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Challenge and threat responses during downward and upward social comparisons

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Abstract

We examined cardiovascular responses indicating challenge and threat during social comparisons. Experiment 1 manipulated comparison direction (i.e. upward/downward) within a cooperative social interaction, during which we measured cardiovascular responses, evaluations of demands and resources, and self-reports. Participants interacting with upward comparison partners evaluated the task as more 'threatening' (demands relative to resources) than participants cooperating with downward comparison partners. Moreover, participants cooperating with upward comparison partners exhibited cardiovascular reactivity consistent with threat (i.e. increased ventricle contractility, no changes in cardiac output, and vasoconstriction). In contrast, participants interacting with downward comparison partners exhibited challenge responses (i.e. increased contractility, increased cardiac output, and vasodilation). This basic finding was extended in Experiment 2 with the examination of a classic moderator of social comparison, attitudinal similarity of the comparison partner. Participants paired with attitudinally dissimilar partners exhibited exacerbated reactions relative to participants paired with attitudinally similar partners. That is, relative to similar partners, dissimilar partners engendered greater threat responses during upward comparisons and a tendency toward greater challenge responses during downward comparisons. These results are discussed within an assimilative/contrast model of social comparisons. Copyright © 2001 John Wiley & Sons, Ltd.

The concept of 'arousal' plays a key role in theoretical statements of the impact of social comparisons (Major, Testa, & Bylsma, 1991; Ruble & Frey, 1991; Tesser, Millar, & Moore, 1988; Wills, 1991). Despite its central role, arousal rarely has been tested explicitly in responses to upward versus downward social comparisons. Tesser and his colleagues (1988) note, that 'simply being outperformed by another produces negative affect and arousal. . .[but] we [are not] aware of any studies of arousal per se conducted in the social comparison tradition'. Although some early research on the role of the autonomic nervous system in social comparisons (e.g. Glass, Gordon, & Hency, 1970; Jamieson & Kaszor, 1986) used physiological measures to assess 'arousal', this research incorporated simple increases and decreases in heart rate or skin conductance in response to social comparison

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information. In contrast, meaningful physiological indexes, that is, physiological responses that share a one-to-one correspondence with a specified psychological construct (Cacioppo, Tassinary, & Berntson, 2000), can provide assessments of less consciously controlled reactions during social comparisons.

In the current research, we used physiological measures to examine the psychological impact of social comparisons. Physiological measures have several advantages over self-report measures in this regard. Specifically, they are continuous, covert, and on-line (Blascovich, 2000). These qualities allow researchers to track changes indexed by physiological responses during behavioral episodes such as ones involving social comparisons. Furthermore, the use of less rather than more consciously controlled measures reduces investigators' concerns for demand characteristics and self-presentational issues that can be evoked when one's skills and abilities are in question. Because of these qualities, physiological measures can provide less contaminated assessments of the impact of social comparisons. In addition, these measures can do so *during* a comparison interaction, thus reducing effects of reappraisal and discounting. Of course, one must establish a valid relationship between physiological measures used and the construct of interest. We believe that our model of challenge and threat and its associated cardiovascular markers provides a valid context to investigate the psychological impact of exposure to social comparison information.

CHALLENGE AND THREAT

We adopt a multi-method approach to identifying challenge and threat states (Blascovich & Mendes, 2000; Blascovich & Tomaka, 1996; Tomaka, Blascovich, Kelsey, & Leitten, 1993). Based on the integration of coping research (Lazarus & Folkman, 1991) and cardiovascular reactivity to stress (Blascovich & Katkin, 1993), our multi-method approach includes the examination of cardiovascular (CV) responses, evaluations[1] of demands and resources, performance, affect, and subjective well-being to differentiate psychological states of challenge and threat. Thus, challenge and threat theory employs a convergent validity approach in which indices of evaluations and cardiovascular responses indicate underlying psychological states (Blascovich, Mendes, & Seery, in press). However, challenge and threat are context-bound, occurring only during motivated performance situations, which are defined as episodes that are self- or goal-relevant, require instrumental cognitive responses, and are active rather than passive. Examples of motivated performance situations include speech delivery, test taking, interpersonal negotiations, and cooperative and competitive task performance.

Challenge and threat can be indicated by self-report responses gathered from pre-task evaluations of demands and resources. In validational studies individuals who perceived the demands of a situation as outweighing their personal resources were characterized as 'threatened'; individuals who evaluated resources as exceeding demands were characterized as 'challenged' (Tomaka *et al.*, 1993). In subsequent iterations of the theory (Blascovich & Mendes, 2000; Blascovich & Tomaka, 1996), demand evaluations were broadened to include perceptions of the *danger*, *uncertainty*, and *required effort* and resource evaluations now include perceptions of *knowledge* and *abilities* relevant to

[1]Previously (e.g. Blascovich & Tomaka, 1996), the term 'appraisal' was used to refer to an individual's assessment of available demands and resources. The term 'evaluation' is now used because we believe that 'appraisal' implies only a conscious cognitive assessment of demands and resources. Blascovich and Mendes (2000) argued that cognitive and affective, unconscious and conscious assessments of demands and resources also occur. In addition, readers often confused our meaning of 'appraisal' with Lazarus's (e.g. Lazarus & Folkman, 1991). Although Larazus's work strongly influenced our challenge and threat model, we believe that we extend the meaning of demands and resources from a purely conscious, cognitive perspective to one including unconscious and affective processes. Hence, we believe 'evaluation' is a more general and thus more appropriate term.

situational performance, as well as *dispositional characteristics* and *external support*. Though it is possible that in a given situation that one of these elements can trigger high overall demand or resource evaluations, similar to Lazarus and colleagues (Lazarus, DeLongis, Folkman, & Gruen, 1985) who argue, 'no single variable. . .can stand for stress' (p. 777), we simultaneously consider all perceptual elements and their potentially additive or synergistic effects.

Challenge and threat can also be indicated by specific CV responses. Following Dienstbier's (1989) work on physiological toughness, activation of the sympathetic adrenomedullary (SAM) is implicated in positive coping, whereas SAM activation and activation of the pituitary-adrenal-cortical (PAC) is associated with 'stress' or negative responses (we label the former reaction challenge and the latter reaction threat). Therefore, we argue that challenge is marked by SAM activation, which enhances cardiac performance, particularly left ventricular contractility and cardiac output, and decreases systemic vascular resistance. In contrast, threat is marked by activation not only of the SAM axis, again increasing contractility, but also activation of the pituitary-adrenal-cortical (PAC) axis, which inhibits decreases in systemic vascular resistance (see Blascovich & Tomaka, 1996, for a review). Thus, specific patterns of CV responses differentiate challenge and threat states.

