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Short Research Note

Embodied emotion concepts: How generating words about pride and disappointment influences posture

SUZANNE OOSTERWIJK[1]*, MARK ROTTEVEEL[1], AGNETA H. FISCHER[1] AND URSULA HESS[2]
[1]*University of Amsterdam, The Netherlands*
[2]*University of Québec, Montréal, Canada*

Abstract

Embodiment theories predict that activating conceptual knowledge about emotions can be accompanied by re-experiencing bodily states, since simulations of sensory, motor, and introspective experiences form the foundation of conceptual representations of emotion. In the present study, we examine whether the activation of the specific emotion concepts of pride and disappointment are embodied in the sense that they are accompanied by changes in posture. Participants generated words associated with pride and disappointment while posture height was measured. Results show that during the generation of disappointment words participants decreased their posture height more than when participants generated pride words. This finding suggests that the activation of conceptual knowledge about disappointment can lead to a spontaneous expression of the associated body posture. In contrast to posture changes along the vertical axis, movement along the horizontal axis was not influenced by concept activation. In addition to bodily simulation the data also indicated introspective simulation, since feelings of disappointment increased after generating disappointment words. The current study provides the first evidence for the claim that the activation of conceptual knowledge about emotion can instantiate spontaneous simulations at a behavioral level. Copyright © 2008 John Wiley & Sons, Ltd.

Human knowledge covers not only concrete objects and events, such as household objects, animals, birthday parties, or a bike ride, but also abstract concepts such as trust, anger, love, and hope. We know what it means to be angry, how we act when we are afraid, what we say when we are in love, and what events can lead to frustration and joy. Emotion knowledge is used when we talk to people, write emails or read a book, and it helps us making sense of our own emotions and the emotions of others. Consequently, an important and interesting question is how this knowledge is represented.

Recently, it has been suggested that conceptual knowledge is represented by re-enacting experiences that occur in interaction with the objects that the knowledge refers to (Barsalou, 1999; Gallese & Lakoff, 2005). Conceptual knowledge about emotion seems to be a perfect test case for this idea, because emotional states (i.e., the ''objects'' of this knowledge) are accompanied by a broad range of bodily experiences, such as physiological reactions, facial expressions, motor reactions, and body postures. Thus, emotion concepts might not be mere symbolic representations (Fodor, 1975), disconnected from what we feel and do when we are experiencing an emotion. In contrast, emotional experiences and bodily reactions may form the foundation of conceptual representations of emotion (Niedenthal, 2007; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Winkielman, Niedenthal, & Oberman, 2008).

*Correspondence to: Suzanne Oosterwijk, Department of Social Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB, Amsterdam, The Netherlands. E-mail: s.oosterwijk@uva.nl

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EMBODIED EMOTION

Embodiment theories (Barsalou, 1999; Gallese & Lakoff, 2005) argue that perceptual and bodily states that occur during interactions with certain objects are simulated in sensory–motor areas in the brain to conceptually represent those objects. According to Barsalou, Niedenthal, Barbey, and Ruppert (2003) conceptual knowledge is formed by storing sensory, motor, and introspective states that co-occur with the experience of events or the interaction with objects. These states are then partially re-enacted when people access memories or think, read and talk about these objects or events. Barsalou (1999) proposes that simulation also underlies concepts that hold knowledge about more abstract categories such as happiness and anger. In this view, social and emotional concepts are so called situated conceptualizations (Barsalou et al., 2003). In situated conceptualizations not only the target object or event is simulated, but also settings, actions, and introspections, thereby creating an experience of ''being there'' (Niedenthal, Barsalou, Winkielman et al., 2005). A situated conceptualization can be seen as a pattern with all kinds of associated representations. According to Barsalou et al. (2003) parts of this pattern can become activated through an inference process called pattern completion. When a situated conceptualization becomes active, inferences are made about components of this conceptualization that are not necessary directly observed or experienced. Interestingly, Barsalou and colleagues propose that these inferences can go beyond simulations in sensory–motor areas in the brain, initiating actual expressions, overt behavior, and even introspective feelings.

