UC Office of the President
Recent Work

Title

Comparing comparisons: Assimilation and contrast processes and outcomes following social and temporal comparison

Permalink

Journal

ISSN

Authors

Vogel, Erin A
Rose, Jason P
Aspiras, Olivia G
et al.

Publication Date
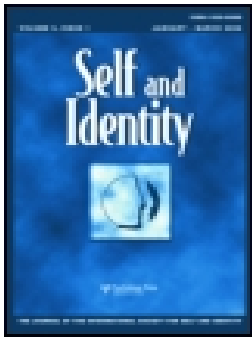
DOI

Comparing comparisons: Assimilation and contrast processes and outcomes following social and temporal comparison

Erin A. Vogel, Jason P. Rose, Olivia G. Aspiras, Keith A. Edmonds & Elizabeth F. Gallinari

Published online: 24 Jul 2019.

Submit your article to this journal

View Crossmark data

Routledge
Taylor & Francis Group

ARTICLE

Check for updates

Comparing comparisons: Assimilation and contrast processes and outcomes following social and temporal comparison

Erin A. Vogel [a], Jason P. Rose[b], Olivia G. Aspiras[b], Keith A. Edmonds[b] and Elizabeth F. Gallinari[b]

[a]Department of Psychiatry and Weill Institute for Neurosciences, University of California, San Francisco, CA, USA; [b]Department of Psychology, University of Toledo, Toledo, OH, USA

ABSTRACT

The present research examines similarities and differences between social and temporal comparison processes in a health-related context. In two studies, participants were randomly assigned to write about an upward or downward, social or temporal comparison target. Participants then reported their perceived similarity to the target and evaluated their own fitness. Consistent with hypotheses, participants who perceived themselves as similar (dissimilar) to an upward comparison target had more positive (negative) self-evaluations. These outcomes reflect assimilation and contrast processes, respectively, though effects were attenuated among those who made downward temporal comparisons in Study 1 and upward comparisons in Study 2. Results suggest that upward social and temporal comparison processes, once engaged, produce similar assimilative and contrastive outcomes.

Imagine someone who is about to begin his first workout at a new gym. To evaluate his own fitness abilities in a new environment, he may compare himself to other gym members. Alternatively, he may compare his present abilities to those of his younger self. Such comparative information is crucial for putting one's own characteristics into context and evaluating oneself (Festinger, 1954), even when objective, diagnostically-superior information is available (e.g., Klein, 1997; Zell & Alicke, 2010b). Indeed, people compare themselves to others on a wide variety of traits and dimensions, including their health habits (Wheeler & Miyake, 1992), to understand their own abilities and identities (Festinger, 1954). Although less researched, different versions of oneself can also serve as comparison targets, a process known as temporal comparison (Albert, 1977). Both social and temporal comparisons can be made to either upward or downward comparison targets – targets who are better off or worse off, respectively, than one's present self (Wills, 1981; Wood, 1989). The direction of the comparison and perceived similarity to the comparison target influence self-evaluations and associated outcomes (Musseweiler, 2003). Despite some overlap in their conceptualization and outcomes, social and temporal comparisons are rarely

---

studied together and research seldom examines underlying processes. Although health and fitness are critical aspects of well-being, with observable indicators that can fuel comparative thought, social and temporal comparison have not yet been experimentally tested together in a health or fitness context. The present research will assess similarities and differences between social and temporal comparison processes and outcomes in health and fitness.

Comparative thought

Engaging in comparative thought requires the perceiver (i.e., the individual making the comparison) to access information about the self and the comparison target. According to the Selective Accessibility Model (SAM; Mussweiler, 2003) – the most prominent model related to comparison processes – comparative thought involves three stages: selection of a comparison target, comparison of the target and the self, and evaluation of the self. Self-evaluations are determined by the perceived characteristics of the comparison target and how those characteristics are perceived in relation to the self (Mussweiler, 2003).

In the selection stage, the perceiver chooses a comparison target. Although targets are often selected without conscious thought (Gilbert, Giesler, & Morris, 1995; Mussweiler & Ruter, 2003), they can also be consciously selected for a variety of purposes, including self-evaluation (Festinger, 1954), self-enhancement (Hakmiller, 1966; Tesser & Smith, 1980; Wills, 1981), and self-improvement (Lockwood & Kunda, 1997). Forced comparisons can also occur when individuals are prompted to make a specific comparison. Next, in the comparison stage, the perceiver begins by forming an overall impression of the comparison target as being either similar to the self or different from the self, then gathers evidence to support the initial impression. Self-relevant evidence confirming initial perceptions of similarity or dissimilarity becomes more salient, regardless of objective similarity or dissimilarity. The perceiver considers evidence of their similarity to the target (similarity testing) or dissimilarity to the target (dissimilarity testing). In the final stage, the perceiver uses the self-knowledge gleaned from similarity or dissimilarity testing to draw conclusions about the self. Similarity testing typically leads to assimilation effects, while dissimilarity testing leads to contrast effects. Assimilating to a positive (i.e., upward comparison) target results in positive self-evaluations, while assimilating to a negative (i.e., downward comparison) target results in negative self-evaluations. On the other hand, contrasting self-evaluations away from an upward comparison target results in negative self-evaluations, while contrasting away from a downward comparison target reflects positively on the self (Mussweiler, 2003).

Similarities and differences in social versus temporal comparison

The Selective Accessibility Model was designed to explain *social* comparison processes, not temporal comparison processes. However, some evidence suggests that temporal comparisons may involve similar stages and processes (Broemer, Grabowski, Gebauer, Ermel, & Diehl, 2008; Hanko, Crusius, & Mussweiler, 2010). For instance, the Reflection and Evaluative Model (Markman & McMullen, 2003) posits that similarity testing occurs when the past self is considered to overlap with the present self. Likewise, contrast occurs when the perceiver views the present self as fundamentally different from the past self. For example, an athlete who performed well last season may assimilate her

present self-evaluations to her past self and therefore evaluate her athletic ability positively (i.e., assimilation). Alternatively, if she views herself as being very different from last season, she may contrast self-evaluations away from her past self and evaluate her present abilities negatively. Despite being the same person, temporal comparison targets vary in their perceived overlap with the present self. When the past self is vaguely defined (Grabowski & Broemer, 2015) or perceived very poorly (McFarland & Alvaro, 2000), the past self can be viewed as fundamentally different from the present self, even when considering relatively recent past selves among younger individuals (Grabowski & Broemer, 2015; Hanko et al., 2010; McFarland & Alvaro, 2000).