SOCIAL COMPARISONS AND CHALLENGE AND THREAT

In the current research we use these well-established physiological markers of challenge and threat to assess the effect of exposure to social comparison information. We argue that relative to downward comparisons, upward comparisons increase demand and lower resource evaluations. Thus, we predict that upward comparisons, in general, should result in threat evaluations and reactivity, whereas downward comparisons should result in challenge evaluations and reactivity.

These predictions are derived from consideration of the specific demands and resources that come to bear when individuals compare themselves with superior versus inferior others in a performance domain. As described above, the components of demand evaluations are danger, uncertainty, and required effort. At least two of these components are more likely to be present during upward comparisons than downward comparisons. Danger may be either physical or psychological. Psychological danger may be evoked when a forced comparison other is clearly superior to the self, and hence poses a threat to self-esteem, and reduced when a comparison other is inferior to the self. Required effort is also more likely to be increased when one compares upward. Upward comparisons convey explicit information that higher performance levels can be met and that one is not achieving those levels; thus, the task should be evaluated as requiring more effort. In contrast, downward comparisons convey information that one is performing relatively well, in which case additional effort is not required.

Upward versus downward comparisons might also differentially affect perceived resources. For the most part, downward comparisons should increase evaluations of perceived knowledge and abilities, whereas upward comparisons should decrease them. Inherent in downward comparisons is the assumption that one has relatively more knowledge and abilities than does a comparison other to perform a task. In contrast, upward comparisons highlight one's relative lack of knowledge and abilities, thus resulting in lowered resource evaluations.

In sum, the upward-threat hypothesis asserts that upward social comparisons will result in increased demand evaluations and decreased resource evaluations. Hence, it leads to the prediction that upward social comparisons will produce threat evaluations and associated patterns of cardiovascular reactivity. In contrast, the downward-challenge hypothesis asserts that downward comparisons engender lowered demand evaluations and increased resource evaluations. Hence, it leads to the prediction that

downward social comparisons will be accompanied by overall challenge evaluations and associated patterns of cardiovascular reactivity.

ASSIMILATION VERSUS CONTRAST EFFECTS OF SOCIAL COMPARISON

Consistent with the upward-threat/downward challenge hypotheses are the general theoretical statements that downward comparisons produce positive affect (Klein, 1997; Morse & Gergen, 1970), whereas upward social comparisons produce negative affect (Brickman & Bulman, 1977; Klein, 1997; Salovey & Rodin, 1984). That is, social comparisons often produce *contrast effects* (Biernat, Manis, & Kobrynowicz, 1997; Morse & Gergen, 1970; Wood, 1989). Recent theory and evidence, however, indicate that these upward-negative/downward-positive affect hypotheses are too simple (e.g., Buunk, Collins, Taylor, VanYperen, & Dakof, 1990).

Several research programs have incorporated, either explicitly or implicitly, *assimilation processes* into social comparison theory. Assimilation in this context is the process by which traits and abilities of the comparison other reflect directly, rather than comparatively, on the comparator. Assimilation processes have been demonstrated in a variety of domains within the social comparison tradition including when individuals possess confidently held self-views (Pelham & Wachsmuth, 1995), when they compare to close others in non-self-relevant domains (Tesser, 1999), and when group identity is salient and distinct (Brewer & Weber, 1994). For example, Brewer and Weber (1994) found that when majority group members were exposed to comparison information self-ratings were consistent with contrast effects. However, when minority group members were exposed to comparison information from an ingroup member their self-ratings were consistent with assimilative effects and comparisons to outgroup members were consistent with contrast effects. That is, individuals self-ratings of academic ability were higher after exposure to an upward comparison that was an ingroup member relative to an outgroup member, but self-ratings were lower following a downward comparison with an ingroup member compared to an outgroup member. Thus, group identification can facilitate assimilation versus contrast effects, particularly if the ingroup is viewed as 'distinctive'.

Predating the Brewer and Weber publication, Wills (1991) offered an interesting speculation as to why subjective well-being may differ between ingroup and outgroup comparisons, particularly during downward comparisons. Wills speculated that during ingroup comparisons medium to large performance discrepancies are met with discomfort, whereas outgroup downward comparisons do not engender discomfort. Thus, Wills predicted that outgroup downward comparisons would result in greater subjective well-being than the same comparison with ingroup members based on differences in levels of discomfort.

Incorporating assimilation and contrast effects in social comparisons with the challenge and threat model is relatively straightforward. Compared to contrast effects, which promote focus on the self compared to others (Biernat *et al.*, 1997), assimilation effects broaden the focus to include collective evaluations of the comparison others' skills and abilities. Thus, during upward comparisons the superior performance of the comparison other reflects directly on the team performance rather than the personal performance of the comparator, thereby increasing resource evaluations. However, during downward comparisons the same perceived collective knowledge and abilities is weakened by the poor performance of the comparison other, in this case decreasing resource evaluations.

Wills' perspective is also easily incorporated into the challenge and threat model. If during downward comparisons discomfort occurs when comparing to ingroup members relative to outgroup members then perceptions of demands would increase via required effort. That is, intense emotions or

negative emotional cues can work as affective distracters thus minimizing the cognitive resources that should be directed toward the task (Blascovich & Mendes, 2000; Mendes, Weisbuch, Seery, & Blascovich, poster to be presented at the Society for Personality and Social Psychology conference, Savannah, GA, February 2002), thereby increasing demand evaluations during ingroup relative to outgroup comparisons. Thus, both perspectives suggest a minimization of positive effects during downward comparisons with ingroup members, and the assimilation model further suggests a minimization of negative effects with ingroup members during upward comparisons.

ATTITUDINAL SIMILARITY AS A MODERATOR OF CONTRAST AND ASSIMILATION

Attitudinal similarity of self to comparison target was identified early as a moderator of social comparison processes (Fisher & Nadler, 1974; Nadler, Jazwinski, Lau, & Miller, 1980; Wagner, 1984). A great deal of research on social comparison preferences has demonstrated that, if given a choice, individuals prefer to compare with similar rather than dissimilar others (Mettee & Smith, 1977; Wood, 1989). Far less research, in contrast, has examined the impact of similarity vs. dissimilarity of comparison others on reactions to forced comparisons (cf. Nadler *et al.*, 1980).

Here, we argue that attitudinal similarity can operate like a social category. That is, finding out that a stranger shares your political and social views works to generate an implicit shared reality that may promote the same 'distinctiveness' found among minority group members and close relationships. Thus, attitudinal similarity of a comparison partner may be more likely to engender assimilative processes, whereas attitudinal dissimilarity underscores the differences in views and opinions and may operate to distinguish the members of the comparison interaction, thus leading to more contrast effects.

