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Laura E. Thomas, Christopher C. Davoli, and James R. Brockmole

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OBSERVATION

Competitive Interaction Leads to Perceptual Distancing Between Actors

Laura E. Thomas
North Dakota State University

Christopher C. Davoli
Central Michigan University

James R. Brockmole
University of Notre Dame

People physically distance themselves from competitors and the disliked, and cooperate less with those who are further away. We examine whether social interaction can also impact the space people perceive between themselves and others by measuring the influence of competitive dynamics on visual perception. In 2 experiments, participants played a ball toss game until they reached a target score. In Experiment 1, a confederate stood across the room from the participant and either (a) played the same game competitively, (b) played the same game cooperatively, or (c) observed the participant without playing, while in Experiment 2, 2 participants played the same versions of the game with each other. After the game, participants provided an estimate of the distance between themselves and the other player. Participants in Experiment 1 who competed with the confederate consistently judged her to be more distant than participants who cooperated with the confederate or played alone. In Experiment 2, players who lost the competition perceived more distance between themselves and their opponents than did players who won, suggesting that the experience of losing a competition drives this perceptual distancing. These findings demonstrate the power of a socially distancing interaction to create perceptual distance between people.

Keywords: embodied perception, distance perception, social interaction, competition

People frequently use distance metaphors to characterize social relationships: friends who were once *close* can *drift apart,* while an unpleasant colleague should be kept at *arm's length* (Lakoff & Johnson, 1980, 1999). These metaphors reflect the power of spatial relationships to influence, and be influenced by, social interactions. For example, people physically distance themselves from competitors and the disliked (e.g., Kleck et al., 1968; Sommer, 1969; Tedesco & Fromme, 1974) and cooperate less with those who are further away (Bradner & Mark, 2002; Sensenig, Reed, & Miller, 1972). Here, we examine whether social interactions can also impact the space people *perceive* between themselves and others.

Our work is grounded in the theory of embodied perception, which proposes that perception is related to actions within, and thoughts and feelings about, the environment (e.g., Glenberg, Witt, & Metcalfe, 2013). For example, an action's plan (e.g., Bekkering & Neggers, 2002), anticipated difficulty (e.g., Doerrfeld, Sebanz, & Shiffrar, 2012), and success (e.g., Witt & Proffitt, 2005) can influence many psychophysical judgments including estimates of size, distance, speed, and weight (see Witt, 2011). The vast majority of these studies focus on a single individual's perception during an isolated activity. However, people commonly perform actions in social contexts where others are present and interacting in some manner. Social contexts are important determinants of one's expectations, actions, and attitudes that may also affect perception in systematic ways. Here, we consider the effects of two contrasting scenarios—competition and cooperation—in order to establish the existence of socioperceptual effects and to investigate the mechanisms that govern their emergence.

How might social contexts influence perception? One intriguing idea is that physical behaviors associated with particular social scenarios will be analogously represented in perception. We noted earlier that people increase their physical distance from competitors. Following competition, observers may experience a perceptual analogue of this effect, seeing each other as being further apart than similarly situated noncompetitive counterparts. In contrast, one's desire to cooperate with another person is inversely related

Laura E. Thomas, Department of Psychology, North Dakota State University; Christopher C. Davoli, Department of Psychology, Central Michigan University; James R. Brockmole, Department of Psychology, University of Notre Dame.

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Correspondence concerning this article should be addressed to Laura E. Thomas, Center for Visual and Cognitive Neuroscience, Department of Psychology, North Dakota State University, NDSU Department 2765, P.O. Box 6050, Fargo, ND 58108-6050. E-mail: laura.e.thomas@ndsu.edu

to their physical distance. Hence, following a cooperative interaction, participants might perceive each other as being closer together than noncooperative counterparts. Such a "behavior-perception alignment hypothesis" has not been explicitly tested, but one recent study is consistent with it. Following social rejection, observers seek affiliation with a social group; they also underestimate the distance between themselves and newly encountered individuals, an effect that might promote new social interactions (Pitts, Wilson, & Hugenberg, 2014). Hence, under this hypothesis, competition and cooperation should bias perception in opposite directions.

