

Psychosocial Resources, Threat, and the Perception of Distance and Height: Support for the Resources and Perception Model

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Threatening things are often perceptually exaggerated, such that they appear higher, closer, of greater duration, or more intense than they actually are. According to the Resources and Perception Model (RPM) psychosocial resources can prevent this exaggeration, leading to more accurate perception. Two studies tested RPM. Study 1 showed that the perceived closeness of a threatening object (a live tarantula) but not an innocuous object (a cat toy) was moderated by induced self-worth. Further, the more self-worth that participants experienced, the less close the tarantula appeared to them. Study 2 showed that greater levels of self-esteem reduced perceived height, but only among participants prevented from holding a protective handrail while looking down. Together, these studies confirm that resources moderate the physical perception of both distance and height, that resources moderate perception of threats but not nonthreats, that different resources have similar moderating effects, and that psychosocial resources can supplant physical resources.

Keywords: psychosocial resources, threat, perception, self-worth, self-esteem, distance, height

There is increasing evidence that basic physical perception is influenced by emotions, motives, and drives. The visual perception of distance is affected by anxiety (Riskind, Moore, & Bowley, 1995) and cognitive dissonance (Balcetis & Dunning, 2007); and the memory of visual fields is affected by arousal and threat (Mathews & Mackintosh, 2004). The steepness of hill slopes (Stefanucci, Proffitt, Clore, & Parekh, 2008) and the intensity of physical pain (Rhudy & Meagher, 2000) are affected by fear and anxiety, and time perception is affected by emotional regulation efforts (Klien, Corwin, & Stine, 2003; Vohs & Schmeichel, 2003).

Common to these findings is a connection between negative arousal and exaggerated perception, such that people who feel greater fear, anxiety, or other aversive states perceive threatening objects and events as larger, closer, more intense, or of greater duration. This connection between threat and psychophysical perception was initially proposed by the early “New Look” research-

ers half a century ago (Easterbrook, 1959). The New Look was stymied by methodological challenges that the available technologies could not address, and a Behaviorist zeitgeist unsympathetic to the New Look’s mentalist leanings (see Erdleyi, 1974). However, the cognitive revolution of the 1970s and 1980s, the emergence of emotions research in the past two decades, and related interest in embodied cognition (Winkielman, Niedenthal, & Oberman, 2008) and unconscious processes (e.g., Bargh, 1997; Wegner, 1994), have made the connection between psychosocial states and psychophysical perception much more tenable.

The Resources and Perception Model

As outlined above, threatening things are perceptually amplified. However, reactions to threats are themselves moderated by psychosocial resources (Baltes & Baltes, 1990; Hobfoll, 1989, 2002). As these resources increase, subjective threat decreases. Psychosocial resources (henceforth referred to simply as “resources”) include social support (Sarason, Sarason, & Pierce, 1990), self-worth (Steele, 1988), self-esteem (Greenberg et al., 1999), self-efficacy (Bandura, 1997), hope (Snyder et al., 1991), optimism (Scheier & Carver, 1985), perceived control (Seligman, 1975), and self-disclosure (Hemenover, 2003). Resources enhance people’s ability to successfully negotiate challenges by boosting morale and self-confidence, increasing social integration, and clarifying perspective (Hobfoll, 2002). As a result, those who enjoy ample resources experience challenges as less subjectively disturbing, and also display more effective coping in the face of adversity (Hobfoll, 2002).

This connection between resources and distress was cleverly demonstrated by Coan, Shaefer, and Davidson (2006). Their par-

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ticipants (all women) anticipated painful electric shocks, but did so while holding their husband's hand, a stranger's hand, or no one's hand. Those who held their husband's hand reported less distress at the prospect of shocks, and their reports of attenuated distress corresponded to reduced activation of brain areas that signal threat. A related study showed that simply looking at photos of a close other, compared to a stranger, produced similar effects (Master et al., 2009).

The Resources and Perception Model (RPM)

If threat amplifies the perception of challenging objects and events, and if resources temper how threats are experienced, then the amplification of disturbing things should be reduced when resources are bolstered. Conversely, when psychosocial resources are depleted the perception of disturbing things should be exaggerated. These propositions form the crux of the Resources and Perception Model (RPM; Harber, Einev-Cohen, & Lang, 2007). According to RPM the self moderates perception; as the self is made more secure (e.g., through reinforced social bonds, affirmed integrity, bolstered self-worth, heightened self-confidence, or by other means) the perception of self-relevant events (both threats and opportunities) becomes less extreme. In its strongest form, RPM predicts that resources enable people to perceive self-relevant events in their proper proportions; to see things as they are.

RPM draws on Lazarus's two-factor model of appraisal (Lazarus, 1966; Lazarus & Smith, 1988) to explain how resources moderate perception. According to Lazarus, when people encounter a potential threat they first determine if the threat is self-relevant (i.e., is it approaching oneself? does it intend to, and is it capable of, harming oneself?). These calculations constitute "primary appraisal." During "secondary appraisal" people evaluate whether they themselves have the means to contend with potential threats (i.e., does one have the skills, confidence, and/or experience to master or deflect challenges?). Threat, says Lazarus, occurs when the primary appraisal of negative events exceed the secondary appraisal of coping ability (Lazarus & Folkman, 1984). Thus given the same challenge, (e.g., a flat tire on a lonely nighttime highway), people with more resources (e.g., the ability to change flats or the possession of a cell-phone) will experience this situation as less threatening than those lacking such resources.

RPM integrates Lazarus's appraisal and threat theory with the New Look's threat and perception framework. Thus, RPM predicts that the stranded motorist would perceive the night air as colder, the rustling in the underbrush as louder, and the lights of the next town as farther away if his or her self-worth, social support, or other psychosocial resources were diminished. However, if any of these resources were restored then the motorist would exaggerate less.