OVERVIEW OF EXPERIMENTS

Two experiments examined the ideas set forth in the introduction. The first experiment tested the upward-threat/downward-challenge hypotheses and Experiment 2 extended the basic contrast model of social comparisons by considering the role of attitudinal similarity of the interaction partner and its effect on contrast versus assimilative responses. In addition, both experiments relied on distinctions in challenge and threat responses as the primary dependent variables.

Both experiments employed a confederate (same sex, race, and approximate age as the participant) who performed better or worse than the participant. The experiment consisted of three phases: (1) an initial interaction — during which the participant and partner met face-to-face; (2) a solitary word-finding task and initial feedback manipulation — during which the participant completed a word-finding task alone and then received comparison information regarding how well he/she did relative to his/her partner; and (3) a cooperative word-finding task — during which the participant and partner engaged in a cooperative word-finding task via a video monitor and intercom system. Relative performance differences were manipulated at the initial feedback phase and again during the cooperative word-finding task. Participants randomly assigned to the upward social comparison condition received feedback that their partner was ranked higher than they were ranked on the solitary word-finding task and then during the cooperative task the confederates generated words faster than did the participants. In the downward comparison condition participants received feedback that their

partner was ranked lower than they were ranked on the solitary word-finding task and then during the cooperative task the confederates generated words slower than did the participants.

EXPERIMENT 1

Methods

Setting and Participants

The social psychophysiology laboratory in the Department of Psychology at the University of California, Santa Barbara served as the experimental setting. This laboratory contains separate control, participant preparation, and recording rooms as well as physiological recording, audiovisual, and computer equipment.

Participants were recruited from the introductory psychology class and from the undergraduate population at the University of California, Santa Barbara.[2] This group included 24 men and 25 women ($N = 49$). Participants received either course credit or were paid USD 10.00 for their participation. Ultimately, one participant was eliminated because of suspicion and six additional participants were excluded because of equipment failure during the experiment or unscorable data, leaving 42 participants for the analyses.

Measures

Cardiovascular Measures. Cardiac and hemodynamic measures were recorded noninvasively using equipment meeting commercial and hospital safety standards and following guidelines established by the Society for Psychophysiological Research (e.g. Sherwood, Allen, Fahrenberg, Kelsey, Lovallo, & van Dooren, 1990). A Minnesota Impedance Cardiograph (Model 304B), a Cortronics (Model 7000) continuously inflated blood pressure monitor, and a Coulbourn ECG amplifier/coupler (Model S75-11) provided physiological signals. Impedance signals were conditioned using Coulbourn amplifiers (Model S79-02).

Impedance cardiographic (*Z*KG) and electrocardiographic (ECG) recordings provided continuous measures of cardiac performance. Impedance cardiography uses a tetrapolar aluminum/mylar tape electrode system to provide basal transthoracic impedance ($Z0$) and the first derivative of basal impedance, the change in impedance over time ($\Delta Z/\Delta t$). Four strips of *Z*KG tape encircle the participant, the first pair around the neck and the second pair around the torso. 'Inner' electrodes were placed at the base of the neck and at the thoracic xiphisternal junction; 'outer' electrodes were placed on the neck and abdomen — separated from the respective inner electrodes by a distance of at least 3 cm. A 4 mA AC 100 kHz current was sent through the two outer electrodes and measures of $Z0$ were obtained via the two inner electrodes.

External EKG recordings were obtained using a Standard Lead II configuration (right arm, left leg, and a right leg ground). The Cortronics blood pressure monitor provided continuous noninvasive recordings of blood pressure from the brachial artery of the participant's nonpreferred arm. An interactive software program developed and tested in a similar laboratory (Kelsey & Guethlein, 1990) was used to record and later ensemble the cardiac and hemodynamic data.

[2]Participants were screened for a heart murmur, pregnancy, and cardiac medication.

We use three cardiovascular responses to differentiate challenge and threat. Specifically, we examine left-ventricular contractility (VC), which is indexed by a decrease in pre-ejection period–the time from the initiation of left ventricular contraction until the aortic valve opens. (For ease of interpretation, we multiply pre-ejection period reactivity by -1 so that an increase in VC corresponds to an increase in contractility.) We calculate changes in cardiac output (CO), which is the amount of blood being pumped by the heart expressed in liters per minute, and we also examine changes in total peripheral resistance (TPR), which is the amount of overall vasoconstriction or vasodilation occurring in the periphery. TPR is derived from blood pressure and impedance cardiographic recordings using the formula (mean arterial pressure/CO) $*$ 80. Following Obrist (1981), we confirm goal-relevance (or task engagement) via significant increases in heart rate (HR) reactivity during the task period.

Word-finding Task. The participants completed two word-finding tasks during the experiment. The first task (the solitary task) was completed alone and the second task (the cooperative task) was completed with the confederate. This task uses an 8×8 matrix of randomly generated letters presented on a computer monitor. The goal of the task is to connect adjacent letters to form words. During the solitary task, the participant called out words as he/she found them in the matrix. During the cooperative task, the participant and the confederate alternated finding words and said them aloud.

Demand and Resource Evaluation. Prior to beginning the cooperative task (i.e. Task #2), but after the instructions were given, participants completed two evaluation questions on the computer monitor. The first question concerned participants' evaluation of their resources to cope with the situation ('I have the resources to perform Task #2 successfully') and the second question concerned participants' evaluation of the demands of the task ('Task #2 is very demanding') Both questions' response formats were anchored at strongly disagree (-4) to strongly agree ($+4$).

Self- and Comparison Other-ratings. Following the cooperative task, we queried participants regarding how well they believed they performed, how well their partner performed, and how well they performed as a team. We also asked them to indicate how friendly, attractive, likable, trustworthy, and intelligent their partner was, how similar they were to their partner, and if they believed their performance was controllable and stable. Again, all responses ranged from -4 (strongly disagree) to $+4$ (strongly agree).

Procedures

Initial Interaction. The participant and confederate arrived and waited in front of closed doors approximately 10 m apart in the hallway outside of the laboratory. Two experimenters greeted the participant and the confederate and explained to them that the study in which they were participating involved 'matches in working styles and ability'. One of the experimenters explained that the two had been matched on several factors that they would review before continuing. The participant and the confederate were told they were matched because they were the same age, major, and class standing (information gathered from a mass testing session at the beginning of the quarter ostensibly was used to insure matching). The experimenters then explained that the two of them would go to separate rooms to fill out forms, but would be seeing each other later in the experiment.

