

# Dare to compare: Fact-based versus simulation-based comparison in daily life <sup>☆</sup>

Amy Summerville <sup>\*</sup>, Neal J. Roese

*Department of Psychology, University of Illinois, 603 E. Daniel St., Champaign, IL 61820, USA*

Received 25 August 2006; revised 6 April 2007

Available online 29 April 2007

## Abstract

We examined the relative frequency of social, counterfactual, past-temporal, and future-temporal comparison in daily life using an experience-sampling method, in which participants were randomly prompted to record thought samples using palmtop computers carried for two weeks. Comparative thought accounted for 12% of all thoughts, and all four comparison types occurred with equivalent frequency. Comparisons may be either fact-based (i.e., based on actuality, as in social and past-temporal comparison) or simulation-based (i.e., based on imagination, as in counterfactual and future-temporal comparison). Because the latter are more “unbounded,” and because greater perceived opportunity invites greater self-improvement, we predicted and found that counterfactual and future-temporal comparison were more likely to be upward (vs. downward) than social and past-temporal comparison. All comparison types focused on approach more than avoidance motives, except for counterfactuals, which showed equivalent focus on both. These findings reveal the prominence of comparative thought in daily life, and underscore the value of an integrative theory that describes social, counterfactual, or temporal comparison using a common theoretical platform.

© 2007 Elsevier Inc. All rights reserved.

*Keywords:* Approach; Avoidance; Counterfactual; Affect; Motivation; Regret; Social comparison; Temporal comparison

People compare themselves to numerous benchmarks, from other people (social comparison), to imaginings of what might have been (counterfactual comparison), and to past or future circumstances (temporal comparison). How common are comparisons, and what functions do they serve in daily life? Established theory presumes that comparisons are frequent (e.g., Festinger, 1954; Mussweiler, 2003; Taylor & Brown, 1988), yet only a few studies have examined their daily occurrence (e.g., Wheeler & Miyake, 1992), and none have contrasted all of social, counterfactual, and temporal comparison simultaneously. The present research examined these various kinds of comparisons in daily life using the experience sampling tech-

nique (e.g., Scollon, Kim-Prieto, & Diener, 2003), in which participants carried palm-style computing devices that prompted them to record thought samples at random times over a 2-week period.

Of key importance was direction of comparison (i.e., upward or downward), which previous theory has linked to specific psychological functions, such as self-improvement (planning and acting to achieve better outcomes) versus affect-regulation (reconstructing circumstances so as to feel better). In the social comparison literature, direction of comparison distinguishes between comparisons to a superior versus inferior other person (e.g., Suls & Wheeler, 2000); in the counterfactual literature, to superior versus inferior alternative circumstances (e.g., Roese, 1997); and in the temporal comparison literature, to a superior or inferior past (or future) self (e.g., Wilson & Ross, 2000). Upward comparisons, by suggesting insights into personal betterment, generally serve a self-improvement function, whereas downward comparisons, which make reality seem

<sup>☆</sup> We thank Jim Olson for comments on an earlier draft. This research was supported National Institute of Mental Health Grant R01-MH55578, awarded to Neal Roese.

<sup>\*</sup> Corresponding author.

*E-mail address:* [asummerv@uiuc.edu](mailto:asummerv@uiuc.edu) (A. Summerville).

more favorable by contrast, may serve primarily an affect-regulation function (Brickman & Bulman, 1977; Taylor & Brown, 1988; Wills, 1981). Although several moderators have been noted (e.g., Buunk, Collins, Taylor, VanYperen, & Dakof, 1990; Markman & McMullen, 2003; Taylor & Lobel, 1989), the connection between direction of comparison and specific psychological functions has informed decades of research. Despite this attention, key questions remain: how often do upward and downward comparisons occur in daily life, and do these frequencies vary as a function of the type of comparison?

There are compelling theoretical reasons to expect that upward versus downward comparisons differ among the comparison types. We suggest that the referents that define these kinds of comparisons confer differences in their tendency to take an upward versus downward form. Specifically, whether the comparisons are primarily *fact-based* versus *simulation-based* may moderate their direction of comparison. A fact-based judgment is one that rests largely on known or assumed factual information, for example observations of real people and real events. Social and past-temporal comparisons are examples of fact-based judgment, in the sense that they focus (for the most part) on information rooted to actual people or events. By contrast, a simulation-based judgment is one that rests on supposition, conjecture, and imagination (e.g., Davies & Stone, 1995; Kahneman & Tversky, 1982). A simulation may be highly accurate if based on accurate knowledge (as in a weather forecast based on reliable temperature and pressure measurements), but at root it is a constructed representation. It does not correspond to an actual event that has clearly transpired. Counterfactual and future-temporal comparisons are examples of simulation-based judgments. They focus respectively on past events that “might have been” had some factual aspects been different, and on future events that may (or may not) come to be. Of course, the distinction between fact-based and simulation-based is relative rather than absolute. Sometimes social comparison, for example, involves considerable conjecture (e.g., they may involve an imagined or idealized person), but relatively speaking, social comparison *on average* involves relatively less conjecture than counterfactual or future-temporal comparison.