Psychosocial Resources and Social Cognition

RPM applies to social cognition as well as to psycho-physical perception, and therefore predicts that resources will affect how people attend to, and evaluate, persons and events that represent subjective threats. There is growing and consistent evidence showing that this is so. Harber et al., (2007) showed that disturbing infant cries were evaluated as conveying more distress among

participants whose social resources had been depleted by recalling a past betrayal (Study 1). However, when participants' social resources were restored by emotionally disclosing betrayal-related thoughts and feelings, amplification did not occur (Study 2).

Related research shows, consistent with RPM predictions, that people with bolstered self-worth more equitably regard disturbing medical information (Harris & Napper, 2005; Reed & Aspinwall, 1998; Sherman, Nelson, & Steele, 2000) and opposing political views (Cohen, Aronson, & Steele, 2000) than their nonaffirmed counterparts. Conversely, depleting self-esteem leads to harsher evaluations of those whose beliefs, attitudes, and values conflict with one's own (Solomon, Greenberg, & Pyszczynski, 1991).

Physical Resources Moderate the Perception of Physical Challenges

Attending to and evaluating disturbing events are clearly related to, but are not the same as, physical perception of these events. Thus, two people may differ in how noxious they regard a threat, or how willing they are to examine it, without differing in how close, large, fast, and so forth, they perceive that threat to be. There is evidence that this level of basic physical perception is moderated by resources, but of the physical rather than psychosocial kind. Dennis Proffitt's recent research on "the economy of action" shows that when a person's physical resources are depleted (due to illness, poor physical condition, fatigue, etc.), his or her visual experience alters such that slopes appear steeper and distances greater (Proffitt, 2006). These visual exaggerations, says Proffitt, serve a valuable adaptive function by conveying how much physical effort an activity will entail, relative to a person's physical ability to undertake that activity. Proffitt and his collaborators have shown that hills appeared steeper for runners toward the end of their runs (when they were more fatigued) than at the start (Proffitt, Bhalla, Gossweiler, & Midgett, 1995), and also for people encumbered by heavy backpacks compared to those not so encumbered (Bhalla & Proffitt, 1999). Other studies showed that as the anticipated effort associated with traversing a distance is increased, the distance itself is seen as greater (Witt, Proffitt, & Epstein, 2004; Proffitt, Stefanucci, Banton, & Epstein, 2003).

RPM proposes that psychosocial resources will moderate basic perception just as do physical resources. There is initial evidence that this is so. Schnall, Harber, Stefanucci, and Proffitt (2008) showed that the psychosocial resource of social support moderates the perceived steepness of hills. In an initial study participants stood at the base of steep hill and reported how steep the slope appeared to them. Those who viewed the hill while accompanied by a friend saw the hill as less steep, and the longer they knew their friend, the less steep the hill appeared to them. In a second study, social support was experimentally induced by having participants mentally image a close friend, a neutral acquaintance, or someone who betrayed them. Participants then estimated the incline of a steep hill. Those who imaged a close friend saw the hill as less steep, and the closer participants felt toward the person they imaged, the less steep the hill appeared to them.

Schnall et al. indicate that psychosocial resources do shape the way that the external, physical world is perceived. However, these studies did not address several issues central to the Resources and Perception Model. First, it is unclear if standing at the base of a steep hill represents a threat in the sense of peril to life and limb

or instead the more innocuous challenge of physical exertion. Second, since there was no “neutral” object in Schnall et al., it is unclear if psychosocial resources moderate perception of any objects or, as RPM predicts, only threatening ones. Third, Schnall et al. only tested the moderating effects of social support, and so it is not clear if other psychosocial resources also moderate the physical perception of threats. Fourth, Schnall et al. explored one important aspect of physical space, incline, but not distance or height.

The present research addressed all these issues. In addition, it tested (in Study 2) whether the presence of a psychosocial resource (self-esteem) can supplant the absence of a physical resource (a protective handrail) when perceiving threat (a five-story drop). This is important, because a central premise of psychosocial resource theory (Hobfoll, 2002), and distinct from Proffitt’s economy of action, is that psychosocial resources can be interchangeable. Thus, as shown in Harber et al., (2007), the resource-depleting effects of a betrayal could be counteracted by the resource-restoring effects of emotional disclosure. Demonstrating that psychosocial resources can substitute for physical ones would indicate that perception is moderated by a generalized ability to cope, rather than by a more narrow calculus of physical affordances relative to physical challenges.

Study 1: Self-Worth and the Perceived Distance to Threatening Versus Innocuous Objects

Previous research on the moderating effects of resources on perception has been limited to the perception of stressful or challenging stimuli, including infant cries (Harber et al., 2007) and steep hill slopes (Schnall et al., 2008). It is therefore unknown whether resources exclusively affect the physical perception of threats (as predicted by the Resources and Perception Model), or of any object—nonthreatening ones as well as threatening ones. Study 1 addressed this question by varying the threatening nature of target objects.

Study 1 also attempted to broaden the range of resources that moderate physical perception, which heretofore have been limited largely to social support (Harber et al., 2007; Schnall et al., 2008). It did so by employing transitory self-worth as the focal resource. Self-worth has been shown to help people attend to disturbing information that they would otherwise avoid (Harris & Napper, 2005; Klein & Harris, 2009; Reed & Aspinwall, 1991). Also, heightened self-esteem (the trait counterpart to transitory self-worth) reduces anxiety (Greenberg et al., 1991), which itself induces exaggerated threat perception (e.g., Rhudy & Meagher, 2000). Showing that self-worth moderates perception, and that it does so only for negatively arousing things, would provide important support for the Resources and Perception Model.

Method

Overview. Participants’ self-worth was boosted, left unchanged, or depleted. Participants then estimated the distance a threatening object (a live tarantula) or to a nonthreatening object (a cat toy) from their face.

Participants

One hundred and seven undergraduate psychology students (63% female; mean age = 20.8, *SD* = 4.12) participated in this

study for class credit. All participants had normal or corrected-to-normal vision.