One of the experimenters escorted the confederate to a preparation room and the other experimenter escorted the participant to a separate room. Upon completion of a consent form for physiological measurement, the experimenter explained that physiological measures would be recorded from both participants because we were interested in how the cardiovascular system responds during different

tasks. The experimenter then attached sensors and transducers necessary for physiological recording. Non-operating sensors were applied to the confederate. Next, the participant was seated upright in a comfortable upholstered chair and a small tray was placed across the lap of the participant with the computer mouse and keyboard. The experimenter instructed the participant to sit quietly for purposes of equipment calibration. A 5-minute baseline period commenced during which cardiovascular responses were collected that served as baseline levels of physiological responses.

After the baseline period, the participant received instructions for the solitary task. The participant was provided instructions via an audiotape and a computer animation program displayed on his/her monitor. After determining that the participant understood the task, a randomly generated matrix of letters appeared on the monitor and the participant began generating words. After two minutes, the experimenter informed the participant that time was up and to advance the computer to the next screen. The experimenter then reported the number of "valid" words that were found by the participant and that number was entered into the computer.[3]

Initial Comparison Manipulation. The experimenter next instructed the participant to again advance his/her screen, which would display how well the participant and his/her partner did relative to other participants in the experiment. After approximately 30 seconds, a list of abbreviations, ostensibly previous participants, ranked from 1 to 38 appeared on the computer screen. Two abbreviations were highlighted in red, one belonging to the participant and the other belonging to the confederate. If the participant was randomly assigned to an upward social comparison, the participant was ranked 29th and the confederate was ranked 8th. If the participant was assigned to a downward social comparison, the participant was ranked 8th and the confederate was ranked 29th. Once the participant confirmed he/she received the information, the participant was instructed to exit the program and to sit quietly for several minutes (the recovery period).

Cooperative Task. At the end of this 5-minute recovery period, the participant and the confederate were informed that the rooms would be connected so that they could see and hear each other. The dyad then received instructions that they would be working together on a word-finding task, similar to the one they completed alone. Furthermore, they were instructed that each would receive a USD 5.00 bonus if together they could find 26 words in four minutes by alternating finding words and saying them out loud.

The participant was instructed to find the first word. The confederate's responses came from a list of over 100 valid words in the matrix and were guided by timed prompts provided by an unheard and unseen experimenter in his/her room. Based on pretesting, two algorithms were created for the timing of responses based on the comparison manipulation. In the upward comparison condition, confederates generated words in *half* the time it took participants to generate words; in the downward comparison condition, confederates generated words in *twice* the time it took participants to generate words. For example, if the participant took 8 seconds to generate a word, the confederate responded with a word 4 seconds later if the participant was assigned to the upward comparison condition, and 16 seconds later if the participant was assigned to the downward comparison condition. Upper and lower limits of responses were also employed such that the maximum amount of time a confederate would wait to respond during an upward social comparison was 7 seconds, whereas the minimum amount of time during a downward comparison was 10 seconds. After four minutes of the cooperative

[3]The number of words the experimenter told them was based on the actual number of words the participant generated plus a subtle conversion depending on the comparison manipulation. For example, if the participant was randomly assigned to an *upward* comparison and generated fewer than 5 words, 1 word was *subtracted* from the participant's actual score; if the participant was randomly assigned to a *downward* comparison and generated at least 5 but fewer than 10 words, 2 words were *added* to the participant's actual score.

word-finding task, the experimenter disconnected the intercom system and entered the recording room with the self- and other ratings questionnaire.

After the participant completed the questionnaire, the sensors were removed and the experimenter probed for suspicion. The participant was then fully debriefed (including obtaining written informed consent following full disclosure of the use of a confederate and a nondisclosure agreement form), paid, and thanked.

Results

Manipulation Check

We confirmed that the manipulation of upward and downward social comparison was successful. Recall that following the cooperative word-finding task, participants completed questions regarding their own performance as well as their partner's performance. Participants' ratings of their partner's performance were higher in the upward comparison condition ($M = 3.3$) than the downward comparison condition ($M = 2.1$), $t(41) = 4.3$, $p < 0.0001$. Moreover, participants' ratings of their own performance were significantly lower in the upward comparison condition ($M = 0.5$) than the downward comparison condition ($M = 2.3$), $t(41) = -4.37$, $p < 0.0001$.

Demand and Resource Evaluations

Following instructions for the cooperative word-finding task, but prior to beginning the task, participants completed two evaluation questions to ascertain their perceived resources to cope with the task, as well as their perceptions regarding the demands of the task. There were no differences between groups ratings regarding perceptions of demands, but there was a significant difference between groups regarding their perceived resources, $t(41) = 2.64$, $p < 0.01$. As predicted, participants in the downward condition reported higher resource evaluations ($M = 2.7$) than participants in the upward condition ($M = 1.5$). In addition, we created a ratio of the evaluations of demands and resources by dividing the participants' ratings of perceived demands by their ratings of perceived resources (we add a constant to all evaluations to eliminate responses of zero; see Tomaka *et al.*, 1993 for a similar procedure). Thus, ratios of 1 indicate demands equal to resources, greater than 1 indicates threat, and less than 1 indicates challenge. As predicted, the challenge/threat ratio differed significantly by experimental condition. The mean ratio of participants in the downward comparison condition ($M = 0.69$) was significantly lower than that of participants in the upward comparison condition ($M = 0.91$), Cohen's $d = 0.65$, $t(41) = 2.09$, $p < 0.04$. Importantly, the ratio from the downward condition differed from 1, $t(21) = 4.43$, $p < 0.0002$, whereas the ratio from the upward condition did not differ from 1, $t(21) = 1.22$, ns.

Cardiovascular Markers

Mean VC, CO, and TPR values were calculated for each minute within each rest and task period. The analytic strategy for the CV data included four steps. First, baseline differences between conditions were compared to confirm that the experimental conditions were equivalent initially. Second, HR changes from baseline during the cooperative task were examined to confirm that participants were engaged in the task. Third, a Multivariate Analysis of Variance (MANOVA) was conducted to examine

relative differences between comparison conditions during the cooperative word-finding task, followed by univariate tests to examine relative predicted differences between VC, CO and TPR by comparison condition. Finally, tests for absolute reactivity, on a measure-by-measure basis, were conducted using univariate tests of reactivity, which allow for confirmation of challenge and threat reactivity by conditions.

Baseline Differences. A multivariate test for differences in baseline CV responses (VC, CO, and TPR) by comparison condition revealed no significant differences ($F < 1$). Thus, the two comparison conditions were equivalent initially. Therefore, reactivity scores were calculated for each measure by subtracting the last minute of the rest period from the first minute of the cooperative task (Kamarck, Jennings, Derski, Glickman-Weiss, & Johnson, 1992).[4]

Task Engagement. Dependent *t*-tests confirmed that HR reactivity during the cooperative task was significantly greater than 0 for participants in the upward and downward comparison conditions (Upward: $M = 15.4$, $p < 0.0001$; Downward: $M = 14.2$, $p < 0.0001$). These analyses confirm that the task required significant engagement and thus met the requirements for a motivated performance situation.