Priming effects on behavior (for a review see Förster & Liberman, 2007) serve as a good example of embodiment effects through situated conceptualizations and pattern completion. Bargh, Chen, and Burrows (1996), for example, demonstrated that participants walked more slowly after they were presented with conceptual knowledge about elderly people. Niedenthal, Barsalou, Winkielman et al. (2005) explain this effect by proposing that the situated conceptualization of elderly people holds a simulation of slow movement, which leads to a re-enactment of this action when the concept becomes active. In addition to work on priming effects, several other studies on social interaction and the processing of social information have indicated that processing social stimuli can produce embodied reactions (see Barsalou et al., 2003 for a review).

The link between embodiment and emotion has also been examined (Niedenthal, 2007). For example, it has been shown that people mimic facial expressions of others, even when these are presented subliminally (Dimberg, Thunberg, & Elmehed, 2000). Furthermore, Wicker, Keysers, Plailly, Royet, Gallese, and Rizzolatti (2003) found that brain areas associated with feelings of disgust overlap with brain areas associated with seeing disgust in other people. Support for the interaction between bodily states and cognitive processing of emotion comes from Glenberg, Havas, Becker, and Rinck (2005) who show that the unobtrusive manipulation of a happy or angry expression affects the reading speed of positive or negative sentences. In addition, it has also been found that approach or avoidance movements interfere with the categorization of positive and negative stimuli (Neumann, Förster, & Strack, 2003; Neumann & Strack, 2000; Rotteveel & Phaf, 2004). Finally, there is extensive support for the idea that the processing of (emotion) concepts is accompanied by simulation in sensory–motor areas in the brain (Chao & Martin, 2000; Pecher, Zeelenberg, & Barsalou, 2003; Vermeulen, Niedenthal, & Luminet, 2007).

Yet, based on the aforementioned experimental work it is not possible to draw conclusions about spontaneous embodiment effects when processing conceptual emotion knowledge as predicted by embodiment theories (Barsalou et al., 2003; Niedenthal, Barsalou, Winkielman et al., 2005). First, experiments showing overlap between personal emotions and emotion from others (Wicker et al., 2003) and imitation (Dimberg et al., 2000) do not imply that embodiment effects occur when merely processing conceptual knowledge without an interpersonal component. Second, even though results from facilitation/interference paradigms lend support for the idea that bodily reactions can influence categorization processes; these studies manipulate bodily reactions and therefore no conclusions can be drawn about spontaneous expressions. In contrast, the current study manipulated the activation of emotion knowledge and measures spontaneous embodiment effects as a dependent variable. And third, despite the fact that the brain is undeniably a part of the body, it cannot be inferred from studies on simulation in the brain that activation of conceptual emotion knowledge will result in overt bodily expressions.

Barsalou et al. (2003) predict that the activation of conceptual knowledge can lead to ''full blown'' execution of behavior. Still, experimental evidence for this prediction has, until now, only been found for non-emotional concepts, such as the elderly (Bargh et al., 1996). Thus, it is still an empirical question whether the activation of conceptual emotion knowledge leads to the execution of overt emotional actions or expressions. In addition, another open question is whether embodiment effects can be extended to re-enactment in the introspective system when emotion knowledge is activated.

According to Barsalou (1999) introspective states are central to abstract concepts and might be simulated on a conscious level when situated conceptualizations become active (Barsalou et al., 2003). The current study is designed to answer these two questions. Following embodiment theories, we hypothesize that the activation of emotion concepts will result in spontaneous expressions of both bodily reactions and subjective states that are typical for the specific emotion.

THE EMBODIMENT OF PRIDE AND DISAPPOINTMENT

The present experiment aims to test predictions from embodiment theories by focusing on postural changes. Posture is considered as one of the non-verbal components of emotional reactions (de Gelder, 2006) and there is experimental support for the idea that people respond to emotional stimuli with changes in posture (Hillman, Rosengren, & Smith, 2004). A strong relation between emotional experience and posture is also evident from postural feedback effects showing that adopting postures can influence affective states (Duclos, Laird, Schneider, Sexter, Stern, & van Lighten, 1989). Two emotions that have been associated with specific body postures are pride and disappointment/sadness. Tracy and Robins (2004) for example, have found that a typical expression of pride is a visibly expanded posture. Moreover, Stepper and Strack (1993) experimentally varied body postures and demonstrated that this influenced feelings of pride. Their results showed that when participants received positive feedback about their performance on a task, they reported more pride after being in an upright position than in a slumped position. In contrast, emotions linked to disappointment and sadness are associated with a slumped position or a decrease in posture (Riskind, 1984).

