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COME A BIT CLOSER: APPROACH MOTOR ACTIONS LEAD TO FEELING SIMILAR AND BEHAVIORAL ASSIMILATION

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We suggest that while approaching a target, individuals are tuned to cues indicating closeness. Conversely, while avoiding a target, individuals are tuned to cues indicating distance. For social targets, this means that approach should be associated with similarities whereas avoidance should be associated with differences between the self and the target. We therefore hypothesized that executing approach (as compared to avoidance) motor actions would (a) lead participants to perceive others as psychologically more similar to themselves, and (b) trigger assimilation to the other's behavior. The first prediction was confirmed in two studies where participants

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rated how psychologically similar persons depicted on photos were to themselves. The second prediction—behavioral assimilation to social information while performing approach motor actions, and behavioral contrast away from social information while performing avoidance motor actions—was confirmed in Study 3.

"Love is the power to see similarity in the dissimilar."

—Theodor Adorno (1974, p. 191)

A growing body of research demonstrates that motor representations interact with cognitive representations such that the processing of information compatible with a certain motor action is facilitated (e.g., Schubert, 2004; Stepper & Strack, 1993; for reviews see Fischer & Zwaan, 2008; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Strack & Deutsch, 2004). One consequence of this is that judgments are biased toward the facilitated information, as, for instance, when women making a fist perceive an individual as more hostile (Schubert, 2004), presumably because they often make a fist when they are faced with a hostile adversary. Given that people more frequently approach similar others than dissimilar ones, we predict that approach behavior leads to perceiving others as more similar to oneself (Studies 1 and 2). This, in turn, should make it more likely that under approach motivation others are included in the self representation (Schwarz & Bless, 1992, 2007). As a result (see Schubert & Häfner, 2003; Wheeler, DeMarree, & Petty, 2007), we expect behavioral assimilation toward standards that had been activated while performing an approach behavior, and behavioral contrast away from standards that had been activated while performing an avoidance behavior (Study 3). Several recent lines of research, which we specify below, are compatible with these assumptions.

The first line of research corroborating our hypothesis deals with distance regulation and valence. Specifically, individuals typically approach positive things and avoid negative things. Therefore, approach actions are compatible with the processing of positive valence and avoidance actions with the processing of negative valence (Chen & Bargh, 1999; Förster & Stepper, 2000; Förster & Strack, 1996, 1997, 1998; Gawronski, Deutsch, & Strack, 2005; Neumann & Strack, 2000). Given that similarity breeds liking and is positively valenced whereas dissimilarity breeds animosity and is negatively valenced (see Montoya, Horton, & Kirchner, 2008, for a review), it follows that approach should be compatible with the processing of similarities to others and avoidance with the processing of differences from others.

Second, recent research on the compatibility between actions and their effects suggests that approach behavior may facilitate the perception of similarities. Specifically, according to Hommel, Müsseler, Aschersleben, and Prinz (2001), actions and their effects are stored together in common codes and effects are used to guide actions. According to this view, actions are the result of the anticipation of certain sensory consequences. Conversely, actions also influence the perception of the effect. For example, individuals who are causing a movement by turning a wheel without actually seeing the movement, experience the movement as having been further than it actually was (Wexler & Klam, 2001). Thus, actions and

effects are compatible and activate each other. Approach and avoidance actions form an especially interesting case with respect to the compatibility of action and effect, and, ultimately, with respect to the compatibility of action and information processing: Approach and avoidance are two fundamental dimensions of motivation, and, most behaviors have a (motor) approach or avoidance component to them. The most proximal effect of an approach action is closeness, and that of an avoidance action is distance (Lewin, 1935). In other words, these effects invariably occur when an approach/avoidance motor action is executed. As compatibility in general is thought to stem from the frequent co-occurrence of elements in everyday life (Förster, 2004; Förster & Strack, 1996), this should result in a tight coupling of the action and the effect. Accordingly, individuals who are approaching should process cues indicating closeness more easily than cues indicating distance while the reverse should be true for individuals who are avoiding.

Though the above statement makes one think first about spatial distance, it should hold for any kind of distance (Lewin, 1951). Indeed, Liberman, Trope, and Stephan (2007) have recently shown that different kinds of distances, such as spatial, temporal, and psychological distances, are regulated in much the same way. In the present article we focused on the perceived psychological distance from other people. Even though the coupling is not perfect, individuals should usually feel close to similar others (Aron, Aron, & Smollan, 1992). Evidence showing that approach motor actions are facilitated when processing information about similar others (e.g., Paladino & Castelli, 2008) adds support to the possibility that an association between approach motor actions and similarity is formed because of their frequent co-occurrence.