Fact-based versus simulation-based judgments differ in their boundedness, that is, in the basic constraints on how they are conceived. Fact-based judgments are bounded by reality, which imposes specific constraints rooted to what actually has been observed, and what is believed to be true. Simulation-based judgments are less bounded: the imagination may range far and wide over many possibilities. Thus, whereas comparisons to another person or to a past event are limited to what that other person is actually like (“she is outgoing”) and what actually happened (“I was inattentive in school”), counterfactual and future-temporal comparisons may select from a far wider palette of possibilities (“I might have been attentive, or excited, or ambitious”; “she may learn to be generous,

become a basketball fan, or volunteer her spare time at a homeless shelter”). Previous theorists have recognized the importance of boundedness in different contexts. For example, Gilovich and Medvec (1995) noted that regrets of inaction (which focus on some action that might have been performed in the past, i.e., an “additive” counterfactual) are less bounded than regrets of action (which focus on actions that were in fact performed, but perhaps should not have been, i.e., a “subtractive” counterfactual). Whereas the latter are constrained by actuality, the “consequences of inactions are . . . potentially infinite: they are bounded only by one’s imagination” (p. 390). Markman, Lindberg, Kray, and Galinsky (2007) demonstrated that regrets of inaction (additive counterfactuals) promote a more expansive processing style, marked by wider conceptual attention and greater creativity.

Gilovich and Medvec (1995) pointed out further that with decreased boundedness comes greater recognition of opportunity and possibility, which other research has shown to be linked to self-improvement and performance facilitation. Simply put, individuals are more likely to engage in self-improvement actions when they perceive their circumstances to be modifiable (Gilbert & Ebert, 2002; Roeser & Summerville, 2005). A wide range of separate research has shown that greater perceptions of control, opportunity, or simple changeability elicit more action-oriented thoughts, greater effort and persistence, and better performance (e.g., Markman, Gavanski, Sherman, & McMullen, 1993; Testa & Major, 1990). For example, individuals who believe in the changeability of their own skills performed better than those who believed that these same skills were invariant (e.g., Dweck & Leggett, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999). In the counterfactual literature, participants induced to focus on regrets of inaction (which are less bounded) than regrets of action subsequently showed greater performance improvements (Roeser, 1994). The regulatory focus literature has also shown that wider consideration of possibilities elicits better performance. That is, a promotion focus involves consideration of a wider range of information than prevention focus (Forster & Higgins, 2005), and overall promotion focus induces better performance (via task persistence) than prevention focus (e.g., Forster, Higgins, & Idson, 1998; Liberman, Idson, Camacho, & Higgins, 1999).

These various theoretical strands converge on the prediction that simulation-based comparisons, because they are less conceptually bounded than fact-based comparisons, will more often connect to self-improvement. If self-improvement is more likely to involve upward than downward comparison, then simulation-based comparisons (counterfactual and future-temporal) should be more likely to take the upward direction of comparison than fact-based comparisons (social and past-temporal). Although no previous research has simultaneously examined social, counterfactual, past-temporal, and future-temporal comparisons in daily life, past research is partly consistent with this prediction. Wheeler and Miyake

(1992)'s diary study indicated that for social comparison, downward comparison was more likely than upward comparison. Wilson and Ross (2000) examined retrospective reports of frequency of comparative thought, and found that future-temporal comparisons were most likely to be upward, past-temporal comparisons were least likely to be upward, with social comparisons falling in between. Roese and Hur (1997) found that spontaneously recorded counterfactual comparisons following performance feedback were mostly upward rather than downward.

The construct of boundedness also yields predictions about the extent to which these different comparison types emphasize approach versus avoidance motives. Approach motives center on acquisition of desired ends, whereas avoidance motives center on prevention of undesired ends. Past research has already revealed a simple association between direction of comparison and motives, such that upward comparisons connect to approach and downward comparisons connect to avoidance motives (in counterfactual comparison: Hur, 2001; in social comparison: Lockwood, Jordan, & Kunda, 2002). Thus, we expected to see this same basic pattern across all comparison types. But might approach and avoidance motives differ in their importance within the comparison types? Two competing predictions seemed plausible. First, some have argued that approach motives are, by definition, less bounded than avoidance motives (Forster & Higgins, 2005; Liberman, Molden, Idson, & Higgins, 2001). That is, approach motives are more likely to involve maximization, or focusing on getting the best that is possible, whereas avoidance motives are more likely to be minimal, in the sense of doing just enough to keep things as they are (i.e., to prevent things from getting worse; Pennington & Roese, 2003). In this view, what matters most is the structural fit between boundedness and motive. Accordingly, the simulation-based comparisons (low boundedness) may be more likely to emphasize approach (also low boundedness) than avoidance, relative to the fact-based comparisons. The second possibility is that the simulation-based comparisons, simply by virtue of their less bounded nature, might afford greater flexibility to serve both (or either) of approach and avoidance goals equivalently. The present research was able to test these competing predictions by assessing the degree of association between comparison type and ratings of approach versus avoidance motives.