Another theoretical possibility is also suggested by the literature: Perception may be particularly vulnerable to biases in situations where the potential for negative outcomes is high, or where negative outcomes result. In addition to the effect of social rejection we just noted, well-documented examples of action-modulated perception hinge on athletic success or failure (e.g., Witt & Proffit, 2005), degree of physical strain (Witt et al., 2008), risk of physical harm (e.g., Stefanucci, Gagnon, Tompkins, & Bullock, 2012), and the presence of strong emotional states such as fear (Stefanucci & Proffitt, 2009). Competition poses a potential threat to competitors' self-esteem because ego hinges on performance (Reinboth & Duda, 2004; Ryan, 1982). Thus, competition involves risk: Although winning a competition can enhance self-esteem and produce positive affect, losing leads to reductions in self-esteem and negative affect (Heatherton & Polivy, 1991; Nummenmaa & Niemi, 2004; Standage, Duda, & Pensgaard, 2005; Thill & Cury, 2000). Under a "risk and negative outcome hypothesis," competition should therefore increase distance estimates. Furthermore, individuals who lose should experience augmented effects of competition on perception. Cooperative scenarios, in contrast, reduce risk to an individual. In fact, in face-to-face interactions, when given a choice between cooperative and competitive behaviors, people opt for cooperation approximately 90% of the time (e.g., Insko et al., 1993; Wildschut, Pinter, Vevea, Insko, & Schopler, 2003). Furthermore, cooperative tasks prompt observers to form a social synergy (Marsh, Richardson, Baron, & Schmidt, 2006) in which environments and actions are perceived in terms of joint, rather than individual, actions and abilities (e.g., Davis, Riley, Shockley, & Cummins-Sebree, 2010). Hence, under this view, cooperation should have a substantially smaller, and perhaps negligible, effect on perception.

Experiment 1

To examine the influence of social interactions on spatial perception, we asked participants to play a simple game with a confederate under cooperative, competitive, and control conditions.

Method

Eighty-one North Dakota State University (NDSU) students were randomly assigned to one of three experimental groups of 27 participants each. Participants stood at a line facing a confederate 3.05 m away and played a game in which they tossed a tennis ball at a Velcro target board with patches worth varying point values lying 1.22 m away on the floor. A second identical target board was positioned the same distance away from the confederate (see Figure 1). Each player in the game would toss a ball toward her target, retrieve the ball, and then return to the starting line. In the *cooperative condition*, the participant and confederate played as a team alternating tosses. Participants in this condition won the game when the team's total cumulative score reached 2,000 or more. In the *competitive condition*, the winner was the first player to individually score 1,000 or more points. In the *control condition*, participants played the game by themselves while standing across from the confederate and won the game when their individual cumulative score reached 1,000 or more. At the end of each round, the confederate announced the total cumulative score (cooperative condition), the cumulative score of each player (competitive condition), or the cumulative score of the participant (control condition). Otherwise, the participant and confederate did not speak to each other. Immediately after completing the game, while both players still stood at their starting lines, participants provided a verbal estimate of the current distance between themselves and the confederate. Three confederates—two women and one man—participated in the study and played with participants equally often across conditions.

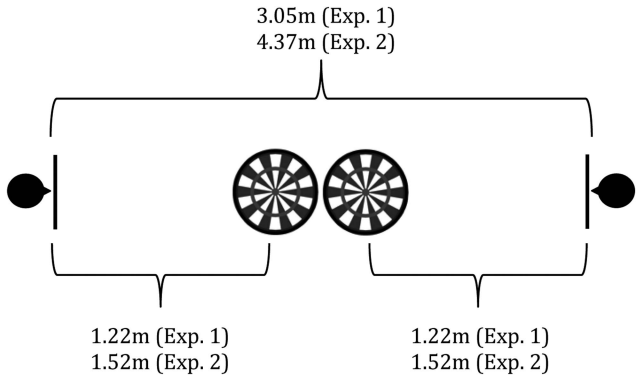

Figure 1. Layout of the experiments.

Results and Discussion

Figure 2 shows the results of Experiment 1. A one-way analysis of variance (ANOVA) indicated that group assignment affected participants' distance estimates, $F(2, 78) = 5.41$, $p < .01$, $\eta^2 = .12$. To determine the source of this effect, planned comparisons were conducted. Participants in the competitive condition perceived the confederate to be further away from them than participants in the cooperative ($p < .02$) or control ($p < .01$) conditions. Participants in the cooperative and control conditions showed no difference in their estimates ($p > .70$). These results suggest that competitive, but not cooperative, social interactions affect how people perceive the space between themselves and others.