Procedure

Cover story and resource manipulation. Participants were told that the study involved the relation between mental imagery and visual perception. They then completed a guided imagery task that served as the self-worth induction. This task successfully moderated transitory self-worth in previous research (Harber, 2005). Each imaging condition began with a relaxation phase to establish a baseline resting state. Participants then generated elaborate and vivid mental images about a personal event relevant to their self-image. *Positive self-worth* participants imaged a time in which they helped a close other; *neutral self-worth* participants imaged the steps involved in doing laundry, and *negative self-worth* participants imaged a time they greatly failed or betrayed a close other.¹ The imaging task involved four progressive phases (e.g., image the person you helped, image his or her problem, image how he or she felt about your involvement, and image the most important scene from this episode), and provided participants with 60 s to produce mental images prompted by each of the four cues. Imagery task instructions were presented via a Walkman-style tape player.

Distance judgment task. Participants completed the distance judgment task next. The distance judgment task, similar to one designed by Winstead and Derlega (1991), employed a 6-ft long section of model train track that was attached to a wooden plank base bordered by wooden walls, creating a trough-like passageway (see Figure 1 A). The entire apparatus was painted black and tilted lengthwise at a moderate (20°) angle that sloped up to the participants’ face. An optometrist’s chin rest was installed at the highest end of the track. Four desk lamps containing ultraviolet light bulbs illuminated the track, and were the only ambient light source during the task. This lighting scheme helped participants focus exclusively on the distance apparatus, reduced spatial cues, and produced an eerie environment likely to heighten unease, especially in the threat condition.

Participants, their faces immobilized in the chin-rest, operated a fishing reel to draw an empty, clear plastic cart mounted on model-train wheels toward themselves. Once participants demonstrated competence with the apparatus, the experimenter pointed out three iridescent-colored flags (visible under the ultraviolet lights) at preset distances—yellow at the furthest distance, green at the middle distance, and pink at the nearest distance. Flags were positioned at relatively far (56 in. or 48 in.), medium (26 in. or 21 in.), or close (8 in. or 6 in.) distances from the chinrest. The distances alternated (e.g., 56 in. or 48 in.) so that previous sets of judgments would not guide later sets. The side of the track on which the flags were attached (left or right) was counterbalanced as well.

Next, participants were shown a new cart, which now contained either a threatening or a nonthreatening object. A live striped-knee tarantula (*Aphonopelma seemanni*), approximately 3.5 inches in diameter, served as the threatening object (Figure 1 B). Spiders are

¹ Affirming one’s own interpersonal kindness is one of the most effective means of affirming self-worth, according to a meta-analysis of self-affirmation studies (McQueen & Klein, 2006).

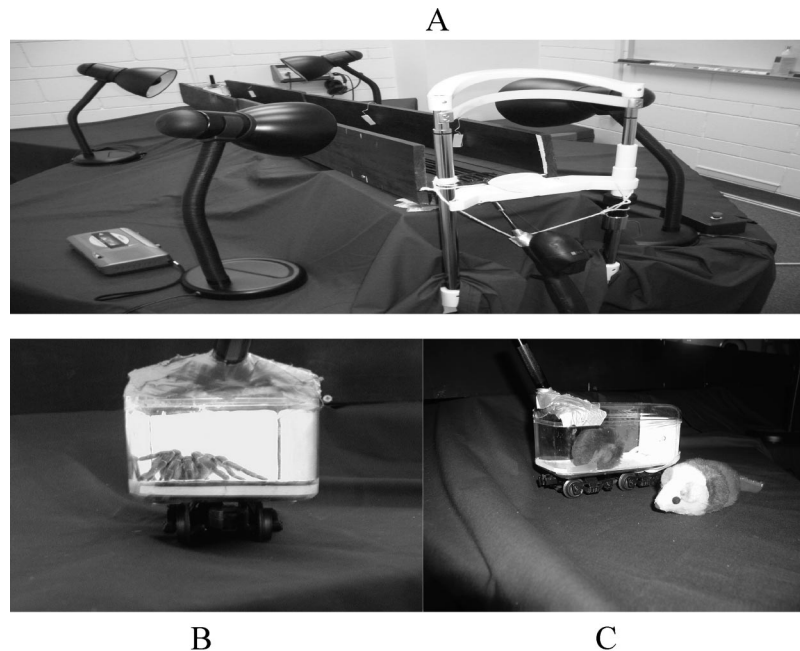


Figure 1. Distance estimation apparatus, Study 1. Subject places face in chin rest, and draws clear plastic cart toward himself/herself by operating fishing reel along model train track (A). Black lights restricted visual cues to iridescent-colored flags on sides of apparatus, and an attached pen-light illuminated the contents of the cart, either a live tarantula (B) or a cat toy (C).

a common source of distress for most people (Armfield, 2007; Riskind et al., 1995). A furry fabric mouse cat toy (approximately 3.5 inches in length, not including tail) or a dark furry cat toy ball (approximately 2.5 inches in diameter) served as the neutral stimuli (Figure 1 C). Two toys were used to control for artifacts associated with toy type. Prior to this presentation, participants had no knowledge that the experiment involved a live tarantula or a cat toy. However, prospective participants who during prescreening indicated bee-sting allergies or severe spider phobia were excluded.

The experimenter attached the cart (illuminated by an attached pen light) containing either the tarantula or cat toy to the fishing line, and placed it at the base of the track. The experimenter then turned off the overhead lights, switched on the ultraviolet lights illuminating the track and the pen light illuminating the cart, and exited the room. The participant was left alone, so as to prevent unintended social support and to minimize other experimenter effects.

Participants received instructions, via the Walkman tape player, to pull the cart toward them from the far end of the track to each of the three flags. Participants stopped the cart at each flag and then gave a verbal estimate of the cart's distance, in inches, from a white line on the track set 5 in. from their faces. Participants believed their distance estimates were recorded only by a small tape recorder situated in the room with them, but these estimates were also recorded by experimenter via a Clear-Com PL Pro intercom. The experimenter also viewed the procedure through a one-way mirror, to confirm adherence to instructions.

After the participant supplied distance estimates on the first test object (tarantula or cat toy), the experimenter reentered the room,

changed the position of the flags, and provided the other test object (cat toy or tarantula). The order in which each participant viewed either the threatening or the neutral stimulus was counterbalanced. Participants once again made verbal estimates of the cart at each of the three distances.