We also tested whether different comparison types might be associated with differing degrees of affect, although we had no theoretical reason to expect such a difference. A further question was whether direction of comparison would be associated with affect, as past research has indicated that affect is both a cause as well as consequence of upward versus downward comparison. Upward more than downward comparison may elicit negative affect by way of a contrast effect, and negative affect may stimulate self-improvement cognitions in general, with upward comparison as one such example (e.g., Roese, 1997; Wheeler & Miyake, 1992). At the same time, other research has shown that expectation

of future performance opportunities shield individuals from the negative affective consequences of upward comparison (Boninger, Glicher, & Strathman, 1994). Thus, to the extent that individuals in our study enjoy a generally optimistic orientation embodying expectations of future opportunity, the association between direction of comparison and affect might be weakened. Nevertheless, no prior research has examined the affect associations involved in direction of comparison simultaneously in social, counterfactual, and temporal comparison.

## Method

### *Participants and procedure*

Thirty-four paid participants (15 women, age  $M = 22.3$  yr) were recruited by flyers posted in campus locations during summer semesters. Prior to receiving the palmtop computer, participants completed a computerized tutorial of definitions and examples used within survey questions, and were tested to ensure correct usage of the classification. Participants repeated this training test until they correctly classified all four of the example thoughts provided. (e.g., classifying “If I’d worn running shoes, I wouldn’t have gotten a blister yesterday” as a comparison focused on “what might have been.”) Participants were also trained to record their responses to the multiple-choice and sliding-scale questionnaire items. Participants selected one of three 10-h daily windows during which the palmtop computer would randomly signal thought sampling. Data were collected daily for 14 days using Palm Zire palmtop computers running iESP software. Participants were signaled seven times during the daily 10-h window selected, with alerts occurring every 1–2 h. Participants had 10 min to respond to the alarm (which beeped continuously until termination) and 2 min to respond to each question before the computer recorded a missed trial and entered sleep mode; trials in which any question went unanswered were classified as “missed” (19.8% of trials). Participants returned to the lab after 1 week so that the palmtop computer could be checked and data backed up, and were asked about any problems they were experiencing. Although minor technical issues were noted (e.g., forgetting how to silence or resume the alarm, one instance of battery failure), no participant reported significant difficulty with the requirements of the study or in classifying their thoughts either during this session or at the end of the two weeks.

In each trial, thought classification proceeded using a hierarchical questionnaire (see Fig. 1). Due to software constraints, we could not collect free response thought listings, but only the responses to multiple-choice questions classifying the thoughts. Participants initially categorized their thoughts as comparison, fact, opinion, or other. They then further categorized the thought using Level 2 descriptors unique to each Level 1 category. Results are presented only for thoughts categorized as “comparison” at Level 1. For thoughts classified as comparisons, the surveys used