Finally, our predictions are also in line with those put forth in a recent model by Förster, Liberman, and Kuschel (2008). Their global/local processing style model (GLOMO) posits that an approach motivation orientation (which can be induced via an approach motor action, see Friedman & Förster, 2000) is associated with a more global processing style and thereby leads to assimilation. It further postulates that an avoidance motivation orientation (which may be instigated by an avoidance motor action) is associated with a more local processing style and thereby leads to contrast. A more inclusive, global processing style should thus make it easier to discover similarities, and a more exclusive, local processing style should make it easier to discover differences (Förster et al., 2008). Hence, the GLOMO as well allows for the prediction that executing an approach motor action leads to perceiving others as more similar to oneself and executing an avoidance motor action leads to perceiving others as more different from the self.

To sum up, integrating different lines of research we conclude that approach motor actions should lead to perceiving others as more similar to the self, and to behaviorally assimilating to them. Respectively, avoidance motor actions are hypothesized to lead to perceiving others as more different and to behavioral contrast away from them. In order to put this reasoning to an experimental test, we set up three studies in which we induced the activation of muscles associated with approach/avoidance motor actions and measured perceived similarities and behavioral assimilation. Specifically, in Study 1, we measured perceived psychological similarity of others to self. In Study 2, we measured perceived psychological similarity of others to self and perceived quietness of others, and in Study 3 we measured behavioral assimilation and contrast. Muscle activation was unobtrusively manipulated by inducing participants to assume either an arm flexion po-

sition or an arm extension position. The first involves the activation of the arm flexor muscle associated with an approach motor action of moving objects toward oneself. The latter involves the activation of the arm extensor muscle associated with an avoidance motor action of moving objects away from oneself (Cacioppo, Priester, & Berntson, 1993; Förster & Strack, 1997, 1998; Neumann & Strack, 2000; Priester, Cacioppo, & Petty, 1996; see also Seibt, Neumann, Nussinson, & Strack, 2008).

STUDY 1: PERCEIVED SIMILARITY OF OTHERS TO SELF

To test our first hypothesis we presented participants with pictures of faces implying various degrees of "objective" psychological similarity to the participant (some male and some female, some young and some old) and asked them to rate how psychologically similar each of these persons was to themselves.

METHOD

Participants. Thirty-eight students from the University of Haifa (18 women, 20 men, aged between 19 and 28) participated in this study. They were either paid NIS 35 (at the time, about $8.50) or were assigned course credit for their participation. Two participants that failed to follow instructions were excluded from the analyses.

Design. We tested our hypotheses in a 2 (arm position: arm flexion versus arm extension) x 2 (age of target person: young versus old) x 2 (matching between gender of target person and gender of participant: same versus different) design with arm position as between-participants factor and age and gender matching as within-participants factors.

Materials and Apparatus. Thirty-six black and white pictures of faces from the Psychological Image Collection at Stirling (PICS, http://pics.psych.stir.ac.uk) were presented on a computer screen (12 young and 6 old women and 11 young and 7 old men). The pictures were selected so that the a-priori likeability and attractiveness of both genders were similar according to a pretest.

In order to control for possible mood effects (see e.g., Gasper & Clore, 2002; Isen & Daubman, 1984) participants were asked to indicate their current mood by making a vertical mark on a horizontal line with its endings marked "very bad" and "very good." Moreover, participants completed the Positive and Negative Affective Scale (PANAS, Watson, Clark, & Tellegen, 1988). To examine possible non-affective differences between the conditions, participants were asked to indicate how easy it was for them to extract the preliminary information about the "psychology" of the persons on a Likert scale from 1 (*very difficult*) to 10 (*very easy*), and, how much they felt that they succeeded in capturing the psychological characteristics of the target persons while rating the degree of similarity (1—*to a very small degree* to 10- *to a very high degree*). We suspected that if participants in the arm flexion condition experience themselves as psychologically similar to others they might experience the task, involving "reading" other people's personality, as easier than those in the arm extension condition. Furthermore, participants were

also asked to indicate how much they enjoyed the task (1 = *did not enjoy it at all* to 9 = *enjoyed it very much*); how successful they were in keeping the muscle tension (1 = *not at all successful* to 10 = *very successful*), and how strenuous it was for them to keep the muscle tension (1 = *not at all strenuous* to 9 = *very strenuous*). A final question was an open-ended probe for suspicion regarding the cover story. Participants expressed no suspicions that were relevant to our hypothesis.