Questionnaires. After completing the verbal distance estimates participants completed a follow-up questionnaire packet that included manipulation checks about feelings of self-worth and the PANAS mood scale (Watson, Clark, & Tellegen, 1988).² Participants were then fully debriefed and thanked for their participation.

Results

Preliminary Analyses

Distance accuracy regarding the threatening and neutral objects was calculated by subtracting participants' distance estimates from the actual distance at each measurement point. These differences between perceived and actual distances were then averaged across all three estimates, resulting in a single overall accuracy measure for each object. Scores greater than zero indicated that the cart was viewed as relatively closer to the subject, and scores lower than zero indicated that it was seen relatively farther away. Scores closer to zero (no discrepancy between actual distance and stated distance) indicated greater accuracy.

Self-worth manipulation check. Increased self-worth, indexed on a 5-point Likert scale, varied by self-worth condition,

² Due to experimenter error, only 78 participants completed the PANAS.

$F(2, 104) = 24.06, p < .001, \eta^2 = .32$. Participants who recalled helping a close other indicated that the mental imagery task made them feel marginally better about themselves ($M = 3.37, SD = .94$) about themselves than those who recalled doing laundry ($M = 2.86, SD = 1.06$), $p < .10$, and significantly better about themselves than those who recalled failing to help another ($M = 1.87, SD = .86$), $p < .01$. Decreased feelings of self-worth were likewise affected by imaging task, $F(2, 103) = 65.68, p < .001, \eta^2 = .56$. Those who recalled failing a close other felt worse about themselves ($M = 3.61, SD = 0.99$) than those who recalled doing laundry ($M = 1.51, SD = .70$), $p < .01$, or those who recalled helping a close other ($M = 1.74, SD = .82$), $p < .01$.³

There was an overall difference in the ease with which people were able to create mental images, $F(2, 104) = 3.39, p < .05, \eta^2 = .06$. Participants in the neutral condition (who thought about laundry) found it easier to create mental images ($M = 3.91, SD = .78$) than did those who thought about failing a close other ($M = 3.35, SD = 1.06$), $p < .05$, and did not differ from those who thought about helping a close other ($M = 3.51, SD = .95$), $p = .18$. The positive and negative self-worth conditions did not differ from each other in ease of imagery, $p = .74$. There was no correlation between ease of generating mental images and distance accuracy, $r(105) = -.08, p = .39$. Discomfort or arousal due to effort generating images was therefore unlikely to have influenced distance estimates.

Threat manipulation check. Fear and anxiety ratings did not differ between the two neutral objects (mouse or ball; $ps > .15$). Further analyses therefore collapsed across the neutral objects. Paired samples *t* tests were conducted to determine whether the tarantula was experienced as more threatening than the neutral objects. Participants rated the tarantula (on a 5-point Likert scale where 1 = *not at all* and 5 = *a great degree*) as generating more fear ($M = 2.49, SD = 1.44$) than the cat toys ($M = 1.07, SD = .31$), $t(105) = 10.10, p < .01$. They also rated the tarantula as generating more anxiety ($M = 2.58, SD = 1.27$) than the cat toys ($M = 1.36, SD = .85$), $t(105) = 8.58, p < .01$.

Order effects. Because participants viewed the tarantula and cat toys in immediate succession, distance estimates from viewing the first object may have influenced estimates for the second. This was the case, as distance estimates of the first object and the second object were highly and positively correlated, $r(105) = .73, p < .01$. Because the first object so greatly influenced how the second object was seen, only distance estimates for the first viewed object were used in subsequent analyses. The experiment therefore became a between-subjects design.

Flag settings. There were no effects on object distance accuracy of varying either flag distances, $F(1, 105) = 0.98, p = .33$, or the side to which the flags were attached, $F(1, 105) = 1.54, p = .22$. Interactions of self-worth condition with flag distance set, $F(2, 100) = 0.02, p = .90$ and flag track side, $F(2, 100) = 1.83, p = .17$ were nonsignificant. Therefore further analyses collapsed across the location (left or right side of the track) and the position of the flags.

Gender effects. There were no gender differences for overall distance perception, $t(105) = -.68, p = .50$, nor for distance perception at any of the three individual distances ($ps > .40$).

In sum, Experiment 1 supported the RPM predictions. Participants whose resources were boosted (by elevating their self-worth) were least likely to distort the visual perception of distance to a

threatening object (a live tarantula) but not to a nonthreatening object (cat toys). Moreover, the more that resources were boosted (due to the self-worth manipulation), the less visual distortion occurred, and the more that resources were depleted, the more visual distortion occurred—but again, only for the threatening object. An unexpected outcome was that participants in the neutral object (cat toy) condition, as a group, were less accurate than affirmed participants in the threatening object (tarantula) condition. We explore this result in the General Discussion.

Main Analyses

The joint effects of self-worth (boosted, unchanged, or depleted) and object type (threatening/tarantula or nonthreatening/cat toy) across the three distance-measure points (far, moderate, close) were tested in a repeated measures analysis of variance (ANOVA). The between-subjects test confirmed that self-worth moderated distance perception, but (as expected) only for the tarantula; self-worth did not affect perception of the nonthreatening cat toy, $F(2, 71) = 4.59, p = .009, \eta^2 = .09$ (see Figure 2).

GLM simple contrasts showed that the average distance judgment to the tarantula by those in boosted self-worth condition was significantly less than that of depleted self-worth participants ($M_{diff} = 6.18, SE = 1.38$), $p = .001$, and that of unchanged self-worth participants ($M_{diff} = 3.61, SE = 1.36$), $p = .01$. Those in the unchanged self-worth condition estimated distance to the tarantula marginally less than those in the depleted self-worth condition ($M_{diff} = 2.56, SE = 1.38$), $p = .07$. Self-worth condition had no effect on distance perceptions supplied by subjects in the “cat toy” condition, $F(2, 47) = 0.83, p = .44$.