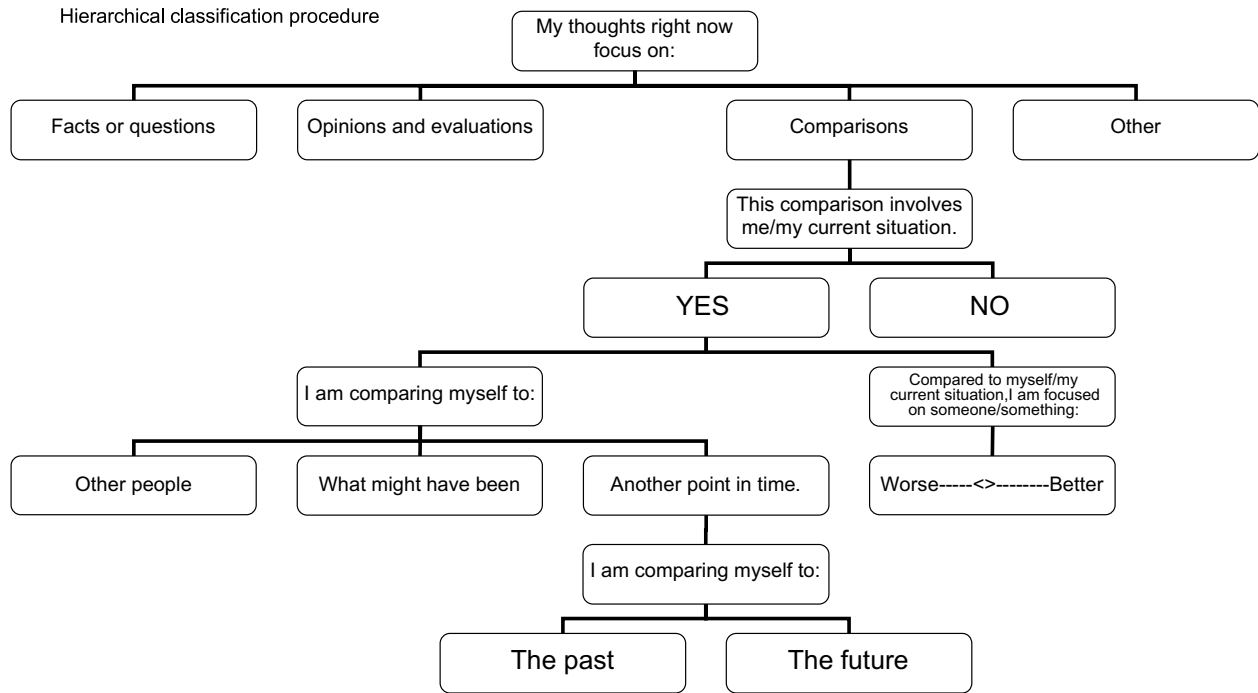


Fig. 1. Hierarchical classification procedure.

the prompt “Right now, I am comparing myself to...” with the response options “other people” (i.e., social comparison), “what might have been” (i.e., counterfactual comparison), or “another point in time” (i.e. temporal comparison). Participants selecting “another point in time” further indicated whether they were comparing themselves to the past or future. Participants used a sliding scale to rate the direction of comparison (upward vs. downward); these ratings were transformed to a –5 to 5 scale.

Participants also used sliding scales to rate their current emotional and motivational state. Participants indicated their level of agreement with the statements “Right now, I am focused on achieving positive outcomes” (i.e., approach motivation) and “Right now, I am focused on avoiding negative outcomes” (i.e., avoidance motivation); these ratings were transformed to a 0 to 10 scale. Mood was assessed with the item “Right now, I am feeling:” with anchors “Bad” and “Good”; these ratings were transformed to a –5 to 5 scale.

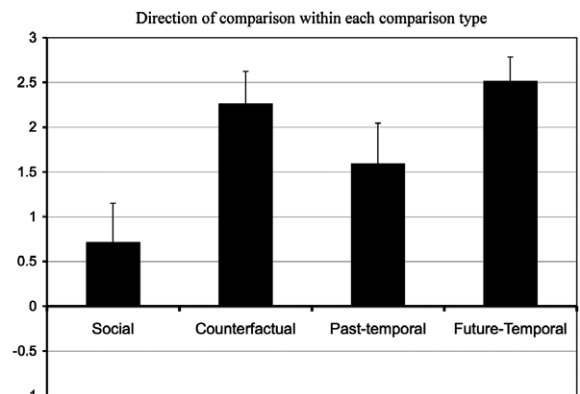
**Results**

Of all thoughts sampled, 12.2% were comparative (range: 0–36.8%, *SD* = 7.98). Of these, we were interested only in self-focused comparisons (57.8% of all comparisons, hence 7.1% of all thoughts sampled). Analyses reported below focused on only on those self-focused comparisons.

Of key interest, the four kinds of comparisons occurred with roughly equivalent frequency: social—24.2%; counterfactual—25.5%; past-temporal—19.4%; future-temporal—

30.9%. These proportions did not differ statistically ( $\chi^2(3) = 4.43, p > .10$ ), with the exception that past-temporal comparisons were less frequent than future-temporal comparisons ( $\chi^2(1) = 4.41, p < .05$ ).

We next examined whether direction of comparison differed across comparison type (see Fig. 2). To account for the non-independent nature of our observations, we used a hierarchical regression approach, nesting trials within participants. To test the primary hypothesis that simulation-based versus fact-based comparisons would differ in direction of comparison, we created a dummy variable that captured this distinction. In a hierarchical regression pre-



Note. Positive values indicate greater focus on upward comparison, whereas negative values indicate greater focus on downward comparison. Scale range is from -5 to 5.

Fig. 2. Direction of comparison within each comparison type. Note: positive values indicate greater focus on upward comparison, whereas negative values indicate greater focus on downward comparison. Scale range is from -5 to 5.

dicting direction from this dummy variable, we indeed found that simulation-based comparisons were overall more upward in direction than fact-based comparisons,  $t(31) = 3.11, p = .004, d = 1.12$ .