Procedure. Participants were recruited for a study on "faces" and were run individually. The cover story (presented on the computer screen) read that we were studying the relationship between hemispheric activation and information processing, and that the arm position was a new method to activate the brain hemispheres (see Friedman & Förster, 2000). Participants further read that they were to complete different tasks concerning intuitive information processing and were then shown the appropriate arm position (arm flexion or arm extension): Arm flexion involved lightly pressing the palm upward against the bottom of the table, keeping the elbow bent at a right angle, and thus activating the arm flexor muscle (associated with approach motor action). Arm extension involved lightly pressing the palm downward against the top of the table, keeping the elbow straight, and thus activating the arm extensor muscle (associated with an avoidance motor action). Next, participants were introduced to "the first information-processing task" (which actually was the only task they were about to complete): The instructions to this task read that recent studies in social psychology suggest that people can extract preliminary information about the "psychology" of others that they do not know (their prominent attributes, their personality lines, and their basic emotional characteristics) by merely observing their faces. They were further told that this process usually takes place unconsciously in the first few seconds of looking at the person. Participants were told that they would be presented with pictures of faces and that their task was to quickly and intuitively decide how psychologically similar that person was to them on a scale from "1" (*not at all similar*) to "11" (*very similar*). While performing the rating task participants assumed the arm position with their dominant arm and typed in their ratings with their free, nondominant hand. It was emphasized that we were interested in the participants' first, immediate impression of the degree of psychological similarity of the target person to themselves. A short break was introduced after the 24th picture during which participants were asked to relax their arm and then to reassume the position before continuing with their ratings.

On each trial the picture of a target person was first presented, complemented after 6 seconds by a similarity scale underneath. Both remained on the screen until the participant answered. The first four trials were practice trials. The following 36 pictures were presented in random order. In trials in which participants did not respond within 4 seconds from the presentation of the scale, they heard a beep after responding to remind them to respond faster on subsequent trials.[1] The ISI was 1000 ms.

After completing the similarity rating task, participants were handed a paper-and-pencil questionnaire with the affective and non-affective control questions. They were then thanked, paid, and debriefed.

1. The reason we did not include responses that occurred more than 4 seconds after presentation of the items is that we believe our effects unfold themselves through intuitive judgments, ones that are based on gut feelings, and not by ones that are based on more analytic, reflective thoughts.

RESULTS AND DISCUSSION

A total of 1.7% of the ratings were provided more than 4000 ms from the presentation of the scale (which is when the beep was sounded) and were therefore neither recorded nor included in the analysis.

Mean similarity ratings were analyzed in a 2 (arm position) x 2 (age of target) x 2 (gender matching) ANOVA with both age of target and gender matching as within-participants factors. As would be expected, strong effects of both age of target, $F(1, 34) = 17.61$, $p = .0002$, $\eta^2_p = .34$, and gender matching, $F(1, 34) = 16.04$, $p = .0003$, $\eta^2_p = .32$, emerged: Participants experienced young target persons as psychologically more similar to themselves ($M = 4.42$) than old target persons ($M = 3.79$), and they experienced target persons of the same gender as psychologically more similar to themselves ($M = 4.41$) than targets of the other gender ($M = 3.80$). The latter effect was stronger when the targets were young than when they were old, $F(1, 34) = 16.87$, $p < .0002$, $\eta^2_p = .33$, for the interaction. In addition, we obtained the expected main effect of arm position, $F(1, 34) = 3.56$, $p = .07$, $\eta^2_p = .09$ ($M_{flexion} = 4.50$, $M_{extension} = 3.76$). No other effects emerged. Thus, our hypothesis that participants in the arm flexion condition would experience others as psychologically more similar to themselves, than those in the arm extension condition was supported.