In addition to group assignment, we considered the degree to which the quality of a participant's performance also influenced her distance estimates. Within the control condition, we defined performance quality as the number of turns taken by the participant to reach 1,000 points. Within both the cooperative and competitive conditions, performance quality was defined as the number of points scored by the participant when the game ended. Correlational analyses indicated no relationship between participant performance and distance estimates within the control, $r = -.01$, $p = .48$, 1-tailed and cooperative conditions, $r = -.04$, $p = .42$, 1-tailed. Within the competitive condition, however, participants who performed more poorly tended to perceive the confederate as further away ($r = -.34$, $p = .04$, 1-tailed). This trend suggests that

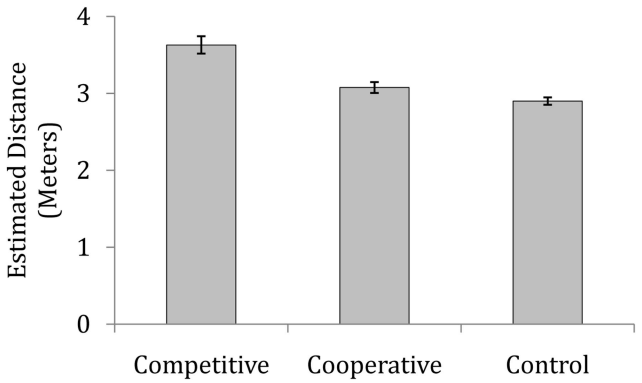

Figure 2. Mean estimated distance for participants in each game playing condition of Experiment 1.

the perceptual consequences of competitive social dynamics may interact with one's degree of success within the competition.

In summary, the results of Experiment 1 are consistent with a "risk and negative outcome" hypothesis of embodied perception. Competition, an inherently risky scenario, led observers to perceive their competitors as further away. This result was exacerbated among those individuals who performed more poorly in the competition. In contrast, less risky cooperative scenarios did not influence perception. However, the design of Experiment 1 did not balance participant performance—in the majority of games across both the competitive and cooperative conditions, the confederate scored more points than the participant. Our results therefore primarily consider distance estimates given by the weaker player. We conducted a second experiment to further test the risk and negative outcome hypothesis in a situation that corrected for this imbalance.

Experiment 2

In Experiment 2, we divided naïve participants into pairs who played the ball-toss game together. We were therefore able to identify and obtain a distance estimate from both a stronger and weaker player within each game. This allowed us to more directly compare the effects of social context and performance outcomes on perception. If, as suggested by the results of Experiment 1, perception is shaped by the negative risk inherent to competition, then losers in a competitive situation should estimate a greater distance between themselves and the winner than vice versa. In contrast, no perceptual differences should be evident between the weaker and stronger players in a cooperative situation.

Method

The methods used in Experiment 2 were the same as in Experiment 1 with the following changes. One hundred sixty-eight NDSU students were equally and randomly assigned to the cooperative, competitive, and control conditions. By increasing the sample size, Experiment 2 obtained more statistical power relative to Experiment 1. Instead of playing with a confederate, participants were randomly paired and played the ball toss game with each other. In the cooperative and competitive conditions, participants took turns tossing a ball, while in the control condition, one participant tossed the ball and the other observed. Experiment 2 was conducted in a larger room than Experiment 1, allowing participants to stand 4.37 m away from each other and 1.52 m away from their respective target boards. After each round, an experimenter retrieved the balls, handed them back to the players, and announced their current scores. Immediately after completing the game, both participants provided a written estimate of the distance between themselves and the other player while standing at their starting lines. After making this estimate, participants completed a short posttest questionnaire that probed for the presence of demand characteristics by asking what they thought the purpose of the study was and what outcome they would predict for the study.