Looking more specifically at each comparison, we found that the two simulation-based comparison (counterfactual and future-temporal) did not differ from each other ( $M_s = 2.28$  vs.  $2.51$ ),  $t(25) = 0.002, p = .99, d = 0.001$ . Further, the two fact-based judgments (social and past-temporal comparison) also did not differ from each other ( $M_s = 0.71$  vs.  $1.59$ ),  $t(26) = 1.61, p = .12, d = 0.63$ . Future-temporal comparisons were significantly more upward than both social ( $t(30) = 3.38, p = .002, d = 1.23$ ) and past-temporal comparisons ( $t(26) = 2.15, p = .04, d = 0.84$ ). Counterfactual comparisons only marginally exceeded social comparisons ( $t(28) = 1.93, p = .06, d = 0.73$ ), and did not differ from past-temporal comparisons ( $t(24) = 1.36, p = .18, d = 0.56$ ).

The percentages of thoughts that exceeded the scale midpoint provided an additional means of capturing the relative frequency of upward versus downward comparisons. Using this index, a similar pattern as above was evident: 80% of counterfactual and as well as of future-temporal comparisons were upward, compared to 69% of past-temporal and 55% of social comparisons. We calculated the percentage of all simulation-based and all fact-based comparisons which exceeded the scale midpoint within each participant (80% vs. 61%, respectively), and then used a hierarchical approach, nesting these two types within each participant. Because not every participant made both types of comparisons, this test was more appropriate than a paired-sample  $t$ -test, which would have contained a large number of missing cells. Consistent with the above analyses, we again found that simulation-based comparisons had a greater percentage of upward comparisons relative to fact-based comparisons,  $t(56) = 2.10, p = .04, d = 0.56$ .

We next examined how direction of comparison was related to motives across and within the four comparison types using hierarchical linear regression. A hierarchical model nesting trials within participants was created in which ratings of approach and avoidance were regressed onto ratings of direction. To begin with, approach motives were rated higher overall than avoidance motives,  $t(32) = 4.75, p < .001, d = 1.68$ . Further, direction of comparison was associated overall with approach, such that comparisons that were relatively more upward were accompanied by greater approach motives,  $\gamma = .23, t(31) = 3.89, p = .001, d = 1.40$ . At the same time, direction of comparison was unrelated to avoidance motives,  $\gamma = .04, t(31) = 0.39, p = .70, d = 0.14$ .

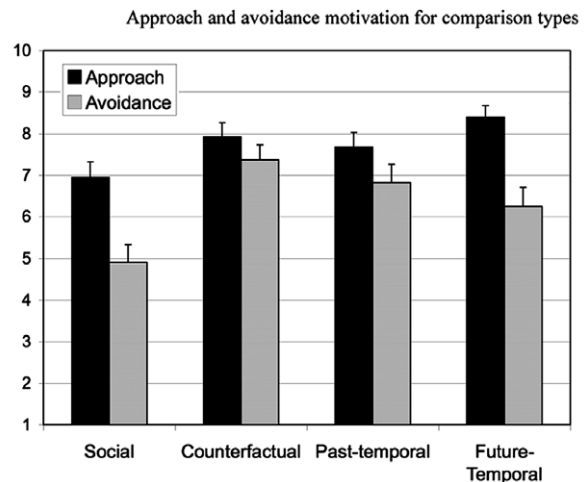
Looking next to associations within each comparison type, we found that social comparisons focused more on approach than avoidance ( $M_s = 6.95$  vs.  $4.91$ ),  $t(20) = 3.22, p = .005, d = 1.44$ . The same pattern was evident in future-temporal comparisons ( $M_s = 8.40$  vs.  $6.25$ ),  $t(19) = 3.74, p = .002, d = 1.72$ . Past-temporal compari-

sons also showed this pattern ( $M_s = 7.68$  vs.  $6.83$ ), although this effect was weaker,  $t(17) = 1.98, p = .06, d = 0.96$ . By contrast, counterfactual thoughts emphasized approach and avoidance equivalently ( $M_s = 7.93$  vs.  $7.37$ ),  $t(18) = 1.63, p = .12, d = 0.77$ . These means are presented in Fig. 3.

In a hierarchical regression predicting mood from direction across all comparisons, direction of comparison was positively correlated with mood,  $\gamma = .22, t(31) = 2.43, p = .02, d = 0.87$ . In other words, the greater the degree of upward comparison, the more positive the affect reported. Looking closer to the types of comparison, the pattern was evident only in counterfactual and past-temporal comparisons ( $\gamma_s = .31, .28$ ) but not social or future-temporal comparisons ( $\gamma_s = .04, .04$ ). Mood ratings exceeded the scale midpoint (and thus indicated an overall degree of happiness) within all comparison types (all  $p_s < .01$ ). Further, of these 4 means, only social and future-temporal comparisons differed significantly ( $M_s = 1.09$  vs.  $2.24$ ),  $t(31) = 2.67, p = .01, d = 0.96$ . Overall, then, we observed no systematic relation between mood and boundedness. The association between upward comparison and positive affect was intriguing and to an extent surprising, and we return to it in Discussion below.