Challenge and Threat: Relative Differences. We next conducted a MANOVA to determine whether CV responses differed as a result of comparison condition. Recall the prediction that interacting with downward comparisons partner would result in cardiovascular challenge, whereas interacting with upward comparison partners would result in threat. The MANOVA using the cardiovascular data (VC, CO, and TPR) from the first minute of the cooperative word-task with one independent variable (comparison: upward, downward) yielded a statistically significant difference, $\eta^2 = 0.25$, $F(3, 38) = 4.06$, $p < 0.01$. Univariate analyses confirmed that all cardiovascular variables contributed to the multivariate effect: VC $(1, 41) = 7.57$, $p < 0.009$; CO $(1, 41) = 6.12$, $p < 0.02$; TPR $(1, 41) = 11.29$, $p < 0.002$. As predicted and consistent with the results from the task evaluations, participants interacting with downward comparison partners exhibited relatively greater challenge responses — increases in VC and CO and larger decreases in TPR — than did participants interacting with upward comparison partners (see Table 1 for mean reactivity by condition).

Table 1. Means and univariate tests from zero (baseline) of cardiovascular reactivity from the cooperative word-finding task

	Experiment 1			
Cardiovascular reactivity	Upward comparison		Downward comparison	
VC	↑	**9.5****	↑	**20.2*****
CO	ø/↓	**0.2**	↑	**1.9****
TPR	ø/↑	**33.7**	↓	**−140.9****

Notes: All condition means were tested against zero to determine significant increases or decreases from baseline. Bold numbers identify values consistent with predicted reactivity and the symbols represent predicted absolute reactivity during challenge and threat states. Legand: ↑ — significant increases from baseline; ↓ — significant decreases from baseline; ø — no significant increases or decreases from baseline.
*$p < 0.05$; **$p < 0.01$; *** $p < 0.001$.

[4]We transformed univariate outliers by assigning the deviant raw score to a value one unit larger or smaller than the next most extreme score.

Challenge and Threat: Absolute Differences. Finally, we examined group means to confirm absolute patterns of cardiovascular responses. Group means of cardiovascular responses by comparison condition and univariate tests of changes from baseline are summarized in Table 1. Participants in the downward comparison condition exhibited the predicted constellation of challenge responses: significant increases in both VC and CO and a significant decrease in TPR. In contrast, participants in the upward comparison condition exhibited the predicted constellation of threat responses: significant VC increases and no change in CO or TPR.

Self- and Comparison Other-Ratings

Only one question differed by comparison condition. Participants in the downward comparison condition were more likely to say that their score was within their control ($M = 1.8$) than were participants in the upward comparison condition ($M = 0.2$), Cohen's $d = 0.86$, $t(41) = -2.75$, $p < 0.009$.

Discussion

The results of Experiment 1 provide strong support for the upward-threat/downward-challenge hypotheses. Participants interacting with upward comparison partners reported lower resource evaluations, and hence more threat evaluations, than were reported by participants interacting with downward comparison partners. In addition, participants in the upward condition exhibited cardiovascular responses consistent with threat reactivity, whereas participants in the downward condition exhibited cardiovascular responses consistent with challenge reactivity. Participants in the downward comparison condition also perceived their performance as more within their control than did those in the upward comparison condition. These findings are generally consistent with the contrast-model of social comparisons. In our second study we extended the upward-threat/downward-challenge hypotheses by examining attitudinal similarity of the interaction partner as a moderator of comparison direction.

EXPERIMENT 2

This experiment followed the same general procedures as Experiment 1 with a few minor changes. First, Experiment 2 manipulated the perceived attitudinal similarity of the comparison other. Second, affective reactions were assessed following the comparison interaction. These two changes are described below.

Method

Participants

Participants ($N = 61$; 40 women, 21 men) were recruited from the introductory psychology course and had completed an opinion survey at the beginning of the quarter. Two participants were excluded due

to suspicion; in addition, the data from one participant were unscorable and were thus excluded, leaving a total of 58 participants for data analyses.

Manipulation of Attitudinal Similarity

We manipulated perceived attitude similarity between each participant and confederate via an opinion questionnaire that all participants completed during a mass pretesting session at the beginning of the academic quarter. Participants completed a 9-item questionnaire, which queried opinions on a variety of controversial issues, including same-sex marriages, abortion, death penalty, and gun control. Prior to each participant's arrival at the laboratory, the experimenter completed a confederate questionnaire based on the partner similarity condition (similar vs. dissimilar) and the participant's responses. If random assignment dictated a similar other condition, the experimenter created a confederate response form that generally agreed with the participant's responses. If, however, the assignment called for a dissimilar other, the experimenter created a response form that indicated significant disagreement.

Once the participant and confederate arrived, the experimenter reviewed the characteristics of the dyad and also explained that the dyad was matched because of their agreement (or disagreement) on the opinion survey. The experimenter then held out the two opinion questionnaires and instructed the dyad that they would be allowed to review their own survey, as well as each other's, prior to the beginning of the experiment. The dyad was then separated; after completing the consent form, the participant was allowed to review his/her survey along with his/her partner's survey.

Positive and Negative Affect

Affective reactions following the cooperative task were assessed using the Positive and Negative Affectivity Scales (PANAS: Watson, Clarke, & Tellegen, 1988). The PANAS consists of ten positive adjectives (e.g. proud, excited) and ten negative adjectives (e.g. distressed, upset). Participants were asked to rate the extent to which the adjectives described them following the interaction on a scale from 1 ('you do not feel this way') to 5('you feel this way a great deal').

Results

Manipulation Check

Again, we confirmed the manipulation of upward and downward comparison. Participant ratings of their partners' performance were higher in the upward comparison ($M = 3.3$) than the downward comparison condition ($M = 1.7$), $F(1, 57) = 28.40$, $p < 0.0001$. Moreover, participants' ratings of their own performance were significantly lower in the upward comparison condition ($M = -0.7$) than the downward comparison condition ($M = 2.4$), $F(1, 57) = 71.28$, $p < 0.0001$. There was no main effect for similarity on these two items nor was the interaction significant. We also confirmed the similarity manipulation. Participants interacting with an attitudinally similar partner rated their partner as more similar ($M = 0.3$) than did participants interacting with an attitudinally dissimilar partner ($M = -1.2$), $F(1, 57) = 11.06$, $p < 0.002$. The main effect for comparison condition was not significant nor was interaction.

