. 170). Comparisons with superior others may further provide hope, inspiration, and motivation by illustrating not only that improvement is possible but also by offering guidance for how it may be achieved (Lockwood & Kunda, 1997, 2000; Suls et al., 2002). In the context of health, upward comparisons were found to positively impact the motivation and intention to improve eating and exercise habits (Diel & Hofmann, 2019; Lockwood et al., 2005) as well as actual walking behavior (Chapman et al., 2016).

As Wills' (1981) downward comparison theory emphasizes, positive effects may also result from comparisons with inferior others. Comparing the self to someone perceived as performing worse can suggest that one's standing is relatively advantaged, which may yield satisfaction with the own achievements and boost self-views. It can further provide information about how to avoid unfavorable states (Lockwood, 2002). Longitudinal research supports the health-enhancing effects of downward comparisons by showing that feeling fitter than one's friends predicts reduced alcohol consumption and increased exercising behavior three months later (Shakya et al., 2015). In a similar vein, an experimental study in a naturalistic setting found that women working out in close proximity to an unfit person exercised longer than those who worked out near a fit person or those who were not surrounded by anyone at all (i.e., control condition) (Wasilenko et al., 2007).

On the contrary, downward comparisons can also induce anxiety as they connote that one's status or performance could decline (Buunk et al., 1990; Suls et al., 2002). Additionally, some researchers argue that downward comparisons do not hold motivational potential and attenuate efforts to improve (e.g., Lockwood et al., 2002). For example, research on health exemplars found that people are less motivated by comparisons with physically unfit rather than physically fit others (Lockwood et al., 2005). Taking into consideration the extremity of the comparison standard, Diel and Hofmann's (2019) results showed that extreme downward standards reduce participants' willingness to pursue challenging health goals.

Collectively, theoretical models and empirical investigations indicate that the consequence of a comparison is not determined by its direction. Upward and downward comparisons can lead to both negative and positive outcomes. In order to accurately predict the consequences of social comparisons, a more nuanced distinction is required.

2.3.2 Assimilation and Contrast in Social Comparison

One way to further classify social comparison consequences is to differentiate between evaluations that are directed toward (i.e., *assimilation*) or away from (i.e., *contrast*) the comparison standard (Corcoran et al., 2011; Gerber, 2020; Pelham & Wachsmuth, 1995). In assimilative comparisons, the similarities between the comparison standard and the self are highlighted. Contrastive comparisons, on the contrary, emphasize the differences between the other and oneself. One could also say that assimilation reduces, and contrast increases, the distance between the person of interest and the comparer.

The most prominent theoretical framework explaining assimilation and contrast in social comparison is the selective accessibility model (SAM, Mussweiler, 2003) (see Figure 1). The SAM proposes that, in light of a potential comparison, individuals first make a quick judgment of overall similarity or dissimilarity between themselves and the standard. This judgment is based on a small number of salient features (e.g., age, gender, physical build). Subsequently, there is a cognitive search for evidence affirming the initial judgment. If the comparison standard is perceived to be generally similar, one will engage in similarity testing, during which information confirming the similarity between the standard and the self (i.e., standard-consistent information) is sought. If the comparison standard is perceived to be rather dissimilar, one will engage in dissimilarity testing, which will activate information confirming dissimilarity between the standard and the self (i.e., standard-inconsistent information). Consequently, similarity testing leads to assimilation and a shift of self-estimates closer to the standard. Dissimilarity testing leads to contrast and a shift of self-estimates away from the standard (Mussweiler, 2003, 2020).

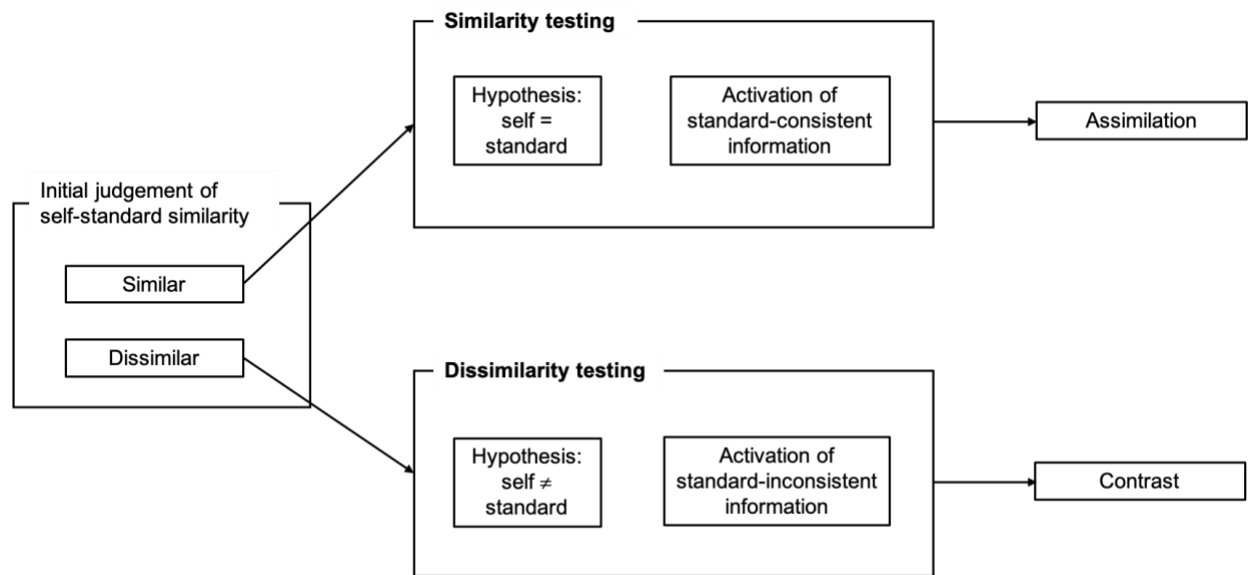


Figure 1. *The Selective Accessibility Mechanisms of Social Comparison.*

Note. Adapted from “Comparison Processes in Social Judgment: Mechanisms and Consequences” by T. Mussweiler, 2003, *Psychological Review*, 110(3), p. 475. (<https://doi.org/10.1037/0033-295X.110.3.472>). Copyright 2003 by the American Psychological Association.

Assimilative and contrastive effects can occur for both comparison directions (Mussweiler, 2001, 2003; Mussweiler et al., 2004b). Table 4 provides a summary of the outcomes for assimilative and contrastive upward and downward comparisons. First, *upward assimilation*, or the focus on similarities with someone judged to be better off, may highlight the achievability of others’ attainments (e.g., “If they can, so do I”) and results in positive effects. As an example, realizing that a famous athlete has a similar social background can encourage efforts to work toward success. Second, *downward assimilation*, or the focus on similarities with someone judged to be worse off, should exemplify one’s closeness to failure and thus lead to negative outcomes. Noticing, for instance, that the own eating habits resemble those of a friend who frequently consumes unhealthy foods will presumably lead to the conclusion that one’s diet is not the very best. Third, *upward contrast*, focusing on dissimilarities with someone performing better, may accentuate the gap between the own abilities and those of a well-performing person. As a result,

negative consequences may arise. For example, seeing a very skilled basketball player, who is different from the self in that he is one foot taller, can be frustrating and may decrease efforts to improve the own basketball skills. Lastly, *downward contrast*, focusing on dissimilarities with someone performing worse, should emphasize the advantage in relation to others and lead to positive outcomes. For instance, thinking about how much faster one can run than a friend who is also training for a marathon may make one feel confident about the upcoming race.

Table 4 *The Effects of Upward and Downward Assimilation and Contrast*

	Upward comparison	Downward comparison
Assimilation (focus on similarities)	+ Positive outcomes	- Negative outcomes
Contrast (focus on dissimilarities)	- Negative outcomes	+ Positive outcomes

Note. Adapted from “A Social Comparison Theory Meta-Analysis 60+ years on” by J. P Gerber, L. Wheeler, and J. Suls, 2018, *Psychological Bulletin*, 144(2), p. 178. (<https://doi.org/10.1037/bul0000127>). Copyright 2018 by the American Psychological Association.

Empirical evidence aligns with the notion that comparison consequences are conditional upon the comparer’s focus on similarities or dissimilarities. Mussweiler (2001) procedurally primed a focus on either similarities or dissimilarities by asking participants to look for similarities or differences between sketches of two scenes. Afterward, participants compared themselves to either someone adjusting well (i.e., upward comparison) or poorly to college (i.e., downward comparison) and rated their own adjustment to college. As expected, the priming carried over to the comparison: Participants primed to focus on similarities evaluated their adjustment to college to be better when they engaged in comparison with an upward rather than a downward standard. Those primed to focus on dissimilarities, on the other hand, evaluated their adjustment to college

to be worse after an upward rather than a downward comparison. Assimilation and contrast effects have also been observed in the realm of health. Participants estimated that they could do more push-ups and run faster if they were subliminally primed with a moderate/similar upward (i.e., Bill Clinton) rather than a moderate/similar downward standard (i.e., Nicki Lauda). In contrast, they were less confident about their athletic abilities if they were exposed to an extreme/dissimilar upward (i.e., Michael Jordan) rather than an extreme/dissimilar downward standard (i.e., Pope John Paul) (Mussweiler et al., 2004a).

The results of Gerber et al.'s meta-analysis (2018) also substantiate the idea that differential consequences emerge depending on whether similarities or dissimilarities present the focus of comparison. Notably, while this meta-analysis demonstrates that focusing on dissimilarities leads to contrast, the authors also conclude that focusing on similarities *tends* to lead to assimilation, but that assimilation effects are less reliable and may occur under specific circumstances only (e.g., after priming).

In essence, the SAM suggests that the varying comparison effects are produced by differences in the accessibility of information confirming similarity or dissimilarity with the person of interest. Accordingly, the consequences of social comparisons may not only depend on whom we compare ourselves to (i.e., upward or downward comparison standards) but also on whether we focus on similarities or differences when doing so.

2.4 Social Comparison in the Context of Health

Social comparison theory has been applied to a broad range of health contexts, including health risk behaviors such as smoking cessation (Gerrard et al., 2005), sun protection (Mahler et al., 2010), alcohol use (Litt et al., 2015), and sexual behavior (Fielder et al., 2013), as well as how

people cope with chronic illnesses such as diabetes (Schokker et al., 2010), cancer (Brakel et al., 2012), and HIV (Derlega et al., 2008). More recent investigations have further started to explore the effectiveness of smartphone applications utilizing social comparison as a tool for promoting health behavior change in domains such as stress-, weight-, and PA-management (Arigo & Suls, 2018). Some researchers even consider social comparison theory to be one of the most important psychological theories for the application to health-related cognitions and behaviors (Buunk & Gibbons, 2013; Litt et al., 2020). The following two paragraphs describe the role of social comparison in eating pathology and PA.

2.4.1 The Contribution of Social Comparison to Eating Pathology

Among the many dimensions social comparison may encompass, comparisons about one's physical appearance may most deleteriously impact mental and physical health. In spite of the fact that appearance presents a relevant comparison domain for both men and women, women, generally speaking, compare their bodies more frequently and experience more severe consequences of doing so than men do. In addition, women's comparisons are more often directed upward than men's (Myers & Crowther, 2009; Strahan et al., 2006). These findings are not surprising considering that women are subject to an exceptionally high pressure to adhere to societal beauty ideals (Buote et al., 2011). Given this particular vulnerability for women to be adversely affected by comparisons of the body, this dissertation will focus on appearance comparison processes in females only.

Festinger's (1954) social comparison theory, applied to the context of appearance, suggests that comparing the own body to that of others may increase a perceived discrepancy between the actual and the ideal body. This discrepancy may lead to negative thoughts about the body (i.e.,

body dissatisfaction) and to attempts to alter the body (i.e., the engagement in extreme diets, compulsive exercise, and other unhealthful compensatory behaviors) in order to reduce the discrepancy (Drutschinin et al., 2018; Fitzsimmons-Craft, 2017). This reasoning is in line with sociocultural theories of body dissatisfaction and eating pathology (e.g., Keery et al., 2004; Thompson et al., 1999; van den Berg et al., 2002), which emphasize the role of appearance comparisons in the development of these negative outcomes.

The harmful effects of appearance comparisons in women are well established. Correlational research has shown that the tendency to engage in appearance comparisons is related to higher levels of appearance-ideal internalization, drive for thinness, body shame, body dissatisfaction, adiposity, and eating pathology (Corning et al., 2006; Lin & Soby, 2016; Myers & Crowther, 2009; Saunders et al., 2019; Schaefer & Thompson, 2014, 2018; Tylka & Sabik, 2010; Yao et al., 2021). Experimental studies have demonstrated that exposure to images of idealized female bodies has negative body and eating-related effects (see Groesz et al., 2002; Want, 2009, for reviews). These exposure effects were driven by comparison processes (Tiggemann & Polivy, 2010; Tiggemann et al., 2009; Bessenoff, 2006). In addition, ecological momentary assessment (EMA) studies, which investigate social comparisons as they occur in natural environments, have shown that appearance comparisons increase the likelihood of disordered eating cognitions and behaviors (Drutschinin et al., 2018; Fitzsimmons-Craft, 2017). A longitudinal study by Arigo et al. (2014) furthermore found that college women's tendency to engage in upward appearance comparisons predicts the onset of clinical eating pathology two months later.

The damaging effects of appearance comparisons are typically attributed to comparisons with upward standards. Some evidence indicates that comparisons with more attractive others (i.e., upward standards) are associated with more negative outcomes than comparisons with less

attractive others (i.e., downward standards) (Leahey et al., 2007, 2011). However, more recent investigations revealed that downward comparisons are also related to body dissatisfaction and eating pathology and do thus not have buffering effects on negative consequences (Drutschinin et al., 2018; Fitzsimmons-Craft, 2017; Lin & Soby, 2016). In contrast to other comparison dimensions, appearance comparisons may therefore raise the risk of body and eating disturbances, irrespective of the comparison direction. Drutschinin et al. (2018) hypothesize that this may be the case because upward, downward, and lateral comparisons all promote a focus on how the body looks, which may increase one's perceived discrepancy from the ideal. Accordingly, it is likely that an elevated general tendency to compare the body against that of others is responsible for the associated detrimental outcomes.

Collectively, theoretical models and the current state of research suggest that appearance comparison is a potential trigger for the onset, development, and maintenance of unhealthy eating practices. The need to address social comparison in the therapy of eating pathology has fortunately been recognized by clinicians, who have incorporated elements that tackle comparison processes into ED treatment manuals (e.g., Fairburn, 2008). In order to advance existing and develop novel prevention and treatment approaches, it is essential to obtain a more elaborate understanding of how appearance comparisons contribute to eating pathology and which factors may help buffer the harmful effects. The prospect that social media amplifies the engagement in body-focused comparisons is alarming and points to the urgency of working toward these aims.

2.4.2 The Relation between Social Comparison and Physical Activity

The consequences of comparisons about PA are multifaceted. PA comparisons do at times elicit negative effects, but they also hold the potential to induce positive thought and action. These

outcomes can likewise be explained by Festinger's (1954) argument that comparisons cause the perception of a discrepancy between the self and others, which the comparer will aim to reduce. In the domain of PA, a discrepancy between oneself and someone more physically active highlights deficits, which may a) provide inspiration and motivation to enhance the own level of PA or b) demotivate actions to achieve desired fitness goals. A discrepancy between the self and someone less physically active affirms one's superior performance, which may c) encourage the maintenance of regular PA or d) suggest that no further efforts are required.

These possible divergent PA outcomes of social comparisons are well reflected in the inconsistent findings of empirical investigations. While some research found that making comparisons facilitates PA (Arigo & Butryn, 2018; Luszczynska et al., 2004), other evidence indicated that comparisons reduce the engagement in PA (Arigo et al., 2021; Arigo, Pasko et al., 2020). For example, a correlational study among adolescents showed that a stronger general tendency to engage in social comparisons was associated with greater PA (Luszczynska et al., 2004). In contrast, an EMA study revealed that midlife women were less physically active when they reported more (vs. fewer) general comparisons than usual, regardless of the comparison direction (Arigo et al., 2021). In particular, each additional comparison decreased PA in the following 30 minutes by 7-14%.

Research differentiating between upward and downward comparisons has yielded mixed results. Increased PA was related to upward comparisons in some studies (Leahey et al., 2010) but downward comparisons in others (Schumacher et al., 2021). The paradoxical findings prompted Diel and Hofmann (2019) to conduct three experiments, in which they did not only manipulate the comparison direction (upward vs. downward) but also the standard extremity (moderate vs. extreme). Their findings suggest that moderate upward standards (i.e., people working out once or

twice a week) enhance PA motivation and extreme downward standards (i.e., people who have never done any exercise) are demotivating. Although moderate downward (i.e., people working out every few months) and extreme upward standards (i.e., people working out every day) seemed to have some motivational potential, the support for these effects was less consistent.

In the aggregate, the existing literature demonstrates that PA-related consequences of social comparisons can be beneficial as well as harmful and may be affected by a wide variety of individual and situational factors. Due to the anticipated benefits, social comparison has become used as a behavior change technique in PA interventions that, for instance, expose individuals to information about the PA levels of other participants (Howlett et al., 2019). This technique is commonly applied in interventions delivered via smartphone apps (Arigo, Brown et al., 2020). Although there is evidence that social comparison is an effective technique for PA behavior change (Olander et al., 2013), the above-described research findings accentuate that change can take two routes, a positive and a negative one. As it is currently unclear which additional factors contribute to the specific consequences, the applicability of existing interventions utilizing social comparison is limited and, even worse, could backfire and discourage PA (Arigo, Brown et al., 2020; Arigo & Suls, 2018). Accordingly, there is a need for continued research that determines when and which types of comparison motivate or demotivate PA so that positive change can be generated.