## Discussion

The present research employed an experience-sampling approach to examine the daily frequencies of various kinds of comparative judgment: social, counterfactual, past-temporal, and future-temporal. Of the thoughts sampled, 12% were comparative, which is a remarkably large proportion given the sheer variety of mental experience. Further, self-focused comparisons, which are the sort of comparison that have garnered the most theoretical attention in social



Note. Greater values indicate greater emphasis on approach or avoidance motives. Scale range is 1–10.

Fig. 3. Approach and avoidance motivation for comparison types. Note: greater values indicate greater emphasis on approach or avoidance motives. Scale range is 1–10.

psychology, accounted for 7.1% of all thoughts sampled. Comparative thought may therefore be said to occupy a significant place in the mental landscape of daily life, thus justifying the theoretical attention such thought processes have garnered in recent decades.

Strikingly, these comparisons were nearly evenly split among the four types of comparison that we examined. Previous research has been unclear on this point. Suls and Mullen (1982), for example, suggested that social comparison predominates over temporal comparison, yet later research by Wilson and Ross (2000) demonstrated the reverse. No similar research has examined counterfactual comparison alongside social and temporal comparison. The present research, by contrast, reveals that in everyday life, none of social, counterfactual, or temporal comparison enjoys a privileged position. This simple observation is important for current theory in that it underscores the value of integrative approaches, such as that taken by Markman and McMullen (2003) in their reflection–evaluation model. These authors were the first to integrate across the different kinds of comparisons using a common theoretical platform, rather than relying on separate theories for each of social, counterfactual, or temporal comparison.

The key focus of the present research was whether direction of comparison differed across the different kinds of comparisons in daily life. We noted that a key difference between types of comparison is whether they are primarily fact-based versus simulation-based; that is, whether they are constructed from information based on actual people or events, or on imagined supposition. Social and past-temporal comparisons are examples of fact-based judgment, whereas counterfactual and future-temporal comparisons are examples of simulation-based judgments. Fact-based judgments are bounded by the facts at hand, whereas simulation-based judgments are less bounded, and hence may embrace information from a far broader range of possibilities. As Gilovich and Medvec (1995) noted, simulation-based judgment is limited only by the bounds of the imagination. Other theory and research suggests that the less the boundedness of the representation, the greater the association with self-improvement cognitions and performance improvement (Forster et al., 1998; Gilbert & Ebert, 2002; Hong et al., 1999; Liberman et al., 1999; Markman et al., 1993, 2007; Testa & Major, 1990; Roesel & Summerville, 2005). Tying these strands together, we predicted that simulation-based judgments (low boundedness) would be more likely to take the upward than downward direction of comparison (which previous theory has connected directly to self-improvement, Brickman & Bulman, 1977; Wills, 1981).

We indeed found that in everyday life, the simulation-based comparisons (counterfactual and future-temporal) were more likely to be upward than the fact-based comparisons (social and past-temporal). Even though social comparison involved the lowest level of upward comparison, these upward thoughts were roughly equivalent in frequency to downward thoughts. This result differs from Wheeler and

Miyake (1992), who reported that downward outnumbered upward thoughts in social comparison, but it is consistent with the result reported by Wilson and Ross (2000). The present findings thus make an important new contribution to an integrated theoretical approach to comparative thought: it is counterfactual and future-temporal comparison (simulation-based judgments) that are most likely to focus on self-improvement, and hence the regulation of ongoing behavior. Social and past-temporal comparison (fact-based judgments) may sometimes connect to self-improvement, but they are perhaps more likely to be directed to other sorts of motives, such as affect-regulation. At the same time, it is important to note that there is not a perfect, one-to-one matching between direction of comparison and motive. For example, an upward counterfactual may be motivated by a desire to make sense of one's experiences rather than by self-improvement, and future-temporal comparison may reflect an idle daydream rather than a well-reasoned intention. Future research that examines more directly the various functions served by upward and downward comparison in daily life will prove highly informative.

In addition to their different patterns of direction of comparison, the four kinds of comparison differed in the extent to which they emphasized approach versus avoidance motives. Social, past-temporal, and future-temporal comparison focused by a wide margin on approach over avoidance, whereas counterfactual comparison focused equally on approach and avoidance. This finding revealed yet another important difference between types of comparative judgment: all but counterfactuals emphasized moving forward toward ideal end-states. Past research has shown a connection between upward comparison and approach motives, and downward comparison and avoidance motives, but this research was situated specifically within either social comparison (Lockwood et al., 2002) or counterfactual comparison (Hur, 2001). Our research, by contrast, found only the association between upward comparison and approach motives, yet nevertheless discovered it to be a pattern common to all the comparisons as they unfold in daily life. Thus, there appears to be a basic psychological connection between focus on an alternative that is better than the current one and a motivational emphasis on achieving a desired, ideal state.