Participants' current mood ratings, their PANAS scores, and the other affective and non-affective control variables were analyzed in *T*-Tests comparing the two arm position conditions. Although we expected participants in the arm flexion condition to experience more ease and more success in performing the task, these predictions were not supported ($T < 1$ for both questions). As expected, however, no other differences between the two conditions emerged either, all Ts < 1.27, all ps > .27. Thus, it seems that the effect of arm position on the experienced similarity to others can not be explained by the affective and non-affective influences that were measured by our control questions.

Together, the results of Study 1 support our hypothesis that when performing approach motor actions people tend to perceive others as more similar to themselves than when performing avoidance motor actions.

Assuming that participants in arm flexion were induced into an approach motivation orientation and that participants in arm extension were induced into an avoidance orientation these results may have implications on a more general level: They provide initial evidence for the claim that approach/avoidance motivational orientations affect people's experienced psychological distance from others. An interesting implication is that when under approach other people seem less estranged, and more akin to us. This should result in feeling more at home in one's social environment when under approach. However, when under avoidance one may feel more different from others, and one's social environment may feel more distanced and alienated.

It is important, however, to consider a possible alternative explanation. In particular, research on regulatory focus suggests that the activation of a promotion focus (which is associated with approach), compared to the activation of a prevention focus (which is associated with avoidance), leads to the use of a lower criterion for accepting potential candidates as fitting one's hypothesis. This might result in more agreement and higher ratings under approach whatever the question is (Crowe & Higgins, 1997, Study 2; Friedman & Förster, 2001, Study 3). In order to

rule out this alternative explanation of our results, we conducted a second study in which we included a second judgment dimension. Specifically, in addition to collecting similarity ratings, we also asked participants to judge the quietness of the persons in a second block. We chose quietness because it is a neutral attribute for individuals according to German word norms (Hager & Hasselhorn, 1994). If results in Study 1 were due to a general judgmental tendency, we should obtain a main effect of arm position on both judgment dimensions. If, however, the effect was due to a more specific effect of arm position on perceived distance, then we should obtain an interaction of arm position and judged dimension. Further, only the faces of young target persons were presented in Study 2.

STUDY 2: PERCEIVED SIMILARITY VERSUS PERCEIVED QUIETNESS

METHOD

Participants. One hundred thirty-three students from the University of Utrecht (86 women, 47 men, aged between 16 and 36) participated in the study. The study formed part of an experimental battery of 45 minutes. Participants were paid 6 (at the time, about $8) for participation or received partial course credit. Two participants had to be excluded for not following instructions, and a further person was excluded because he indicated to have been completely unsuccessful in maintaining the arm position.

Design. This study consisted of a 2 (arm position: arm flexion versus arm extension) x 2 (task: similarity versus quietness ratings) x 2 (order of tasks: first similarity versus first quietness task) x 2 (gender matching: same versus different) design with arm position and order as between-participants factors and task and gender matching as within-participants factors.

Material and Apparatus. The entire study was presented on 15-inch computer screens and participants typed their ratings in using a standard keyboard. For the judgment tasks, we chose eight of the female and eight of the male faces that were used in Study 1. The control questions were the same as in Study 1, except that the questions about task difficulty and task enjoyment were asked twice (once with respect to each task). In addition, in this study mood was measured with a Likert scale ("How well do you feel right now?" on a scale from "1" *not at all* to "9" *very*).

Procedure. Participants completed the task in individual cubicles. In the beginning of the battery, the experimenter showed participants the correct arm position as in Study 1. He or she then told them that they would be instructed by the computer on when to perform the arm position and left. The present study was administered about 20 minutes into the session after two unrelated tasks. Participants read the same cover story and general instructions as in Study 1. They also read the same text as in Study 1 about the ability to form quick impressions of other people. Half of the participants were then instructed to judge how psychologically similar that person was to them (as in Study 1) and the other half were instructed to judge the quietness of the persons in the photos on a scale from "1" (*not at all*) to "11" (*very quiet*). Next, participants were instructed to assume the arm

position that they had been shown with their dominant arm. They then completed two practice trials with their respective task and then the 16 main trials. Again, the scale appeared 6 seconds after onset of the photo, but unlike in Study 1, participants received no feedback for slow reactions. After completing the first task, they could relax their arm, were introduced to the second task, resumed the arm position and completed again 2 practice and 16 main trials with the other judgment. Finally, we administered the PANAS, the mood question, and the other control questions, including an open-ended probe for suspicions. Participants expressed no suspicions that were relevant to our hypothesis. After completing the rest of the battery, participants were thanked, debriefed, and received their payment or partial course credit.