3 Appearance Comparisons and Eating Pathology: A Moderated Serial Mediation Analysis Exploring Body Image Flexibility and Body Appreciation as Mediators and Self-Compassion as Moderator

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Abstract

Comparing one's body against the bodies of others is related to lower positive body image and higher eating pathology. Underlying mechanisms as well as protective factors of these relationships are yet to be discovered. The present study examined body image flexibility and body appreciation as potential mediators of the association between appearance comparisons and eating disorder psychopathology. Additionally, it was tested whether self-compassion moderates the mediational effects. In an online sample comprising 250 women ($M_{age} = 42.66$, $SD = 12.24$), the inverse relationship between appearance comparisons and body appreciation was mediated by body image flexibility and the positive relationship between appearance comparisons and eating disorder psychopathology was mediated by body image flexibility and serially mediated by body image flexibility and body appreciation, when controlling for body mass index and age. Simple mediations were further moderated by self-compassion, such that indirect effects were attenuated at high levels of self-compassion. Promoting body image flexibility may be one potential target for helping women to engage in less maladaptive and more adaptive ways of treating the body

when comparing one's appearance. Building self-compassion may be another potential target that may protect body image flexibility and its correlates in the face of appearance comparisons.

Keywords: appearance comparisons; body image flexibility; self-compassion; eating disorders; body appreciation.

Introduction

Many women compare their bodies to those of peers and media images and consequently experience negative thoughts about body weight and shape (Fitzsimmons-Craft et al., 2015; Leahey, Crowther, & Ciesla, 2011; Leahey, Crowther, & Mickelson, 2007). The effects of appearance comparisons are commonly explained using sociocultural models of body dissatisfaction and eating disorders (e.g., Keery, van den Berg, & Thompson, 2004; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; van den Berg, Thompson, Obremski-Brandon, & Coovert, 2002), which argue that frequently engaging in appearance comparisons is a risk factor for body and eating-related disturbances. Indeed, a great body of research demonstrates that heightened appearance comparison tendencies are associated with eating disorder psychopathology (Arigo, Schumacher, & Martin, 2014; Rodgers, Chabrol, & Paxton, 2011; van den Berg et al., 2002). Further, appearance comparisons have been found to be inversely related to *body appreciation*, a form of positive body image which involves taking care of the body by proactively engaging in behaviors to accept, respect, and protect the body (Andrew, Tiggemann, & Clark, 2016; Avalos, Tylka, & Wood-Barcalow, 2005; Homan & Tylka, 2015; Siegel, Huellemann, Hillier, & Campbell, 2020; Tylka & Wood-Barcalow, 2015).

While potential predictors and outcomes of the tendency to engage in appearance comparisons have been extensively explored, underlying mechanisms and protective factors remain mostly unknown. These investigations are likely to have important implications for the development and refinement of interventions that reduce eating pathology and promote a positive stance towards the body.

The Mediating Roles of Body Image Flexibility and Body Appreciation

Cognitive-behavioral models of body image (i.e., Cash, 2011; Webb, Butler-Ajibade, & Robinson, 2014) propose that individuals react to cognitive processes, such as appearance comparisons, with different self-regulatory coping strategies (Cash, 2011; Webb et al., 2014). While eating disorders are conceptualized as maladaptive coping strategies, positive ways of thinking about and treating the body, such as body appreciation and body image flexibility, constitute adaptive strategies in managing distressing cognitions (Webb, 2015; Webb et al., 2014).

Body image flexibility presents the body image-specific version of psychological flexibility, which serves as the foundation and presumed mechanism of change in Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999) (Sandoz, Wilson, Merwin, & Kellum, 2013). It is defined as the capacity to experience and accept unwanted thoughts and feelings regarding the body so that one is able to engage in value-consistent action despite being concerned about body size, weight, or shape (Sandoz et al., 2013). In contrast, diminished levels of body image flexibility and attempts to avoid aversive ideas related to the body have been associated with enhanced eating disorder psychopathology as well as reduced body appreciation among non-clinical samples (see Rogers, Webb, & Jafari, 2018, for a review).

Importantly, a central assumption of ACT is that it is not the disturbing thoughts and feelings per se which elicit dysfunctional behaviors, but rather the way individuals *relate* to these cognitions (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). More specifically and related to body image, it may be the inability to flexibly approach body-related distress that accounts for the negative outcomes associated with unfavorable thoughts (Sandoz et al., 2013). In line with this reasoning, past research has explored diminished body image flexibility as a potential underlying mechanism of the association between dysfunctional body- and eating-related cognitions and

maladaptive behavioral outcomes. For example, Wendell, Masuda, and Le (2012) revealed that, among U.S. female and male undergraduates, the relationship between disordered eating cognitions and disordered eating behaviors is partially attributable to low body image flexibility. Similarly, in a sample of White college-bound females, body image flexibility has been found to partially mediate the association between body dissatisfaction, operationalized as body size discrepancy (i.e., the deviation between current and ideal body size), and body appreciation (Webb, 2015).

Surprisingly, even though cognitive-behavioral models of body image (i.e., Cash, 2011; Webb et al., 2014) explicitly mention appearance comparisons as potential harmful cognitive processes and body image flexibility has been found to explain women's behavioral responses to internal body image threats (e.g., Wendell et al., 2012; Webb, 2015), the mediating effect of body image flexibility in the context of appearance comparisons has only been investigated once. In this study, body image flexibility mediated the relationship between appearance comparisons with peers and inflexible eating among female Portuguese students (Ferreira, Trindade, & Martinho, 2016). Similarly, body image flexibility might also account for the connections between appearance comparisons and eating pathology as well as body appreciation. In other words, we suggest that the use of less adaptive and more maladaptive coping strategies in the presence of frequent appearance comparisons may not be a direct result of the comparison process, but may rather be attributable to the inability to openly confront distressing body-related cognitions.

Not only might appearance comparisons predict eating disorder psychopathology and body appreciation via body image flexibility separately, but the extent to which women appreciate their bodies may contribute to explaining eating pathology in this context. Consistent with this theorizing, body appreciation has been related to lower levels of eating pathology (Gillen, 2015;

Tylka & Wood-Barcalow, 2015). Furthermore, there is evidence that body appreciation mediates the links between intrapersonal body image threats (e.g., perfectionism, self-objectification) and adaptive eating behaviors (i.e., intuitive eating; Augustus-Horvath & Tylka, 2011; Iannantuono & Tylka, 2012). Accordingly, the relationship between appearance comparisons and eating disorder psychopathology might be serially mediated by body image flexibility and body appreciation, respectively.

The Moderating Role of Self-Compassion

One promising candidate for addressing the etiology of poor body image and eating pathology is the cultivation of self-compassion (Braun, Park, & Gorin, 2016). *Self-compassion* involves responding to personal inadequacies or failures with self-kindness rather than self-criticism, a mindful stance rather than overidentification, and the understanding that challenges are part of the human condition rather than isolating experiences (Neff, 2003). Although self-compassion and body image flexibility intersect by both entailing awareness and openness as key processes, self-compassion is conceptually distinct in that it additionally involves self-directed warmth and understanding and is not limited to thoughts about the body (Neff & Dahm, 2015).

Theoretically, treating oneself with compassion when encountering distressing cognitions should allow individuals to effectively regulate arising affect and behavior (Sirois, Kitner, & Hirsch, 2015; Terry & Leary, 2011). In fact, research supports the theory that self-compassion serves a protective function against body and eating disturbances by interacting with risk factors, including heightened appearance comparison tendencies, to disrupt their detrimental effects (see Braun et al., 2016, for a review). Cross-sectional studies showed that the negative effect of appearance comparisons on body appreciation was moderated by self-compassion, such that this effect disappeared when women possessed high levels of self-compassion (Homan & Tylka, 2015;

Siegel et al., 2020). However, other scholars have revealed inconsistencies in the protective role of self-compassion for the link between appearance comparisons and alternative positive body image constructs (e.g., appearance esteem) among girls and adult women (Modica, 2019; Rodgers et al., 2017). Additionally, the role of self-compassion within the association between appearance comparisons and eating disorder psychopathology has not yet been investigated. The mixed results for indicators of positive body image and the absence of research on eating disorder psychopathology point to the need for further examination to clarify whether self-compassion can ameliorate outcomes related to appearance comparisons.

The relationship between self-compassion and body image flexibility has as well received research attention, with results indicating that self-compassion is linked to higher levels of body image flexibility (e.g., Prowse, Bore, and Dyer, 2013; Schoenefeld & Webb, 2013; Webb & Hardin, 2016). Nevertheless, evidence of self-compassion as a moderator of the relationships between body image flexibility and other variables is sparse and has merely been explored in female undergraduate students by Kelly, Vimalakanthan and Miller (2014), who found self-compassion to attenuate the negative association between body mass index (BMI) and body image flexibility, when controlling for self-esteem. To the best of our knowledge, no study has yet explored the protective role of self-compassion in the relationship between appearance comparisons and body image flexibility.

In their conceptual overview of body- and eating-related protective factors, Tylka and Kroon Van Diest (2015) argue that self-compassion may, among other pathways, work by interrupting the mediational chains through which risk factors lead to maladaptive outcomes. In line with this proposition and the theoretical links outlined above, self-compassion might protect

against decreased body image flexibility associated with appearance comparisons and, in turn, against low levels of body appreciation and high levels of eating disorder psychopathology.

The Present Research

The purpose of the present study was to explore the roles of body image flexibility and body appreciation as mediators and self-compassion as moderator in the connection between appearance comparisons and eating disorder psychopathology. We predicted that the associations between appearance comparisons and both eating disorder psychopathology and body appreciation would be mediated via body image flexibility. We also expected that there would be a serial mediation effect of appearance comparisons on eating disorder psychopathology via body image flexibility (first mediator) and body appreciation (second mediator). Further, we hypothesized that self-compassion would moderate the association between appearance comparisons and body image flexibility, such that the hypothesized simple and serial mediation effects would be conditional upon participants' levels of self-compassion.

Method

Participants and Procedure

Data were collected through Amazon's crowdsourcing website Mechanical Turk (MTurk). MTurk is recognized as a reliable and valid tool to gather high-quality data for social science research in general (Buhrmester, Kwang, & Gosling, 2011) and body image research specifically (Gardner, Brown, & Boice, 2012). The study was advertised as an exploration of "women's body and eating-related attitudes and behaviors." Female MTurk workers from the U.S. who had achieved at least a 98% approval rate and completed at least 10,000 hits were eligible for participation. The sample was limited to female workers since women, compared to men, have been found to more frequently engage in appearance comparisons and their body image seems to

be affected more strongly by these comparisons (Davison & McCabe, 2005; Halliwell, 2012; Myers & Crowther, 2009). Consequently, self-compassion may be more likely to protect women, rather than men, from the body image and eating correlates of appearance comparisons.

Interested participants were directed to a survey link. After providing informed consent and indicating their gender (for verification of being female), women completed the measures described below in the listed order. Participants were each remunerated \$2.00 in exchange of their time. Women with large amounts of missing data due to early termination of the study (i.e., answering < 20% of all measure items, $n = 6$) were excluded from the data set. The final sample constituted a total of 250 women, which is considered sufficient based on the recommended sample size of at least 200 for structural equation models (Tomarken & Waller, 2005), as per our planned analysis. Participants were between 23 and 73 years ($M_{age} = 42.66$, $SD = 12.24$) with a BMI [BMI = (weight in pounds/height in inches²) × 703] between 14.88 and 55.08 ($M = 26.99$, $SD = 6.62$). Based on typically utilized BMI classifications, the sample breakdown was: 4.8% underweight (BMI less than 18.5), 40.8% normal weight (BMI between 18.5 and 24.9), 26% overweight (BMI between 25 and 29.9), and 28.4% obese (BMI of 30 and higher). The ethnic background of most participants was White/Caucasian (85.2%), followed by Black/African American (6.4%), Asian (3.2%), Hispanic/Latino (2.8%), and other ethnicities (2.4%). Participants' highest completed education level was some bachelor's degree (44.8%), college (33.2%), master's degree (10.8%), high school degree or less (9.2%), or doctorate (2.0%).

Measures

Appearance comparisons. The Upward and Downward Appearance Comparison Scale (UPACS/DACS; O'Brien et al., 2009) comprises 18 items rated from 1 = *strongly disagree* to 5 = *strongly agree*. The UPACS contains 10 statements on comparisons to people whose appearance

is perceived as superior (upward comparisons; e.g., “I tend to compare myself to people I think look better than me”). The DACS contains eight statements on comparisons to people whose appearance is perceived as inferior (downward comparisons; e.g., “I compare myself to people less good looking than me”). UPACS/DACS scores have demonstrated internal consistency and construct validity among female undergraduates (O’Brien et al., 2009). Given that past research has indicated a strong positive correlation between the UPACS and the DACS among young women (Fardouly, Diedrichs, Vartanian, & Halliwell, 2015; O’Brien et al., 2009; Vartanian & Dey, 2013), items of both subscales were combined and averaged, with higher scores demonstrating a greater tendency to engage in appearance comparisons. Cronbach’s alpha of the combined measure in the present study was .95.

Self-compassion. The Self-Compassion Scale (SCS; Neff, 2003) comprises 26 items rated from 1 = *almost never* to 5 = *almost always*. SCS items can be separated into six subscales measuring the three facets of self-compassion: (a) Self-Kindness (5 items; e.g., “I’m tolerant of my own flaws and inadequacies”) versus Self-Judgment (5 items; e.g., “I’m disapproving and judgmental about my own flaws and inadequacies”), (b) Common Humanity (4 items; e.g., “I try to see my failings as part of the human condition”) versus Isolation (4 items; e.g., “When I fail at something that’s important to me, I tend to feel alone in my failure”) and (c) Mindfulness (4 items; e.g., “When something upsets me I try to keep my emotions in balance”) versus Over-Identification (4 items; e.g., “When I’m feeling down I tend to obsess and fixate on everything that’s wrong”). Scores can be analyzed by calculating mean scores for the six subscales separately or/and by calculating a total score, for which negative subscale items are reverse scored and a grand mean of all subscales is computed. In the current study, both the total score as well as the subscale scores were utilized. While higher negative component (i.e., Self-Judgment, Isolation, and Over-

Identification) scores indicate greater uncompassionate behavior, higher total and positive component (i.e., Self-Kindness, Common Humanity, and Mindfulness) scores indicate greater compassionate behavior. Scores on the SCS have shown internal consistency, 3-week test-retest reliability, and construct validity among primarily female U.S. undergraduates (Neff, 2003, 2016). In this study, Cronbach's alphas were .97 for the total score and .92, .92, .89, .91, .86, and .90 for Self-Kindness, Self-Judgment, Common Humanity, Isolation, Mindfulness, and Over-Identification, respectively.

Eating disorder psychopathology. The Eating Disorder Examination Questionnaire 6.0 (EDE-Q 6.0; Fairburn & Beglin, 1994) contains 28 items that assess eating disorder psychopathology over the past 28 days. Twenty-two items concern the intensity of psychopathology aspects, rated from 0 = *no days/none of the times/not at all* to 6 = *every day/every time/markedly*. These items yield a global score as well as four subscale scores representing Dietary Restraint (e.g., "Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight?"), Eating Concern (e.g., "Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in?"), Shape Concern (e.g., "Has your shape influenced how you think about (judge) yourself as a person?"), and Weight Concern (e.g., "How dissatisfied have you been with your weight?"). A global score is calculated by averaging the subscale scores, with higher scores reflecting higher levels of eating disorder psychopathology. EDE-Q scores have demonstrated internal consistency and 2-week test-retest reliability among various non-clinical female samples (see Berg, Peterson, Frazier, & Crow, 2012, for a review). In the current study, only the 22 items assessing the intensity of eating disorders were administered. Cronbach's alpha of the global score was .94.

Body image flexibility. The Body Image-Acceptance and Action Questionnaire (BI-AAQ; Sandoz et al., 2013) comprises 12 items (e.g., “Worrying about my weight makes it difficult for me to live a life that I value”), rated from 1 = *never true* to 7 = *always true*. All BI-AAQ items are reverse scored and summed, with higher scores representing greater body image flexibility. Scores on the BI-AAQ have shown internal consistency, 3-week test-retest reliability, and construct validity among primarily female U.S. undergraduates and U.S. community women (Sandoz et al., 2013; Timko et al., 2014). In the present study, Cronbach’s alpha was .97.

Body appreciation. The Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015) comprises 10 items (e.g., “I feel good about my body”) rated from 1 = *never* to 5 = *always*. BAS-2 scores are averaged with higher scores indicating higher levels of body appreciation. Scores on the BAS-2 have shown internal consistency, 3-week test-retest reliability, and construct validity in U.S. female community and undergraduate samples (Tylka & Wood-Barcalow, 2015). Cronbach’s alpha in the current sample was .97.

Demographic items. Participants reported their age, ethnic background, highest completed education level, height (in inches), and weight (in pounds). Self-reported height and weight were used to calculate BMI.