OVERVIEW OF THE PRESENT STUDY

The question we examine in the present study is whether the activation of the specific emotion concepts of pride and disappointment are embodied in the sense that they are accompanied by specific changes in posture. These concepts will be activated through a word generation task commonly used to activate semantic or conceptual knowledge (Martin & Chao, 2001). We assume that the word generation task in the present study will not access the lexical system, but the conceptual system by producing words referring to mental states, antecedents and events associated with pride and disappointment (Barsalou, Santos, Simmons, & Wilson, in press). We will assess this assumption by exploring the words generated in the two emotion concept tasks. We hypothesize that the concepts of pride and disappointment are represented by experiences associated with the emotions pride and disappointment. Through the process of pattern completion, the activation of these concepts can result in simulations of both bodily responses and subjective states that belong to the situated conceptualizations of pride and disappointment (Barsalou et al., 2003; Niedenthal et al., 2005). Therefore, we will measure both posture change (along a vertical and horizontal axes) and subjective feelings of pride and disappointment. Our first prediction is that the activation of the concept of pride will lead to an expanded posture and the activation of the concept of disappointment will lead to a slumped posture. Our second prediction is that accessing the concepts of disappointment and pride will result in congruent feelings.

METHOD

Participants

Sixty-five undergraduate psychology students participated in the study for course credit or a payment of 7 euro. All participants gave informed consent for the recording and use of audio-video material. Participants were debriefed through email after full completion of the experiment. Five participants were excluded from the posture analysis, because they had moved out of range of the digital video camera. Three participants were excluded because of system failure during the registration of posture. Thus, analyses were performed on 57 participants (52 women).

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Design

The experiment was conducted as a complete within-subjects design. Participants completed four different word generation tasks concerning four different concepts: two neutral tasks (bathroom and kitchen) and two emotion tasks (pride and disappointment). Participants always started with a neutral task followed by an emotion task. The specific combination of the neutral and experimental tasks was counterbalanced. (i.e., kitchen-pride, bathroom-disappointment; bathroom-pride, kitchen-disappointment; kitchen-disappointment, bathroom-pride; and bathroom-disappointment, kitchen-pride). The dependent measures were vertical and horizontal changes in posture and subjective reports of pride and disappointment.

Materials and Procedure

Before the start of the word generation tasks, participants were asked to complete a ''wellbeing'' scale (Hess & Blairy, 2001). This scale consists of 28 items describing emotional states (''I feel cheerful,'' ''I feel irritated'') and physical sensations (''I have butterflies in my stomach,'' ''I feel dizzy''). Participants were asked to circle the number best describing their state at that moment. Participants could provide their answer on a scale from 0 (not at all) to 6 (to a strong extent). Two questions targeting pride and disappointment were added to this questionnaire, namely ''I feel good about myself'' and ''I feel bad about myself.'' We decided not to ask for pride and disappointment ratings directly to prevent priming the target concepts. The wellbeing scale was administered three times: at the beginning of the study, after the first emotion concept task (pride or disappointment depending on the counterbalance condition), and after the second emotion concept task.

The general instruction and all consecutive instructions for the different concepts were presented on the computer screen. To obscure the goal of the study, participants were explained in the general instruction that the experimenter was looking for words associated with specific categories to generate stimulus material. It was emphasized that both single words and descriptions using multiple words could be generated. Participants were told that the tasks took 1 minute and a half to complete during which a clock showed the remaining time on the computer screen. Participants wore a headset with a microphone to record the words. Finally, participants were told that at random moments during the four tasks they would be asked to fill in a wellbeing questionnaire. After this general instruction, instructions for the different word generation tasks were given.

Participants were asked ''to generate as many words possible that are associated to kitchen; bathroom; success/pride; failure/disappointment.'' We decided to use the combination of success/pride and failure/disappointment for two reasons. First, the combination with success and failure made the concepts very self-relevant for the first-year students participating in our study. Since self-relevance can enhance embodiment effects (Niedenthal, Barsalou, Ric, & Krauth-Gruber, 2005) we added words associated with personal achievement. Second, most experimental work on posture and feelings of pride and disappointment incorporate task feedback, thereby making a connection with achievement (Roberts & Arefi-Afshar, 2007; Stepper & Strack, 1993). To match these studies we combined the emotion words with achievement antecedents.