In the domain of health and fitness, the literature has found evidence of assimilation and contrast with both social and temporal comparison targets, following both upward and downward comparison. However, it is notable that most of this research has focused on social (not temporal) comparison. In this research, upward assimilation typically leads to positive outcomes by providing hope and inspiration, or by changing perceptions to focus on positive aspects of the self. For example, patients with serious illnesses often prefer comparisons to patients who are doing well (Stanton, Danoff-Burg, Cameron, Snider, & Kirk, 1999; Taylor & Lobel, 1989). On the other hand, downward assimilation occurs when the perceiver believes they may be similar or become similar to a target who is doing poorly. For example, cancer patients who previously felt positively about their prognosis reported lower quality of life and lower life satisfaction after hearing from cancer patients who were doing poorly (Brakel, Dijkstra, & Buunk, 2014). Likewise, individuals who perceived themselves to be similar to a comparison target who was at high risk for skin cancer also perceived their own risk to be high (Hoffner & Ye, 2009). In both situations, participants assimilated their self-evaluations to these downward social comparison targets.

The effects of contrast on self-evaluations follow the opposite pattern as assimilation: upward contrast leads to negative self-evaluations and downward contrast leads to positive self-evaluations. Most research has focused on self-perceptions related to diet, exercise, and weight. For example, individuals who view idealized media images often engage in upward social comparison, view their own bodies as being inferior to the images (i.e., upward contrast), and experience body dissatisfaction as a result (e.g., Betz, Sabik, & Ramsey, 2019; Thompson, Heinberg, Altabe, & Tatleff-Dunn, 1999).

As noted above, most of the research in health contexts involves social comparison, and the small amount of research on temporal comparisons has focused on self-perceptions and health status among the elderly. This research shows that temporal comparison can engender beneficial, assimilative effects when elderly individuals compared their current health status to their recent past (Spini, Clemence, & Ghisletta, 2007), but harmful, contrastive effects when comparing to the more distant past (Suls, Marco, & Tobin, 1991). Though not explicitly examined in these two disparate studies, this finding could be due to greater perceived similarity to the self in the recent past than in the distant past. Aside from these studies, little is known about whether temporal comparison processes and outcomes operate similarly to social comparisons in health-relevant contexts. However, research on temporal comparison processes and outcomes in non-health domains (e.g., academic performances) suggests that similarity and dissimilarity testing occur in both social and temporal comparison, resulting in assimilation and contrast outcomes regardless of comparison type. Though social comparison effects

are sometimes stronger, they follow the same directional pattern as temporal comparison (Müller-Kalthoff, Helm, & Möller, 2017; Wolff, Helm, Zimmermann, Nagy, & Möller, 2018; Zell & Alicke, 2009).

Current research

In sum, it is likely that temporal and social comparison operate similarly in terms of assimilative and contrastive patterns in response to upward and downward comparisons (once engaged). However, there are fewer studies on temporal comparison processes and outcomes than social (particularly in a health context) and there is a dearth of research that examines the processes and outcomes of social and temporal comparison simultaneously. Moreover, the few studies that have directly compared the effects of social and temporal comparison focused on novel, performance-based contexts in which a test score or ranking may be the perceiver's only piece of information about their own ability (e.g., Butler, 2000; Zell & Alicke, 2009, 2010a) or focused on perceptions of fairness in evaluations based on others' comparative thought, rather than self-evaluations (Chun, Brockner, & De Cremer, 2018). Moreover, this prior research represents an unusual type of temporal comparison context, where direct, objective feedback is provided. Although useful in elucidating the effects of comparative feedback on self-evaluations, these study designs may not reflect how comparative thought operates in daily life. Additional research (Müller-Kalthoff et al., 2017; Wolff et al., 2018) has examined the influence of social and temporal comparison on self-evaluations of academic performance without the use of specific test scores. Results in this domain showed that social and temporal comparisons influenced self-evaluations of academic performance similarly, such that upward (downward) comparison resulted in more negative (positive) self-evaluations. Although informative, these studies focused only on academics and did not measure perceived similarity to the comparison target, which may have limited their ability to detect assimilation effects.

The present research was among the first to examine social and temporal comparison processes and outcomes under the same framework and in a health-relevant domain. Examining these issues in the context of health may have applied value as low-cost, low-risk interventions to change self-evaluations and subsequent health behaviors. Social comparison targets are readily available in group exercise environments (e.g., at gyms, on sports teams) and temporal comparison targets may be viewed as highly realistic due to their overlap with the present self (Lockwood & Kunda, 1997). The relative influence of social comparison and temporal comparison in young adults, who have not been through many distinct stages of life, has rarely been examined. Health habits formed in young adulthood are predictive of future health (Ferreira, Twisk, van Mechelen, Kemper, & Stehouwer, 2005) and young adults often gain information about their fitness from observing their peers (Arroyo & Brunner, 2016). Therefore, it is important to understand how young adults use comparative thought to evaluate their own health and fitness. Moreover, unlike studies in which participants receive social and temporal comparison feedback (e.g., Butler, 2000; Zell & Alicke, 2009, 2010a), participants in the present research generated their own social or temporal comparison information using preexisting knowledge of their own health and fitness and that of others. This was important for ecological validity because, in many situations, people do not receive explicit, objective feedback about their performances.

Comparison information can come from simply observing others or reflecting on oneself (Summerville & Roese, 2008; Wheeler & Miyake, 1992). Lastly, the present research not only examined the outcomes of comparison (i.e., self-evaluations, behavioral intentions), but also examined the processes that occur when making social and temporal comparisons, using the Selective Accessibility Model (SAM) as a framework (Mussweiler, 2003) – particularly the impact of perceived similarity/dissimilarity on self-evaluations.

The purpose of the present research was to examine whether assimilative and contrastive processes and outcomes operate similarly in social and temporal comparison to influence self-evaluations of health and fitness. In the present research, participants were prompted to compare their present fitness to that of an upward social, downward social, upward temporal, or downward temporal comparison target. Then, we measured perceived similarity to the target and self-evaluations of fitness. Based on the Selective Accessibility Model (Mussweiler, 2003), the main outcome was self-evaluation of fitness. Because the extant literature has found assimilation and contrast of self-evaluations following both social and temporal comparison, we hypothesized that perceived similarity to the comparison target would moderate the relationship between comparison direction and self-evaluations. Regardless of whether the comparison was social or temporal, participants who perceived themselves to be similar to a comparison target would have more positive self-evaluations in the upward comparison conditions than downward comparison conditions (i.e., assimilation), while those who perceived dissimilarity would have more positive self-evaluations in the downward conditions than upward (i.e., contrast). Specifically, we hypothesized that comparison direction and target similarity would interact to influence self-evaluations; however, no interactions involving comparison type were predicted.

Study 1

Data for Study 1 were taken from two samples of college students that were part of a larger investigation into the similarities and differences between social and temporal comparison in a health context. Study design, procedure, and relevant measures were identical across samples. Participants in the second sample completed a few additional measures not directly relevant to the present research questions. Samples were merged to increase statistical power.

Method

Participants and design
Participants were randomly assigned to one cell in a 2 (comparison direction: upward or downward) X 2 (comparison type: social or temporal) between-subjects design. No participants were excluded from analyses. Participants were 362 undergraduates (282 female) from a large, Midwestern university. The racial makeup of the sample was 69.1% White, 17.4% African American/Black, 4.4% Asian, 7.2% multiple races, and 1.9% unknown.