RESULTS AND DISCUSSION

As in Study 1, ratings provided more than 4000 ms from the presentation of the scale (4.1%) were not included in the analysis.

Mean similarity and quietness ratings were analyzed in a 2 (arm position) X 2 (order of tasks) X 2 (gender matching) X 2 (task) mixed-model ANOVA. Strong effects of both task, $F(1, 126) = 176.79$, $p < .001$, $\eta^2_p = .58$, and gender matching, $F(1, 126) = 41.00$, $p < .001$, $\eta^2_p = .24$, emerged: Participants gave higher quietness ($M = 6.00$) than similarity ratings ($M = 4.32$), and they rated persons of the same gender higher on both dimensions ($M = 5.39$) than persons of the other gender ($M = 4.92$). The latter effect was somewhat stronger for the similarity than for the quietness ratings, $F(1, 126) = 2.95$, $p = .09$, $\eta^2_p = .02$, for the interaction.

In addition, we obtained a main effect of arm position, $F(1, 126) = 3.19$, $p = .08$, $\eta^2_p = .02$ ($M_{flexion} = 5.29$, $M_{extension} = 5.03$) which was qualified by the expected interaction with task (see Figure 1), $F(1, 126) = 4.43$, $p = .04$, $\eta^2_p = .03$: the effect of arm position was significant for the similarity rating, $F(1, 126) = 5.75$, $p = .02$, $\eta^2_p = .04$, but not for the quietness rating, $F < 1$. This effect was not further qualified by order, nor by gender matching or by the 4-way interaction, all Fs < 1. Thus, in line with our hypotheses, participants who flexed their arm experienced others as psychologically more similar to them, but not as quieter than participants who extended their arm.

AW: Text change from "Figure 2" to "Figure 1" ok?

Order of the tasks also had an influence on the results, $F(1, 126) = 8.39$, $p = .004$, $\eta^2_p = .06$, which was qualified by a marginal interaction with task, $F(1, 126) = 3.24$, $p = .08$, $\eta^2_p = .02$: Similarity ratings were higher when the similarity task was second ($M = 4.64$) than when it was first ($M = 4.00$), $F(1, 126) = 8.70$, $p = .004$, $\eta^2_p = .06$. However, no such effect emerged for the quietness ratings,[2] $F(1, 126) = 1.35$, $p = .25$, $\eta^2_p = .01$.

There was also a marginal interaction of arm position with gender matching, $F(1, 126) = 2.89$, $p = .09$, $\eta^2_p = .02$, which was qualified by an Arm position x Gender matching x Order of tasks interaction,[3] $F(1, 126) = 4.61$, $p = .03$, $\eta^2_p = .04$: When judging same-sex targets, participants gave higher ratings (across tasks) in the arm

2. This pattern could be due to an assimilation of the similarity ratings to the in general higher quietness ratings when the similarity task follows the quietness task. Alternatively it could be due to an increased feeling of familiarity with the target persons when presented with them for the second time, a feeling that might have contributed to a greater sense of similarity.

3. No other effects emerged, all Fs < 2.0, all ps > .16.

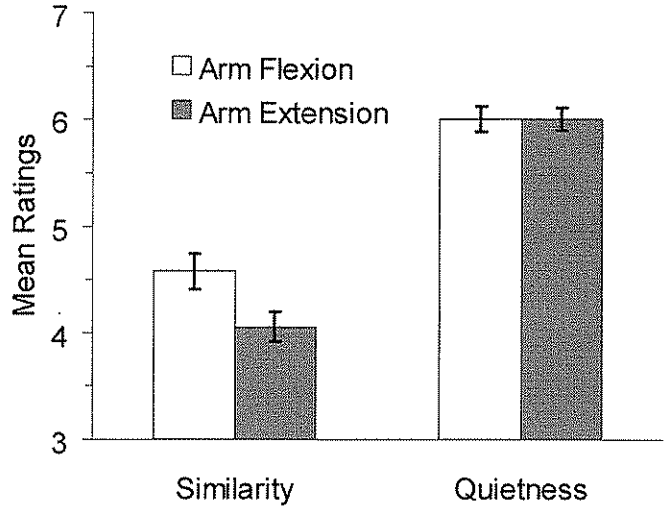

FIGURE 1. Mean ratings of psychological similarity of others to self versus quietness of others on scales from 1 through 11 as a function of arm position. Error bars represent 1 SEM (Study 2).

flexion ($M = 5.58$) than in the arm extension ($M = 5.20$) condition, $F(1, 126) = 5.25$, $p = .02$, $\eta^2_p = .04$, independent of order. When judging opposite-sex targets, the same pattern has emerged for participants who started with the quietness task ($M_{flexion} = 5.39$, $M_{extension} = 4.96$), $F(1, 126) = 4.25$, $p = .04$, $\eta^2_p = .04$. However, no effect of arm position was obtained for those who started with the similarity task, $F < 1$.

