Commentary

Embodied goal pursuit

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Daum, Sommerville, and Prinz propose that the interrelation between the symbolic and embodied system needs more research attention. The proposal is based on the observation that human infants start out with embodied processes to understand the actions of others, and that these processes allow them to communicate with other people surprisingly well. What does the symbolic (language) system add to an infant's communication when it becomes available to the infant around the end of the first year of life? Because the embodied versus the symbolic system are potentially dissociable and can yield different perception and interpretation of the same social behavior, the study of whether and how embodied and symbolic understanding is coordinated seems crucial. The authors suggest that the interaction between the embodied and symbolic systems can best be studied by analyzing how the bi-directional relation of the two systems affects social-cognitive development, as the infant becomes a mature social agent. Specifically, they propose to investigate the extent to which the embodied and the symbolic systems work together, impede each other, or are independent in affecting social communication and thus a person's social-cognitive development.

The authors also suggest studying the interaction of the two systems at their developmental roots. Indeed, it is when the embodied system is "hit" by the symbolic system that processes of how the two systems affect each other should become evident. Daum et al. describe various lines of research supporting each of the proposed relations between the systems: Collaboration, interference, and independence. For instance, regarding collaboration, children's early embodied social understanding and skills are observed to form the bedrock for a more formal understanding of other persons' behavior (Aschersleben, Hofer, & Jovanovic, 2008).

Daum et al. provide valuable insights into a new and exciting route of analyzing how the embodied and the symbolic systems interrelate. These insights from an ontogenetic perspective may be supplemented by research from a situational perspective. The latter research would ask: How do the embodied and the symbolic systems relate in influencing the behavior of a person in a specified context? The analysis of goal pursuit provides an ideal opportunity to study this question. Research on goal pursuit (goal setting and goal striving) so far has focused on the symbolic system. Specifically, people are considered to commit to goals and plan their attainment by using symbolic procedures. Stepping back from this traditional perspective (Oettingen & Gollwitzer, 2001), the question arises to what extent the embodied system and the symbolic system work together, work against each other, or work independently in affecting goal setting and goal striving.

Research on goal pursuit has long distinguished between aspects of *goal setting*, such as goal choice and commitment, and aspects of *goal striving*, such as goal enactment and shielding (Lewin, Dembo, Festinger, & Sears, 1944; summary by Oettingen & Gollwitzer, 2001). Successful goal attainment requires sufficient commitment to goals. It also requires the planning of appropriate goal-oriented behaviors during the subsequent goal-striving phase. *Mentally contrasting* a desired positive future with its impeding negative reality is a self-regulatory strategy that may lead to strong goal commitments

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(Oettingen, Pak, & Schnetter, 2001). Strong goal commitments are necessary but not sufficient to attain goals. Goal realization is facilitated by supplementing a goal to which an individual feels committed with an *implementation intention*, an if-then plan that details when, where, and how the individual will take action (Gollwitzer, 1999).

The self-regulatory procedure of mental contrasting entails the conjoint mental elaboration of the desired positive future and the present negative reality, thereby making both simultaneously accessible. As in mental contrasting the positive future is elaborated first, the negative reality is now perceived as ''standing in the way'' of realizing the positive future, triggering a necessity to act to attain the desired positive future. When perceived chances of successfully realizing the positive future (expectations of success) are high, mental contrasting energizes the individual to take action thus leading to strong goal commitments. Experimental studies in various domains support this model (Oettingen et al., 2001; Oettingen, Mayer, Sevincer, Stephens, Pak, & Hagenah, 2009). For example, in the academic and professional domains experiments pertained to improving in maths, studying abroad, combining work and family life, and developing one's professional skills. In the interpersonal domain, mental contrasting participants succeeded in solving interpersonal conflicts, in getting to know an attractive stranger, and in successfully seeking help. In the health domain, experiments have addressed smoking cessation and coping with acute stressors (summary by Oettingen & Stephens, 2009).

Whereas mere goals (or goal intentions) have the format of ''I intend to achieve x!'' whereby x may specify a desired outcome or behavior, implementation intentions take the form of ''And if situation y occurs, then I will perform the goal-directed behavior z!'' For example, an individual may have set the goal intention to lose weight, and may furnish this goal with an implementation intention, such as ''If I am dining at a restaurant and the waiter asks for my order, then I will ask for a salad.'' In the presence of the critical situation, the intended goal-directed behavior is initiated immediately, effortlessly, and without conscious intent. By identifying critical opportunities and appropriate goal-directed actions in advance, these plans help individuals overcome many common challenges to successful goal attainment in various life domains such as achievement, interpersonal relations, and health (summaries by Gollwitzer, 1999; Gollwitzer & Sheeran, 2006).