Results and Discussion

Figure 3 shows the results of Experiment 2. Based on individual points scored, each participant was classified as being either the stronger or weaker player in a cooperative pair, the winner or loser in a competitive pair, or the player or observer in a control pair. A comparison of the estimated distances for higher versus lower scorers across each of the three experimental groups indicated no main effect of group, $F(2, 168) = .78$, $p > .40$, but a significant main effect of score (high vs. low), $F(1, 168) = 7.06$, $p < .01$, $\eta^2 = .04$, and a significant interaction between group and score, $F(2, 168) = 3.38$, $p < .05$, $\eta^2 = .04$. Tukey post hoc tests showed that when participants were pitted against each other in the competitive condition, the players who lost perceived more distance between themselves and their opponent than did the players who won ($p < .01$). In contrast, performance on the ball-toss task did not influence distance estimates in the cooperative or control conditions ($p > .9$ for both comparisons). Responses on the posttest questionnaire indicated that none of the participants suspected we were manipulating the competitive dynamics of the game across different groups, and none had consciously linked the idea of performance in the ball toss game to variations in distance estimates.

As in Experiment 1, performance quality influenced the perception of one's distance from a competitor. In this case, losers provided distance estimates that were substantially larger than winners. In stark contrast, participants in the cooperative condition who likewise scored fewer points than their partners did not

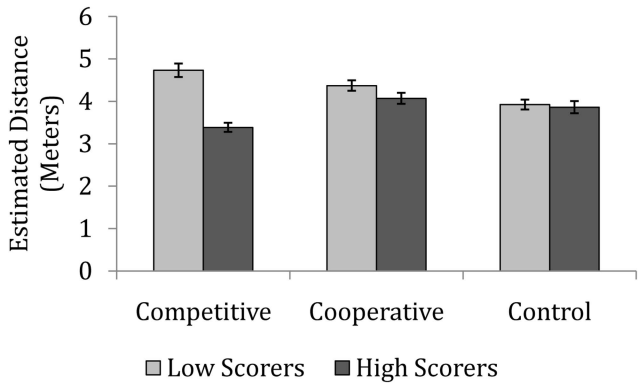

Figure 3. Mean estimated distance for participants in each game playing condition of Experiment 2.

perceive these partners as standing farther from them than the participants who performed better in the ball-toss task. Likewise, participants who never actually tossed a ball but instead observed another participant did not perceive this player as being more or less distant than the active player. Taken together, these results indicate that poor performers do not universally see their counterparts (be them teammates or competitors) as more distant. Instead, the specific social context of losing a competition leads players to see their opponents as being farther away.

General Discussion

Visual perception of the physical environment is scaled by a person's capacity for action (Witt, 2011), modified by fear or threat (Cole, Balcetis, & Dunning, 2013; Stefanucci, Proffitt, Clore, & Parekh, 2008; Teachman, Stefanucci, Clerkin, Cody, & Proffitt, 2008), and shaped by the presence of a supportive friend (Schnall, Harber, Stefanucci, & Proffitt, 2008) or capable coactor (Doerrfeld et al., 2012). Here, we have shown for the first time that the dynamics of social interactions can also impact perception. In two experiments, observers who were engaged in a competitive interaction perceived their counterpart as being farther away compared with being placed in a neutral context. The magnitude of this effect was inversely related to performance: individuals who lost the game displayed greater perceptual bias. In contrast, cooperative contexts had no influence on distance perception. Because the players remained well outside each other's regions of personal space (e.g., Hayduk, 1981) and could not physically aid each other, we cannot attribute these perceptual effects to changes in participants' abilities to effectively act—or coact—within the environment. Hence, it was not participants' actions per se, but the competitive nature of the social encounter and its unsuccessful outcome that created increased perceptual distance between actors.

Had perception simply mirrored behavior in social situations, cooperation should have decreased perceived distance, just as competition increased it. The fact that competition, but not cooperation, biased perception is more consistent with our "risk and negative outcome hypothesis" of perceptual bias. Losing a competition threatens self-esteem and introduces anxiety, depression, and anger (e.g., Heatherton & Polivy, 1991). Losers in our competitive condition likely experienced greater levels of ego threat and negative affect than players in the cooperative or control conditions, who presumably experienced similarly low levels of negative affect during the experiment. The additional negative experience of losing would make these feelings more salient and contribute more strongly to participants' overall impressions—including their perception of distance—than the more pleasant and lower-stakes "wins" that participants in the cooperative and control conditions experienced (e.g., Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Kahneman & Tversky, 1982). Additionally, the zero-sum situation of the competitive condition, in which one player's success directly equated with another's failure, created a stark delineation between players that likely held greater social salience than either of the other conditions.