Demand and Resource Evaluations

Neither of the main effects using perceived demands, resources, and the ratio of the two were significant. However, the interaction of comparison and similarity was significant or marginally significant with all three dependent variables and the direction of the effect was consistent among the evaluations (the means are presented in Table 2). The general pattern of means is consistent with the prediction that comparisons with dissimilar relative to similar others would produce more contrast effects.

The interaction using ratings of perceived resources was significant, $F(1, 57) = 3.78$, $p < 0.05$. Consistent with contrast effects, participants comparing to dissimilar partners perceived higher resources during downward comparisons than upward comparisons, $F(1, 28) = 5.04$, $p < 0.03$. There was no difference between participants who compared to attitudinally similar partners based on comparison direction. The interaction with demands was only marginally significant, $F(1, 57) = 2.96$, $p < 0.09$, but the pattern of means again suggest more contrast effects when comparing with dissimilar partners and more assimilation when comparing with similar partners.

Finally, the ratio of demands and resources also yielded a significant comparison by partner interaction, $F(1, 57) = 4.69$, $p < 0.03$. Paralleling the findings with the demand and resource questions, we observed contrast effects with dissimilar partners, that is higher ratios during upward compared to downward comparisons, $F(1, 28) = 4.24$, $p < 0.05$. However, though the mean ratios from similar comparisons were in the direction of assimilation effects, that is, higher ratios during downward than upward, the simple effects test was not significant. Therefore, in general we observed patterns of evaluations consistent with more contrast effects during comparisons with dissimilar other, but no contrast effects with similar others and a trend toward more assimilation effects with similar others.

Cardiovascular Markers

Baseline Differences. As in Experiment 1, a multivariate test for differences in baseline physiological levels (VC, CO, and TPR) by comparison direction and perceived similarity conditions revealed no significant main effects or interaction, confirming that the conditions were equivalent initially.

Table 2. Pre-task evaluations of demands, resources, and the demands/resource ratio

Evaluation/ comparison direction	Attitudinally similar partner	Attitudinally dissimilar partner
Resources		
Upward	2.4	1.5
Downward	2.3	2.8
Demands		
Upward	−0.2	0.4
Downward	0.7	−0.7
Ratio (demands/resources)		
Upward	0.71	0.97
Downward	0.84	0.71

Note: $N = 58$. Resource and demand evaluations ranged from −4 to +4. The ratio was calculated as demands/resources after a constant was added to the evaluations.

Task Engagement. To test for engagement during the cooperative task, we compared increases in HR across the four experimental conditions. These analyses revealed significant HR increases during the cooperative task (all $ps < 0.01$) for all four conditions (Downward-Dissimilar: $M = 14.8$; Downward-Similar: $M = 16.0$; Upward-Dissimilar: $M = 14.1$; Upward-Similar: $M = 12.7$).

Challenge and Threat: Relative Differences. As in Experiment 1, we conducted a MANOVA to determine whether cardiovascular responses differed significantly as a result of experimental conditions. The MANOVA yielded a significant main effect for comparison direction, $\eta^2 = 0.65$, $F(3, 50) = 30.40$, $p < 0.0001$. Univariate analyses confirmed that all cardiovascular variables contributed to the multivariate effect: VC, $F(1, 55) = 40.75$, $p < 0.0001$; CO, $F(1, 55) = 33.32$, $p < 0.0001$; TPR, $F(1, 55) = 67.52$, $p < 0.0001$. Replicating Experiment 1, participants engaged in a task with an upward comparison partner exhibited cardiovascular threat responses whereas participants interacting with a downward comparison partner exhibited cardiovascular challenge responses. The multivariate main effect for attitudinal similarity was not significant ($F < 1$).

However, this main effect is qualified by a significant multivariate interaction, $F(3, 50) = 2.70$, $p < 0.05$. Univariate tests confirmed that all three cardiovascular variables contributed to the interaction: VC, $F(1, 55) = 4.31$, $p < 0.05$; CO, $F(1, 55) = 4.44$, $p < 0.04$; TPR, $F(1, 55) = 4.98$, $p < 0.03$. The mean reactivity data by condition are graphed in Figure 1. To examine the nature of the interaction we conducted simple effects tests within each similarity condition. Both multivariate effects were significant and supported the contrast effects perspective, that is more threat during upward comparisons and more challenge during downward comparisons. However, the magnitude of the effect sizes between similar and dissimilar conditions was different (Dissimilar: $\eta^2 = 0.74$; Similar; $\eta^2 = 0.53$). Therefore, we tested the proposition that within each comparison direction, interactions with dissimilar partners resulted in exacerbated contrast effects.

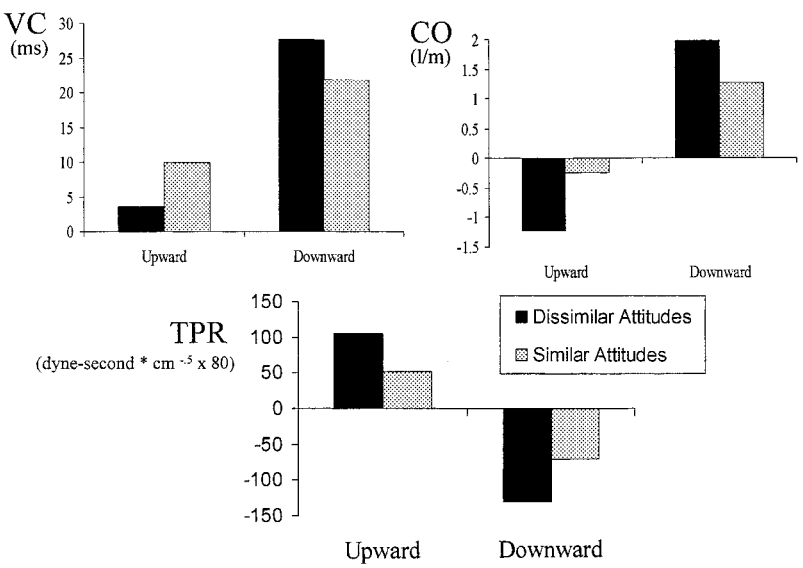

Figure 1. Cardiovascular values from the first minute of the cooperative word-finding task by comparison direction and attitudinal similarity. All variables are expressed as change scores from resting levels of response. Ventricle contractility is expressed in milliseconds, Cardiac Output in liters per minute, and Total Peripheral Resistance in resistance units

Within the *upward comparison* condition, a MANOVA with attitudinal similarity as the single independent variable yielded a marginal multivariate main effect, $F(3, 24) = 2.65$, $p < 0.07$. Univariate analyses indicated that VC and CO contributed significantly to the main effect, but TPR did not (VC, $p < 0.03$; CO, $p < 0.04$; TPR, $p < 0.10$). The direction of these effects indicated that upward comparisons with attitudinally dissimilar partners were associated with less VC, lower CO, and marginally greater vasoconstriction than were upward comparisons with an attitudinally similar partner (see Figure 1). Thus, greater cardiovascular threat responses were observed following upward comparisons with attitudinally dissimilar partners than attitudinally similar partners.