Measures and procedure
Participants came to the lab in groups of 1–4 and were seated at individual computers. The experimenter obtained informed consent from each participant. Then, participants completed the remainder of the experiment using MediaLab software (Jarvis, 2014).

Participants first completed the experimental manipulation by writing about a comparison target using guided questions. First, participants were directed to consider a comparison target. The upward (downward) social comparison prompt read, "Think about a person you know who is more (less) physically fit than you. You will answer a number of questions about this person." The upward (downward) temporal comparison prompt read, "Think about yourself during a time in your life when you were more (less) physically fit than you are now. You will answer a number of questions about your younger self." To promote greater consideration of the comparison target and bolster the impact of the comparison, participants then answered more specific questions about the target. The first 5 questions were free-response; the last 2 used Likert-type scales (see Appendix A). Then, they completed the following measures.

Self-evaluations. Participants answered a series of 5 questions about their perceptions of their own health and fitness abilities using 1–5 Likert-type scales (see Appendix B). Sample items included "How strong are you?" (1 = *very weak*; 5 = *very strong*) and "How fast can you run, bike, or swim?" (1 = *very slowly or not at all*; 5 = *very fast*). A self-evaluation score was computed using the mean of the 5 items (α = .79; M = 3.31, SD = .65).[1]

Perceived similarity. As part of their description of the target person, participants in the *social (temporal)* comparison conditions indicated their perceived similarity to the target person using the following item: "How similar is *this person's fitness level (your fitness level during that time)* to *your own fitness level (your fitness level now)*?" (1 = *not at all similar*, 9 = *completely similar*; M = 4.49, SD = 2.14).

Results and discussion

First, we examined the main and interactive effects of comparison type, comparison direction, and perceived similarity on self-evaluations. Second, we examined differences in perceived similarity to the comparison target between participants who made upward versus downward comparisons, and those who made social versus temporal comparisons.

Self-evaluations by perceived similarity and experimental condition

Self-evaluation scores were regressed on comparison type (social or temporal), comparison direction (upward or downward), and perceived similarity to the comparison target. Main effects were entered in the first step of the model, two-way interactions in the second step, and the three-way interaction in the third. Main effects accounted for 7.1% of the variance in self-evaluations (p < .001). There was a significant main effect of target similarity such that greater perceived similarity was associated with more positive self-perceptions of fitness, β = .28, t = 5.23, p < .001. There were no main effects of comparison direction (β = −.08, t = −1.47, p = .143) or comparison type (β = −.05, t = −.94, p = .349). Two-way interactions accounted for an additional 14.7% of the variance (p < .001). The type X direction (β = −.02, t = −.26, p = .793) and type X similarity (β = .11, t = 1.63, p = .104) interactions were not significant.

Most relevant to the primary hypothesis, comparison direction and perceived similarity interacted to influence self-evaluations ($\beta = .55$, $t = 8.00$, $p < .001$; Figure 1). Follow-up simple slopes analyses showed that, among participants who made upward comparisons, those who perceived high similarity had more positive self-evaluations than those who perceived low similarity ($\beta = .37$, $t = 6.77$, $p < .001$). The opposite pattern was observed for downward comparisons, such that participants with high perceived similarity to a downward comparison target had more negative self-evaluations than those with low perceived similarity ($\beta = -.14$, $t = -2.52$, $p = .012$). This suggests that assimilation and contrast effects occurred as hypothesized in both upward and downward comparison.

The three-way interaction accounted for a smaller but significant 1.6% of additional variance in self-evaluations ($\beta = -.27$, $t = -2.72$, $p = .007$). Follow-up simple slope tests and slope difference tests were conducted to interpret the interaction. Simple slopes showed that perceived similarity interacted with comparison direction, as described above and depicted in Figure 1, for upward social ($\beta = .45$, $t = 7.18$, $p < .001$), upward temporal ($\beta = .40$, $t = 6.25$, $p < .001$), and downward social ($\beta = -.24$, $t = -3.39$, $p = .001$) comparisons. However, perceived similarity did not interact with comparison direction among participants who made downward temporal comparisons ($\beta = .05$, $t = .82$, $p = .412$; Figure 2). Importantly, slope difference tests demonstrated that upward social and upward temporal comparison showed similar patterns of self-evaluations depending on perceived similarity (i.e., greater perceived similarity resulting in more positive self-evaluations, $t = -.69$, $p = .492$). This finding supports our hypothesis that once engaged, social and temporal comparison processes would operate similarly. Downward social and downward temporal comparison showed significantly different patterns, due to the weak influence of perceived similarity on self-evaluations following downward temporal comparison ($t = 3.18$, $p = .002$; Figure 2).

Perceived similarity to the comparison target by comparison direction and type

A 2 (comparison direction: upward or downward) X 2 (comparison type: social or temporal) ANOVA showed that perceived similarity to the comparison target significantly differed by condition. There was a main effect of comparison direction, such that participants perceived themselves as more similar to upward comparison targets
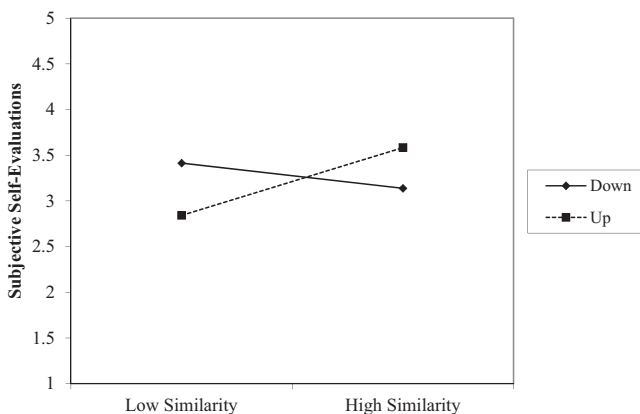

Figure 1. Self-evaluations of fitness by perceived similarity and comparison direction (study 1).
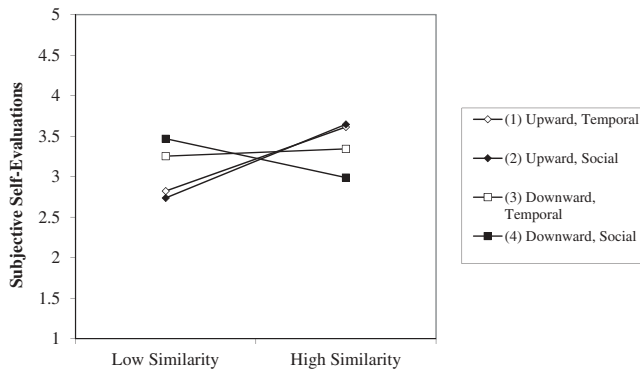
Figure 2. Self-evaluations of fitness by perceived similarity, comparison direction, and comparison type (study 1).