Statistical Analyses

Means, standard deviations (SDs), and bivariate correlations were obtained to examine the associations between all study variables (see Table 5). Next, a moderated serial mediation structural equation model was assessed by means of maximum likelihood path analysis (Muthén, Muthén, & Asparouhov, 2017) in Mplus version 7.31. A set of indices were used to determine the fit of the model: Chi-square (χ^2), the root mean square error of approximation (RMSEA) with 90% confidence intervals, the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the

standardized root mean square residual (SRMR) index. Acceptable model fit is indicated by a non-significant χ^2 value, a RMSEA value $< .08$, CFI and TLI values $> .95$, and a SRMR value $< .05$ (Hu & Bentler, 1999). Modification indices were requested to inspect whether the model fit would be improved by including additional, theoretically plausible, pathways (Kline, 2015).

The moderated serial mediation model was quantified in order to determine whether body image flexibility mediated the effects of appearance comparisons on eating disorder psychopathology and body appreciation and whether body image flexibility and body appreciation serially mediated the relationship between appearance comparisons and eating disorder psychopathology. Moreover, this model was utilized to test whether self-compassion moderated the association between appearance comparisons and body image flexibility as well as the potential simple and serial mediation effects. To identify the nature of these associations, conditional effects at low (mean $- 1 SD$), medium (mean), and high (mean $+ 1 SD$) values of self-compassion were inspected. The model was tested using 95% bias-corrected confidence intervals (CIs) based on 5000 bootstrap samples. Significance is demonstrated if the case zero is not contained in the CIs (Muthén et al., 2017). All variables were standardized prior to path analysis.

Results

Data Screening and Descriptive Information

Prior to analysis, data were screened for missing data points, outliers, and violations of assumptions for the planned analysis. Any other items than height and weight were required to continue with the questionnaire. Even though answers to height and weight questions were not mandatory, all completers answered these questions. Therefore, removing non-completers created a data set with no missing data points on any measure. A one-way ANOVA was conducted to test whether completers and non-completers differed in age. No significant difference in age emerged,

$F(1, 254) = 0.63, p = .43$. Outliers were defined as values that were $\pm 3 SD$ the group mean. One univariate outlier for BMI was detected. Four multivariate outliers were detected via Mahalanobis distance. Since removing outliers did not show differences in significance for any test, results for the full sample were reported. All assumptions for the planned analysis were met.

Table 5 provides means, *SDs*, and intercorrelations for all study variables. Appearance comparisons were positively correlated with eating disorder psychopathology and negatively correlated with body image flexibility and body appreciation. Self-compassion was inversely associated with appearance comparisons and eating disorder psychopathology and positively associated with body appreciation. Body image flexibility correlated negatively with eating disorder psychopathology and positively with body appreciation. All correlations were in the anticipated directions. Further, BMI was positively related to eating disorder psychopathology and negatively related to body image flexibility and body appreciation, while age was negatively related to appearance comparisons and positively related to self-compassion, body image flexibility, and body appreciation. On these grounds, BMI and age were included as covariates.

Table 5 Means, Standard Deviations, Score Ranges, and Bivariate Correlations between Variables for Study 3.1^a

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Appearance Comparisons	--												
2. Self-Compassion	-.46***	--											
3. Self-Kindness	-.26***	.86***	--										
4. Self-Judgment	.54***	-.88***	-.71***	--									
5. Common Humanity	-.14*	.76***	.75***	-.48***	--								
6. Isolation	.56***	-.85***	-.58***	.83***	-.47***	--							
7. Mindfulness	-.21**	.83***	.83***	-.58***	.76***	-.51***	--						
8. Over-Identification	.55***	-.86***	-.60***	.84***	-.45***	.85***	-.59***	--					
9. Body Image Flexibility	-.63***	.56***	.43***	-.64***	.23***	-.59***	.33***	-.57***	--				
10. Eating Disorder Psycho-pathology	.56***	-.50***	-.39***	.59***	-.19**	.54***	-.29***	.52***	-.84***	--			
11. Body Appreciation	-.40***	-.70***	.64***	-.65***	.46***	-.58***	.57***	-.63***	.63***	-.61***	--		
12. BMI	.05	-.10	-.05	.16*	.04	.15*	-.04	.13*	-.36***	.42***	-.30***	--	
13. Age	-.21**	.26***	.23***	-.20**	.19**	-.20**	.25***	-.22***	.23***	-.10	.13*	.03	--
<i>M</i>	2.77	3.07	3.07	3.11	3.15	3.06	3.30	2.92	59.84	2.00	3.17	26.99	42.66
<i>SD</i>	0.99	0.98	1.10	1.21	1.14	1.26	1.03	1.24	20.62	1.50	1.11	6.62	12.24
Range ^b	1-5	1-5	1-5	1-5	1-5	1-5	1-5	1-5	12-84	0-6	1-5	14.88-55.08	23-73

Note. $N = 250$; * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed); ^a The numbering of the study was added to this dissertation and is not included in the original published article; ^b Ranges for appearance comparisons, self-compassion, self-kindness, self-judgment, common humanity, isolation, mindfulness, over-identification, body image flexibility, eating disorder psychopathology, and body appreciation represent possible ranges while ranges for BMI and age represent lowest and highest values among the sample.

Test of the Structural Model

The initially tested model showed a non-acceptable fit to the data, $\chi^2(4, N = 250) = 96.28$, $p < .001$, RMSEA (90% CI .25; .36) = .304, CFI = 0.88, TLI = 0.47, SRMR = .054. Modification indices (MIs) indicated that including a direct pathway between self-compassion and body appreciation (MI = 79.13) would improve the model fit. On the basis of past research supporting this association (e.g., Andrew et al., 2016; Kelly & Stephen, 2016; Wasylikiw, MacKinnon, & MacLellan, 2012), this modification was incorporated. The revised model, $\chi^2(3, N = 250) = 1.14$, $p = .76$, RMSEA (90% CI .00; .07) < .001, CFI = 1.00, TLI = 1.00, SRMR = .005, revealed a significantly better fit to the data than the original model, $\chi^2_{difference}(1, N = 250) = 95.14$, $p < .001$.

In order to test whether the revised model, assuming that women who frequently engage in appearance comparisons show lower levels of body image flexibility, is superior to a model assuming that women lower in body image flexibility are prone to making more appearance comparisons, these two models were evaluated against each other. The alternative model with a direct pathway from body image flexibility to appearance comparisons, $\chi^2(7, N = 250) = 32.64$, $p < .001$, RMSEA (90% CI .08; .16) = .121, CFI = 0.97, TLI = 0.90, SRMR = .042, showed a significantly worse fit to the data than the revised model with a direct pathway from appearance comparisons to body image flexibility, $\chi^2_{difference}(4, N = 250) = 31.50$, $p < .001$.

Results of the final model are displayed in Figure 2 and Table 6. The model explained 60% of the variance in body image flexibility, 75% of the variance in eating disorder psychopathology, and 59% of the variance in body appreciation. As expected, the negative pathways from appearance comparisons to body image flexibility, $\beta = -.48$, $p < .001$, 95% CI [-.56; -.39], and

from body image flexibility to eating disorder psychopathology, $\beta = -.67, p < .001, 95\% \text{ CI } [-.76; -.58]$, as well as the positive pathway from body image flexibility to body appreciation, $\beta = .32, p < .001, 95\% \text{ CI } [.20; .43]$, were significant. The direct pathway from appearance comparisons to eating disorder psychopathology, $\beta = .11, p = .01, 95\% \text{ CI } [.04; .17]$, was significant, while the direct pathway from appearance comparisons to body appreciation, $\beta = .04, p = .54, 95\% \text{ CI } [-.07; .14]$, was non-significant. Furthermore, the positive pathways from self-compassion to body image flexibility, $\beta = .30, p < .001, 95\% \text{ CI } [.23; .40]$, and to body appreciation, $\beta = .54, p < .001, 95\% \text{ CI } [.44; .63]$, were significant. Lastly, body appreciation was negatively associated with eating disorder psychopathology, $\beta = -.12, p = .01, 95\% \text{ CI } [-.19; -.04]$.

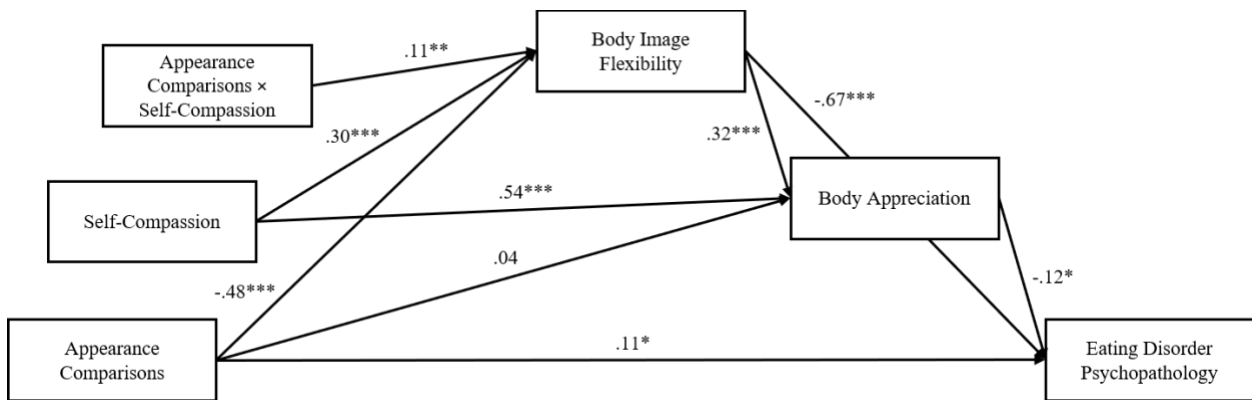


Figure 2. Path Coefficients for the Moderated Serial Mediation Model for Study 3.1.

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, two-tailed; coefficients are standardized; for simplification reasons, control variables are not reported in the figure.

Table 6 Path Coefficients Estimating Predictor–Mediator and Predictor–Criterion Associations for Study 3.1

Predictor	β	SE	95% CI
Mediator: Body Image Flexibility			
Appearance Comparisons	-.48***	.05	-.56; -.39
Self-Compassion	.30***	.05	.23; .39
Appearance Comparisons \times Self-Compassion	.11*	.05	.03; .18
BMI	-.32***	.05	-.40; -.24
Age	.06	.04	-.01; .12
$R^2 = .60$			
Mediator: Body Appreciation			
Appearance Comparisons	.04	.06	-.08; .14
Body Image Flexibility	.32***	.07	.20; .43
Self-Compassion	.54***	.06	.44; .63
BMI	-.13*	.06	-.22; -.04
Age	-.07	.04	-.13; .00
$R^2 = .59$			
Criterion: Eating Disorder Psychopathology			
Appearance Comparisons	.11*	.04	.04; .17
Body Image Flexibility	-.67***	.06	-.76; -.58
Body Appreciation	-.12*	.05	-.19; -.04
BMI	.14***	.04	.08; .21
Age	.08**	.03	.03; .13
$R^2 = .75$			

Note. $N = 250$; * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed); coefficients are standardized.

Tests of Moderated Mediation and Moderated Serial Mediation

First, we examined whether body image flexibility and body appreciation function as mediators in the present model. As expected, tests of indirect effects suggest that appearance comparisons were positively associated with eating disorder psychopathology via body image

flexibility, $\beta = .32, p < .001, 95\% \text{ CI } [.26; .40]$, and negatively associated with body appreciation via body image flexibility, $\beta = -.15, p < .001, 95\% \text{ CI } [-.22; -.09]$. Further, the indirect effect of appearance comparisons on eating disorder psychopathology via body image flexibility and body appreciation (serial mediation) was significant, $\beta = .02, p = .04, 95\% \text{ CI } [.01; .04]$. Note that the indirect effect of appearance comparisons on eating disorder psychopathology via body appreciation was not examined because the non-significant direct effect from appearance comparisons to body appreciation precluded mediation.

To assess the influence of self-compassion on body image flexibility and the respective downstream associations, we examined whether self-compassion moderated the direct effect of appearance comparisons on body image flexibility, the simple mediation effects on eating disorder psychopathology and body appreciation, and the serial mediation effect. In accordance with our hypotheses, the relationship between appearance comparisons and body image flexibility was moderated by self-compassion, as indicated by the significant interaction of appearance comparisons and self-compassion, $\beta = .11, p = .02, 95\% \text{ CI } [.03; .18]$. Conditional effects of appearance comparisons on body image flexibility were significant for low (mean - 1 *SD*) self-compassion, $\beta = -.59, p < .001, 95\% \text{ CI } [-.72; -.44]$, medium (mean) self-compassion, $\beta = -.48, p < .001, 95\% \text{ CI } [-.56; -.39]$, and high (mean + 1 *SD*) self-compassion, $\beta = -.37, p < .001, 95\% \text{ CI } [-.46; -.29]$ (see Figure 3). As indicated by the diverging coefficients, the negative association between appearance comparisons and body image flexibility was weakest at high, compared to medium and low, self-compassion.

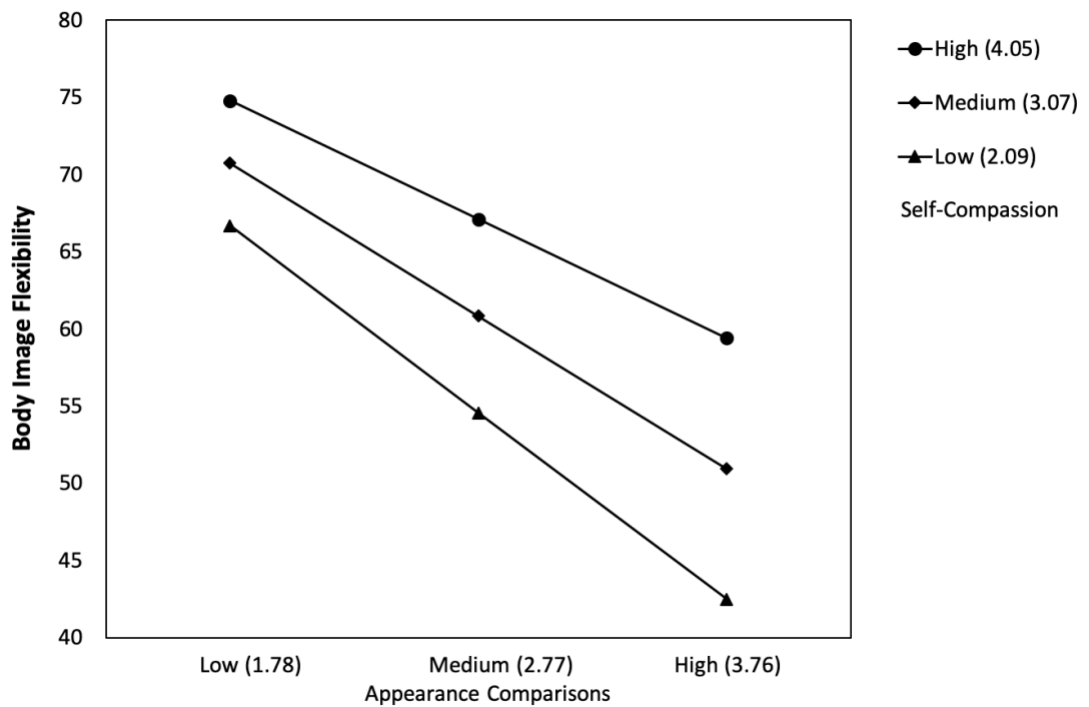


Figure 3. *Conditional Effects of Low (Mean – 1 SD), Medium (Mean), and High (Mean + 1 SD) Levels of Appearance Comparisons on Body Image Flexibility at Low (Mean – 1 SD), Medium (Mean), and High (Mean + 1 SD) Levels of Self-Compassion for Study 3.1.*

Further, the positive indirect effect of appearance comparisons on eating disorder psychopathology via body image flexibility was moderated by self-compassion, $\beta = -.07$, $p = .02$, 95% CI [-.12; -.02]. More specifically, the mediation effect was significant at low, $\beta = .40$, $p < .001$, 95% CI [.30; .50], medium, $\beta = .32$, $p < .001$, 95% CI [.26; .40], and high, $\beta = .25$, $p < .001$, 95% CI [.19; .32], levels of self-compassion. Moreover, the negative indirect effect of appearance comparisons on body appreciation via body image flexibility did depend on self-compassion, $\beta = .03$, $p = .04$, 95% CI [.01; .07]. Conditional effects were significant when levels of self-compassion were low, $\beta = -.19$, $p < .001$, 95% CI [-.28; -.11], medium, $\beta = -.15$, $p < .001$, 95% CI [-.22; -.09], and high, $\beta = -.12$, $p < .001$, 95% CI [-.18; -.07]. Thus, both indirect effects were attenuated most for women high, compared to medium and low, in self-compassion.

Unexpectedly, self-compassion was not found to moderate the positive indirect effect of appearance comparisons on eating disorder psychopathology via body image flexibility and body appreciation, $\beta = -.00, p = .13, 95\% \text{ CI } [-.01; -.00]$. Conditional effects were significant at low, $\beta = .02, p = .04, 95\% \text{ CI } [-.28; -.11]$, medium, $\beta = .02, p = .04, 95\% \text{ CI } [-.22; -.09]$, and high, $\beta = .01, p = .04, 95\% \text{ CI } [-.18; -.07]$, self-compassion.