Tests for absolute changes in the upward-comparison condition with attitudinally similar partners yielded significant increased in VC, no change in CO, and no change in TPR, a constellation of reactions confirming threat responses (see Table 3). Furthermore, upward comparison with attitudinally dissimilar partners yielded significant increases in VC, decreases in CO, and significant increases in TPR, indicating a stronger threat response. Thus, both upward comparison conditions were accompanied by CV threat responses, but the responses were stronger in the dissimilar than similar condition.

Simple effects tests among participants in the *downward comparison* condition yielded a significant multivariate main effect for attitudinal similarity of partner, $F(3, 24) = 3.83$, $p < 0.02$. However, all the univariate tests revealed only marginally significant differences based on similarity (VC, $p < 0.10$; CO, $p < 0.08$; TPR, $p < 0.06$). Although, the pattern of means was consistent with greater challenge responses among participants paired with attitudinally dissimilar partners than attitudinally similar partners. Follow-up tests of absolute cardiovascular changes confirmed that both attitudinally similar and dissimilar downward comparison partners engendered cardiovascular challenge responses (see Table 3). Thus, consistent with other research (Tesser, 1999; Major, Schiaccitano, & Crocker, 1993), we observed stronger effects of comparison others during upward comparisons than downward comparison.

In summary, patterns of CV responses indicated that among those interacting with upward comparison partners, attitudinally dissimilar partners engendered greater threat than did attitudinally similar partners. Among those interacting with downward comparison partners, both similar and dissimilar partners engendered challenge responses and there was a tendency toward greater challenge with dissimilar others. Again, we observed clear contrast effects with dissimilar partners, but attenuated contrast effects with similar partners.

Table 3. Means and univariate tests from zero (baseline) of cardiovascular reactivity from the cooperative word-finding task by comparison direction and partners' attitudinal similarity

	Experiment 2							
	Upward-dissimilar		Upward-similar		Downward-dissimilar		Downward-similar	
VC	↑	**4.1***	↑	**10.0*****	↑	**27.7*****	↑	**22.0*****
CO	ø/↓	**−1.3*****	ø/↓	**−0.2**	↑	**2.0****	↑	**1.3****
TPR	ø/↑	**113.0*****	ø/↓	**51.7***	↓	**−130.8*****	↓	**−70.2***

Notes: All condition means were tested against zero to determine significant increases or decreases from baseline. Bold numbers identify values consistent with predicted reactivity and the symbols represent absolute reactivity during challenge and threat states. Legend: ↑ — significant increases from baseline; ↓ — significant decreases from baseline; ø — no significant increases or decreases from baseline.
*$p < 0.05$; **$p < 0.01$; *** $p < 0.001$.

Correlational Analyses

To further explore the differences in contrast and assimilation as a function of similarity, we conducted correlational analyses using CV responses and participants' similarity ratings of their partner. If assimilation processes are operating then during upward comparisons participants CV responses should be correlated in the direction of more perceived similarity the less physiological threat (or more challenge). This is the exact pattern of responses that we observed (VC: $r = 0.19$, ns; CO: $r = 0.37$, $p < 0.04$; TPR: $r = -0.31$, $p < 0.05$). In addition, the pattern of responses was reversed from the downward conditions (though not significant), with perceptions of greater similarity leading to greater threat (or less challenge) (VC: $r = -0.17$; CO: $r = -0.07$; TPR: $r = 16$). Although the magnitude of the relationships were modest, the direction and consistency of the pattern supports the idea that more assimilation processes occur with similar others and more contrast effects with dissimilar others.

Self- and Comparison-other Ratings

Replicating Experiment 1, participants in the downward comparison condition rated their performance as more within their control ($M = 1.3$) than did participants in the upward comparison condition ($M = -1.2$), $F(1, 57) = 26.42$, $p < 0.0001$. In addition, participants rated team performance better after downward comparisons ($M = 2.3$) than upward comparisons ($M = 1.3$), $F(1, 57) = 8.94$, $p < 0.01$. No other main effects for comparison condition were found.

We did observe some self-reports that were consistent with previous research on the effects of attitudinal similarity. Participants rated their exerted effort greater when interacting with attitudinally similar partners ($M = 1.6$) compared to attitudinally dissimilar partners ($M = -0.6$), $F(1, 57) = 4.27$, $p < 0.05$. Also, participants interacting with an attitudinally similar partner liked their partner more ($M = 2.3$) than participants working with an attitudinally dissimilar partner ($M = 1.4$), $F(1, 57) = 4.19$, $p < 0.05$.

Lastly, one interaction was found with the self-report items that paralleled the findings from the evaluations and physiological data. Participants' ratings of their partners' verbal skills yielded a significant comparison direction by attitudinal similarity interaction, $F(1, 57) = 4.72$, $p < 0.04$. Participants interacting with dissimilar others rated the verbal skills of an upward comparison partner higher than a downward comparison partner ($Ms = 2.0$ and 0.4, respectively), but the difference in partners' verbal skills was not significant between groups interacting with similar partners (Upward: $M = 1.8$; Downward: $M = 1.7$).

Affective Reactions

Positive and negative adjectives were combined to form two indexes of positive and negative affect. Both indexes had high alphas (positive: $\alpha = 0.88$; negative: $\alpha = 0.81$). A significant main effect for comparison direction was found for the overall positive index, $F(1, 57) = 6.28$, $p < 0.02$. Consistent with previous research, participants reported more positive affective reactions following downward comparisons ($M = 2.9$) than upward comparisons ($M = 2.4$). The index for negative affect also yielded a main effect for comparison direction, $F(1, 57) = 6.19$, $p < 0.02$. Participants reported more negative affect following upward comparisons ($M = 1.8$) than downward comparisons ($M = 1.5$). Neither the main effects for

attitudinal similarity nor the interactions between similarity and comparison direction were significant.

Based on Wills' prediction, that downward comparisons with ingroup members result in more discomfort, we *a priori* selected affective reactions that best captured responses of discomfort, (i.e. distressed, upset, and hostile). This 'discomfort' scale yielded a significant comparison by attitudinal similarity interaction, $F(1, 57) = 4.11$, $p < 0.05$. Paralleling the evaluations and reactivity data, participants reported more 'discomfort' during upward comparisons with dissimilar others ($M = 1.9$) than similar others ($M = 1.5$) and during downward comparisons participants reported less discomfort with dissimilar others ($M = 1.2$) than similar others ($M = 1.8$).