($M = 4.97$, $SD = 2.08$) than downward comparison targets ($M = 3.99$, $SD = 2.09$), regardless of comparison type ($F(1, 358) = 20.46$, $p < .001$, $d = .47$). There was also a main effect of comparison type, such that perceived similarity to temporal comparison targets ($M = 4.72$, $SD = 2.12$) was higher than perceived similarity to social comparison targets ($M = 4.26$, $SD = 2.13$), regardless of comparison direction ($F(1, 358) = 4.57$, $p = .033$, $d = .22$). These main effects were qualified by a comparison direction X type interaction ($F(1, 358) = 6.69$, $p = .010$). A one-way ANOVA with post-hoc Tukey tests was conducted to determine which of the four experimental conditions significantly differed from one another (see Table 1). Perceived similarity to downward social comparison targets was significantly lower than perceived similarity to upward social ($p < .001$, $d = .77$), upward temporal ($p < .001$, $d = .72$), and downward temporal ($p = .006$, $d = .51$) comparison targets (see Table 1).

Discussion

Consistent with hypotheses, perceived similarity and comparison direction interacted such that perceiving one's fitness as similar to an upward (downward) comparison target was associated with more positive (negative) self-evaluations, while perceiving dissimilarity resulted in opposite patterns. Unexpectedly, among participants who made downward temporal comparisons, self-evaluations did not significantly differ by perceived similarity. For the remaining conditions, it appears that participants assimilated their self-evaluations to similar targets and contrasted self-evaluations away from dissimilar targets, regardless of comparison type (social or temporal). However, it is difficult to

Table 1. Perceived similarity to the comparison target by comparison type and direction (study 1).

	Social	Temporal	TOTAL
Upward	5.02 (2.08)*	4.92 (2.09)*	4.97 (2.08)[b]
Downward	3.48 (1.90)	4.51 (2.15)*	3.99 (2.09)[b]
TOTAL	4.26 (2.13)[a]	4.72 (2.12)[a]	4.49 (2.14)

[a]Significant main effect of comparison type in a 2 (type) X 2 (direction) ANOVA
[b]Significant main effect of comparison direction in a 2 (type) X 2 (direction) ANOVA
*Significantly different from downward social comparison in a one-way ANOVA

discern whether assimilation and contrast are occurring without knowing how participants would evaluate themselves if they did not make a comparison (Bruchmann, 2017). Moreover, without manipulation check questions, it is unclear whether all participants made the comparisons prescribed in each experimental condition. A second study was conducted to address these limitations.

Study 2

The design of Study 2 included the same four conditions as Study 1, plus a no-comparison control condition (recommended by Bruchmann, 2017 over using a lateral comparison). If comparative thought produced both assimilation and contrast, we would expect self-evaluations to be more positive following upward (downward) comparisons with high (low) similarity and more negative following upward (downward) comparisons with low (high) similarity, with self-evaluations in the no-comparison control condition falling in the middle. We also included two manipulation check questions to ensure that participants were making the prescribed comparisons.

Method

Participants, design, and procedure

Participants were randomly assigned to one of five conditions in a 2 (comparison direction: upward or downward) X 2 (comparison type: social or temporal) between-subjects design with a floating no-comparison control condition. An *a priori* power analysis was conducted using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). The effect size for the hypothesized two-way interaction was calculated using the observed effect size (Step 2 R^2 Δ) from Study 1. The power analysis suggested that 86 participants would be needed to detect a similar effect at 80% power. We recruited additional participants to increase statistical power and to account for random assignment of participants to the no-comparison control condition.

Participants were 141 undergraduates (93 female) from the same university as Study 1. The racial makeup of the sample was 66.7% White, 19.9% African American/Black, 3.5% Asian, 5.0% unknown, and 5.0% multiple races. The study followed the same procedure as Study 1. Participants in the no-comparison control condition answered questions about themselves that were unrelated to fitness or to other people (see Appendix A) instead of questions about a comparison target. Participants whose answer-(s) to the manipulation check questions (described below) were inconsistent with their prescribed comparisons (*n* = 30) were excluded from subsequent analyses.

Measures

Participants completed the same measures of self-evaluations and perceived similarity to the target (in the four comparison conditions) as in Study 1.[2] Then, participants completed two additional manipulation check questions: 1) "Think about the questions you just answered. Who were you describing in your answers to those questions?" (myself, someone else), and 2) "Which of the following best describes the person in your answers?" (healthy and fit, unhealthy and unfit).

Results and discussion

First, as in Study 1, we examined self-evaluations by perceived similarity and experimental condition. This analysis excluded participants in the control condition, who did not compare themselves to a target ($n = 28$; final $N = 83$). Second, to further interpret the similarity X direction interaction identified in Study 1, we compared self-evaluations in four groups: upward (downward) comparison to a similar target, upward (downward) comparison to a dissimilar target, and no-comparison control (final $N = 111$). Third, as in Study 1, we compared perceived similarity to the comparison target by comparison direction (upward or downward) and comparison type (social or temporal), excluding control condition participants who did not make a comparison ($n = 28$; final $N = 83$).

Self-evaluations by perceived similarity and experimental condition

Comparison type, direction, and perceived similarity were regressed on subjective self-evaluations of fitness. There were no significant main effects of comparison type ($\beta = -.08$, $t = -.73$, $p = .470$), direction ($\beta = .05$, $t = .43$, $p = .669$), or perceived similarity ($\beta = .09$, $t = .80$, $p = .429$), and they accounted for a non-significant 1.8% of variance in self-evaluations in Step 1 ($p = .703$). The two-way interactions entered in Step 2 accounted for a significant 15.4% of variance ($p = .005$). Comparison type did not significantly interact with direction ($\beta = .11$, $t = .52$, $p = .606$) or similarity ($\beta = .11$, $t = .69$, $p = .492$). However, as in Study 1, the hypothesized direction X similarity interaction was significant ($\beta = .62$, $t = 3.17$, $p = .002$; Figure 3). Follow-up simple slopes showed that the effect of downward comparison on self-evaluations was moderated by perceived similarity ($\beta = -.30$, $t = -2.47$, $p = .016$). The moderation effect of similarity on upward comparison was in the expected and same direction as Study 1, despite not reaching statistical significance ($\beta = .17$, $t = 1.46$, $p = .149$). Consistent with hypotheses, the 3-way interaction accounted for a small and non-significant 1.0% of the variance and the interaction term was not significant ($\beta = .31$, $t = .98$, $p = .331$). Although the 3-way interaction was significant in Study 1 but not here in Study 2, the amount of unique variance accounted for by the 3-way interaction across studies was comparable and small (1.6% in Study 1 and 1.0% in Study 2).