In follow-up analyses, subscales of the self-compassion measure were utilized to identify whether certain components of self-compassion drove the effects. For this purpose, six separate models with one self-compassion component as the moderator and identical pathways to those of the final model were inspected.¹ Results of these analyses are displayed in Table 7. Moderation effects of the relationship between appearance comparisons and body image flexibility were non-significant for mindfulness, $\beta = .05, p = .26, 95\% \text{ CI } [-.03; .12]$, marginally significant for isolation, $\beta = -.08, p = .06, 95\% \text{ CI } [-.15; -.01]$, and significant for all other self-compassion components (see Table 7). The same pattern of results emerged for moderated mediation effects on eating disorder psychopathology and body appreciation. Moderated serial mediation effects were non-significant for all self-compassion components. Moreover, conditional direct and indirect effects were significant at low, medium, and high levels of the particular self-compassion component for all components.

¹ All models showed acceptable fit to the data: Self-kindness, $\chi^2 (3, N = 250) = 3.30, p = .35, \text{RMSEA } (90\% \text{ CI } .00; .11) = .020, \text{CFI} = 1.00, \text{TLI} = 1.00, \text{SRMR} = .009$, self-judgment, $\chi^2 (3, N = 250) = 1.28, p = .74, \text{RMSEA } (90\% \text{ CI } .00; .08) < .001, \text{CFI} = 1.00, \text{TLI} = 1.00, \text{SRMR} = .004$, common humanity, $\chi^2 (3, N = 250) = 6.47, p = .09, \text{RMSEA } (90\% \text{ CI } .00; .14) = .068, \text{CFI} = 1.00, \text{TLI} = 0.97, \text{SRMR} = .013$, isolation, $\chi^2 (3, N = 250) = 0.53, p = .91, \text{RMSEA } (90\% \text{ CI } .00; .04) < .001, \text{CFI} = 1.00, \text{TLI} = 1.00, \text{SRMR} = .003$, mindfulness, $\chi^2 (3, N = 250) = 5.11, p = .16, \text{RMSEA } (90\% \text{ CI } .00; .13) = .053, \text{CFI} = 1.00, \text{TLI} = 0.98, \text{SRMR} = .011$, over-identification, $\chi^2 (3, N = 250) = 1.56, p = .67, \text{RMSEA } (90\% \text{ CI } .00; .08) < .001, \text{CFI} = 1.00, \text{TLI} = 0.98, \text{SRMR} = .008$.

Table 7 Tests of Moderation, Moderated Mediation, and Moderated Serial Mediation with Conditional Effects for Self-Compassion Components for Study 3.1

Moderator	Moderation			Moderated Mediation			Moderated Serial Mediation			
	Criterion: Body Image Flexibility	Mediator: Body Image Flexibility	Criterion: Eating Disorder Psychopathology	Mediator: Body Image Flexibility	Mediator: Body Image Flexibility	Criterion: Body Image Appreciation	Mediator 1: Body Image Flexibility	Mediator 2: Body Image Appreciation	Criterion: Eating Disorder Psychopathology	
	$\beta(SE)$	95% CI	$\beta(SE)$	95% CI	$\beta(SE)$	95% CI	$\beta(SE)$	95% CI	$\beta(SE)$	95% CI
Self-Kindness	.10(.04)**	.04; .17	-.07(.03)**	-.11; -.03	.04(.02)*	.01; .06	-.00(.00)	-.01; .00		
Low	-.65(.07)***	-.75; -.53	.44(.05)***	.35; .53	-.22(.05)***	-.30; -.15	.03(.01)*	.01; .05		
Medium	-.54(.05)***	-.62; -.47	.37(.04)***	.31; .44	-.19(.04)***	-.25; -.19	.02(.01)*	.01; .04		
High	-.44(.05)***	-.52; -.36	.30(.04)***	.24; .37	-.15(.03)***	-.21; -.10	.02(.01)*	.01; .03		
Self-Judgment	-.12(.05)*	-.19; -.04	.08(.03)*	.03; .13	-.04(.02)*	-.08; -.01	.01(.00)	.00; .01		
Low	-.30(.06)***	-.40; -.21	.20(.04)***	.14; .20	-.10(.03)***	-.16; -.06	.01(.01)*	.01; .03		
Medium	-.41(.06)***	-.51; -.31	.28(.04)***	.22; .36	-.14(.04)***	-.21; -.09	.02(.01)*	.01; .03		
High	-.53(.09)***	-.67; -.38	.36(.06)***	.26; .46	-.18(.05)***	-.28; -.11	.02(.01)*	.01; .04		
Common Humanity	.09(.04)*	.03; .15	-.06(.03)*	-.11; -.02	.04(.02)*	.01; .07	-.01(.00)	-.01; .00		
Low	-.66(.05)***	-.75; -.57	.45(.05)***	.37; .53	-.31(.05)***	-.39; -.24	.04(.02)*	.01; .06		
Medium	-.58(.04)***	-.65; -.51	.39(.04)***	.33; .46	-.27(.04)***	-.34; -.21	.03(.01)*	.01; .06		
High	-.49(.06)***	-.58; -.39	.33(.05)***	.25; .41	-.23(.04)***	-.31; -.16	.03(.01)*	.01; .05		

Moderation		Moderated Mediation				Moderated Serial Mediation	
		Mediator: Body Image Flexibility	Mediator: Body Image Flexibility	Mediator: Body Image Flexibility	Mediator 1: Body Image Flexibility	Mediator 2: Body Appreciation	
Moderator	Criterion: Body Image Flexibility	$\beta(SE)$	95 % CI	$\beta(SE)$	95 % CI	$\beta(SE)$	95 % CI
Isolation	Criterion: Eating Disorder Psychopathology	-.08(.04)	-.15; -.01	.06(.03)	.01; .10	-.04(.02)	-.07; -.01
Low		-.37(.06)***	-.47; -.28	.25(.04)***	.18; .32	-.16(.04)***	-.24; -.10
Medium		-.45(.06)***	-.54; -.35	.30(.04)***	.24; .38	-.20(.05)***	-.28; -.13
High		-.53(.09)***	-.67; -.39	.36(.06)***	.27; .46	-.23(.06)***	-.34; -.14
Mindfulness	Criterion: Eating Disorder Psychopathology	.05(.04)	-.03; .12	-.03(.03)	-.08; .02	.02(.02)	-.01; .05
Low		-.62(.08)***	-.73; -.49	.42(.06)***	.33; .51	-.26(.05)***	-.35; -.18
Medium		-.57(.05)***	-.64; -.49	.38(.04)***	.32; .46	-.24(.04)***	-.32; -.17
High		-.52(.05)***	-.60; -.43	.35(.04)***	.28; .42	-.22(.04)***	-.29; -.15
Over-Identification	Criterion: Eating Disorder Psychopathology	-.10(.05)*	-.18; -.02	.07(.03)*	.02; .12	-.04(.02)*	-.08; -.01
Low		-.36(.06)***	-.46; -.27	.24(.04)***	.18; .32	-.15(.04)***	-.21; -.09
Medium		-.46(.06)***	-.56; -.36	.31(.04)***	.24; .39	-.19(.05)***	-.27; -.12
High		-.57(.09)***	-.71; -.40	.38(.06)***	.28; .49	-.23(.06)***	-.33; -.14

Note. $N = 250$; low = mean $- 1 SD$; medium = mean; high = mean $+ 1 SD$; the predictor was appearance comparisons for all tests; * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed); coefficients are standardized.

Discussion

The present study examined the roles of body image flexibility, body appreciation, and self-compassion in the connection between appearance comparisons and eating disorder psychopathology. In line with previous studies (e.g., Andrew et al., 2016; Arigo et al., 2014; Homan & Tylka, 2015; van den Berg et al., 2002), this study showed that appearance comparisons were positively related to eating disorder psychopathology and negatively related to body appreciation. Results were also consistent with past research (Ferreira et al., 2016) in showing that appearance comparisons were associated with the reduced ability to accept aversive thoughts regarding the body and engage in valued action when having concerns about body size, weight, or shape. Further, self-compassion was linked to lower eating pathology and greater body appreciation and body image flexibility. The findings align with those of Braun et al. (2016), who, in their systematic review on self-compassion, body image, and eating disorder psychopathology, conclude that a kind attitude towards oneself may be advantageous in the domain of body image and eating.

Body Image Flexibility and Body Appreciation as Mediators

In support of our hypotheses, results revealed that body image flexibility mediated the positive relationship between appearance comparisons and eating disorder psychopathology and the inverse relationship between appearance comparisons and body appreciation. Our results align with Webb et al.'s (2014) understanding of body image flexibility as an adaptive self-regulatory mechanism and extend cognitive-behavioral models of body image (i.e., Cash, 2011; Webb et al., 2014), by showing that low levels of body image flexibility may explain the associations between appearance comparison processes and eating pathology as well as body appreciation.

The inverse path between body appreciation and eating disorder psychopathology in this model is consistent with previous research (Gillen, 2015; Tylka & Wood-Barcalow, 2015) and connotes that low levels of body appreciation may contribute to the use of maladaptive eating behaviors. Evidence of serial mediation suggests that the relationship between women's tendency to frequently engage in appearance comparisons and eating pathology may be attributable to an inflexible response style when thinking negatively about their body as well as lacking appreciation of their body. These findings help to expand theoretical frameworks (i.e., Cash, 2011; Webb et al., 2014) since they indicate that comparison processes may be connected to a complex sequencing of cognitive and behavioral self-regulatory coping strategies and provide preliminary insights on the role that positive body image might play in lowering eating disorder pathology.

Self-Compassion as Moderator

As expected, self-compassion moderated the association between appearance comparisons and body image flexibility, such that the positive relationship between appearance comparisons and eating disorder psychopathology via body image flexibility as well as the negative relationship between appearance comparisons and body appreciation via body image flexibility were weakened when women possessed high levels of self-compassion.

The finding that self-compassion weakened the relation between appearance comparisons and body image flexibility highlights self-compassion's potential protective role in cognitive processes related to low body image flexibility. In addition, this is the first study to provide support for the idea that the well-documented association between appearance comparisons and eating disorder psychopathology may be buffered by self-compassion's effect on body image flexibility. By demonstrating that the beneficial effect of self-compassion on body appreciation in the context of appearance comparisons is likely due to self-compassion's amplifying effect on body image

flexibility, results complement the findings by Homan and Tylka (2015) and Siegel et al. (2020) and resolve inconsistencies around self-compassion's beneficial impact on positive body image in the face of appearance comparisons (Rodgers et al., 2017; Modica, 2019).

Contrary to our hypotheses and previous research (Homan & Tylka, 2015; Kelly, Vimalakanthan, et al., 2014; Siegel et al., 2020), the indirect effects of appearance comparisons on eating disorder psychopathology and body appreciation via body image flexibility were not absent but only attenuated at high levels of self-compassion. In addition, the serial mediation effect of appearance comparisons on eating disorder psychopathology via body image flexibility and body appreciation was not significantly moderated by self-compassion. Both findings could be related to the small effect size for the moderation of self-compassion. However, past studies (Homan & Tylka, 2015; Kelly, Vimalakanthan, et al., 2014; Siegel et al., 2020) have observed effect sizes in similar magnitude, which could be attributable to the unfamiliarity with self-compassion in Western culture (Homan & Tylka, 2015). Another explanation may be the very strong association between appearance comparisons and body image flexibility observed in the present study, which could indicate that the potential shielding effects of self-compassion may have certain limits.

Results of the follow-up analyses, which showed that the proposed relationships were not moderated by mindfulness but by all other self-compassion components, suggest that becoming aware of one's negative body-related thoughts may not be sufficient to buffer against frequent appearance comparisons. Instead, practicing self-kindness, recognizing common humanity, and avoiding self-judgment, isolation, and over-identification seem to be the active ingredients, protecting from eating pathology and low positive body image related to appearance comparisons. Nevertheless, mindfulness may constitute a prerequisite for the other self-compassion components (e.g., awareness of negative thoughts may be required to face these with kindness; Neff & Dahm,

2015). Clearly, there is a need for continued investigation of which self-compassion aspects are most relevant for the development of positive body image and the prevention and treatment of eating disorders.

The current findings hold several implications for preventive and treatment efforts to mitigate the risk of eating disorders and poor body image. First, the mediating effects of body image flexibility tentatively suggest that cultivating body image flexibility could present an instrumental approach to managing appearance comparisons. Targeting how women relate to stressful internal events instead of aiming to reduce or eliminate appearance comparisons is likely to be the more promising strategy, especially since modern technologies such as social media platforms (e.g., Instagram) provided women with ample opportunities to engage in comparisons (Fardouly et al., 2015) and comparison processes may even occur automatically, outside conscious awareness (Want, 2009). Although promising, longitudinal and experimental investigations are clearly needed to confirm these assumptions.

Second, the moderating effects of self-compassion propose that building a compassionate stance towards the self in general may help women to more skillfully accept negative thoughts about the body and to continue engaging in value-consistent action despite experiencing aversive content. Thus, encouraging self-kindness and the perspective that everyone experiences disappointments and suffering, could provide means to adaptively manage dysfunctional cognitions regarding the body, to abstain from unhealthy eating practices, and above and beyond to engage in positive ways of treating the body. Indeed, evidence suggests that interventions for increasing self-compassion, including therapeutic approaches (e.g., Compassion Focused Therapy; Gilbert, 2010), are effective in reducing body image concerns and eating disorders (Albertson, Neff, & Dill-Shackleford, 2014; Gale, Gilbert, Read, & Goss, 2014; Kelly & Carter, 2015; Kelly,

Carter, & Borairi, 2014). However, more research investigating the effects of self-compassion interventions in subclinical populations is warranted (Steindl, Buchanan, Goss, & Allan, 2017). Additionally, the development of affordable interventions for improving self-compassion skills (e.g., online programs or smartphone apps) is necessary to improve accessibility (Linardon, Susanto, Tepper, & Fuller-Tyszkiewicz, 2020).

Limitations and Additional Future Research Directions

The results of this study should be interpreted in acknowledgment of several limitations that inform areas of future research. First, the cross-sectional and correlational design does not allow to draw conclusions about cause-and-effect relationships. Future research employing longitudinal and experimental designs is needed. For example, ecological momentary assessment (EMA) methods (e.g., through daily diary) could clarify whether the proposed relationships hold true for real-life cognitions and behaviors. Further, it would be interesting to test whether self-compassion interventions are capable to protect from appearance comparisons and result in greater adaptive eating and body image coping.

Second, this study investigated a non-clinical sample of adult women. It is currently unclear whether the shown associations exist in girls and adolescent females as well as those who have been diagnosed with clinical-level eating disorders or body dysmorphic disorder. Replicating results for these target groups is important, given that it is particularly common for girls and adolescent women to compare their bodies (Warren, Schoen, & Shafer, 2010) and that appearance comparisons have been identified as a maintenance factor for eating pathology (Fairburn, 2008). Additionally, it would be interesting to explore whether the same associations hold true for men, especially since appearance comparisons have as well been associated with lower body appreciation and greater disordered eating among men (Alleva, Paraskeva, Craddock, & Diedrichs,

2018; Halliwell & Harvey, 2006) and self-compassion has been found to buffer the relationship between body image concerns and eating pathology in men (Linardon et al., 2020). It should further be noted that the mean age of this sample ($M_{age} = 42.66$) is higher compared to most body image research samples. Potential reasons for this deviation could be that many body image studies utilize student samples, which have been found to be significantly younger than MTurk worker samples (Paolacci, Chandler, & Ipeirotis, 2010), and that older women might have been more willing or interested to participate in a survey on body and eating-related attitudes and behaviors.

A third limitation to this study pertains the psychometric properties of the utilized measures. The BI-AAQ as well as the SCS have recently been criticized for capturing the absence of body image flexibility and self-compassion, respectively, rather than the presence of these constructs (López et al., 2015; Webb et al., 2015).

An interesting direction for future research could be to explore whether body image flexibility also accounts for the negative outcomes related to alternative external and internal body image threats (e.g., exposure to idealized images, self-objectification, thin- and athletic-ideal internalization). Since the present results indicate that body image flexibility may serve as an intermediary process of disturbing internal experiences about the body and adaptive outcomes, future research could investigate whether a flexible approach towards disturbing thoughts about the body also explains the negative associations between appearance comparisons and additional adaptive outcomes, such as a more broad conceptualization of beauty, body pride, attunement (i.e., body responsiveness and mindful self-care), or intuitive eating, which have all been shown to correlate with body image flexibility (Rogers et al., 2018).

Conclusion

Frequently evaluating one's body against how other bodies look like may be related to less adaptive and more maladaptive strategies to cope with body- and eating-related distress. However, dysfunctional behaviors could be attributable to an avoidant approach when thinking negatively about the body as well as to low appreciation of one's body. Cultivating a general attitude of self-compassion may help women to accept distressing internal events about the body, which could protect them against harmful behaviors related to heightened appearance comparison tendencies. Though future experimental research is required, the findings highlight the potential value of targeting body image flexibility and self-compassion as factors for the prevention and treatment of eating disorders as well as the promotion of positive body image.

4 Perceived Similarity Determines Social Comparison Effects of More and Less Physically Active Others

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Abstract

This research tested whether the effects of physical activity (PA) comparisons depend on the perceived similarity to the comparison standard. In three experimental studies, participants compared themselves to either a more or a less physically active person. Results showed that perceived similarity determined comparison outcomes: Participants' PA self-evaluation and self-efficacy were higher when focusing on similarities with more (vs. less) (Study 4.1²) and dissimilarities with less (vs. more) active others (Study 4.1 and 4.2). Reconsidering an unfavorable similarity judgment (i.e., noticing similarities with less and dissimilarities with more active others) increased participants' PA self-evaluation, self-efficacy, and intention (Study 4.3).