After the word generation tasks an exit questionnaire was presented. First, participants were asked some demographic questions. Then they were asked to rate on a scale from 0 (not difficult at all) to 6 (very difficult) the difficulty of the four word generation tasks. To examine the emergence of autobiographical memories during the word generation task we asked participants to rate on a scale from 0 (not at all) to 6 (to a strong extent) whether autobiographical memories were activated and used when generating words. Finally, participants were asked in an open question about the possible goals of the study. After they finished the exit interview they were thanked and received their course credit or payment.

Posture Registration and Data Reduction

During the word generation tasks participants were seated in a chair that was bolted to the floor. Posture changes could therefore not be attributed to movement of the chair. Participants were wearing a headset for the registration of the audio input. The top of the headset, corresponding to the top of the head of the participant, was marked with a yellow stripe to make objective coding of posture height possible. To ensure that the placement of the headset remained constant during the

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four tasks, participants were asked not to move their headset or to touch it during the tasks. A digital camera was hidden inside a carton document file planted on a bookshelf standing at a distance of 2.7 m on the left hand side from where the participant was seated. The camera filmed participants from the side during the four different word generation tasks. The four 90 seconds video files were scored using an in-house developed scoring program. Posture was scored blind to condition by clicking on the highest visible part of the yellow stripe on the head of the participant. The scoring program identified the coordinates in pixels (x, y) belonging to this position. This procedure was repeated every 2 seconds, resulting in 46 data points representing the horizontal and vertical position of the marked point on the head of the participant over time. These coordinates were taken as an objective measure of both vertical and horizontal movements of the participants during the word generation tasks. Because we unobtrusively placed a grid based ‘‘work schedule’’ on the wall behind the participants it was possible to calibrate changes in pixels to changes in millimeters. Adjusting for the distance between the camera and the participant and the distance between the camera and the wall, we calculated that a change of 1 pixel corresponds to roughly a change of 1 mm in height.

After the collection of 46 data points in all four-word generation tasks, data were transformed in two steps. First, we performed a baseline correction in which all 46 data points gathered during the pride and disappointment task were corrected for the average posture height in the last 10 seconds (i.e., 5 data points) of the preceding neutral task. We decided to perform this baseline correction to be able to see whether generating pride and disappointment words led to any changes in posture compared to the generation of neutral words. This correction resulted in two postural change scores with 46 levels each, representing the change in posture height during the pride task compared to the last part of the preceding neutral task and the change in posture height during the disappointment task compared to the last part of the preceding neutral task. Second, we reduced the number of data points from 46 to 5 by averaging data points 2–10, 11–19, 20–28, 29–37, and 38–46. The first data point was skipped to create equal numbers in every cell. This was done for both the pride and the failure condition and resulted in two postural change scores with five levels each, representing the average change in posture height for 18 seconds of word generation. The main analysis for posture height presented in the results section is performed with these postural change scores, the analysis on horizontal movement is based on scores calculated in exactly the same way. Where necessary, F-values are corrected for violation of the sphericity assumption using the Greenhouse–Geisser procedure.

RESULTS

Posture Height

A repeated measures analysis was performed with postural change along the vertical axis as the dependent variable and two within factors: *time* (five levels) and *concept* (two levels: pride and disappointment). This analysis showed a main effect for concept, $F(1, 56) = 5.07$, $p = .028$, $\eta_p^2 = .083$, such that during the disappointment task participants decreased their posture height significantly more ($M = -3.92$, $SE = 1.12$) than during the pride task ($M = -.93$, $SE = .89$). Second, there was a main effect for *time* $F(3, 140) = 16.89$, $p < .0001$, partial $\eta_p^2 = .23$, $\varepsilon = .63$, indicated by a general decrease of posture height over time. This general decrease over time was qualified by a significant *concept* × *time* interaction, $F(3, 164) = 2.82$, $p = .042$, partial $\eta_p^2 = .048$, $\varepsilon = .73$. Simple effects for successive time points indicated a significant decrease in posture height in the disappointment condition between time points 1 and 2 ($p < .001$), 2 and 3 ($p < .05$), and 3 and 4 ($p < .01$) whereas comparisons between these time points did not reach significance in the pride condition. In the disappointment condition participants decreased their posture height up to 6.1 pixels, which corresponds to a decrease in height of 6 mm. In the pride condition participants decreased their posture height up to 2.3 pixels, corresponding to a decrease of 2 mm.