Multivariate tests (Pillai’s trace) revealed a three-way interaction between self-worth, object, and distance (far, medium, close), $F(4, 200) = 3.08, p = .017, \eta^2 = .058$. This interaction was explored by examining the self-worth (boosted, unchanged, or depleted) by object (tarantula or cat toy) interactions at each of the three distance points (far, medium, and close range). Results (see Table 1) show that self-worth selectively moderated perception of distance to the tarantula (but not to the cat toy) at the furthest distance, $F(2, 100) = 4.21, p = .018, \eta^2 = .08$, and for the middle distance, $F(2, 100) = 4.22, p = .017, \eta^2 = .08$. However, there was no difference at the nearest distance, $F(2, 100) = 0.34, p = .71, \eta^2 = .01$. This is probably because the nearest distance (6 in. or 8 in.) was so close as to prevent meaningful distortions (see Rambli & Kalawsky, 2006).

Internal analyses. Internal analyses indicated that conditional differences in distance estimation were moderated by self-worth. Feeling good about oneself due to the imaging task (as measured in the manipulation check) correlated to seeing the tarantula at its true (i.e., more remote) distance, $r(55) = -.27, p < .05$, whereas feeling bad about oneself was correlated to seeing the tarantula as nearer than it actually was, $r(55) = .31, p < .05$. When viewing the neutral object, however, there was no relationship

³ All post hoc tests were Tukey’s tests of multiple comparisons.

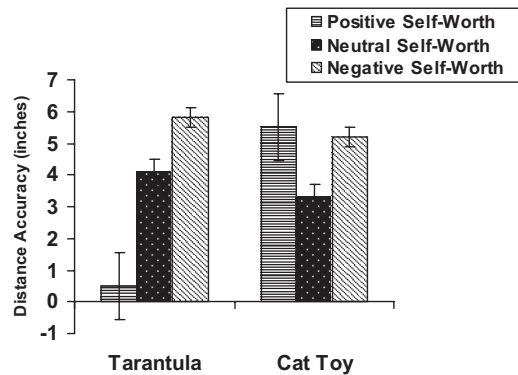


Figure 2. Mean accuracy scores (actual distance minus estimated distance) as a function of self-worth condition and target object.

between distance accuracy and feeling good about oneself, $r(48) = -.01$, $p = .97$, or feeling bad about oneself, $r(48) = .13$, $p = .37$. Thus, changes in self-worth only affected threat perception, as RPM predicts.

Mood confounds. Analyses of PANAS mood scale scores indicated that the self-worth manipulation had no effect on positive mood, $F(2, 77) = .79$, $p = .46$, $\eta^2 = .02$, or on negative mood, $F(2, 78) = .36$, $p = .70$, $\eta^2 = .01$. Nor was there an association between overall distance accuracy and either positive mood, $r(78) = .04$, $p = .76$, or negative mood, $r(79) = .01$, $p = .90$. Finally, mood did not affect distance perception for either the tarantula or the neutral object (all $ps > .35$). Analysis of covariance (ANCOVA) showed that the Self-worth \times Object interaction for distance perception remained significant even when the influence of mood was statistically controlled, $F(2, 71) = 3.36$, $p < .05$, $\eta^2 = .08$. These nonsignificant effects of mood suggest that the overall results were not due to differences in participants' co-occurring changes in mood. This negligible contribution of mood mirrors other research on the effects of manipulated self-worth (McQueen & Klein, 2006).

Study 2: Height Perception as a Function of Internal and External Resources

The perception of height is moderated by height-related threat; those who are constitutionally more fearful of heights, and those placed in conditions designed to increase height fears, perceive heights as greater than their less fearful (or less fear-induced) counterparts (Clerkin, Cody, Stefanucci, Proffitt, & Teachman, 2009; Stefanucci & Proffitt, 2009; Stefanucci et al., 2008). If height perception is increased by conditions that arouse threat, then the presence or absence of resources should moderate height perception. Study 2 tested if this was so, using self-esteem as the moderating psychosocial resource.

Do psychosocial resources supplement physical resources. Stefanucci et al. (2008) showed that height fears lead to exaggerated height perception when looking down from an elevation. Moreover, this exaggeration is itself moderated by physical conditions that can either add or detract from the discomfort people experience when looking down from heights. Participants in Stefanucci et al. estimated hill steepness when looking down from the top of a hill. Those who did so when

standing upon an unstable skateboard generated more extreme estimates than did those who stood on solid ground. Thus fear moderates height perception, but mainly in the absence of physical resources (e.g., stable footing).

Would psychosocial resources, such as solid sense of self, operate as do physical resources, such as solid footing, in the perception of physical threats? The fungible nature of psychosocial resources (i.e., the presence of one resource can supplement for the absence of another, per Baltes & Baltes, 1990) suggests that they may do so. But does this substitutability extend to physical resources, such that augmented intrapsychic resources compensate for reduced external, physical resources? The present study tested that this resource substitution occurs.

In sum, Study 2 had three objectives; 1) to test whether psychosocial resources affect the perception of heights; 2) to test whether trait self-esteem can moderate perception, and; 3) to test whether an internal psychosocial resource (self-esteem) can compensate for the absence of an external physical resource (a protective handrail) when judging a potentially hazardous height.

Method

Overview. Participants completed the Rosenberg self-esteem measure (Rosenberg, 1965) during an omnibus prescreening and then several weeks later estimated the distance to the floor from a height of five stories. Participants made these distance estimates with their hands on a stabilizing atrium railing or with their hands taped behind their backs while peering down over the railing.

Participants. Ninety-one undergraduate psychology students (64.9% female; mean age = 20.18, $SD = 03.53$) participated in this study for class credit. All participants had normal or corrected to normal vision.