Keywords: social comparison; physical activity; exercise; self-evaluation; self-efficacy.

² The numbering of the studies was adapted to the structure of this dissertation and deviates from the numbering in the submitted manuscript.

Introduction

Despite evidence that regular physical activity (PA) results in mental and physical health benefits (Warburton et al., 2006), more than a quarter of the global adult population do not meet the World Health Organization's (WHO) recommendations for sufficient PA (Guthold et al., 2018). Accordingly, the promotion of PA presents an urgent target within the health psychology domain. In line with various theoretical frameworks (Bandura, 2004; Deci & Ryan, 2008), social influences largely contribute to whether and to what extent individuals engage in PA (McNeill et al., 2006). One particular social influence that predicts individuals' PA is the comparison with others (Luszczynska et al., 2004). However, the factors determining whether a comparison results in beneficial or adverse outcomes, as well as the underlying mechanisms explaining these effects, remain largely unexplored. In addition, research on strategies that could be applied to modify PA comparison consequences is lacking. These investigations are likely to yield valuable implications for the effective use of social comparison in the promotion of PA.

Social Comparison and PA Self-Evaluation and Self-Efficacy

Comparisons with others are a ubiquitous part of everyday life that shapes how we think about our abilities and performances (Marsh et al., 2020). In the realm of PA, social comparisons may play a crucial role in the formation of two specific types of self-beliefs, namely *PA self-evaluation* and *self-efficacy*. First, the evaluation of one's PA is predicted by comparisons in this context. For example, Chanal et al. (2005) showed that students evaluated their physical abilities less positively when their classmates were highly skilled in gymnastics than when they possessed fewer gymnastic skills. Second, self-efficacy, the belief in one's capability to execute behaviors, is affected by observing the behavior of others (Bandura, 1977). Social comparison can be

considered a specific type of observational learning and may thus impact efficacy beliefs (Carmona et al., 2008).

The Moderating Role of Perceived Similarity

Social comparisons can have both positive and negative impacts on the comparer. While comparisons with others performing better (i.e., *upward comparisons*) can inspire self-improvement, they can also be discouraging. Comparisons with others doing worse (i.e., *downward comparisons*) can boost self-views, but can also lead to reduced efforts to improve and pursue goals (Bellizzi et al., 2006; Suls et al., 2002). A comparison's outcome can thus not be determined by the *comparison direction* alone, suggesting that additional factors are most likely involved.

One such factor may be the *perceived similarity* to the comparison standard, which can be understood through the lens of the selective accessibility model (SAM; Mussweiler, 2003): When faced with a comparison opportunity, individuals first make a rapid judgment of overall similarity between themselves and the standard and subsequently focus on information consistent with this initial assessment. As a result, focusing on information confirming similarity is likely to lead to assimilation (i.e., moving self-beliefs toward the standard) and focusing on information confirming dissimilarity is likely to lead to contrast (i.e., moving self-beliefs away from the standard). Taken together, comparisons should have positive impacts when focusing on similarities with an upward (vs. downward) and when focusing on dissimilarities with a downward (vs. upward) standard (Mussweiler, 2003).

Despite preliminary evidence substantiating the role of perceived similarity in PA comparisons (Diel & Hofmann, 2019; Mussweiler et al., 2004b), the potential moderating effect of perceived similarity in the context of PA comparisons has not been examined until now. We

suggest that perceived similarity will moderate the effect of comparison direction on PA self-evaluation and self-efficacy. We predict that individuals will evaluate their PA more positively and feel more efficacious to engage in PA if they focus on similarities with an upward (vs. downward) standard. Conversely, individuals should have a more favorable evaluation and greater efficacy beliefs if they focus on dissimilarities with a downward (vs. upward) standard.

The Mediating Roles of Self-Evaluation and Self-Efficacy

Self-evaluation and self-efficacy present important sources for goal commitment and self-improvement (Garcia et al., 2013; Martin et al., 2016). The importance of self-beliefs for the willingness to engage in PA has long been recognized by theoretical models for health behavior change (Bandura, 2004; Ryan & Deci, 2007) and is supported by empirical evidence (Biddle et al., 2021). Hence, comparison effects on PA self-evaluation and self-efficacy may be positively associated with PA intention. As both of these self-beliefs have been shown to mediate the links between social environmental factors and PA intention and behavior (Kim et al., 2020; Puente & Anshel, 2010), we suggest that they will mediate the link between comparison direction and PA intention.

Considering the Opposite as a Strategy for Influencing PA Comparison Effects

Given that comparisons with others have benefits but also drawbacks, it is vital to explore strategies that could be applied to influence unfavorable comparison outcomes and ultimately promote PA. One candidate for doing so may be the *consider-the-opposite strategy* (COS) (Lord et al., 1984; Mussweiler et al., 2000), which involves generating evidence contradicting one's initial beliefs (i.e., anchors). By increasing the accessibility of previously neglected information, the COS reduces people's tendency to rely on anchors when making judgments (Mussweiler et al., 2000).

There is currently no evidence for the application of the COS in the realm of social comparison. As perceived similarity to a comparison standard can be contemplated an anchor, we expect that the COS can be used to elicit information contrary to the initially perceived similarity, which may ultimately alter comparison outcomes. Specifically, we propose that PA self-evaluation, self-efficacy, and intention will increase after participants consider the opposite of their initial focus on dissimilarities with an upward standard and similarities with a downward standard. We expect a decrease in these values after participants consider the opposite of their initial focus on similarities with an upward and dissimilarities with a downward standard.

The Present Research

The first aim of the present research is to test the proposed moderated mediation model, including comparison direction (predictor), perceived similarity (moderator), and PA self-evaluation and self-efficacy (mediators) for the prediction of PA intention (outcome). The second aim of this research is to explore whether comparison effects can be influenced via the COS. Three experiments were conducted. In Study 4.1, participants were asked how much they focused on similarities and differences with an upward or downward comparison standard. Study 4.2 used a perceived similarity manipulation, instructing participants to focus on similarities or differences with either standard. In Study 4.3, participants were instructed to consider the opposite of their initial perceived similarity.

Study 4.1

In Study 4.1, we manipulated the comparison direction (upward vs. downward) and subsequently assessed participants' perceived similarity to the standard as well as their PA self-evaluation, self-efficacy, and intention.

Methods

Participants and Procedure

Participants were recruited through Amazon’s Mechanical Turk (MTurk). MTurk workers from the U.S. between 18 and 64 years old were eligible for participation. A G*Power analysis (Faul et al., 2007) indicated a required sample size of $N = 92$, assuming a medium effect size ($f^2 = 0.15$), $\alpha = .05$, power = .80, and a multiple linear regression model with five predictors. The sample included 240 respondents (see Table 8). Participants received US-\$1.50 as compensation. All study procedures followed the ethical principles of the Declaration of Helsinki (World Medical Association, 2013).

Table 8 Participants’ Demographic Characteristics and Past-Week Physical Activity for Study 4.1, 4.2, and 4.3

	Study 4.1		Study 4.2		Study 4.3	
	<i>M (SD)</i>	<i>Range</i>	<i>M (SD)</i>	<i>Range</i>	<i>M (SD)</i>	<i>Range</i>
Age	41.00 (11.05)	18.00- 64.00	40.56 (10.72)	20.00- 64.00	40.96 (10.76) ^a	20.00- 64.00
BMI	26.60 (7.39) ^a	14.06- 58.82	26.70 (5.82)	16.80- 47.76	27.02 (5.94)	14.43- 52.12
Past-Week PA (MET minutes)	2709 (2766)	0-13968	2895 (3676) ^a	0-23172	2899 (3501)	0-25998
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Gender						
Female	129	53.75	147	59.27	131	53.69
Male	111	46.25	98	39.52	108	44.26
Non-binary	0	0.00	2	0.81	2	0.82
Other	0	0.00	0	0.00	1	0.41
Prefer not to say	0	0.00	1	0.40	2	0.82
Education level						
High school degree or less	29	12.08	35	14.11	20	8.20
Some college	76	31.67	56	22.58	75	30.74
Bachelor’s degree	99	41.25	119	47.98	112	45.90
Master’s degree	31	12.92	35	14.11	32	13.11
Doctorate	5	2.08	1	0.40	3	1.23
Prefer not to say	0	0.00	2	0.81	2	0.82

	Study 4.1		Study 4.2		Study 4.3	
	<i>M (SD)</i>	<i>Range</i>	<i>M (SD)</i>	<i>Range</i>	<i>M (SD)</i>	<i>Range</i>
Ethnic background						
White/Caucasian	194	80.83	202	81.45	192	78.69
Hispanic/Latino	14	5.83	12	4.84	5	2.05
Black/African American	15	6.25	15	6.05	19	7.79
Asian	11	4.58	12	4.84	22	9.02
Other	5	2.08	5	2.02	2	0.82
Prefer not to say	1	0.42	2	0.81	4	1.64

Note. PA = physical activity. ^a Conditions differed significantly. The pattern of the main analyses results did not change when condition differences were accounted for by including affected variables as covariates.

Participants first read the letter of information, provided informed consent, and indicated their gender to provide them with a same-sex standard description for the social comparison task.³ Participants were then asked to complete the social comparison task, which was described as a pretest of stimulus material for another study. Next, participants indicated the degree to which they focused on similarities and differences with the standard and completed the measures described below in the listed order.⁴

Social Comparison Task

To manipulate the comparison direction, about half of the participants read the description of an upward standard (*upward condition*), while the other half read the description of a downward standard (*downward condition*; see Appendix). The upward standard was described as a person who regularly engages in sports, incorporates movement into everyday life, and has good physical abilities. The downward standard was described as a person who does not engage in any sport, avoids movement in everyday life, and has poor physical abilities. Participants were then instructed

³ In case “non-binary” or “prefer not to say” were chosen for gender, the standard description was randomly assigned.

⁴ For PA-related measures, it was noted that PA refers to any bodily movement that requires energy expenditure.

to write a few sentences about how their PA compares to the standard. For statistical analyses, the dummy-coded variable *comparison direction* (i.e., 0 = upward; 1 = downward) was created.

Measures

Perceived similarity. Similarity was measured by four items asking about the extent to which participants focused on similarities (e.g., “While comparing yourself to [Name], how much did you focus on similarities between yourself and [Name]?”; Cronbach’s $\alpha = .96$) and four items on the extent to which participants focused on dissimilarities with the standard (e.g., While comparing yourself to [Name], how much did you focus on differences between yourself and [Name]?”; $\alpha = .97$). Items were rated from 1 = *not at all* to 5 = *most of the time* (see Arigo et al., 2015, for a similar procedure). Separate mean scores were calculated.⁵

PA self-evaluation. PA self-evaluation was assessed with three items (“How satisfied are you with your level of PA?”, “How physically active do you find yourself?”, “How good do you feel about your level of PA?”; $\alpha = .97$) rated from 1 = *not at all* to 7 = *very much* (see Papies & Nicolaije, 2012, for a similar procedure).

PA self-efficacy. PA self-efficacy was measured with three items (“I am confident that I can find means and ways to be physically active”, “I am confident that I can accomplish my PA goals that I set”, “I am confident that I can overcome barriers and challenges with regard to PA if I try hard enough”; $\alpha = .90$) drawn from the Exercise Self-Efficacy Scale (Kroll et al., 2007). Items were rated from 1 = *not at all true* to 4 = *always true*.

PA intention. Based on guidelines for measuring intention (Ajzen, 2019), three items (“I intend to be physically active over the next 7 days”, “I will frequently exercise in the upcoming 7

⁵ See Appendix for factor analysis and moderated mediation results using dissimilarity as moderator.

days”, “Next week, I will be physically active in my daily life”; $\alpha = .95$) were rated from 1 = *strongly disagree* to 7 = *strongly agree*.

Past-week PA. For descriptive purposes, time spent being physically active over the past week was assessed using the International PA Questionnaire Short Form (IPAQ-SF; Craig et al., 2003). Guidelines for data processing (IPAQ Research Committee, 2005) were followed to calculate metabolic equivalent of task (MET) minutes.

Perceived comparison direction. To test whether the comparison direction manipulation was successful, one item (“Compared to [Name], I am ...”), rated from 1 = *much less physically active* to 7 = *much more physically active*, was included.

Demographics. In addition to the identified gender and age, participants indicated their ethnicity, education, height (in inches), and weight (in pounds).

Data sharing

De-identified datasets, syntax, outputs, explanatory-memo, and supplemental materials are available at <http://doi.org/10.17605/OSF.IO/67PQA>.

Results

As evidence of a successful manipulation, participants in the upward condition rated themselves to be less physically active than the standard ($M = 2.13$, $SD = 1.19$), whereas participants in the downward condition rated themselves to be more physically active than the standard ($M = 5.79$, $SD = 1.13$), $t(238) = -24.46$, $p < .001$.

We estimated a moderated mediation model using PROCESS Model 7 (Hayes, 2015) with 5,000 bootstrap samples to test whether similarity moderated the potential indirect relationship between comparison direction and PA intention via self-evaluation and self-efficacy. To identify

the nature of the interaction, conditional effects at low (mean -1 SD) and high (mean $+1$ SD) similarity were inspected. Continuous variables were standardized prior to analyses.

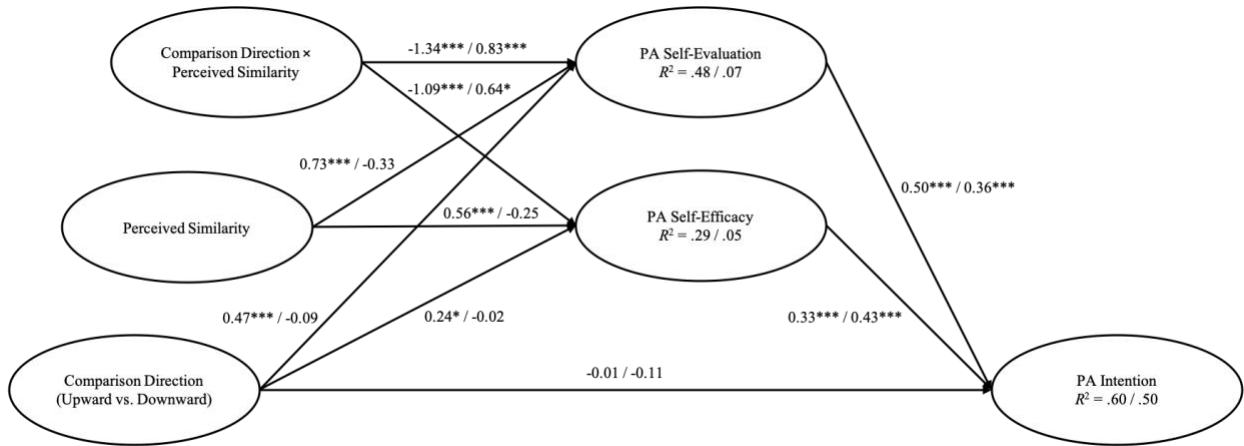


Figure 4. Moderated Mediation Results for Study 4.1 and 4.2.

Note. Perceived similarity constitutes a continuous variable in Study 4.1 and a categorical variable (similarity vs. dissimilarity) in Study 4.2. Coefficients to the left of the slash refer to Study 4.1 and the ones to the right of the slash refer to Study 4.2; COS = consider-the-opposite strategy; PA = physical activity; * $p < .05$, *** $p < .001$ (two-tailed); coefficients are unstandardized.

Results revealed significant Comparison Direction \times Similarity effects on PA self-evaluation, $B = -1.634$, $SE = .10$, $p < .001$, and self-efficacy, $B = -1.09$, $SE = .11$, $p < .001$ (see Figure 4). Conditional effects of comparison direction on PA self-evaluation were significant for low, $B = 1.81$, $SE = .14$, $p < .001$, and high similarity, $B = -0.87$, $SE = .14$, $p < .001$. Conditional effects of comparison direction on PA self-efficacy were significant for low, $B = 1.33$, $SE = .16$, $p < .001$, and high similarity, $B = -0.84$, $SE = .16$, $p < .001$. In other words, when similarity to the comparison standard was high, participants comparing upward had higher levels of PA self-evaluation and self-efficacy than those comparing downward. When similarity was low, PA self-evaluation and self-efficacy were greater for participants comparing downward (vs. upward) (see Table 9).

Table 9 Means and Standard Deviations of PA Self-Evaluation and Self-Efficacy per Condition for Study 4.1 and 4.2

Measures	Study 4.1			Study 4.2		
		PA Self-Evaluation	PA Self-Efficacy		PA Self-Evaluation	PA Self-Efficacy
	<i>n</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>n</i>	<i>M(SD)</i>	<i>M(SD)</i>
Upward Similarity	120	4.86(1.60)	3.35(0.78)	58	4.03(1.71)	3.10(0.74)
Downward Similarity	120	3.35(2.06)	2.74(1.00)	65	3.87(1.76)	3.09(0.62)
Upward Dissimilarity	120	2.32(2.00)	2.53(0.97)	65	3.45(1.74)	2.93(0.69)
Downward Dissimilarity	120	5.47(1.63)	3.49(0.79)	60	4.73(1.59)	3.36(0.57)

Note. PA = physical activity. Response scales ranged from 1 = *not at all* to 7 = *very much* for PA self-evaluation and from 1 = *not at all true* to 4 = *always true* for PA self-efficacy. For Study 4.1, scores at low (mean – 1 *SD*) and high (mean + 1 *SD*) perceived similarity are presented.