In line with our expectations the results show that participants decreased their posture height during the generation of disappointment words, whereas contrary to our expectations participants did not increase their posture height when generating pride words. However, note that the first data point for pride in Figure 1 is a positive number, indicating an increase in posture height compared to the final part of the preceding neutral task. To explore this increase further we decided to perform 9 one-sample t-tests (one-tailed) to test whether the first 9 data points in the pride condition (which are underlying the first averaged data point) are significantly larger than zero. Using a stringent p-level of .005 by applying the

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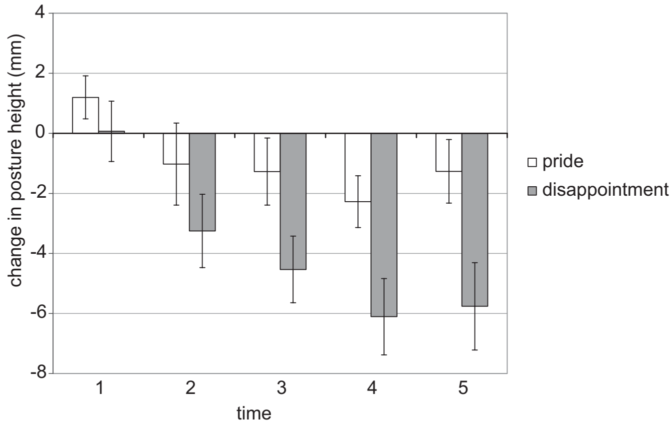

Figure 1. Average change in posture height (*y*-axis, in millimeters) over time during the pride and disappointment word generation tasks. Error bars represent standard errors

Bonferroni correction, we found that for point 3 ($t(56) = 2.76$, $p < .004$), corresponding to the 6th second of the pride task, and for point 5 ($t(56) = 2.76$, $p < .004$), corresponding to the 10th second of the pride task, posture height differed significantly from zero, which indicates an increase in posture height.

Horizontal Movement

Participants can move along a vertical axis, indicating posture height, but they can also move along a horizontal axis, indicating movement forward or backward. Since our predictions are specifically about posture height, we did not expect differences between the pride and disappointment condition in terms of horizontal movement. This was indeed the case, a repeated measures analysis with horizontal movement as the dependent variable and *time* (five levels) and *concept* (two levels: pride and disappointment) as within variables showed no main effect of *concept*, $F < 1$, and no interaction between *time* and *concept*, $F < 1$. The main effect of time, however, was significant, $F(2, 125) = 5.51$, $p = .004$, partial $\eta_p^2 = .09$, $\varepsilon = .56$, indicating a general movement forward over time.

Subjective Reports

Two items in the wellbeing questionnaire specifically targeted pride (''I feel good about myself'') and disappointment (''I feel bad about myself''). After correction for the subjective state at baseline, we performed paired sample *t*-tests to compare mean changes in subjective state after the generation of pride and disappointment words. For the disappointment item we found a significant difference, $t(56) = 1.73$, $p = .045$ (one-tailed), such that participants felt worse about themselves after generating disappointment words ($M = .09$, $SD = 1.24$) than after generating pride words ($M = -.12$, $SD = .98$). The item targeting pride did not show any significant effects. In addition, we looked at the single item ''irritation'' to control for possible differences in the amount of irritation participants felt during the generation of pride and disappointment words. The paired sample *t*-test approached significance, $t(56) = 1.94$, $p = .057$. Irritation increased more compared to baseline after generating disappointment words ($M = .26$, $SD = .88$) than after generating pride words ($M = .05$, $SD = .61$).

Because the goal of our study was to find embodiment effects, it is important to rule out that the decrease in posture height after generating disappointment words is caused by changes in emotional states, such as feeling bad about oneself or irritation. We therefore added the scores for these states as covariates to the main analysis on posture height. None of these analyses showed any main effects of the covariates or any interactions between the covariates and the factors *concept*

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and *time* (all *p*-values $> .2$). Furthermore, even though no covariates were significant, adding these covariates to the analyses resulted in highly similar effects as the formerly presented analysis.