Procedure

Introduction and cover story. This study was conducted at the Rutgers/Newark School of Law and Social Justice, a five-story

Table 1

Perceived Distance as a Function of Target Threat (Tarantula vs. Cat Toy) and Self-Worth Condition (Bolstered, Unchanged, Depleted) at Far, Medium, and Close Distances, Study 1

	Tarantula		Cat toy	
	Mean	SD	Mean	SD
Furthest distance				
Bolstered self-worth	4.00	9.02	12.88	8.48
Unchanged self-worth	10.26	8.59	8.81	10.49
Depleted self-worth	14.89	7.76	11.83	11.35
Middle distance				
Bolstered self-worth	-2.21	6.30	3.81	6.23
Unchanged self-worth	2.37	5.28	1.19	6.07
Depleted self-worth	4.33	4.93	3.50	5.23
Closest distance				
Bolstered self-worth	-0.32	1.95	-0.06	2.41
Unchanged self-worth	-0.32	1.95	-0.13	2.33
Depleted self-worth	0.79	1.80	0.28	1.84

Note. Furthest distance = 56" or 48", medium distance = 26" or 21", closest distance = 8" or 6".

building with an inner atrium. A staircase and landing surround the circumference of the atrium, providing an unobstructed view from the fourth floor to the basement floor, five stories (76 feet) below. Participants arrived at the building lobby and were greeted there by an experimenter. They were then taken to a small study room where they completed a consent form and were told that the experiment concerned visual perception.

Height estimation task. Participants were brought via an elevator to the fourth floor, and then walked to the stairwell landing. They were told that the study concerned height perception, and that they would make a series of height judgments. The direct measure involved peering down over the fourth floor railing and estimating how high up they were, in feet, to the basement floor, five stories below. Participants were shown a 1-ft ruler to orient them to this metric.

Two indirect measures were also employed. One was estimating how long (in seconds) it would take for an imaginary ping-pong ball to fall to the floor, with longer durations implying greater height. Participants “held” the imaginary ball under their chins. When the experimenter said “go” the participants dropped the ball, watched its imagined descent, and said “stop” when the ball hit the floor. The experimenter recorded the duration of the imagined ball drop (i.e., “go” to “stop”) with a stopwatch.

The other was estimating the size of a large (16.5 in. by 16.5 in.) letter “U” (the first letter of “University”) etched into the atrium floor at ground level. According to Stefanucci and Proffitt, (2009), greater perceived height should cause items on the ground to be estimated as larger than they are, a phenomenon referred to as “distance scaling.” This effect is the psychophysical counterpart to seeing a large truck as toy-like from an airplane, and surmising from the extreme height that the truck is in fact large. The order in which all three measures (direct height, ball-drop, and letter-size) were taken was counterbalanced.

Handrail access. Before completing the height estimation tasks, participants were placed in one of two physical resource conditions. Those in the “hands on” condition were instructed to place their hands on the handrail that ran along the perimeter of the walkway overlooking the view to the basement floor. Those in the “hands off” condition had their hands secured behind their backs with a paper strip taped at the ends (see Figure 3A and 3B).

Participants in both the “hands on” and “hands off” conditions were told that their access or lack of access to the railing served to prevent measurement bias. The actual intent of these conditions was to supply or deprive participants with a physical resource (a protective handrail). Holding the handrail was anticipated to serve as an external physical resource that would make internal resources (self-esteem) redundant, and therefore all participants who held the handrail, regardless of their self-esteem, were expected to provide equivalent and relatively accurate height estimates. However, for participants deprived of the handrail, self-esteem was expected to supplement for the absence of the external resources provided by the handrail. As a result, those with lower esteem were expected to exaggerate height more so than those with greater self-esteem.

After supplying height estimates, participants reported negative affect aroused by the height task (how scared, afraid, and discomforted they felt when looking down). They did this while instructed to peer over the railing, in order to make the height and associated feelings salient. Participants also reported on their suspicion that the task was other than as described in the cover story, and their age and gender.

Results and Discussion

Preliminary Analyses

Data reduction. The three measures of height-related distress (feeling scared, afraid, and discomfort) were summed and averaged into a negative arousal index ($\alpha = .91$).

Outliers. Analysis of perceived height (in feet) revealed three extreme outliers (more than 3 *SDs* above the mean). All these outliers were in the no-handrail condition and all had low self-esteem—the population predicted to exaggerate height estimates. These participants’ scores were transformed to equal the next highest score within 3 *SDs*, plus 1, as per Field (2009).

DV presentation order. The order in which the three height measures were taken affected the direct measure of height (as a nonsignificant trend), $F(2, 44) = 2.33, p = .11$, and marginally affected ball-drop $F(2, 43) = 2.93, p = .064$. It had no effect on



Figure 3. Height judgment task. Subjects look down over handrail to estimate distance to floor from a height of five stories, either with their hands on the protective handrail (A) or with their hands restrained and therefore deprived access to the handrail (B).

letter-size, $F(2, 42) = 1.53$, $p = .24$.⁴ Because only half the subjects reported presentation order and because its effect was only marginal, presentation order was not included in further analyses.

Suspicion. Suspicion regarding the experiment cover story was low ($M = 1.42$, $SD = 0.92$ on a 5-point scale where 1 = *very little*), and did not differ by experimental condition, $F(1, 42) = 0.17$, $p = .68$.

Negative arousal and height perception. Negative reactions to height corresponded to more extreme height perception, $r = .24$, $p = .022$, replicating previous findings (Clerkin et al., 2009 and Stefanucci & Proffitt, 2009). Thus, the more distressed participants felt peering down to the floor five stories below, the further down the floor appeared to them. However, negative arousal was not significantly correlated to either of the two indirect measures of perceived height, duration of ball drop, $r = .10$, $p = .32$ and width of letter “U,” $r = .043$, $p = .73$.

Main Analyses

This study predicted that perceived height would be jointly determined by handrail access and self-esteem. This prediction was tested using moderated multiple regression (Aiken & West, 1991), with self-esteem (centered) and handrail access (coded as a dummy variable) entered into Model 1, and the Esteem \times Handrail access cross-product entered into Model 2 (see Table 2). Results for the direct measure of height (i.e., height in feet from the handrail to the floor below) confirmed that self-esteem moderated the effect of handrail access on perceived height (see Figure 4). Separate simple effects tests showed that for participants instructed to grasp the handrail while looking down, self-esteem had no effect on perceived height, $b = 10.30$, $SE = 11.83$, $t = .86$, $p = .389$. However, for participants whose hands had been taped behind their backs and were therefore deprived handrail access, those with less esteem estimated the height as greater than did those with more esteem, $b = -54.11$, $SE = 19.18$, $t = .282$, $p = .007$.