Congruent with our hypotheses, tests of conditional indirect effects suggest that the relationship between comparison direction and PA intention was mediated by PA self-evaluation at low, $B = 0.90$, $SE = .15$, 95% CI [0.61; 1.19], and high similarity, $B = -0.43$, $SE = .10$, 95% CI [-0.63; -0.24]. Likewise, the relationship between comparison direction and PA intention was mediated by PA self-efficacy at low, $B = 0.45$, $SE = .13$, 95% CI [0.23; 0.71], and high similarity, $B = -0.29$, $SE = .10$, 95% CI [-0.52; -0.12]. The results further revealed significant moderated mediation indices for PA self-evaluation, $B = -0.66$, $SE = .11$, 95% CI [-0.88; -0.44] and self-efficacy, $B = -0.37$, $SE = .11$, 95% CI [-0.59; -0.18].

Discussion

Study 4.1 showed that the effects of upward and downward comparisons depend on the extent to which similarities and differences between the self and the standard are recognized. Participants who focused on similarities with the standard evaluated their PA more positively and felt more efficacious to engage in PA if they read about an upward, compared to a downward standard. Participants who focused on dissimilarities had higher levels of PA self-evaluation and self-efficacy if they read about a downward, compared to an upward standard. Further, PA self-

evaluation and self-efficacy explained the association between comparison direction and intention. These findings provide a potential explanation for the differential effects observed in research examining PA upward and downward comparisons in isolation (Lockwood et al., 2005; Shakya et al., 2015) and add to investigations of factors moderating PA comparison effects (e.g., standard extremity; Diel & Hofmann, 2019).

Whereas perceived similarity was measured in Study 4.1, Study 4.2 tested whether experimentally manipulating participants' perceived similarity has similar effects. These insights would offer implications regarding how PA comparisons could be influenced so that favorable self-beliefs and the willingness to be active are promoted.

Study 4.2

Study 4.2 aimed to replicate the results of Study 4.1, using a similarity manipulation (similarity vs. dissimilarity) first and a comparison direction manipulation (upward vs. downward) second.

Methods

Participants and Procedure

The recruitment, eligibility criteria, procedures, and sample size calculations for Study 4.2 resembled these of Study 4.1. In total, 248 participants took part in the study (see Table 8). A similarity manipulation was added to the comparison task: Before reading the upward or downward standard description, participants were instructed to either focus on similarities or differences in terms of PA. Accordingly, participants were randomized to one of the following conditions: *upward similarity*, *downward similarity*, *upward dissimilarity*, and *downward dissimilarity*. Perceived similarity items (see Study 4.1) were used as manipulation checks and assessed as the last measure before the demographics.

Measures

The measures were identical to those used in Study 4.1. Cronbach's α was .94, .87, .94, .96, and .98 for PA self-evaluation, self-efficacy, intention, similarity, and dissimilarity, respectively.

Results

Participants in the upward conditions ($M = 1.95$, $SD = 1.17$) judged themselves to be less physically active than the standard, while participants in the downward conditions ($M = 5.81$, $SD = 1.17$) judged themselves to be more physically active than the standard, $t(246) = -25.94$, $p < .001$. Participants in the similarity conditions indicated a greater similarity to the standard ($M = 3.60$, $SD = 1.30$) than those in the dissimilarity conditions ($M = 2.49$, $SD = 1.34$), $t(246) = 6.65$, $p < .001$. Conversely, participants in the similarity conditions indicated lower values of dissimilarity ($M = 3.10$, $SD = 1.39$) than those in the dissimilarity conditions ($M = 4.19$, $SD = 1.15$), $t(246) = -6.73$, $p < .001$.

Analyses identical to these applied in Study 4.1 were used to test for moderated mediation. As expected, the Comparison Direction \times Similarity effects on PA self-evaluation, $B = 0.83$, $SE = .25$, $p < .001$, and self-efficacy, $B = 0.64$, $SE = .25$, $p = .01$, were significant (see Figure 4). Conditional effects of comparison direction on PA self-evaluation were significant for the dissimilarity, $B = 0.73$, $SE = .17$, $p < .001$, and unexpectedly, non-significant for the similarity condition, $B = -0.09$, $SE = .18$, $p = .60$. Conditional effect of comparison direction on PA self-efficacy were significant for the dissimilarity, $B = 0.62$, $SE = .18$, $p < .001$, but non-significant for the similarity condition, $B = -0.02$, $SE = .18$, $p = .93$. Participants focusing on differences with a downward standard evaluated their PA more positively and felt more efficacious to be active than participants focusing on differences with an upward standard (see Table 9).

Conditional indirect effects of comparison direction on PA intention via PA self-evaluation were significant for the dissimilarity, $B = 0.27$, $SE = .08$, 95% CI [0.13; 0.44], and non-significant for the similarity condition, $B = -.03$, $SE = .07$, 95% CI [-0.18; 0.10]. Similarly, conditional indirect effects of comparison direction on PA intention via PA self-efficacy were significant for the dissimilarity, $B = 0.27$, $SE = .08$, 95% CI [0.12; 0.44], but non-significant for the similarity condition, $B = -0.01$, $SE = .08$, 95% CI [-0.16; 0.16]. Indices of moderated mediation were significant for both PA self-evaluation, $B = 0.30$, $SE = .11$, 95% CI [0.11; 0.53], and self-efficacy, $B = 0.28$, $SE = .11$, 95% CI [0.06; 0.50].

Discussion

Study 4.2 demonstrated that participants had higher levels of PA self-evaluation and self-efficacy if they focused on dissimilarities with a downward rather than an upward standard. Surprisingly, participants who were instructed to focus on similarities with an upward (vs. downward) standard did not exhibit greater PA self-evaluation and self-efficacy. This finding may be explained in light of recent meta-analysis results (Gerber et al., 2018), which suggest that there is only weak support for the assimilation effects predicted by Mussweiler (2003). The authors conclude that assimilation may require similarity priming rather than explicit induction. Nevertheless, the current findings yield experimental evidence for the crucial role of perceived similarity in PA comparisons. Moreover, PA self-evaluation and self-efficacy mediated the association between comparison direction and intention, but only if participants focused on dissimilarities.

These findings show that (a) the perception of dissimilarity can be induced by explicit instruction to seek for differences with others before overall similarity is assessed, and (b) doing so has important downstream effects. Study 4.2's findings do, however, not offer insights on

whether perceived similarity can also be manipulated after the initial similarity judgment, as defined by the SAM (Mussweiler, 2003), has already taken place. This drawback was addressed by Study 4.3, in which we examined the COS as a potential debiasing strategy for modifying comparison outcomes.

Study 4.3

Study 4.3 aimed to test whether considering the opposite of one's initial similarity judgment would impact PA comparison outcomes. We first manipulated the comparison direction (upward vs. downward) and assessed similarity and outcome measures. Secondly, we manipulated similarity employing the COS and repeatedly measured outcomes.

Methods

Participants and Procedure

Sample size calculations (G*Power; Faul et al., 2007) predicted a required sample size of $N = 92$, assuming a medium effect size, $\alpha = .05$, power = .80, and a repeated measures design with four groups and two measurements. A total of 244 respondents took part in the study (see Table 8). In the first part (T1), participants engaged in the social comparison task used in Study 4.1, indicated whether they focused on similarities or differences, and completed outcome measures. In the second part (T2), they engaged in a second comparison with the same standard but were asked to consider the opposite of their initially reported similarity and to list as many similarities (vs. differences) between the self and the standard, in terms of PA, as they could find. Subsequently, participants completed outcome measures again.

Participants were thus randomized to one of the following conditions: upward similarity at T1 with a dissimilarity focus during the COS at T2 (*upward initial similarity COS*), upward dissimilarity at T1 with a similarity focus during the COS at T2 (*upward initial dissimilarity COS*),

downward similarity at T1 with a dissimilarity focus during the COS at T2 (*downward initial similarity COS*), downward dissimilarity at T1 with a similarity focus during the COS at T2 (*downward initial dissimilarity COS*). To reinforce participants' willingness to think about information contradicting their initial impression, it was added to the task description that, during comparisons, people tend to notice similarities (vs. differences) at first but become aware of differences (vs. similarities) when taking a closer look. Perceived similarity items (see Study 4.1) were used as manipulation checks.

To provide a rationale for the COS task, participants were told that the study would aim to explore people's ability to adapt their thinking and broaden their perspectives. One filler item (i.e., "Overall, how difficult or easy did you find the task to adapt your thinking?"), rated from 1 = *very difficult* to 5 = *very easy*, was used to substantiate the cover story. Participants received US-\$2.00 as compensation. The remainder of the procedure was identical to Study 4.1.

Measures

COS. The dummy-coded variable COS (i.e., 0 = initial similarity; 1 = initial dissimilarity) was created using one item assessing the perceived similarity at T1 (i.e., "While comparing yourself to [Name], did you rather focus on similarities or differences between yourself and [Name]?"). This item could be answered with "*I rather focused on similarities between myself and [Name]*" or "*I rather focused on differences between myself and [Name]*."

The remaining measures were identical to those used in Study 4.1. Cronbach's α was .96, .90, and .95, for PA self-evaluation, self-efficacy, and intention at T1, respectively, and .97, .92, and .96 at T2. Cronbach's α was .98 for similarity and .99 for dissimilarity.

Results

As anticipated, participants in the upward conditions judged themselves to be less active than the standard ($M = 2.40$, $SD = 1.43$), while participants in the downward conditions judged themselves to be more active than the standard ($M = 5.65$, $SD = 1.26$), $t(242) = -18.84$, $p < .001$. Further, participants focusing on similarities during the COS indicated a greater similarity to the standard ($M = 4.30$, $SD = 0.80$) than those focusing on differences ($M = 2.34$, $SD = 1.31$), $t(242) = -14.50$, $p < .001$. In contrast, participants focusing on similarities during the COS indicated lower values of dissimilarity ($M = 2.26$, $SD = 1.27$) than those focusing on differences ($M = 4.07$, $SD = 1.10$), $t(242) = 11.14$, $p < .001$.

Separate mixed ANOVAs were conducted to test the potential three-way interaction effect between Comparison Direction (upward vs. downward), COS (initial similarity vs. initial dissimilarity), and Time (T1 vs. T2) on PA self-evaluation, self-efficacy, and intention. Simple effects of Time within Comparison Direction and COS were inspected to identify for which conditions the time differences existed.

Results revealed a significant Time \times Comparison Direction \times COS effect on PA self-evaluation, $F(1, 240) = 30.30$, $p < .001$, $\eta_p^2 = .11$ (see Table 10). Self-evaluation increased from T1 to T2 in the upward initial dissimilarity, $F(1, 240) = 28.29$, $p < .001$, $\eta_p^2 = .11$, and the downward initial dissimilarity COS conditions, $F(1, 240) = 6.82$, $p = .01$, $\eta_p^2 = .03$. There was a marginally significant decrease in self-evaluation in the downward initial dissimilarity COS condition, $F(1, 240) = 3.18$, $p = .08$, $\eta_p^2 = .03$, and no significant time difference in self-evaluation in the upward initial similarity COS condition, $F(1, 240) = 2.64$, $p = .11$, $\eta_p^2 = .01$.

The Time \times Comparison Direction \times COS effect on PA self-efficacy was significant, $F(1, 240) = 26.40$, $p < .001$, $\eta_p^2 = .10$. Self-efficacy increased from T1 to T2 in the upward initial

dissimilarity, $F(1, 240) = 22.08, p < .001, \eta_p^2 = .08$, and the downward initial similarity COS conditions, $F(1, 240) = 4.83, p = .03, \eta_p^2 = .02$. Self-efficacy decreased in the downward initial dissimilarity COS condition, $F(1, 240) = 5.53, p = .02, \eta_p^2 = .02$. Participants in the upward initial similarity COS condition did not show significant changes in self-efficacy over time, $F(1, 240) = 2.28, p = .13, \eta_p^2 = .01$.

The Time \times Comparison Direction \times COS effect on PA intention was significant, $F(1, 240) = 16.89, p < .001, \eta_p^2 = .07$. Intention increased from T1 to T2 in the upward initial dissimilarity, $F(1, 240) = 23.06, p < .001, \eta_p^2 = .09$, and the downward initial similarity COS conditions, $F(1, 240) = 12.36, p = .001, \eta_p^2 = .05$. There were no significant differences in intention across time in both the upward initial similarity and downward initial dissimilarity COS conditions, $F(1, 240) = 0.08, p = .77, \eta_p^2 = .00$ and $F(1, 240) = 0.003, p = .96, \eta_p^2 = .00$, respectively.⁶

⁶ See Appendix for moderated mediation analyses with difference scores reflecting PA self-evaluation, self-efficacy, and intention change from T1 to T2.

Table 10 Condition Differences in Study Variables over Time for Study 4.3

Condition	Constructs												
	PA Self-Evaluation				PA Self-Efficacy				PA Intention				
	T1	T2	Simple Effects of Time	η_p^2 ; F tests	T1	T2	Simple Effects of Time	η_p^2 ; F tests	T1	T2	Simple Effects of Time	η_p^2 ; F tests	
	$M(SD)$	$M(SD)$	η_p^2 ; F tests	$M(SD)$	$M(SD)$	$M(SD)$	η_p^2 ; F tests	$M(SD)$	$M(SD)$	$M(SD)$	η_p^2 ; F tests	$M(SD)$	$M(SD)$
Upward Initial Similarity COS ($n = 47$)	5.49 (1.32)	5.30 (1.47)	.01; 2.64	3.51 (0.50)	3.42 (0.51)	6.17 (1.00)	.01; 2.28	6.17 (1.00)	6.20 (0.93)	6.20 (0.93)	.00; 0.08	6.20 (0.93)	6.20 (0.93)
Downward Initial Similarity COS ($n = 38$)	2.75 (1.60)	3.10 (1.76)	.03; 6.82**	2.63 (0.71)	2.78 (0.84)	3.98 (1.73)	.02; 4.83*	3.98 (1.73)	4.36 (1.95)	4.36 (1.95)	.05; 12.36***	4.36 (1.95)	4.36 (1.95)
Upward Initial Dissimilarity COS ($n = 69$)	2.72 (1.69)	3.24 (1.80)	.11; 28.29***	2.79 (0.75)	3.03 (0.80)	4.20 (1.85)	.08; 22.08***	4.20 (1.85)	4.59 (1.91)	4.59 (1.91)	.09; 23.06***	4.59 (1.91)	4.59 (1.91)
Downward Initial Dissimilarity COS ($n = 90$)	4.75 (1.46)	4.60 (1.66)	.01; 3.18	3.34 (0.61)	3.24 (0.70)	5.79 (1.41)	.02; 5.53*	5.79 (1.41)	5.78 (1.38)	5.78 (1.38)	.00; 0.003	5.78 (1.38)	5.78 (1.38)
Time \times Comparison Direction \times COS			η_p^2 ; F test				η_p^2 ; F test				η_p^2 ; F test		
			.11; 30.30***				.10; 26.40***				.07; 16.89***		

Note. Simple effects of Time within Comparison Direction and COS; COS = consider-the-opposite strategy; PA = physical activity; response scales ranged from 1 = *not at all* to 7 = *very much* for PA self-evaluation, from 1 = *not at all true* to 4 = *always true* for PA self-efficacy, and from 1 = *strongly disagree* to 7 = *strongly agree* for PA intention; * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed).

Discussion

Study 4.3 showed that PA self-evaluation, self-efficacy, and intention improved from T1 to T2 if participants reconsidered their initial focus on dissimilarities with an upward and similarities with a downward standard. These findings offer preliminary evidence for the COS as an effective strategy for debiasing similarity perceptions, which may bring about improvements in how individuals evaluate their PA as well as how capable they feel and how willing they are to execute PA.

General Discussion

In three studies, we shed light on how social comparisons impact PA self-evaluation, self-efficacy, and intention. Grounded in the SAM (Mussweiler, 2003), the present research demonstrates that the effects of comparisons with more and less active others depend on the perceived similarity to that person. We found that participants evaluated their PA more favorably and felt more efficacious to be physically active when focusing on dissimilarities with a downward rather than an upward standard (Study 4.1 and 4.2) and when focusing on similarities with an upward rather than a downward standard (Study 4.1).

Additionally, we showed that the impact of one's initial similarity judgment can be partly compensated by the COS (Study 4.3). By demonstrating the COS' applicability in the domain of social comparison, our findings add value to previous research on its use for correcting anchoring effects (Mussweiler et al., 2000). While outcomes improved in the favorable conditions (i.e., downward initial similarity COS and upward initial dissimilarity COS), they did not decline in the unfavorable conditions (i.e., upward initial similarity COS and downward initial dissimilarity COS). These findings lend support for a potential fortunate mechanism: The search for contradictory evidence may be prevented if self-defeating outcomes would arise. Exploring

whether such a protective mechanism exists, at which instances it occurs, and how it works present avenues for future research.

The results also provide insights into the mediating roles of PA self-evaluation and self-efficacy in the relationship between comparison direction and PA intention. The impact of comparisons on the beliefs about how active one is and how active one can be may thus explain *why* comparisons contribute to individuals' intention to engage in PA. These results align with social-cognitive models stressing the importance of self-beliefs in health behavior change (Bandura, 2004).