Difficulty and Autobiographical Memory

Participants found it significantly harder to generate pride ($M = 4.04$, $SD = 1.33$) and disappointment ($M = 4.31$, $SD = 1.41$) words than kitchen ($M = 1.73$, $SD = 1.31$) and bathroom ($M = 1.76$, $SD = 1.23$) words (all t's $(44) > 9.00$, $p < .001$). However, neither the two control tasks nor the two experimental tasks differed from each other in perceived difficulty. Most participants indicated that they had retrieved and used autobiographical memories during the generation of the pride and disappointment words. The two experimental tasks did not differ in the extent to which participants *retrieved* autobiographical memories during word generation. The extent to which participants reported to have actually *used* their memories differed marginally between experimental tasks: in the pride task participants made more use of their memories than in the disappointment task, $t(48) = 2.00$, $p = .053$. There were no significant correlations between task difficulty and postural change and the retrieval and use of autobiographical memories and postural change.

In the exit questionnaire, we probed participants for possible ideas about the goal of our study. Importantly, none of the participants made remarks about a relation between the words generated and posture. In addition, none of the participants showed any suspicion about being filmed or the presence of the hidden camera.

Pride and Disappointment Words

According to Barsalou et al. (2007) properties generated for abstract concepts focus mostly on mental states and events. These sort of generated words fall under the category of object-situation responses and are indicative of the use of situated simulations. Consistent with this view we found that most words verbalized by the participants were descriptions of situations, personal attributions, events and reactions associated with pride and disappointment. For pride, participants listed school, sport, and university as associated concepts in general, but they also referred to specific antecedents, such as ‘‘good marks,’’ ‘‘winning a game,’’ ‘‘diploma,’’ or simply ‘‘did well.’’ Participants also generated words related to consequences of pride and success, such as ‘‘applause’’ or ‘‘throwing a party’’ and words referring to emotional reactions (‘‘feeling happy’’). In addition, many participants listed words associated to self-esteem and most people referred to significant others (parents, friends, family).

For disappointment, most participants listed antecedents of disappointment or failure, either very broad (‘‘doing bad,’’ ‘‘losing,’’ or ‘‘bad preparation’’) or more specific (‘‘failing psychophysiology exam’’ or ‘‘getting an F’’). More general concepts were also mentioned, such as school, exams, and driving test. Similar to pride, words referring to family and self-esteem were also listed. In addition, many participants listed different emotion words, such as ‘‘shame,’’ ‘‘fear,’’ ‘‘feeling angry,’’ ‘‘depression,’’ and ‘‘crying.’’ Interestingly, some participants referred to the future with expressions such as ‘‘better next time,’’ or named potential strategies for future success (‘‘work harder’’).

Participants did not differ in starting time (in seconds) when generating pride ($M = 6.9$ seconds, $SD = 4.0$) or disappointment words ($M = 7.5$ seconds, $SD = 2.8$), $t(55) = 1.08$, $p = .29$, nor did they differ in time when they stopped generating pride ($M = 74.6$ seconds, $SD = 19.0$) or disappointment words ($M = 70.9$ seconds, $SD = 20.4$), $t(55) = 1.47$, $p = .15$. In terms of numbers, participants generated significantly more words in the pride condition ($M = 12.6$, $SD = 4.7$) than in the disappointment condition ($M = 11.3$, $SD = 5.0$), $t(51) = 2.38$, $p < .05$.

DISCUSSION

The results of this study clearly show a decrease in posture height along the vertical axis during the generation of disappointment words, whereas this decrease was absent during the generation of pride words. This finding confirms our prediction that the activation of emotion knowledge about disappointment can lead to the spontaneous adaption of the posture associated with this emotion. In addition to vertical changes in posture, we also examined horizontal changes in

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posture. In line with our predictions, we did not find horizontal changes during the generation of pride and disappointment words. This suggests that embodied reactions when accessing knowledge about disappointment are specific to changes in height.

Although we can conclude that posture changes were congruent to the activated concept of disappointment, we cannot draw straightforward conclusions about posture changes when activating knowledge about pride. The data did show an increase in posture height during the first moments of the pride task; however this effect was rather weak and should therefore be interpreted with caution. It is an intriguing question why we found a stronger embodiment effect for disappointment than for pride. There are two factors in the current study that might have influenced this finding. First, the general effect of slouching in our experiment, as indicated by the main effect of time, could have inhibited an increase in posture height. Apparently participants relax during the word generation tasks and therefore decrease in height, because they take a more comfortable position in the chair. The finding that this decrease in height was less strong in the pride condition could suggest a weak embodiment effect, which was not strong enough, however, to counter the general slouching. Second, the majority of our participants were women. Since it has been found that proprioceptive effects of upright posture work stronger for men than for woman (Roberts & Arefi-Afshar, 2007) it is possible that men are more sensitive to pride manipulations. Thus, an increase in posture when generating pride words might have occurred when testing only male participants.