How could embodiment enter the goal setting procedure of mental contrasting? First, people may embody their thoughts while engaged in mental contrasting itself (on-line embodiment; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). For instance, a person in the first part of her mental contrasting procedure elaborates her future success in resolving an important interpersonal problem which would make her feel relieved; while she elaborates the desired future, she takes on a matched posture of relief. In the second part of the mental contrasting procedure, she elaborates her main aspect of negative reality, being shy; while she elaborates this negative reality, she takes on a matched posture of shyness. Second, people can embody the content of mental contrasting by modeling the future and reality according to embodied experiences in the past (off-line embodiment). For instance, a person elaborates the positive future of being relieved and the negative reality of being shy based on relief and shyness she enacted in the past.

How would one conduct experiments to test the degree to which embodiment will facilitate, impede, or leave unaffected the effects of mental contrasting on goal commitment? Ideally, one would establish three control groups in addition to an experimental group in which on-line or off-line embodiment matches the contents of mental contrasting. The first control group would be an antagonistic embodiment group, the second a static embodiment group, and the third a no treatment group. To refer back to the example of solving an interpersonal problem, in the antagonistic embodiment control group (on-line), the postures of relief (future), and shyness (reality) as established in the experimental group would be countered by antagonistic postures of worry (future) and assertiveness (reality). Similarly, in the off-line antagonistic embodiment control group, people would elaborate future and reality based on their past postures of worry (future) and assertiveness (reality). In the static control group, participants would take on a static posture which prevents them from taking a posture in accordance with their thoughts (on-line) or they would be prevented to engage in thinking about taking such postures in the past (off-line). To stay with the example above, when thinking about future and reality, participants would be prevented to take on postures of relief and shyness or they would be prevented to think about how they acted relieved and shy in the past. The no treatment control group would establish a classic mental contrasting procedure. Strength of goal commitment would be the dependent variable.

The described experimental design allows observing to what extent the embodied system (on-line and off-line) collaborates, interferes with, or is independent of the symbolic system. Specifically, stronger goal commitment in the experimental (matched embodiment) condition as compared to all other conditions would indicate that embodiment strengthens mental contrasting effects not only when compared to antagonistic and no embodiment, but also as compared to mere symbolic (language) instructions applied in classic experiments on mental contrasting. Moreover, stronger commitment in the static control group as compared to the antagonistic embodiment control group would indicate that

antagonistic embodiment indeed interferes with the symbolic system. Finally, stronger goal commitment in the no-treatment control group as compared to the static control group would suggest that spontaneous embodiment is partly responsible for mental contrasting effects on goal commitments obtained in classic mental contrasting experiments using symbolic (language) instructions. Importantly, the described effects on goal commitment might turn out to be reversed. Such results would speak for interference of goal commitment by matched embodiment and facilitation by antagonistic embodiment. Else, goal commitment might not be affected by any of the embodiment manipulations described above, which would indicate that the embodied and symbolic systems are independent in affecting goal setting by mental contrasting.

The situational interaction of the embodied and the symbolic systems might also be studied by embodying the cognitive procedures of forming implementation intentions. First, people may embody their thoughts about situation and goal-directed behavior with matched embodiment while they are in the process of forming implementation intentions (on-line). For instance, a person with the set goal of solving an important interpersonal problem will in the first part of the implementation intention procedure specify an anticipated situation of feeling shy in talking to her partner while taking on a matched posture of shyness; she then specifies the goal-directed action of being assertive while taking on a matched posture of assertiveness. Second, people can embody the content of their implementation intention elements by specifying the situation and the goal-directed action according to matched embodied enactments in the past (off-line). For instance, a person specifies the situation of feeling shy based on postures of shyness taken in the past; and she specifies the goal-directed action of being assertive based on postures of assertiveness taken in the past. Experiments testing these ideas would again involve the three control groups described above in addition to the experimental group of matched embodiment (e.g., antagonistic embodiment control group, static embodiment control group, and no treatment control group). Dependent variable would be the effectiveness of goal striving. Analogous to the analysis of embodiment effects on mental contrasting and goal commitment, experimental results pertaining to embodiment effects on implementation intentions and goal striving would reveal insights how the embodied and the symbolic systems interrelate.

In sum, Daum et al. take an ontogenetic approach to study the interrelation of the embodied and the symbolic system. They report research that detects collaboration, interference, and independence of the two systems in social-cognitive development. We have suggested supplementing this view with a situational approach that tries to disentangle the two systems as they unfold in applying self-regulatory procedures of goal pursuit. Specifically, asking whether embodiment plays a facilitating, interfering, or independent role in goal setting (mental contrasting) and goal striving (implementation intention), we suggested to measure effects on goal setting and goal striving as a function of enriching the two self-regulatory procedures with various forms of embodiment. Research on embodiment in Social Psychology (summary by Semin & Smith, 2008) has traditionally focused on the representation of thoughts (e.g., stereotypes) and feelings (e.g., moods and specific emotions). In the proposed research on goal pursuit we are not focusing on the representation of goals, that is, whether goals are primarily represented in terms of symbols (language) or whether they are (also) embodied. Rather, we are concerned with the embodiment of cognitive procedures. Specifically, we have focused on the goal setting procedure of mental contrasting, and the goal striving procedure of forming implementation intentions. This procedural approach should unveil whether symbolic cognitive procedures benefit from being enriched by embodiment.

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