Finally, although Study 2 had a smaller sample size than Study 1 (partly due to the fact that two samples were combined for Study 1), an *a priori* power analysis using G*Power (Faul et al., 2007) suggested that the sample size would be sufficient even after removing the no-comparison control group. Unexpectedly, an additional 30 participants were excluded from analyses due to failed manipulation checks. Nonetheless, a post hoc power analysis showed that Study 2 was adequately powered to detect the hypothesized direction X similarity interaction (observed $R^2 \Delta = .154$, $\pi = .81$), which was statistically significant in both studies.

Self-evaluations by perceived similarity and comparison direction

Similarity was divided into high similarity (similarity > 4) or low similarity (similarity ≤ 4), resulting in five conditions: downward comparison/low similarity, downward comparison/high similarity, upward comparison/low similarity, upward comparison/high similarity, and no-comparison control. A one-way ANOVA showed significant differences in self-
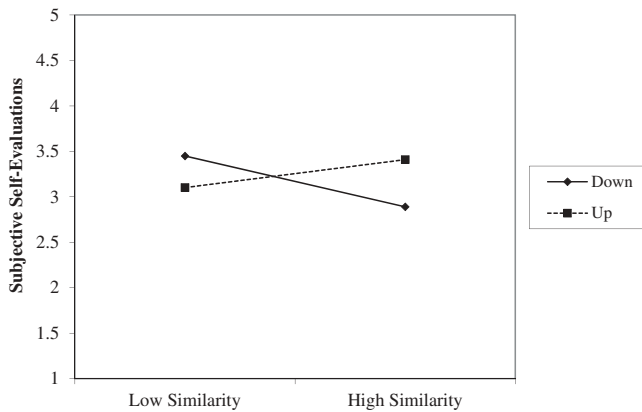
Figure 3. Self-evaluations of fitness by perceived similarity and comparison direction (study 2).

evaluations between conditions ($F(4, 106) = 3.22$, $p = .016$). Planned contrasts examined the control condition relative to each of the other conditions. Self-evaluations were significantly lower following downward comparison to high-similarity targets ($M = 2.84$, $SD = .40$) and marginally lower following upward comparison to low-similarity targets ($M = 3.13$, $SD = .46$), compared to the control condition ($M = 3.40$, $SD = .55$), $ds = 1.16$ ($p = .011$) and .53 ($p = .057$), respectively. This pattern of results suggests that both assimilation and contrast occurred, but only when the comparison led to negative self-views (i.e., assimilation to similar downward targets or contrast from dissimilar upward targets). Comparative thought did not significantly improve self-evaluations, compared to the control condition, when it was hypothesized to lead to positive self-views (i.e., upward comparison to high-similarity targets, downward comparison to low-similarity targets; d's < .17, p's > .562). Rather, self-evaluations were relatively positive already in the absence of making comparisons and such comparisons were not sufficient to increase these evaluations.

Perceived similarity to the comparison target by comparison direction and type

A 2 (comparison direction) X 2 (comparison type) ANOVA showed no significant differences in perceived similarity by comparison type ($F(1, 79) = .33$, $p = .566$) and no direction X type interaction ($F(1,79) = .32$, $p = .574$). However, as in Study 1, there was a significant main effect of comparison direction ($F(1, 79) = 5.77$, $p = .019$), such that participants perceived themselves as more similar to upward ($M = 4.44$, $SD = 1.75$) than downward ($M = 3.39$, $SD = 1.59$) comparison targets ($d = .63$).

General discussion

Social and temporal comparison are rarely studied within the same framework, and extant research on social and temporal comparison in health and fitness has rarely examined underlying processes. The purpose of this research was to assess the similarities and differences between social and temporal comparison processes (i.e., similarity and dissimilarity testing) and self-evaluations in a health-relevant context. Participants wrote about a comparison target: either another person (social comparison conditions) or a past self (temporal comparison conditions) who was either healthier than them

(upward comparison conditions) or less healthy than them (downward comparison conditions). Then, participants evaluated their perceived similarity to the person and their present fitness. In Study 2, participants in a control condition evaluated their present fitness without making a comparison.

Effects of comparison direction and perceived similarity on self-evaluations

Across both studies, comparison direction (upward or downward) interacted with perceived similarity to influence subjective self-evaluations of fitness. Consistent with our primary hypothesis, participants in both studies who perceived themselves as similar (dissimilar) to a downward comparison target had more negative (positive) self-evaluations. This pattern of results is suggestive of assimilation and contrast processes, respectively, following downward comparison. That is, consistent with the SAM and other models of comparative thought (Markman & McMullen, 2003; Mussweiler, 2003), making downward comparisons to similar (dissimilar) targets leads people to recruit information from memory that is consistent with being unfit (fit), and this information then impacts the judgment process. In Study 1, participants who perceived themselves as similar (dissimilar) to an upward comparison target had more positive (negative) self-evaluations. Although self-evaluations did not significantly differ by perceived similarity for upward comparisons in Study 2, this may be due to a smaller sample size. Indeed, the same directional pattern was observed, with identical effect sizes for the 2-way interaction models (Step 2 R^2 Δ = .15 in Studies 1 and 2). In sum, participants assimilated their self-evaluations to comparison targets perceived as similar and contrasted self-evaluations away from comparison targets perceived as dissimilar, though effects were stronger for downward than upward comparisons (in Study 2). Finally, in Study 1, the effects of downward temporal comparison on self-evaluations did not differ by perceived similarity. This may be due to young adults' relatively short health history. Compounded with reluctance to derogate one's past self (Peetz & Wilson, 2014), most young adults likely had a restricted range of comparison targets from which to select. This result is important to consider in the context of doing temporal comparison research with younger samples. However, it is notable that the 3-way interaction did not replicate in Study 2 and its effect was small across both studies (Step 3 R^2 Δ = .016 and .010 across Studies 1 and 2, respectively). More strikingly, temporal and social comparison showed consistent patterns across both studies.

Effects of comparative thought on self-evaluations relative to no comparison

Taken together, the effects found across both studies suggest the presence of assimilation to similar comparison targets and contrast from dissimilar comparison targets, regardless of whether the targets were social or temporal. However, incorporating a no-comparison control condition, Study 2 demonstrated that self-evaluations were fairly high without engaging in comparative thought. This finding is consistent with the default tendency to view oneself as better than average (Alicke, 1985) in order to maintain psychological well-being (Taylor & Brown, 1988). Because self-evaluations were already positive, the comparisons made in this study may not have been strong enough to further elevate self-perceptions of fitness. Indeed, comparison to a similar

upward or dissimilar downward target, which would be expected to produce positive self-evaluations (via assimilation and contrast, respectively), had little effect on self-evaluations of fitness. The finding that control conditions are not always different from upward or downward comparison is consistent with a recent paper calling for the use of control groups in social comparison research (Bruchmann, 2017). However, we demonstrated that self-evaluations could be decreased by comparing oneself to a similar downward target or a dissimilar upward target. Importantly, these findings suggest that both assimilation and contrast occur for upward and downward comparison, but can be constrained by positive baseline self-evaluations.