The current findings should be interpreted in light of several limitations. First, the relationships between mediators and the dependent variable are correlational (Pirlott & MacKinnon, 2016), preventing conclusions about whether PA self-evaluation and self-efficacy causally affect intention. Second, given the PA intention-behavior discordance (Rhodes & de Bruijn, 2013), we cannot be certain about whether the observed changes in intention would cause behavior change. Third, the robustness of the COS effect could be studied in more detail, expanding time differences between T1 and T2 by using communication materials of public health bodies (e.g., WHO).

Conclusion

Collectively, our findings are promising from an individual-level perspective, as they suggest that effortful thought can be used to selectively increase the accessibility of similarity information to favorably impact PA comparison effects. Efforts to focus on differences with less active and similarities with more active others may foster a positive view of one's abilities, which is essential to taking action.

5 General Conclusion

The central aim of the present dissertation was to examine the contribution of social comparison to human health, specifically with regard to the fields of eating pathology and PA. This chapter summarizes the main findings and draws theoretical and practical implications. The key limitations of the studies and future directions for research will also be described. Table 11 summarizes the main findings and implications of the studies conducted.

Table 11 Summary of the Main Findings presented in Chapter 3 and 4

Chapter 3		Chapter 4	
	Study 3.1	Study 4.1	Study 4.2
Objectives	Test the proposed moderated serial mediation model: appearance comparisons (predictor), self-compassion (moderator), body image flexibility (mediator 1), body appreciation (mediator 2), eating disorder psychopathology (outcome).	Test the proposed moderated mediation model: comparison direction (predictor), perceived similarity (moderator), PA self-evaluation and self-efficacy (mediators), PA intention (outcome).	Replicate the results of Study 4.1 using a perceived similarity manipulation.
Method	Online survey via MTurk (N = 250)	Online survey via MTurk (N = 240)	Online survey via MTurk (N = 248)
Main findings	<ul style="list-style-type: none"> - Appearance comparisons were positively associated with eating disorder psychopathology. - Body image flexibility and body appreciation serially mediated this association. - Self-compassion moderated the mediation effects of body image flexibility. 	<ul style="list-style-type: none"> - Perceived similarity moderated the effects of comparison direction on PA self-evaluation and self-efficacy. - PA self-evaluation and self-efficacy mediated the association between comparison direction and PA intention. 	<ul style="list-style-type: none"> - The proposed moderated mediation model held true. - Dissimilarity, but not similarity, moderated the indirect effects of comparison direction on PA intention via self-evaluation and self-efficacy.
			Online survey via MTurk (N = 244)
			<ul style="list-style-type: none"> - PA self-evaluation, self-efficacy, and intention increased from T1 to T2 if participants considered the opposite of their initial focus on dissimilarities with an upward and similarities with a downward standard.

Chapter 3

Study 3.1

Chapter 4

Study 4.2

Study 4.3

Main findings

- Findings of decreased outcomes from T1 to T2 if participants considered the opposite of their initial focus on similarities with an upward or downward standard were largely absent.

- Implications
- The promotion of body image flexibility could help women treat their bodies in more adaptive and less maladaptive ways when faced with appearance comparisons.
 - Establishing and strengthening women's self-compassion may protect them from the harmful correlates of appearance comparisons.

- The effects of PA comparisons depend on the perceived similarity to more and less active others.
- Focusing on differences with less and similarities with more active others may improve PA-related outcomes.
- Perceived similarity can be affected via cognitive effort and thus presents a potential target for promoting PA.

Note. MTurk = Mechanical Turk (Amazon's crowdsourcing website); COS = consider-the-opposite strategy; PA = physical activity.

5.1 Summary of Findings and Theoretical Implications

With respect to the domain of eating, this dissertation shows that women's tendency to make comparisons about their appearance is associated with lower positive body image and higher eating pathology. This finding is in line with previous studies (Drutschinin et al., 2018; Schaefer & Thompson, 2014, 2018) and suggests that frequent comparison of the own body to those of others may trigger unhealthy and pathological eating.

The present research extends theoretical frameworks that capture the relationship between social comparisons, body image, and eating pathology (e.g., Cash, 2011; Fitzsimmons-Craft et al., 2014; van den Berg et al., 2002) in two ways. First, these models do not differentiate between comparisons to superior or inferior others and, accordingly, lack clarity as to which specific type of comparison brings about the associated adverse effects. Past research on the predictive utility of downward comparisons for body image concerns and ED symptoms is also inconsistent (Drutschinin et al., 2018; Fitzsimmons-Craft, 2017; Lin & Soby, 2016). The present finding that appearance comparisons were exclusively related to negative outcomes, although participants reported the frequency of both upward and downward comparisons, helps resolve these inconsistencies and suggests that comparisons to less attractive others may be as harmful as comparisons to more attractive others. It is therefore relevant that investigations of theoretical models use measures that assess comparisons in both directions, such as the Upward and Downward Appearance Comparison Scale (UPACS/DACS; O'Brien et al., 2009) or the Physical Appearance Comparison Scale-3 (PACS-3; Schaefer & Thompson, 2018).

Second, theoretical frameworks have, so far, mainly contemplated body dissatisfaction as an explanatory variable for how appearance comparisons may be linked to eating pathology (Donovan et al., 2020; Hockey et al., 2021; Rodgers et al., 2011). This dissertation provides

preliminary support for the role of two positive body image facets in this relationship, namely body image flexibility and body appreciation. It proves that the reduced ability to accept negative thoughts about one's appearance and low levels of appreciation for the own body may explain the disturbed eating behaviors related to elevated appearance comparison tendencies. Future studies that test whether positive ways of treating the body can counteract frequent appearance comparisons will be useful.

The present research further expands the self-compassion literature by clarifying the role of self-compassion within the connection between appearance comparisons and eating pathology. At the same time, it contributes to investigations of protective factors against poor body image and eating pathology in general (Crago et al., 2001; Levine & Smolak, 2016) and, more specifically, in the face of comparisons about the body (Homan & Tylka, 2015; Siegel et al., 2020). It reveals that high levels of self-compassion may weaken the association between appearance comparisons and eating pathology by its beneficial impact on body image flexibility. This finding suggests that a compassionate stance toward the self may help women adaptively manage body comparisons and could protect them from hazardous eating behaviors.

With regard to the domain of PA, this dissertation unravels the consequences of comparisons with more and less active others. Past research found that both upward and downward comparisons can give rise to positive and negative outcomes (Arigo et al., 2021; Lockwood et al., 2005). The determining and explanatory factors of these effects are currently unclear. The present three studies address these gaps and clarify that the outcomes of PA comparisons may depend on the perceived similarity with the person of interest. In particular, looking for similarities with more active and differences with less active others may make one feel more positive about the own activity level, more efficacious to be physically active, and, ultimately, more willing to engage in

PA. Noticing similarities with inactive and differences with active people could result in declines in these outcomes. On these grounds, it can be inferred that efforts to focus on differences with less and similarities with more active others could promote PA.

Moreover, the results of Study 4.1 and Study 4.2 indicate that the relationship of upward and downward comparisons with the intention to engage in PA may be attributable to the comparison's effect on how the own performance is evaluated and how capable one feels to execute PA. This insight demonstrates the importance of addressing PA-related self-beliefs when aiming to raise individuals' PA levels.

Lastly, Study 4.3 shows that thinking about why one's initial impression of similarity or dissimilarity may be incorrect could improve the outcomes of unfavorable comparison processes (i.e., focusing on dissimilarities with more active or similarities with less active others) and encourage individuals to maintain or initiate PA. By doing so, this dissertation provides preliminary evidence for the efficacy of a cognitive technique in controlling comparison consequences. Correspondingly, it accentuates the role of self-determined action in social comparison: Although many comparisons are executed automatically (Mussweiler et al., 2004a; Stapel & Blanton, 2004), this does not imply that we completely lack influence on these processes. Instead, taking a step back and reconsidering one's assessment could be an effective tool for altering comparison outcomes and improving health.

Collectively, the present research in the domain of PA advances our understanding of how social comparison can be harnessed to generate health-enhancing behaviors. It provides additional empirical evidence to support the SAM (Mussweiler, 2003) and proves its usefulness for explaining the consequences of PA comparisons. Moreover, to our knowledge, it constitutes the

first application of the COS (Lord et al., 1984; Mussweiler et al., 2000) within the realm of social comparison.

Taking a holistic view on both research fields covered in this dissertation, it is striking that comparisons regarding appearance were consistently associated with negative body- and eating-related cognitions and behaviors, but comparisons about PA had favorable effects under certain circumstances. This finding demonstrates that comparison effects can vary greatly, depending on the domain in question, which aligns with prior research showing that body comparisons may be less inspiring than ability-, lifestyle-, or opinion-based comparisons (McKee et al., 2013). The seemingly oppositional results may, however, also be interpreted in light of a similarity that becomes apparent when taking a closer look: Social comparisons are assigned frustrating effects in the body image and ED literature (Myers & Crowther, 2009; Rodgers et al., 2011) but motivating effects in the PA literature (Diel & Hofmann, 2019; Diel et al., 2021). However, the attempts to change the body associated with appearance comparisons may also be seen as increased motivation, despite in a destructive form (i.e., the motivation to alter weight and shape may manifest in unhealthy behavioral patterns such as restrictive eating, purging, or overexercising). A valuable direction for future research would be to explore when and how this motivational force is accompanied by action that supports rather than undermines health (e.g., eating a balanced diet, exercising for functionality and health reasons).

5.2 Practical Implications

The findings presented in this dissertation offer several practical implications for how disordered eating practices may be reduced and PA can be enhanced. Evidence of chapter 3 highlights the importance of addressing social comparison in the prevention and treatment of poor body image and eating pathology. Empirically supported cognitive-behavioral treatment manuals

for body and eating disturbances do provide guidance on how to handle comparison-making (Cash, 2008; Fairburn, 2008). However, these primarily focus on identifying and reducing the frequency with which comparisons about shape and weight are made. While these goals are undoubtedly relevant for those who engage in comparison to an elevated extent, it is unreasonable to believe that women can escape the many comparison prompts they face on a daily basis and abstain from comparison completely.

The present findings suggest that, instead of trying to reduce or eliminate appearance comparisons, teaching women how to adaptively manage these experiences may be a more fruitful strategy. Body image flexibility and self-compassion present two potential targets for improving the capacity to cope with appearance comparisons. In particular, cultivating body image flexibility and self-compassion should allow females to recognize intrusive thoughts about the body, attend to them in a non-judgmental and compassionate manner, and continue to engage in valued living without acting on them via unhealthy coping strategies, such as dietary restriction, binge eating, or compensatory behaviors (Sandoz et al., 2013). Research shows that these skills can be enhanced through psychological interventions and that such enhancements are effective in reducing eating pathology (see Linardon et al., 2021; Braun et al., 2016, for reviews). For example, a 12-session program comprised of psychoeducation, mindfulness, and compassion successfully increased body image flexibility and self-compassion and decreased eating pathology in obese women diagnosed with binge eating disorder, compared to a waitlist control group. These improvements were maintained at three and six months post intervention (Pinto-Gouveia et al., 2017).

On these grounds, it can be concluded that ED prevention and treatment efforts should inform about the harmful effects of appearance comparisons. They should further support the cultivation of a compassionate approach toward the self in general and a flexible handling of

aversive body-related thoughts in order to attenuate the effects of unfavorable comparisons. Psychoeducation may initially be used to create awareness around the serious consequences of constantly comparing one's looks. Third-wave behavioral therapies, such as Acceptance and Commitment Therapy (Hayes et al., 2011) and Compassion-Focused Therapy (Gilbert, 2009), provide means to incorporate the development of body image flexibility and self-compassion into clinical practice. Non-clinical and subclinical populations may benefit from self-compassion guided meditations and exercises based on the Mindful Self-Compassion (MSC) training protocol (Germer & Neff, 2019). Moreover, techniques such as mirror reflections (i.e., looking into the mirror and assessing what one sees) or self-monitoring by writing a body image diary could facilitate acceptance of difficult body thoughts and emotions (Cash, 2011).

The findings of chapter 4 suggest that, when appropriately applied, social comparison may be used to raise individuals' PA levels. Desirable effects could be achieved by focusing on differences with less active and similarities with more active others. Several individual-level recommendations can be deduced from this insight. Given that people typically respond to comparisons in contrastive ways (i.e., they focus on discrepancies between the self and the person of interest) and predominantly compare themselves to better-performing others (Gerber et al., 2018), there is a need to increase the visibility of downward comparison standards. One strategy that may allow individuals to recognize their superiority in terms of PA could be to increase the diversity in their surroundings. It could be helpful, not only to compare the self against friends with similar interests and capacities but to broaden one's horizon and actively call to mind persons who are less physically active. Differentiating the own performance from those of others doing worse is likely to boost self-beliefs and encourage the maintenance of regular PA and good health.

In order to improve the outcomes of dissimilarity-focused comparisons with better-performing others, it could be beneficial to put one's appraisals into question and generate counterarguments (e.g., "Am I really that different from this sporty person?", "Are there similarities between the two of us that I may have overlooked?"). Doing so may make one realize that an unfavorable assessment was incorrect. The same strategy can be applied when similarities with worse-performing others present the focus of attention. Notably, this cognitive approach requires a certain degree of conscious processing, which is not always given due to the automatic nature of social comparisons (Gilbert et al., 1995). Practicing mindfulness could help individuals' become aware of biases in comparison-making and reconsider similarity judgments from an objective stance. Despite preliminary evidence that mindfully engaging in comparison leads to more accurate performance evaluations of creativity (Langer et al., 2010), the potential beneficial impact of mindfulness on similarity perceptions during social comparison will need to be put to the test in future investigations.

Although currently lacking empirical support in the domain of social comparison, there is reason to believe that self-regulation tools, such as implementation intentions (i.e., "When I compare myself to someone who is more physically active, I will focus on similarities with that person."; Gollwitzer, 1999), may as well serve to control similarity perceptions and improve PA comparison outcomes. The use of if-then plans is particularly promising as these have been shown to operate automatically, once consciously set up (Sheeran et al., 2006), and were found to effectively generate health behavior change (Hagger & Luszczynska, 2014).

The findings of chapter 4 further hold societal-level implications. First, they suggest that positive role models like famous athletes could promote PA by highlighting common grounds. They could, for example, report about the beginnings of their career and the struggles they had to

overcome. Narratives as these may make superstars from the world of sport appear more similar, which could induce inspiration. Second, the present evidence emphasizes that developers of behavior change interventions utilizing social comparison should take the following individual factors into account: (a) the person's level of PA in relation to that of others who serve as comparison standards and (b) the perceived similarity to these standards. Incorporating such personal information into interventions certainly presents a major challenge as it is not always accessible. Nevertheless, there is hope for innovative solutions that put these recommendations into practice. For instance, Zhu et al. (2021) recently used artificial intelligence to personalize social comparison features of a PA promotion app (i.e., users' preferences for upward or downward comparison were inferred and the steps of others were adapted accordingly). This personalization indeed enhanced PA motivation.

5.3 Limitations and Future Research Directions

The studies presented in this dissertation possess limitations that point to valuable directions for future research. First, all studies employed self-report measures and did not examine actual behavior. Self-report measures are prone to recall and response biases, such as inaccurate memory or social desirability, limiting their validity (Althubaiti, 2016). Future research may benefit from applying direct measures. For PA, this could be realized via the use of motion sensors (i.e., accelerometers, pedometers) or by direct observation in laboratory settings (e.g., distance traveled on a treadmill). The direct assessment of eating pathology presents a greater challenge and may only be feasible in clinical settings. Precision and accuracy may nevertheless be improved by means of EMA methodology, which includes repeated sampling of current behaviors in real-time and natural settings (e.g., through smartphone apps, text messaging, or online surveys).

Second, the cross-sectional nature of the study on eating pathology and the vignettes used in the studies regarding PA limit the ecological validity of the findings. It would be insightful to investigate the effects of more realistic, real-life comparisons, such as those taking place via social media. These platforms prompt comparisons about appearance, healthy eating, and PA with strangers as well as people who are personally known and therefore constitute an important target for social comparison research. The findings of Study 3.1 should additionally be interpreted with caution as the study design induces the problem of reverse causality (i.e., the direction of the investigated relationship may be the other way around such that, instead of X affecting Y , Y affects X) (Leszczensky & Wolbring, 2019). The present results indicate that appearance comparisons are associated with eating pathology in some way, but the causal direction of this association remains unclear. It could be that appearance comparisons lead to increased eating pathology. However, the converse, namely that eating pathology causes greater appearance comparison tendencies, is also plausible. The fact that eating disorder psychopathology was assessed over the past 28 days may have enhanced the possibility of reverse causality. Research designs capturing the cause and effect relationship between appearance comparisons and eating pathology would offer valuable clarification.

Third, the data collection for all studies took place via Amazon's crowdsourcing website MTurk. While MTurk is considered a valid instrument for obtaining social science data of high quality (Buhrmester et al., 2018), MTurk workers may not accurately represent the general population. They tend to be younger, lower in household income, higher in education, and politically more democratic-oriented than the U.S. adult population (Casey et al., 2017; Levay et al., 2016). In terms of health, MTurk workers were found to be more likely to report being in excellent health and to exercise but, at the same time, also demonstrated higher levels of

psychopathology, including EDs (Kambanis et al., 2021; Walters et al., 2018). These differences restrict the generalizability of the present findings and call for research using more representative samples.