The boundedness conception suggested two further possible relations between the various comparison types and approach versus avoidance motives: first, simulation-based comparisons (low boundedness) may be more likely to emphasize approach (also low boundedness) than avoidance, relative to the fact-based comparisons, and second, simulation-based comparisons, simply by virtue of their less bounded nature, might afford greater flexibility to serve both (or either) of approach and avoidance goals equivalently. The first idea was supported by a weak tendency for simulation-based comparisons to yield higher approach ratings than fact-based comparisons. The second possibility was not confirmed: only counterfactual comparisons seemed to involve the inherent flexibility to embrace

approach and avoidance equivalently. This latter finding is interesting, in that Mandel and Lehman (1996) suggested that counterfactuals are predominantly avoidance-focused. Our findings qualify their assertion, suggesting that in everyday life, counterfactual comparisons are more avoidance-focused *relative to* other forms of comparative judgment.

Surprisingly, affect was found to be related to direction of comparison in a manner different from much previous research, such that upward comparison was associated with more positive affect. This relation was significant only in comparisons focusing on the past (counterfactual and past-temporal), with the other comparisons showing a null relation. Of course, given the correlational nature of our data, it is impossible to say whether affect was cause or consequence of direction of comparison. However, one intriguing possibility is that an ongoing focus on future possibilities and opportunities might serve to weaken the link between affect and direction of comparison. For example, Boninger et al. (1994) reported that among participants who were likely to focus on the future and on the benefits of learning from mistakes, the typically observed negative affective consequences of upward counterfactual comparison was quashed, relative to those participants less likely to focus on “what can be done in the future.” Similarly, McMullen and Markman (2002) found that upward counterfactual comparisons corresponded to more positive affect (an assimilation effect) when a situation remained open (rather than closed) to future modification, such as at halftime in a basketball game. Perhaps among our young participants, life itself may be metaphorically at half-time. By sampling comparative thought across a variety of daily activities, we may have captured more of this opportunity orientation, and perhaps revealed that affective assimilation rather than contrast effects are more common than has previously been observable using laboratory tasks.

Another interpretation of the association of affect and direction might be made, given the correlational nature of our measurement. Specifically, affect-regulation is particularly necessary in the face of increasingly negative affect. Because participants reported the thought at the instant of the trial, the affective impact of the comparison might not yet have occurred, and we may have measured the affective state preceding and immediately surrounding the comparative thought, rather than the affective consequences. The correlation could thus indicate that negative affect triggered downward comparisons, which would be consistent with earlier research on affect repair (e.g. Aspinwall & Taylor, 1993; Gibbons, 1986; Wills, 1981). Research designed to trace the time course of affect-regulation via strategic generation of comparative thoughts could confirm the plausibility of this interpretation.

The present research provided a unique portrait of the daily frequency of different forms of comparative judgment and their directions of comparison. Like any portrait, this picture depends on the subjects tested (college students), hence we encourage validation of these

results in a more diverse sample. In updating the conclusions of past research, the present research nevertheless provides new evidence that bolsters established theory linking direction of comparison to psychological functions (Brickman & Bulman, 1977; Taylor & Brown, 1988; Wills, 1981; Wood, Michela, & Giordano, 2000), yet also extends this theory by showing additionally that particular *kinds* of comparative judgment are, overall, differentially associated with particular functions. By taking into account basic differences in the form of the comparison, i.e., between fact-based and simulation-based comparison, we observed a general pattern that low boundedness points to upward comparison. Counterfactual and future-temporal comparisons mainly take the upward direction of comparison, whereas social and past-temporal are more likely to embody either of upward or downward comparison.

## References

- Aspinwall, L. G., & Taylor, S. E. (1993). Effects of comparison direction, threat, and self-esteem on affect, self-evaluation, and expected success. *Journal of Personality and Social Psychology*, *64*, 708–722.
- Boninger, D. S., Glicher, F., & Strathman, A. (1994). Counterfactual thinking: From what might have been to what may be. *Journal of Personality and Social Psychology*, *67*, 297–307.
- Brickman, P., & Bulman, R. J. (1977). Pleasure and pain in social comparison. In J. M. Suls & R. L. Miller (Eds.), *Social comparison processes: Theoretical and empirical perspectives* (pp. 149–186). Washington, DC: Hemisphere.
- Buunk, B. P., Collins, R. L., Taylor, S. E., VanYperen, N. W., & Dakof, G. A. (1990). The affective consequences of social comparison: Either direction has its ups and downs. *Journal of Personality and Social Psychology*, *59*, 1238–1249.
- Davies, M., & Stone, T. (Eds.). (1995). *Mental simulation: Evaluations and applications*. Oxford: Blackwell Publishers.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*, 256–273.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*, 117–140.
- Forster, J., & Higgins, E. T. (2005). How global versus local perception fits regulatory focus. *Psychological Science*, *16*, 631–636.
- Forster, J., Higgins, E. T., & Idson, L. C. (1998). Approach and avoidance strength during goal attainment: Regulatory focus and the “goal looms larger” effect. *Journal of Personality and Social Psychology*, *75*, 1115–1131.
- Gibbons, F. X. (1986). Social comparison and depression: Company’s effect on misery. *Journal of Personality and Social Psychology*, *51*, 140–148.
- Gilbert, D. T., & Ebert, J. E. J. (2002). Decisions and revisions: The affective forecasting of changeable outcomes. *Journal of Personality and Social Psychology*, *82*, 503–514.
- Gilovich, T., & Medvec, V. H. (1995). The experience of regret: What, when, and why. *Psychological Review*, *102*, 379–395.
- Hong, Y. Y., Chiu, C., Dweck, C. S., Lin, D., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology*, *77*, 588–599.
- Hur, T. (2001). The role of regulatory focus in activation of counterfactual thinking. *Korean Journal of Social and Personality Psychology*, *15*, 159–171.
- Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 201–208). New York: Cambridge University Press.