Our novel risk and negative outcome hypothesis dovetails well with existing demonstrations of attentional bias based on athletic performance, physical exertion, and negative affect. Why might these situations be particularly influential on perception? In cases like these, attributing poor performance to a faster moving ball or fear to greater heights may provide some degree of ego protection. Similarly, in the case of competition, long-held associations between physical and social distance may help create the bias we have observed. Social categorical membership influences mental representations of spatial information (e.g., Maddox, Rapp, Brion, & Taylor, 2008), and—in some situations—can lead to perception of cultural out-group members as being more distant than in-group members (Soliman & Glenberg, 2014). Perceiving winning competitors as being more physically distant could help people more readily delineate them as out-group members. When you cannot keep your distance from an opponent whose performance eclipses your own, it is perhaps easier to process the implications that this competitor is not *on your side* if you see him as being farther away from you.

References

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology, 5,* 323–370. http://dx.doi.org/10.1037/1089-2680.5.4.323

Bekkering, H., & Neggers, S. F. W. (2002). Visual search is modulated by action intentions. *Psychological Science, 13,* 370–374. http://dx.doi.org/10.1111/j.0956-7976.2002.00466.x

Bradner, E., & Mark, G. (2002). Why distance matters: Effects on cooperation, persuasion and deception. *Proceedings of the ACM Conference on Computer Supported Cooperative Work (CSCU'02),* 226–235.

Cole, S., Balcetis, E., & Dunning, D. (2013). Affective signals of threat increase perceived proximity. *Psychological Science, 24,* 34–40. http://dx.doi.org/10.1177/0956797612446953

Davis, T. J., Riley, M. A., Shockley, K., & Cummins-Sebree, S. (2010). Perceiving affordances for joint actions. *Perception, 39,* 1624–1644. http://dx.doi.org/10.1068/p6712

Doerrfeld, A., Sebanz, N., & Shiffrar, M. (2012). Expecting to lift a box together makes the load look lighter. *Psychological Research, 76,* 467–475. http://dx.doi.org/10.1007/s00426-011-0398-4

Glenberg, A. M., Witt, J. K., & Metcalfe, J. (2013). From the revolution to embodiment: 25 years of cognitive psychology. *Perspectives on Psychological Science, 8,* 573–585. http://dx.doi.org/10.1177/1745691613498098

Hayduk, L. A. (1981). The permeability of personal space. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 13,* 274–287. http://dx.doi.org/10.1037/h0081182

Heatherton, T. F., & Polivy, J. (1991). Development and validation of a scale for measuring state self-esteem. *Journal of Personality and Social Psychology, 60,* 895–910. http://dx.doi.org/10.1037/0022-3514.60.6.895

Insko, C. A., Schopler, J., Drigotas, S. M., Graetz, K. A., Kennedy, J., Cox, C., & Bornstein, G. (1993). The role of communication in interindividual-intergroup discontinuity. *Journal of Conflict Resolution, 37,* 108–138. http://dx.doi.org/10.1177/0022002793037001005

Kahneman, D., & Tversky, A. (1982). The psychology of preferences. *Scientific American, 246,* 160–173. http://dx.doi.org/10.1038/scientificamerican0182-160

Kleck, R., Buck, P. L., Goller, W. L., London, R. S., Pfeiffer, J. R., & Vukcevic, D. P. (1968). Effect of stigmatizing conditions on the use of personal space. *Psychological Reports, 23,* 111–118. http://dx.doi.org/10.2466/pr0.1968.23.1.111

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago, IL: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought.* New York, NY: Basic Books.

Maddox, K. B., Rapp, D. N., Brion, S., & Taylor, H. A. (2008). Social influences on spatial memory. *Memory & Cognition, 36,* 479–494. http://dx.doi.org/10.3758/MC.36.3.479

Marsh, K. L., Richardson, M. J., Baron, R. M., & Schmidt, R. C. (2006). Contrasting approaches to perceiving and acting with others. *Ecological Psychology, 18,* 1–38. http://dx.doi.org/10.1207/s15326969eco1801_1

Nummenmaa, L., & Niemi, P. (2004). Inducing affective states with success-failure manipulations: A meta-analysis. *Emotion, 4,* 207–214. http://dx.doi.org/10.1037/1528-3542.4.2.207

Pitts, S., Wilson, J. P., & Hugenberg, K. (2014). When one is ostracized, others loom: Social rejections makes other people appear closer. *Social Psychological and Personality Science, 5,* 550–557. http://dx.doi.org/10.1177/1948550613511502

Reinboth, M., & Duda, J. L. (2004). The motivational climate, perceived ability, and athletes' psychological and physical well-being. *The Sport Psychologist, 18,* 237–251.