Fourth, the studies presented in chapter 4 were conducted in the midst of the COVID-19 pandemic. During this time, most American states implemented policy measures to reduce the spread of the virus, which invited people to self-isolate and stay at home. Governments banned athletic programs and closed gyms. While some barriers to PA may have been removed due to the pandemic (e.g., lack of time), individuals' opportunities to exercise and integrate movement into daily life have simultaneously been impaired (Symons et al., 2021). These extraordinary circumstances may have influenced participants' evaluation and efficacy beliefs about PA as well as their intention to be physically active and consequently present a potential confounder in this research.

Lastly, this dissertation examined appearance and PA comparisons separately from each other. It is, however, likely that comparisons about the body, eating, and PA collectively impact healthful as well as unhealthy eating and PA practices (Saunders et al., 2019; Fitzsimmons-Craft, 2017). Moreover, the relationship between these two health behaviors may be of reciprocal nature. While increased PA may lead to the consumption of a more healthful diet and vice versa (Annesi & Porter, 2013), maladaptive PA behaviors (e.g., overexercising, exercising despite injury, illness, or fatigue) may fuel pathological eating and the other way around (Meyer et al., 2011). Future studies should consider these interrelations and take a holistic perspective to determine the effects of eating-, body-, and PA-related comparisons.

5.4 Closure Statement

This dissertation contributes to social comparison research in the context of human health and demonstrates the relevance of social comparison processes in health-related cognitions and behaviors. In the realms of eating pathology and PA, it provides evidence for a factor determining positive or negative outcomes (i.e., perceived similarity), underlying mechanism explaining associations and effects (i.e., body image flexibility, body appreciation, PA self-evaluation, PA self-efficacy), a protective factor (i.e., self-compassion), and a strategy for improving health consequences (i.e., consider-the-opposite strategy). These insights assist a better coping with unfavorable comparisons and shed light on how social comparison can be harnessed as a tool for promoting health.

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Appendix

Supplemental material for chapter 4: Perceived Similarity Determines Social Comparison Effects of More and Less Physically Active Others

A. Social Comparison Task Descriptions

Female Upward Standard

For as long as she can remember, Anna has engaged in some kind of sport. During her school time, she has been a member of the swim and volleyball team and participated in several other team sports. Until today, she has been swimming three times a week. In addition, Anna has a passion for running and strength training. She usually goes for a run two times a week and strengthens her muscles two times a week for 45 minutes each. In her daily life, Anna also looks for any possible opportunity to move. Although she does not live close to her office, she rides her bike to get there every morning, regardless of the weather conditions. This takes her about 30 minutes one way. Further, she takes the stairs and walks short to medium distances. Regular physical activity allows Anna to be strong and flexible at the same time. She can easily touch her toes when bending forward and she has no trouble carrying heavy groceries. She also has a good endurance, enabling her to climb the stairs to the third floor without arriving out of breath. Anna's active lifestyle results in improved overall health and a longer life expectancy. Given her active and healthy lifestyle, she is among the privileged small group of people who have the very lowest risk for developing cardiovascular diseases, bone diseases, diabetes, obesity, and mental illnesses such as depression.

Female Downward Standard

For as long as she can remember, Anna has hated sports. She has never participated in any kind of sport during her time at school. She has tried out swimming, running, strength training as well as volleyball and several other team sports but doesn't keep up doing any sports. During her leisure time, Anna prefers activities that require no or little body movement. If her friends ask her to join them on a hike in the mountains or to go swimming in summer, she usually refuses. In her daily life, Anna also tries to avoid any possible opportunity to move. Walking to her office would take her around 10 minutes. Although she lives close to the office, she takes public transport or the car to get there, every morning, because she finds walking extremely boring and avoids it as much as she can. Further, she tries to avoid stairs and takes the elevator or the escalator instead. Since Anna does not move a lot, she is weak and inflexible. She is not able to reach her toes when bending forward and has trouble carrying heavy groceries. She also has a bad endurance, which leaves her out of breath when climbing the stairs from the ground floor to the first floor. Anna's inactive lifestyle results in decreased overall health and a shorter life expectancy. Given her inactive and unhealthy lifestyle, she is in the small group of people who have the very highest risk for developing cardiovascular diseases, bone diseases, diabetes, obesity, and mental illnesses such as depression.

Male Upward Standard

For as long as he can remember, John has engaged in some kind of sport. During his school time, he has been a member of the swim and volleyball team and participated in several other team sports. Until today, he has been swimming three times a week. In addition, John has a passion for running and strength training. He usually goes for a run two times a week and strengthens his muscles two times a week for 45 minutes each. In his daily life, John also looks for any possible opportunity to move. Although he does not live close to his office, he rides his bike to get there every morning, regardless of the weather conditions. This takes him about 30 minutes one way. Further, he takes the stairs and walks short to medium distances. Regular physical activity allows John to be strong and flexible at the same time. He can easily touch his toes when bending forward and he has no trouble carrying heavy groceries. He also has a good endurance, enabling him to climb the stairs to the third floor without arriving out of breath. John's active lifestyle results in improved overall health and a longer life expectancy. Given his active and healthy lifestyle, he is among the privileged small group of people who have the very lowest risk for developing cardiovascular diseases, bone diseases, diabetes, obesity, and mental illnesses such as depression.

Male Downward Standard

For as long as he can remember, John has hated sports. He has never participated in any kind of sport during his time at school. He has tried out swimming, running, strength training as well as volleyball and several other team sports but doesn't keep up doing any sports. During his leisure time, John prefers activities that require no or little body movement. If his friends ask him to join them on a hike in the mountains or to go swimming in summer, he usually refuses. In his daily life, John also tries to avoid any possible opportunity to move. Walking to his office would take him around 10 minutes. Although he lives close to the office, he takes public transport or the car to get there every morning because he finds walking extremely boring and avoids it as much as he can. Further, he tries to avoid stairs and takes the elevator or the escalator instead. Since John does not move a lot, he is weak and inflexible. He is not able to reach his toes when bending forward and has trouble carrying heavy groceries. He also has a bad endurance, which leaves him out of breath when climbing the stairs from the ground floor to the first floor. John's inactive lifestyle results in decreased overall health and a shorter life expectancy. Given his inactive and unhealthy lifestyle, he is in the small group of people who have the very highest risk for developing cardiovascular diseases, bone diseases, diabetes, obesity, and mental illnesses such as depression.

B. Supplementary Analysis 1: Exploratory Principal Factor Analysis with Perceived Similarity Items for Study 4.1

In line with empirical evidence indicating that similarity and dissimilarity present distinct aspects of a comparison (Arigo et al., 2015, 2020), an exploratory principal axis factor analysis using oblique rotation revealed a two-dimensional structure. On this basis, separate mean scores were calculated, with higher scores demonstrating greater perceived (dis)similarity.

Table B1 *Perceived Similarity Item-Factor Loadings for Study 4.1*

Items	Item-Factor Loadings	
	Perceived Dissimilarity	Perceived Similarity
While comparing yourself to [<i>Name of comparison standard</i>], ...		
how much did you focus on differences between yourself and [<i>Name</i>]?	.93	
to what extent did you think about how you are different from [<i>Name</i>]?	.92	
how much did you reflect on ways in which you and [<i>Name</i>] are different from each other?	.98	
to what extent did you pay attention to differences between yourself and [<i>Name</i>]?	.87	
how much did you focus on similarities between yourself and [<i>Name</i>]?		.95
to what extent did you think about how you are similar to [<i>Name</i>]?		.96
how much did you reflect on ways in which you and [<i>Name</i>] are similar to each other?		.91
to what extent did you pay attention to similarities between yourself and [<i>Name</i>]?		.97
Eigenvalues	6.19	1.08
Variance Explained (%)	77.42	13.47

Note. $N = 240$. The response scale ranged from 1 = *not at all* to 5 = *most of the time*. Exploratory principal axis factor analysis results were obtained using oblique rotation. Item factor loadings are based on the pattern matrix. The factor solution was adequate for this data (Kaiser-Meyer-Olkin = .93; Barlette’s test of sphericity: $\chi^2(28) = 2592.00, p < .001$).

C. Supplementary Analysis 2: Moderated Mediation Results with Perceived Dissimilarity as Moderator for Study 4.1

We estimated the same moderated mediation model described under Study 4.1 but utilized perceived *dissimilarity* as moderator. To identify the nature of the potential interaction, conditional effects at low (mean -1 *SD*) and high (mean + 0.95 *SDs*⁷) perceived dissimilarity were inspected. Results revealed significant effects of Comparison Direction × Perceived Similarity on PA self-evaluation, $B = 1.14$, $SE = .11$, $p < .001$, 95% CI [0.93; 1.34], and self-efficacy, $B = 0.98$, $SE = .11$, $p < .001$, 95% CI [0.75; 1.20] (see Figure C1).

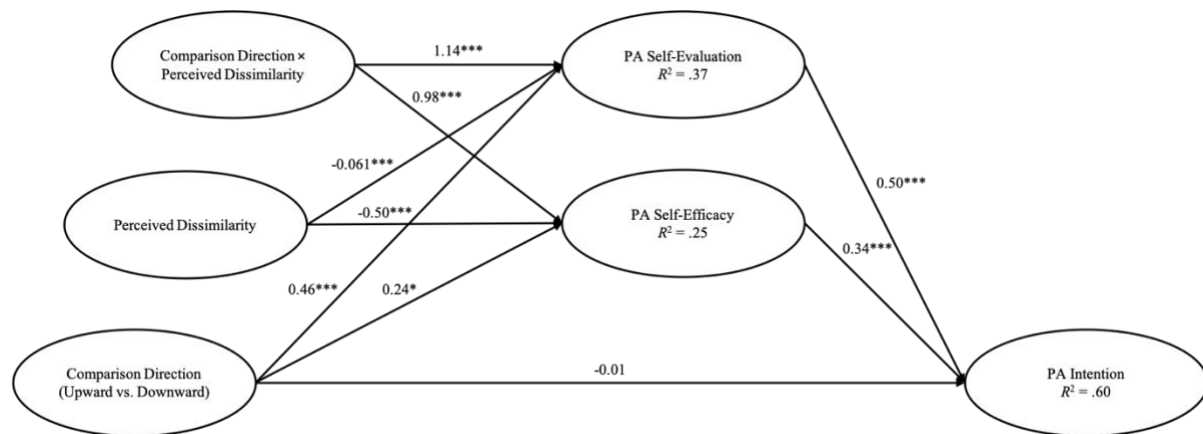


Figure C1. Moderated Mediation Results with Perceived Dissimilarity as Moderator for Study 4.1.

Note. * $p < .05$, *** $p < .001$ (two-tailed); coefficients are unstandardized.

The conditional effect of comparison direction on PA self-evaluation was negative for low perceived dissimilarity, $B = -0.68$, $SE = .15$, $p < .001$, 95% CI [-0.97; -0.38], but positive for high perceived dissimilarity, $B = 1.53$, $SE = .14$, $p < .001$, 95% CI [1.25; 1.82] (see Table C1). The conditional effect of comparison direction on PA self-efficacy was negative for low perceived

⁷ Mean + 0.95 *SDs* equals the highest possible score on the perceived dissimilarity response scale.

dissimilarity, $B = -0.74$, $SE = .16$, $p < .001$, 95% CI [-1.06; -0.42], but positive for high perceived dissimilarity, $B = 1.16$, $SE = .16$, $p < .001$, 95% CI [0.86; 1.47].

Table C1 Means and Standard Deviations of PA Self-Evaluation and Self-Efficacy per Condition for Moderated Mediation Results with Perceived Dissimilarity as Moderator in Study 4.1.

Measures	PA Self-Evaluation		PA Self-Efficacy
	<i>n</i>	<i>M(SD)</i>	<i>M(SD)</i>
Upward low Dissimilarity	120	4.76(1.81)	3.33(0.82)
Downward low Dissimilarity	120	3.58(2.21)	2.80(1.01)
Upward high Dissimilarity	120	2.69(2.07)	2.62(0.94)
Downward high Dissimilarity	120	5.36(1.81)	3.47(0.82)

Note. PA = physical activity; low = mean – 1 *SD*; high = mean + 0.95 *SDs* (equaling the highest possible score on the perceived dissimilarity response scale). Response scales ranged from 1 = *not at all* to 7 = *very much* for PA self-evaluation and from 1 = *not at all true* to 4 = *always true* for PA self-efficacy.

Congruent with our hypotheses, tests of conditional indirect effects suggested that the relationship between comparison direction and PA intention was mediated by PA self-evaluation at low, $B = -0.34$, $SE = .10$, 95% CI [-0.54; -0.15], and high perceived dissimilarity, $B = 0.76$, $SE = .13$, 95% CI [0.51; 1.03]. Likewise, the relationship between comparison direction and PA intention was mediated by PA self-efficacy at and low, $B = -0.25$, $SE = .10$, 95% CI [-0.47; -0.09], and high perceived dissimilarity, $B = 0.40$, $SE = .10$, 95% CI [0.21; 0.61]. Further, results revealed significant moderated mediation indices for PA self-evaluation, $B = .56$, $SE = .10$, 95% CI [0.38; 0.77], and self-efficacy, $B = 0.33$, $SE = .10$, 95% CI [0.17; 0.53].

Hence, the effects on PA self-evaluation and PA self-efficacy did not differ depending on whether perceived similarity or perceived dissimilarity was utilized as moderator in the model. This suggests that the conceptual difference between perceived similarity and dissimilarity, as presumed by Arigo et al. (2015, 2020), may be of minor importance in the present context.

D. Supplementary Analysis 3: Moderated Mediation Results for Study 4.3

We tested the proposed moderated mediation model with difference score variables reflecting the change in PA self-evaluation, self-efficacy, and intention from T1 to T2. The effects of Social Comparison \times COS on PA self-evaluation and self-efficacy change were significant ($p < .001$) as were the conditional effects of comparison direction on PA self-evaluation and self-efficacy change for both the initial similarity and the initial dissimilarity COS conditions ($p < .01$). Conditional indirect effects and the index of moderated mediation were significant for PA self-efficacy change but non-significant for PA self-evaluation change. Further, change in self-efficacy, but not self-evaluation, predicted changes in intention.

Table D1 *Moderated Mediation Results with Conditional and Conditional Indirect Effects for COS for Study 4.3*

Moderator: COS	Mediator: PA Self-Evaluation Change		Mediator: PA Self-Efficacy Change	
	<i>B</i> (<i>SE</i>)	95 % CI	<i>B</i> (<i>SE</i>)	95 % CI
Conditional Effects				
Initial Similarity COS	0.62(.20)**	0.22; 1.02	0.54(.21)**	0.14; 0.95
Initial Dissimilarity COS	-0.78(.15)***	-1.07; -0.48	-0.77(.15)***	-1.06; -0.47
Conditional Indirect Effects				
Initial Similarity COS	0.03(.06)	-0.07; 0.17	0.18(.09)	0.03; 0.38
Initial Dissimilarity COS	-0.04(.07)	-0.19; 0.10	-0.25(.12)	-0.50; -0.05
Index of Moderated Mediation	-0.07(.13)	-0.35; 0.16	-0.43(.19)	-0.83; -0.08

Note. $N = 244$; Comparison standard was used as predictor and PA intention change as outcome; COS = consider-the-opposite strategy; PA = physical activity; ** $p < .01$, *** $p < .001$ (two-tailed); CIs indicate significance for conditional indirect effects and indices of moderated mediation; coefficients are unstandardized.

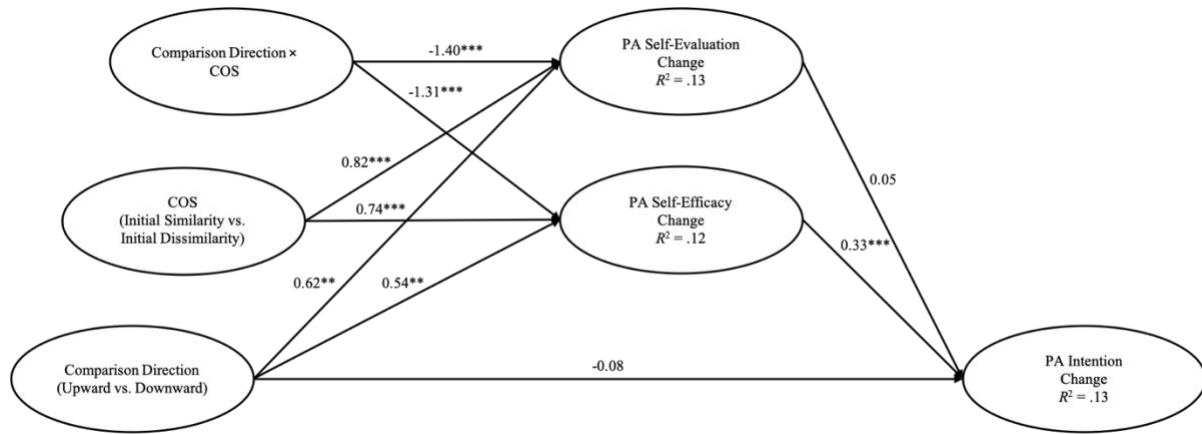


Figure D2. Moderated Mediation Results for Study 4.3.

Note. COS = consider-the-opposite strategy; PA = physical activity; ** $p < .01$, *** $p < .001$ (two-tailed); coefficients are unstandardized.