The current findings support the core assumption of embodiment theories that conceptual knowledge is represented by simulating bodily states and that accessing this knowledge can lead to re-enactment of these states (Barsalou, 1999; Niedenthal, Barsalou, Winkielman et al., 2005). The finding that the body posture associated with disappointment (Riskind, 1984) is adopted when people think about this emotion, suggests that bodily states can be spontaneous and overtly re-enacted when accessing emotion concepts. Barsalou et al. (2003) propose that the activation of situated conceptualizations can lead to embodied reactions through the process of pattern completion. In our case, this would mean that the activation of the situated conceptualization of disappointment activated associated components, such as body posture, that were consequently re-enacted. As predicted, we found overt re-enactment in both the body and the introspective system. First of all, the generation of disappointment words resulted in a slumped body posture. Second, our data showed re-enactment of actual feelings of disappointment when thinking about this concept. This was indicated by the finding that participants felt ''bad about themselves'' to a larger extent after generating disappointment words than after generating pride words. This would be in line with Barsalou's (1999) claim that introspective experiences can be re-enacted in the same way as bodily reactions when conceptual knowledge is activated.

However, since exit data indicated that participants used autobiographical memories in the word generation tasks, the increase in negative feeling after the disappointment task could also be an autobiographical memory effect (i.e., thinking about your own failures makes you feel bad about yourself). If this is the case, this may suggest that it is not the activation of the concept *per se*, but rather the experience of emotion caused by the emergence of memories that explains the changes in posture. However, because covariance analysis gave no indication that subjective feelings of disappointment were mediating the effect on posture, it is more likely that the feeling state is an embodiment effect in itself (i.e., accessing conceptual knowledge about disappointment does not only decrease your posture, but also makes you feel bad). Research on the postural feedback effect (Duclos et al., 1989; Stepper & Strack, 1993) has demonstrated similar forms of re-enactment, where not only the activation of a concept, but also the adoption of the bodily posture itself leads to congruent subjective feelings.

Concerning the activation of autobiographical memories; it might not be surprising that the activation of semantic knowledge about emotion activates episodic memories. According to Conway (1990) autobiographical memories play an important role in the conceptual representation of emotion. Furthermore, situated conceptualization are based on real-life experiences (Barsalou et al., 2003) and thus it is likely that conceptual knowledge also activates memories about instances when one has experienced events associated to that knowledge. Finally, we deliberately incorporated achievement antecedents in our manipulation to make the activated concepts self-relevant, which could have led to the activation of self-relevant experiences in memory. Nevertheless, it would be relevant to further investigate the extent to which the classic distinction between semantic and episodic memory is applicable to conceptual knowledge about emotion, and how this distinction influences embodiment effects.

There are two points of critique about the current study that we would like to discuss. First of all, it is possible that the act of talking influences posture height. However, since participants verbalized more words in the pride condition than in the failure condition, it is unlikely that the act of talking resulted in the decrease in posture height demonstrated in the disappointment condition. Second, our manipulation consisted of a word generation task, which can rely on lexical associations, instead of the more conceptually oriented property generation task. Nevertheless, the words generated in the present study are not indicative of lexical processing. Participants verbalized words that were associated with situations and events concerning pride and disappointment. In addition, participants often generated words referring to emotional and mental states. According to Barsalou and Wiemer-Hastings (2005) information about situations, events and introspections are central to abstract concepts. Thus, the exploration of the words in the present study indicates that participants generated words by processing conceptual meaning. Consequently, we believe that the words generated in both the pride and disappointment condition are indicative of the activation of situated conceptualizations of pride and disappointment (Barsalou et al., 2003).

To our knowledge the current study provides the first evidence for the claim that the activation of conceptual knowledge about emotion can instantiate spontaneous simulations at an overt level, leading to actual bodily expressions. Yet, many questions are still open for investigation concerning the overlap between the knowledge activated when talking, thinking, or reading about emotion and the actual experience and expression of emotion itself.

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