Discussion

The results of Experiment 2 generally replicate and extend Experiment 1. Participants interacting with upward comparison partners exhibited cardiovascular threat responses, reported less control of their performance, and reported more negative affect, whereas downward comparisons engendered more challenge reactivity, greater perceptions of control, and more positive affect. Importantly, Experiment 2 also demonstrates the utility of physiological measures for the study of social comparisons by including the examination of a classic moderator of social comparisons.

We observed a significant interaction between attitudinal similarity and comparison condition. The nature of the interaction supported the contention that salience of dissimilarity, as opposed to similarity, results in more contrast effects. We observed exacerbated reactions among participants interacting with attitudinally dissimilar others. Among upward comparisons, attitudinally dissimilar partners, relative to similar partners, engendered greater threat evaluations, stronger CV threat responses, and greater reported 'discomfort'. Among downward comparisons, attitudinally dissimilar partners engendered more challenge evaluations, a tendency toward stronger CV challenge responses, and less 'discomfort'. Thus, our findings are generally consistent with Wills' (1991) argument that downward comparisons with dissimilar partners result in relatively more positive reactions than with similar partners because a downward comparison with a similar other increases discomfort. Indeed, we found evidence that downward comparisons with attitudinally similar others result in more discomfort than downward comparison with attitudinally dissimilar others.

The difference between Wills' speculation and assimilation effects is subtle, but there are differences even though the predicted outcomes are the same. The assimilation proposition is one that anticipates less positive responses from a downward comparison due to the others' relatively poor performance reflecting directly on the comparator. Wills' prediction is that discomfort arises when one is superior to a member of their ingroup, which does not occur when one is superior to an outgroup member. The evidence here does not put to rest the differences between the perspectives, though there is evidence for both, and the two perspectives can be treated as more complementary than contradictory. However, the evidence for differences in discomfort in Experiment 2 does comport well with Wills' prediction.

A final speculation we would offer is that upward comparisons with dissimilar others might evoke implicit validation of a dissimilar other's views when they are proven to be superior. If this is true then the validation occurs even though the task and the opinions are completely unrelated constructs. Further research might extend these findings by examining the mechanism through which the psychological connection of opinions and threat occur and also examine the potential role of task relevant versus task irrelevant similarity.

SUMMARY

In both experiments, we demonstrated that in general, upward comparisons result in threat, characterized by relatively larger demands/resources ratios and marked by the cardiovascular threat pattern (i.e. increased cardiac contractility coupled with no increases in cardiac output, and vasoconstriction), and (in Experiment 2) increased negative affect. In contrast, downward comparisons resulted in challenge, characterized by lower demands/resources ratios and marked by the cardiovascular challenge pattern (i.e. increased cardiac contractility and cardiac output and vasodilation), and increased positive affect.

Experiment 2 extended the findings of experiment 1 by examining the importance of attitudinal similarity of the interaction partner in comparison interactions. Perceptions of attitudinal similarity with the comparison partner interacted with comparison condition. We argued that, in general, attitudinally dissimilar partners engendered exacerbated reactions, such that upward comparisons were more threatening and downward comparisons tended to be more challenging than the same comparisons with attitudinally similar partners. These patterns of findings are consistent with the contrast model during interactions with dissimilar others and an attenuation of contrast with similar others. Though we did observe suggestive evidence for assimilation via correlational analyses suggesting that as individuals perceived greater similarity between themselves and their partner upward comparisons were less threatening and downward comparisons were less challenging.

Limitations

It is important to note some potential limitations of these experiments. The first is that our manipulation of comparison direction may have been confounded with exerted effort. That is, due to the timing procedure participants in the upward condition had to 'work harder' by generating more words than participants in the downward condition. Thus, the differences in CV responses may have been purely a function of increased CV effort. There are two reasons to believe the observed results were not purely a function of effort. First, there were no differences in HR responses between groups, which are typically used as an indication of effort (see Wright & Kirby, in press). Second, and more importantly, in subsequent studies (Mendes, 2001, Experiment 2; Mendes, Major, & Blascovich, 'Effects of perceived controllability on challenge out threat reactivity during social comparison', in preparation, Experiment 1) we examined the effects of comparison direction crossed with the presence or absence of a comparison other using the same paradigm described here. In the no-present-other condition participants were instructed to respond with a word every time they heard a bell, which rang at the same time intervals as the comparison-other-present condition. We found on average that if no comparison other was present, participants did not exhibit significant increases in HR even though they were performing at the same rate as the participants in the upward/comparison-other-present condition. Furthermore, using a subsample of participants who did exhibit HR increases in the no-comparison-other condition, we observed only weak challenge responses from both comparison conditions. That is, only when participants are explicitly comparing to a present other did the challenge and threat responses occur as described in this article.

Another potential confound is that the comparison manipulation may have been confounded with success and failure. Again, we believe the study with no comparison other can at least partially answer this question. Though all participants received their ranked scores following the solitary task, only the participants who had to cooperate with a partner exhibit challenge and threat responses. Thus, though

participants in the no-comparison-other condition received success or failure feedback the comparison others' presence is what drove the challenge and threat differences.

Finally, though we have presented the results of Experiment 2 within a contrast/assimilation model, there was considerably more evidence for the contrast versus no-contrast effects. An examination of the means between studies sheds some light on this finding. When comparing Table 1 to Table 3, two important differences are clear. First, it appears that dissimilarity in Experiment 2 worked to exacerbate already apparent contrast effects during upward comparisons. That is, the magnitude of CV responses between the upward condition in Experiment 1 and the upward-similar condition in Experiment 2 were comparable. It is the upward-dissimilar condition in Experiment 2 that appears to have engendered greater threat responses. Second, it appears that the downward condition in Experiment 1 yielded similar results to the downward-dissimilar condition in Experiment 2. Thus, the similarity condition in experiment 2 resulted in a relative dampening of the challenge responses, providing evidence for more assimilative processes during downward comparisons. Therefore, both processes may have been operating, though it appears as more contrast effects occurred during upward comparisons and more assimilative processes were present during downward comparisons.

Final Thoughts

Taken together, these two experiments demonstrate the utility of using cardiovascular markers for the study of social comparison and set the stage for researches to use this paradigm as a way to test other moderators of social comparisons. For example, we are currently examining how other aspects of the comparison partner interact with comparison direction. Aspects such as similarity in race, sex, and status of a comparison other might interact very differently from what we found with attitudinal similarity. These ideas are well suited for testing within the challenge and threat framework.

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