Differences in perceived similarity by comparison direction and comparison type

Across both studies, perceived similarity to upward comparison targets was higher than perceived similarity to downward comparison targets (see also Hakmiller, 1966; Kiviniemi, Snyder, & Johnson, 2008; McFarland & Alvaro, 2000; Tesser & Smith, 1980; Wills, 1981). In Study 1, participants perceived themselves as more similar to temporal comparison targets than social comparison targets, likely reflecting accurate perceptions of having more in common with oneself than with other people. Moreover, participants perceived less similarity to downward social comparison targets than other targets. This may reflect a greater range of possible downward social comparison targets from which to select, as the majority of U.S. adults do not meet recommended physical activity guidelines (Centers for Disease Control and Prevention, 2017). However, these latter two findings did not replicate in Study 2. Rather, the most robust finding across studies was a greater perceived similarity to upward comparison targets, consistent with the finding that self-evaluations were relatively high in a control group that did not engage in comparative thought. Taken together, these effects suggest that motivational forces (i.e., self-enhancement) and target extremity (i.e., availability of more extreme downward social comparison targets than other targets) may affect perceived similarity. While patterns consistent with assimilation and contrast for self-evaluations were evident across both upward and downward comparison (though notably stronger with downward), the results involving similarity perception suggest that, on average, assimilation effects may be more natural for upward comparisons than downward comparisons.

Implications

The present research extends prior work comparing the effects of social and temporal comparison on self-evaluations (Butler, 2000; Müller-Kalthoff et al., 2017; Wolff et al., 2018; Zell & Alicke, 2009, 2010a) by replicating results in a new domain (i.e., health and fitness), including a no-comparison control group, and measuring perceived similarity to the comparison target. First, as in research conducted in other domains, social and temporal comparison affected self-evaluations in similar patterns in the present study. Results suggest that self-evaluations of health and fitness from comparative thought follow similar patterns, with evidence of both assimilation and contrast effects. In the domain of health and fitness, young adults often look up to dissimilar upward targets in order to motivate themselves to improve their fitness (Betz et al., 2019; Thompson et al., 1999). Results of these two studies suggest that such comparisons may actually create

contrastive effects on self-evaluation, regardless of whether the comparison target is social or temporal.

Second, because the present research incorporated a no-comparison control group, we were able to determine that self-evaluations were relatively positive, and assimilation and contrast effects mostly shifted self-evaluations downward (depending upon their perceived similarity to the target person). Previous research examining temporal and social comparison typically did not include a no-comparison control group. Because of a general tendency to perceive oneself positively across domains (Alicke, 1985), it is possible that the effects of comparative thought on self-evaluations in other domains would be similarly constrained by positive baseline self-evaluations. Study 2 also included manipulation check questions to ensure that participants who did not make the prescribed comparisons were excluded from analyses. Based on the relatively large number of participants who answered one or both questions incorrectly (21%), including manipulation check questions in future studies of comparative thought appears prudent. Studies that include manipulation check questions should be sufficiently powered to account for a potential loss of participants in analyses. Despite the sample size reduction due to failed manipulation checks, Study 2 retained 81% power to detect the hypothesized interaction.

Finally, we extended previous research by demonstrating the importance of measuring perceived similarity to a comparison target, as the effects of comparison direction on self-evaluations were dependent on perceived similarity. Although participants in Study 1 perceived higher similarity to temporal than to social comparison targets, participants in both studies still tended to contrast self-evaluations away from temporal comparison targets when they perceived dissimilarity. This finding is consistent with literature showing that past selves can be viewed as fundamentally different from present selves (Grabowski & Broemer, 2015; McFarland & Alvaro, 2000). When perceived similarity is taken into account, the type of comparison is less important than its direction.

Overall, results support both the Selective Accessibility (Mussweiler, 2003) and the Reflection and Evaluation (Markman & McMullen, 2003) Models of social and temporal comparison. These models of comparative thought both posit that the comparison process involves accessing relevant information about oneself and the target and evaluating oneself accordingly. The process of reflection is akin to that of similarity testing, while that of evaluation can be likened to dissimilarity testing (Markman & McMullen, 2003; Mussweiler, 2003). One key difference between the two models is that the Reflection and Evaluation Model is based on mental simulation, and the self-relevant information need not be factual (Markman & McMullen, 2003). Unlike much of the prior research in which social and temporal comparison were studied together (Butler, 2000; Zell & Alicke, 2009, 2010a), participants in the present study were not given factual information about the target. Rather, they generated information about themselves and the target person they selected. This paradigm is reflective of many situations in daily life in which individuals use comparative thought to evaluate themselves in the absence of objective information (Festinger, 1954). Overall, the present results support the tenets of the Reflection and Evaluation Model for both social and temporal comparison. Importantly, although both models have a cognitive focus, motivational forces seemed to be at work as well. Self-evaluations were largely positive even without comparative thought, and participants perceived themselves as more similar to

fit than unfit targets, even though most adults in the U.S. engage in relatively little physical activity (Centers for Disease Control and Prevention, 2017).

Limitations and future directions

The present research had several notable limitations. First, all participants in this study were prompted to make comparisons using guided questions. Although manipulation check questions in Study 2 suggested that the majority of participants made the prescribed comparisons, and the guided questions were written to simulate everyday comparative thought processes in the absence of objective performance feedback, future research could use more ecologically valid procedures, such as asking participants to view photographs of themselves or others at different levels of fitness.

Second, upward comparison did not consistently produce strong effects across both studies. Downward comparisons may have been stronger due to a greater availability of unfit than fit targets (Centers for Disease Control and Prevention, 2017) and relatively positive self-evaluations (likely due to self-enhancement; Alicke, 1985). However, young adults often make upward comparisons in the domain of fitness (Arroyo & Brunner, 2016), and initial perceptions of dissimilarity may result in negative self-evaluations.

Third, the samples obtained in these studies were young adult college students, whose health and fitness are unlikely to have changed dramatically throughout their lives. Indeed, results of Study 1 showed that the effects of downward temporal comparison on self-evaluations did not differ by perceived similarity, perhaps due to a restricted range of available downward temporal comparison targets (though this effect was not evident in Study 2). The effects of temporal comparisons, in particular, may differ in older adults, though temporal comparisons are likely to be more constrained than social comparisons in most domains due to a limited selection of past selves. Importantly, although older individuals have more life experience from which to draw when making temporal comparisons, research suggests no significant differences in the influence of temporal comparison on health-related self-evaluations between individuals at various stages of adult life (Robinson-Whelan & Kiecolt-Glaser, 1997). Moreover, given the strong connection between physical activity in young adulthood and later metabolic health (Ferreira et al., 2005), it is important to understand how comparative thought influences young adults' views of their fitness. Nonetheless, future research should aim to recruit more diverse samples.