- Liberman, N., Idson, L. C., Camacho, C. J., & Higgins, E. T. (1999). Promotion and prevention choices between stability and change. *Journal of Personality and Social Psychology*, 77, 1135–1145.
- Liberman, N., Molden, D. C., Idson, L. C., & Higgins, E. T. (2001). Promotion and prevention focus on alternative hypotheses: Implications for attributional functions. *Journal of Personality and Social Psychology*, 80, 5–18.
- Lockwood, P., Jordan, C. H., & Kunda, Z. (2002). Motivation by positive or negative role models: Regulatory focus determines who will best inspire us. *Journal of Personality and Social Psychology*, 83, 854–864.
- Mandel, D. R., & Lehman, D. R. (1996). Counterfactual thinking and ascriptions of cause and preventability. *Journal of Personality and Social Psychology*, 71, 450–463.
- Markman, K. D., Gavanski, I., Sherman, S. J., & McMullen, M. N. (1993). The mental simulation of better and worse possible worlds. *Journal of Experimental Social Psychology*, 29, 87–109.
- Markman, K. D., Lindberg, M. J., Kray, L. J., & Galinsky, A. D. (2007). Implications of counterfactual structure for creative generation and analytical problem solving. *Personality and Social Psychology Bulletin*, 33, 312–314.
- Markman, K. D., & McMullen, M. N. (2003). A reflection and evaluation model of comparative thinking. *Personality and Social Psychology Review*, 7, 244–267.
- McMullen, M. N., & Markman, K. D. (2002). Affective impact of close counterfactuals: Implications of possible futures for possible pasts. *Journal of Experimental Social Psychology*, 38, 64–70.
- Mussweiler, T. (2003). Comparison processes in social judgment: Mechanisms and consequences. *Psychological Review*, 110, 472–489.
- Pennington, G. L., & Roese, N. J. (2003). Regulatory focus and temporal perspective. *Journal of Experimental Social Psychology*, 39, 563–576.
- Roese, N. J. (1994). The functional basis of counterfactual thinking. *Journal of Personality and Social Psychology*, 66, 805–818.
- Roese, N. J. (1997). Counterfactual thinking. *Psychological Bulletin*, 121, 133–148.
- Roese, N. J., & Hur, T. (1997). Affective determinants of counterfactual thinking. *Social Cognition*, 15, 333–350.
- Roese, N. J., & Summerville, A. (2005). What we regret most . . . and why. *Personality and Social Psychology Bulletin*, 31, 1273–1285.
- Scollon, C. N., Kim-Prieto, C., & Diener, E. (2003). Experience sampling: Promises and pitfalls, strengths and weaknesses. *Journal of Happiness Studies*, 4, 5–34.
- Suls, J., & Mullen, B. (1982). From the cradle to the grave: Comparison and self-evaluation across the life-span. In J. Suls (Ed.), *Psychological perspectives on the self* (Vol. 1, pp. 97–125). Hillsdale, NJ: Erlbaum.
- Suls, J., & Wheeler, L. (Eds.) (2000). *Handbook of social comparison: Theory and research*. New York: Plenum Press.
- Testa, M., & Major, B. (1990). The impact of social comparisons after failure: The moderating effects of perceived control. *Basic and Applied Social Psychology*, 11, 205–218.
- 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 contacts. *Psychological Review*, 96, 569–575.
- 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*, 90, 245–271.
- Wilson, A. E., & Ross, M. (2000). The frequency of temporal-self and social comparisons in people's personal appraisals. *Journal of Personality and Social Psychology*, 78, 928–942.
- Wood, J. V., Michela, J. L., & Giordano, C. (2000). Downward comparison in everyday life: Reconciling self-enhancement models with the mood-cognition priming model. *Journal of Personality and Social Psychology*, 79, 563–579.