The main effect of handrail access, wherein those who could not grasp the handrail saw the height as more extreme than those who could grasp the handrail is noteworthy. This conceptually replicates Stefanucci et al., 2008, and reinforces the general prediction that the absence of physical safeguards amplifies the perception of physical risks.

Table 2

Summary of Hierarchical Regression Analysis Testing the Interactive Effect of Self-Esteem and Hand Rail Access on Height Perception, Study 2 (N = 91)

Variable	B	SE B	β
Step 1			
Handrail condition	41.39	19.41	0.22*
Esteem	-24.18	11.85	-0.2*
Step 2			
Handrail condition	41.99	18.69	2.25*
Esteem	10.30	16.74	0.09
Handrail condition* esteem	-64.40	22.88	-0.41**

Note. $R^2 = .088$ for Model 1 ($p = .018$); $\Delta R^2 = .076$ for Model 2 ($p = .006$).

* $p < .05$. ** $p < .01$.

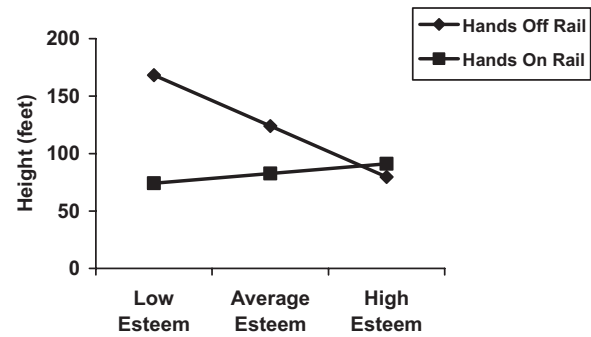


Figure 4. Height estimation (in feet) as a function of trait self-esteem and handrail access.

Neither of the two indirect measures, the imaginary ping pong ball's descent time and the estimated width of the letter U, interacted with self-esteem (ball descent: $b = -1.28$, $SE = 1.41$, $t = .90$, $p = .369$; letter width: $b = -1.051$, $SE = 2.06$, $t = -.51$, $p = .61$). Follow-up tests indicated that these measures may not have served as reliable indicators of perceived height. Neither correlated with the direct height measure, nor with each other (all $r_s \leq .19$), and as previously mentioned neither correlated with negative reactions to height.

In sum, Study 2 showed that a stable internal resource, self-esteem, moderated height perception, but did so mainly in the absence of an external resource (i.e., a protective handrail). Thus, as expected, a psychosocial resource can compensate for the absence of a physical resource in the visual experience of disconcerting height.

General Discussion

The Resources and Perception Model predicts that psychosocial resources moderate the physical perception of threatening objects. The present research supports this central premise of the model and several of its key tenets. Study 1 showed that when the resource of self-worth was depleted a threatening object—a live tarantula—was seen as closer than was actually the case, but when self-worth was bolstered the tarantula was seen at very near its true distance. However, self-worth had no effect on the perception of a neutral object (an innocuous cat toy) confirming that, as RPM predicts, resources selectively moderate the perception of threats. Internal analyses indicated that changes in self-worth moderated these effects. The more the imaging task increased self-worth, the further away the tarantula appeared; the more the imaging task depleted self-worth, the closer the tarantula appeared. However, varying degrees of boosted or depleted self-worth did not affect the perceived distance of the nonthreatening cat toy, showing again that, as predicted, resources selectively affect threat perception.

Study 2 confirmed RPM using a different resource, trait self-esteem, and a different visual task, the perception of vertical drops (looking down from a five-story height). Participants with less esteem were more likely to exaggerate the distance to the floor, but

⁴ Due to experimenter error, only 45 subjects were asked about presentation order and suspicion.

only in the absence of a physical resource (i.e., a protective handrail). Thus, a psychosocial resource compensated for the absence of a physical resource. In fact, psychosocial resources probably matter most in the absence of other resources.

Studies 1 and 2 demonstrated the generality of RPM. They showed that resources moderate not only the perception of hill slants (as per Schnall et al., 2008), but also affect the perception of distance and heights—two quite different aspects of geographical space. The two studies also showed that these moderating effects are not limited to one particular resource (i.e., social support) but extend to transitory changes in self-worth and to stable levels of self-esteem, resources that have both been shown to temper reactions to threats (Cohen et al., 2000; Greenberg et al., 1991; Master et al., 2009). Critically, the two studies presented here show that resources moderate the perception of physical threats (dangerous animals, hazardous heights), and are not limited to the implicit calculus of metabolic costs (i.e., how much physical effort a situation might demand, relative to one's physical resources).

Resources and accuracy. Previous research has shown that self-affirmation induces greater willingness to attend to threats (Cohen et al., 2000; Klein & Harris, 2009; Harris & Napper, 2005; Reed & Aspinwall, 1998). RPM goes beyond these attentional biases, and predicts that self-worth (and other resources) affects not only the willingness to cognize threats, but also how threats are actually perceived. Study 1 showed that participants in the bolstered self-worth condition erred less than 1 in. in their aggregated distance estimates to the tarantula, while those in the depleted self-worth condition erred by nearly 6 in. In Study 2, high-esteem participants in the hands-restrained condition estimated the 76 foot distance to the floor below as 78 feet, a very modest overestimation. In contrast, those whose self-worth was depleted estimated the same height as 172 feet; a substantial overestimation. These findings complement Schnall et al., where social support reduced the tendency to overestimate hill slope steepness.

The present studies also show that the effect of resources on perception is not unidirectional; that is, resources do not simply cause all objects to be seen as more distant (i.e., the tarantula in Study 1) or as closer (i.e., height in Study 2). Instead, they show that the relative distance perception is moderated by the threat-relevance that such distance implies. Thus, when an object's closeness represents increased threat (e.g., a live tarantula), resources reduce exaggerated closeness; when its distance represents threat (e.g., looking down five stories), resources reduce exaggerated distance.