Finally, objective self-evaluations of fitness showed poor psychometric properties and were not used in analyses. Subjective self-evaluations may have been altered by shifting reference points (e.g., the objective strength associated with a judgment of "very strong") to match desired similarity to upward comparison targets and dissimilarity to downward comparison targets (Kiviniemi et al., 2008). While subjective self-evaluations (i.e., comparing the self in relation to others) are very common in daily life (Festinger, 1954; Wheeler & Miyake, 1992) and are ecologically valid, future research incorporating more robust measures of objective self-evaluations may be informative.

Conclusions

The present research extends social and temporal comparison theory by examining similarities and differences in their processes and self-evaluation outcomes under the same framework. Results demonstrated that, once engaged, downward social and temporal comparison processes produced similar outcomes. Specifically, young adults in two studies who perceived themselves as similar (dissimilar) to a downward comparison target had more negative (positive) self-evaluations. Results supported existing models of social and temporal comparison (Markman & McMullen, 2003; Mussweiler, 2003) and extended them by studying social and temporal comparison under the same framework in the context of young adults' fitness. Developing a richer understanding of how these processes are similar and different across comparison types can help to clarify the role of comparisons in self-evaluation and behavior.

Notes

1. An additional four items assessed objective perceptions of abilities using open-ended free response questions. Sample items included, "Estimate how many sit-ups you could perform without taking a break" and "Estimate how many pounds you could lift". All objective self-evaluation items were Z-scored, with speed recoded such that higher numbers reflected better athletic ability (Mussweiler, Ruter, & Epstude, 2004). Outliers in objective estimates were Winsorized, such that final Z-scores for each item were within 3 standard deviations of the mean. Reliability was poor ($\alpha = .42$) and correlations between items were relatively low (r's $< .44$). Therefore, analyses focused on subjective self-evaluations. The use of subjective self-evaluations is consistent with prior research involving both social and temporal comparison (Butler, 2000; Müller-Kalthoff et al., 2017; Wolff et al., 2018; Zell & Alicke, 2009, 2010a).
2. Factor analysis using maximum likelihood extraction and direct oblimin rotation was used for both subjective and objective self-evaluations. As in Study 1, the objective self-evaluations had poor psychometric properties ($\alpha = .34$) and no clear factor structure. Subjective self-evaluations loaded onto one factor, with the exception of the final item ("How physically fit ['in shape'] are you currently?"). When that item was dropped, alpha improved, though it remained relatively low ($\alpha = .64$). A mean subjective self-evaluations score was computed from the four items that were retained ($M = 3.27$, $SD = .58$).

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Erin A. Vogel http://orcid.org/0000-0002-7193-8720

References

Albert, S. (1977). Temporal comparison theory. *Psychological Review*, *84*, 485–503.

Alicke, M. D. (1985). Global self-evaluation as determined by the desirability and controllability of trait adjectives. *Personality Processes and Individual Differences*, *49*, 1621–1630.

Arroyo, A., & Brunner, S. R. (2016). Negative body talk as an outcome of friends' fitness posts on social networking sites: Body surveillance and social comparison as potential moderators. *Journal of Applied Communication Research*, *44*, 216–235.

Betz, D. E., Sabik, N. J., & Ramsey, L. R. (2019). Ideal comparisons: Body ideals harm women's body image through social comparison. *Body Image*, *29*, 100–109.

Brakel, T. M., Dijkstra, A., & Buunk, A. P. (2014). Targeting cancer patients' quality of life through social comparison: A randomized trial. *Psychology & Health*, *29*, 950–966.

Broemer, P., Grabowski, A., Gebauer, J. E., Ermel, O., & Diehl, M. (2008). How temporal distance from past selves influences self-perception. *European Journal of Social Psychology*, *38*, 697–714.

Bruchmann, K. (2017). Compared to what? The importance of control groups in social comparison research. *Basic and Applied Social Psychology*, *39*, 91–100.

Butler, R. (2000). Making judgments about ability: The role of implicit theories of ability in moderating inferences from temporal and social comparison information. *Journal of Personality and Social Psychology*, *78*, 965–978.

Centers for Disease Control and Prevention. (2017). National health interview survey. Retrieved from https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2017_SHS_Table_A-14.pdf

Chun, J. S., Brockner, J., & De Cremer, D. (2018). How temporal and social comparisons in performance evaluation affect fairness perceptions. *Organizational Behavior and Human Decision Processes*, *145*, 1–15.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175–191.

Ferreira, I., Twisk, J. W. R., van Mechelen, W., Kemper, H. C. G., & Stehouwer, C. D. A. (2005). Development of fatness, fitness, and lifestyle from adolescence to the age of 36 years. Determinants of the metabolic syndrome in young adults: The amsterdam growth and health longitudinal study. *Archives of Internal Medicine*, *165*, 42–48.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*, 117–140.

Gilbert, D. T., Giesler, R. B., & Morris, K. A. (1995). When comparisons arise. *Journal of Personality and Social Psychology*, *69*, 227–236.

Grabowski, A., & Broemer, P. (2015). Temporal self-extension: Implications for temporal comparison and autobiographical memory. *Polish Psychological Bulletin*, *46*, 246–261.

Hakmiller, K. L. (1966). Threats as a determinant of downward comparison. *Journal of Experimental Social Psychology Supplement*, *1*, 32–39.

Hanko, K., Crusius, J., & Mussweiler, T. (2010). When I and me are different: Assimilation and contrast in temporal self-comparisons. *European Journal of Social Psychology*, *40*, 160–168.

Hoffner, C., & Ye, J. (2009). Young adults' responses to news about sunscreen and skin cancer: The role of framing and social comparison. *Health Communication*, *24*, 189–198.

Jarvis, B. G. (2014). MediaLab (Version 2012.4.118) [Computer Software]. New York, NY.

Kiviniemi, M. T., Snyder, M., & Johnson, B. C. (2008). Motivated dimension manipulation in the processing of social comparison information. *Self and Identity*, *7*, 225–242.

Klein, W. M. (1997). Objective standards are not enough: Affective, self-evaluative, and behavioral responses to social comparison information. *Journal of Personality and Social Psychology*, *72*, 763–774.

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

Markman, K. D., & McMullen, M. N. (2003). A reflection and evaluation model of comparative thinking. *Personality and Social Psychology Review*, *7*, 244–267.

McFarland, C., & Alvaro, C. (2000). The impact of motivation on temporal comparisons: Coping with traumatic events by perceiving personal growth. *Journal of Personality and Social Psychology*, *79*, 327–343.

Müller-Kalthoff, H., Helm, F., & Möller, J. (2017). The big three of comparative judgment: On the effects of social, temporal, and dimensional comparisons on academic self-concept. *Social Psychology of Education*, *20*, 849–873.

Mussweiler, T. (2003). Comparison processes in social judgment: Mechanisms and consequences. *Psychological Review*, *110*, 472–489.