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43,* 450–461. http://dx.doi.org/10.1037/0022-3514.43.3.450

Schnall, S., Harber, K. D., Stefanucci, J. K., & Proffitt, D. R. (2008). Social support and the perception of geographical slant. *Journal of Experimental Social Psychology, 44,* 1246–1255. http://dx.doi.org/10.1016/j.jesp.2008.04.011

Sensenig, J., Reed, T., & Miller, J. S. (1972). Cooperation in the prisoner's dilemma as a function of interpersonal distance. *Psychonomic Science, 26,* 105–106. http://dx.doi.org/10.3758/BF03335449

Soliman, T., & Glenberg, A. M. (2014). The embodiment of culture. In L. Shaprio (Ed.), *The Routledge handbook of embodied cognition* (pp. 207–219).

Sommer, R. (1969). *Personal space: The behavioral basis of design*. Englewood Cliffs, NJ: Prentice Hall.

Standage, M., Duda, J. L., & Pensgaard, A. M. (2005). The effect of competitive outcome and task-involving, ego-involving, and cooperative structures on the psychological well-being of individuals engaged in a co-ordination task: A self-determination approach. *Motivation and Emotion, 29,* 41–68. http://dx.doi.org/10.1007/s11031-005-4415-z

Stefanucci, J. K., Gagnon, K. T., Tompkins, C. L., & Bullock, K. E. (2012). Plunging into the pool of death: Imagining a dangerous outcome influences distance perception. *Perception, 41,* 1–11. http://dx.doi.org/10.1068/p7131

Stefanucci, J. K., & Proffitt, D. R. (2009). The roles of altitude and fear in the perception of height. *Journal of Experimental Psychology: Human Perception and Performance, 35,* 424–438. http://dx.doi.org/10.1037/a0013894

Stefanucci, J. K., Proffitt, D. R., Clore, G. L., & Parekh, N. (2008). Skating down a steeper slope: Fear influences the perception of geographical slant. *Perception, 37,* 321–323. http://dx.doi.org/10.1068/p5796

Teachman, B. A., Stefanucci, J. K., Clerkin, E. M., Cody, M. W., & Proffitt, D. R. (2008). A new mode of fear expression: Perceptual bias in height fear. *Emotion, 8,* 296–301. http://dx.doi.org/10.1037/1528-3542.8.2.296

Tedesco, J. F., & Fromme, D. K. (1974). Cooperation, competition, and personal space. *Sociometry, 37,* 116–121. http://dx.doi.org/10.2307/2786471

Thill, E. E., & Cury, C. (2000). Learning to play golf under different goal conditions: Their effects on irrelevant thoughts and on subsequent control strategies. *European Journal of Social Psychology, 30,* 101–122. http://dx.doi.org/10.1002/(SICI)1099-0992(200001/02)30:1<101::AID-EJSP979>3.0.CO;2-E

Wildschut, T., Pinter, B., Vevea, J. L., Insko, C. A., & Schopler, J. (2003). Beyond the group mind: A quantitative review of the interindividual-intergroup discontinuity effect. *Psychological Bulletin, 129,* 698–722. http://dx.doi.org/10.1037/0033-2909.129.5.698

Witt, J. K. (2011). Action's effect on perception. *Current Directions in Psychological Science, 20,* 201–206. http://dx.doi.org/10.1177/0963721411408770

Witt, J. K., Linkenauger, S. A., Bakdash, J. Z., Augustyn, J. A., Cook, A. S., & Proffitt, D. R. (2009). The long road of pain: Chronic pain increases perceived distance. *Experimental Brain Research, 192,* 145–148.

Witt, J. K., & Proffitt, D. R. (2005). See the ball, hit the ball. *Psychological Science, 16,* 937–938. http://dx.doi.org/10.1111/j.1467-9280.2005.01640.x

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