Collectively, these findings suggest that those with greater resources will perceive the geographical properties of objects (distance, height, slope) more accurately. However, more data gathered from a greater variety of designs will be needed to more firmly assert that resources promote visual accuracy.

Resources, perception, and coping. The present studies, along with Harber et al., 2007 and Schnall et al., (2008), indicate a heretofore unappreciated way in which psychosocial resources may improve psychological coping. They do so by presenting people with a subjectively less stressful physical and social world. The burgeoning research on affective states and exaggerated perception shows that people literally see and feel threats as closer, larger, more intense and of longer duration (Klein et al., 2003; Rhudy & Meagher, 2000; Riskind et al., 1995; Stefanucci et al., 2008). Day to day, living in this hostile world of amplified threat

would likely induce the heightened vigilance and preparatory defense that constitute chronic stress, and thereby create the health risks that stresses present (Dickerson & Kemeny, 2004; Selye, 1956). However, if resources moderate threat perception, as RPM studies show, then the day-to-day world should appear less ominous. As a result chronic stress and the health costs stress imposes should be likewise reduced.

Practical implications. Police, fire, military, health workers, and other emergency professionals are often required to make quick judgments leading to consequential actions based on limited and fleeting information about potential threats. Failure to perceive actual threats, as well as seeing threats where none exist, can present dire costs. The present research suggests that the kind and quality of resources emergency personnel enjoy might beneficially affect their performance. Thus, emergency workers with greater social support, self-efficacy, or self-worth might be better able to accurately appraise, and thereby respond, to potential threats.

Caveats and Alternative Explanations

Mood. An alternative explanation for the present findings is that they reflect changes in mood rather than in resources. This is unlikely. In Study 1, the direct manipulation of resources via the imaging task did not produce corresponding changes in reported mood. Further, distance estimates to either the tarantula or to the cat toy did not covary with either positive mood or negative mood, and the interaction between self-worth level and object type (threat vs. nonthreat) remained significant even after mood was statistically controlled. The null relationship in Study 1 between self-worth condition and mood mirrors related self-affirmation studies, which also found dissociations between affirmation and mood (McQueen & Klein, 2006).

In Study 2 negative reactions to looking down to the floor five stories below did correlate with height perception. However, in this case the affective reaction arose from the threat (looking down over the railing) and not from the resource (self-esteem). As such, this correlation supplied a manipulation check confirming that the height was indeed disturbing and that, in accord with previous research (e.g., Stefanucci et al., 2008), this height-generated distress led to more extreme height estimates.

Selective accuracy of high threat/bolstered resources in Study 1. Self-worth and estimated distance to threat and non-threat objects interacted in the predicted manner in Study 1. However, somewhat unexpectedly, accuracy was especially high among self-worth boosted participants in the threat condition, even surpassing that of subjects in the nonthreat condition. Recent research by Klein and Harris (2009) provides an explanation for this selective accuracy. Klein and Harris predicted, and found, that self-affirmation biases visual attention toward threatening cues. Self-affirmed participants in their study more rapidly focused on threatening words, whereas nonaffirmed participants tended to divert attention from these words. This more rapid attention to threats—compared to avoidance—would permit more thorough analyses of threats. If so, then affirmed participants in Study 1 may have been more accurate because affirmation prompted them to attend more fully, and to therefore process more carefully, the threat-inducing tarantula.

Indirect measures, Study 2. The predicted interaction between self-esteem and height was confirmed for the direct measure

of height (as measured in feet from railing to floor). However, the two indirect measures did not produce any significant effects. There are several reasons why this may have occurred. First, neither the perceived duration of the ball drop nor the perceived size of the letter “U” imprinted on the basement floor were correlated with height-related distress. If these stimuli were not influenced by threat, they could not be moderated by threat-tempering resources. Second, these indirect measures did not correlate with the direct measure or with each other, indicating that they were not reliable indices of height. Finally, each of these measures may have been undermined by artifacts particular to them. The ball drop measure may have required participants to look down longer in order to produce more exaggerated fall-durations; but height-related distress may have deterred prolonged staring at the floor below (as per Klein & Harris, 2009). As a result the same fear that would produce more exaggerated fall-duration estimates may have deflected attention from the fall-duration task.

The distance scaling task may have been undermined by using a meaningful and familiar target (the letter “U,” “University” etched on the basement floor) rather than a novel and nonmeaningful object as successfully used by Stefanucci and Proffitt (2009). Participants could have made a common sense judgment about how such a decorative letter would be scaled, and relied on this propositionally based calculation rather than affective cues. Indeed, people are less likely to use affective cues when more objective ones are available (Forgas & Vargas, 2000).

Issues of process and mechanism. To date, the Resources and Perception Model has shown that psychosocial resources can moderate social and psychophysical perception. The next step is demonstrating the mechanisms and means by which these perceptual effects occur. Work in progress (Gorman & Harber, 2011) is testing whether resources affect the threat/challenge dimensions of physiological response to negative events (e.g., Blascovich, Mendes, Hunter, & Salomon, 1999), and if these physiological reactions in turn moderate perception of threatening objects. The manner in which resources influence threat perception is yet to be determined. Do reduced resources hyper-attune perceivers to the threatening aspects of objects, or do enhanced resources attune perceivers to the tractable aspects of threat? Ongoing explorations of RPM will address these questions.

Conclusion

Basic perception requires higher-order mental input to assimilate brute sensory stimulation, making the business of perceiving actively constructive rather than passively receptive (Gregory, 1998). The present research indicates that psychosocial resources inform how perception is assembled. Participants whose self-regard was affirmed were less likely to exaggerate the closeness of a tarantula than those whose self-regard was diminished; participants with robust self-esteem were less likely than those with low esteem to exaggerate heights (if deprived of a protective handrail). Together, these findings suggest that the clarity with which people perceive the outer world is shaped by the sympathy with which they regard themselves.

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