Mussweiler, T., & Ruter, K. (2003). What friends are for! The use of routine standards in social comparison. *Journal of Personality and Social Psychology*, *85*, 467–481.

Mussweiler, T., Ruter, K., & Epstude, K. (2004). The man who wasn't there: Subliminal social comparison standards influence self-evaluation. *Journal of Experimental Social Psychology*, *40*, 689–696.

Peetz, J., & Wilson, A. E. (2014). Making time: Selective use of temporal landmarks as barriers between current and future selves. *Personality and Social Psychology Bulletin*, *40*, 44–56.

Robinson-Whelan, S., & Kiecolt-Glaser, J. (1997). The importance of social versus temporal comparison appraisals among older adults. *Journal of Applied Social Psychology*, *27*, 959–966.

Spini, D., Clemence, A., & Ghisletta, P. (2007). How are temporal and social comparisons related to appraisals of self-rated health during very old age? *Swiss Journal of Psychology*, *66*, 79–89.

Stanton, A. L., Danoff-Burg, S., Cameron, C. L., Snider, P. R., & Kirk, S. B. (1999). Social comparison and adjustment to breast cancer: An experimental examination of upward affiliation and downward evaluation. *Health Psychology*, *18*, 151–158.

Suls, J., Marco, C., & Tobin, S. (1991). The role of temporal comparison, social comparison, and direct appraisal in the elderly's self-evaluations of health. *Journal of Applied Social Psychology*, *21*, 1125–1144.

Summerville, A., & Roese, N. J. (2008). Dare to compare: Fact-based versus simulation-based comparison in daily life. *Journal of Experimental Social Psychology*, *44*, 664–671.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, *103*, 193–210.

Taylor, S. E., & Lobel, M. (1989). Social comparison activity under threat: Downward evaluation and upward contact. *Psychological Review*, *96*, 569–575.

Tesser, A., & Smith, J. (1980). Some effects of task relevance and friendship on helping: You don't always help the one you like. *Journal of Experimental Social Psychology*, *16*, 582–590.

Thompson, J. K., Heinberg, L. J., Altabe, M., & Tatleff-Dunn, S. (1999). *Exacting beauty: Theory, assessment, and treatment of body image disturbance*. Washington, D. C.: American Psychological Association.

Wheeler, L., & Miyake, K. (1992). Social comparison in everyday life. *Journal of Personality and Social Psychology*, *62*, 760–773.

Wills, T. A. (1981). Downward comparison principles in social psychology. *Psychological Bulletin*, *2*, 245–271.

Wolff, F., Helm, F., Zimmermann, F., Nagy, G., & Möller, J. (2018). On the effects of social, temporal, and dimensional comparisons on academic self-concept. *Journal of Educational Psychology*, *110*, 1005–1025.

Wood, J. V. (1989). Theory and research concerning social comparisons of personal attributes. *Psychological Bulletin*, *106*, 231–248.

Zell, E., & Alicke, M. D. (2009). Self-evaluative effects of temporal and social comparison. *Journal of Experimental Social Psychology*, *45*, 223–227.

Zell, E., & Alicke, M. D. (2010a). Comparisons over time: Temporal trajectories, social comparison, and self-evaluation. *European Journal of Social Psychology*, *40*, 375–382.

Zell, E., & Alicke, M. D. (2010b). The local dominance effect in self-evaluation: Evidence and explanations. *Personality and Social Psychology Review*, *14*, 368–384.

Appendix A

Guided questions used to prompt social comparison (Studies 1 and 2), temporal comparison (Studies 1 and 2), and no comparison (Study 2)

Instructions (social and temporal comparison conditions)

Upward social comparison: "Think about a person you know fairly well who is more physically fit than you. You will answer a number of questions about this person."

Downward social comparison: "Think about a person you know fairly well who is less physically fit than you. You will answer a number of questions about this person."

Upward temporal comparison: "Think about yourself during a time in your life when you were more physically fit than you are now. You will answer a number of questions about your younger self."

Downward temporal comparison: "Think about yourself during a time in your life when you were less physically fit than you are now. You will answer a number of questions about your younger self."

Guided Questions (social and temporal comparison conditions; Studies 1 and 2)

(1) What makes *this person (made you) unfit and unhealthy (fit and healthy)*?
(2) *Does this person (did you)* play any sports, either for school, club, or recreation? What sports *do (did) they (you)* play?
(3) Describe *this person's physical strength (your physical strength during that time). Are they (were you)* capable of lifting heavy things?
(4) Describe *this person's endurance (your endurance during that time). Are they (were you)* capable of running a race? Going for a long walk or bike ride?
(5) Describe *this person's (your)* general weight and body type *(during that time)*.
(6) How *does this person's (did your)* physical fitness compare to other people of *their (your)* age and gender?

1	2	3	4	5
Much less fit than average	Less fit than average	Average	Fitter than average	Much fitter than average

(7) How similar is *this person's fitness level (your fitness level during that time)* to *your own fitness level (your fitness level now)*?

1	2	3	4	5	6	7	8	9
Not at all similar								Completely similar

No-comparison control (Study 2): "Think about yourself and your life. You will answer a number of questions about yourself.

(1) How would you describe yourself?

(2) What is your favorite thing to do in your free time? What is your least favorite chore or least favorite thing you have to do?

(3) Describe your experience in school. What is your major? What are your favorite and least favorite classes?

(4) What are some TV shows or movies you've watched recently?

(5) Describe your schedule on a weekday. What do you usually do with your time?

(6) How many hours of sleep do you usually get on a weeknight? Pick the option that best describes your sleep:

1	2	3	4	5
Less than 5 hours	5–6 hours	6–7 hours	7–8 hours	More than 8 hours

(7) How busy are you?

1	2	3	4	5	6	7	8	9
Not busy at all								Extremely busy

Appendix B

Subjective and objective self-evaluation items (Studies 1 and 2)

(1) How many sit-ups could you perform?*

1	2	3	4	5
No sit-ups or very few	A few sit-ups	A moderate amount of sit-ups	Quite a few sit-ups	Very many sit-ups

(2) Estimate how many sit-ups you could perform without taking a break. _____

(3) How fast can you run, bike, or swim?*

1	2	3	4	5
Very slowly or not at all	Slowly	Moderate	Fast	Very fast

(4) Estimate how many seconds would you need to run 100 meters (the straight part of one side of a running track). _____

(5) How is your endurance (your ability to exercise for a long time without taking a break)?*

1	2	3	4	5
Very poor	Poor	Moderate	Good	Very good

(6) Estimate how many minutes you could run or do other intense cardiovascular exercise without stopping. _____

(7) How strong are you?*

1	2	3	4	5
Very weak	Weak	Moderate	Strong	Very strong

(8) Estimate how many pounds you could lift. _____

(9) How physically fit ("in shape") are you currently?*

1	2	3	4	5
Not at all physically fit				Very physically fit

aSubjective self-evaluation item used in analyses