Whatever the reason for this unexpected interaction, importantly, it does not qualify our expected interaction of task and arm condition. Thus, it cannot change the main conclusion from this study which is that the effect of arm position on similarity judgments is task specific.

Participants' current mood ratings, their PANAS scores, and the other control variables were analyzed in T-Tests comparing the two arm position conditions. No differences between the two conditions emerged, all $Ts < 1.2$, all $ps > .25$.

If the activation of muscles associated with approach/avoidance motor actions affects perceived similarity of others to the self, this should have consequences for categorization processes: others should have a higher likelihood of being categorized in the same category as the self when performing an approach motor action, and in a different category when performing an avoidance motor action. As these categorization processes are assumed to underlie assimilation and contrast in general (Schwarz & Bless, 1992, 2007; see also Förster et al., 2008; Stapel & Koomen, 2000, 2001) and behavioral assimilation and contrast in particular (Schubert & Häfner, 2003; Spears, Gordijn, Dijksterhuis, & Stapel, 2004) we expected that arm flexion should lead to behavioral assimilation and arm extension to behavioral contrast. Consequently, in Study 3, we examine the effect of motivational orientation on behavior.

STUDY 3: BEHAVIORAL ASSIMILATION AND CONTRAST

Many studies from recent years have shown that priming people with social stereotypes can modulate their behavior in the direction of the stereotype. For example, it has been shown that when primed with the stereotype of the elderly participants' behavior assimilated toward behaviors associated with that group: participants were slower in walking away from the experimental session (Bargh, Chen, & Burrows, 1996, Study 2) and in performing a lexical decision task (Dijksterhuis, Spears, & Lépinasse, 2001; Kawakami, Young, & Dovidio, 2002), and they performed worse on various memory tasks (Dijksterhuis, Aarts, Bargh, & van Knippenberg, 2000; Dijksterhuis, Bargh, & Miedema, 2000). Bargh et al. (1996) explain that the activation of the stereotype increases the accessibility of mental representations of stereotypical behaviors thus rendering these behaviors more likely to be performed spontaneously. Importantly, however, priming participants with exemplars has been shown to lead to behavioral contrast (Dijksterhuis, Spears, Postmes, Stapel, Koomen, van Knippenberg, & Scheepers, 1998; Dijksterhuis et al., 2001). It has been argued that behavioral contrast results from the spontaneous comparison between the exemplar and the self, a comparison that activates stereotype-inconsistent knowledge (Dijksterhuis et al., 1998, 2001; Haddock, Macrae, & Fleck, 2002).

Building on this theorizing Schubert and Häfner (2003) have suggested that the critical determinant of whether automatic behavior is assimilated toward or contrasted away from the typical behavior of the primed persons is whether the primed persons are perceived as belonging to the same category of the perceiver or not. If the primed persons are perceived as belonging to the same category as the perceiver, or if they are included in the self representation (see Wheeler, DeMarree, & Petty, 2007; Wheeler & Petty, 2001) behavioral assimilation results. If not, a social comparison between the perceiver and the primed persons takes place, giving rise to behavioral contrast. As noted earlier, if performing an approach motor action increases the perceived similarity of others to self and performing an avoidance motor action decreases it then others are more likely to be categorized in the same category as the self, or to be included in the self, when performing an approach motor action but they are more likely to be categorized in different categories when performing an avoidance motor action. Extending Schubert and Häfner's (2003) and Wheeler et al.'s (2007) reasoning to the present research question, we therefore assume that while performing an approach motor action both stereotype *and* exemplar primes should lead to behavioral assimilation whereas stereotypes and exemplars that are processed while performing an avoidance motor action both should trigger contrastive behavior. To test this hypothesis, participants in Study 3 were primed with group labels that (according to a pretest) are associated with a high degree of intelligence (professors) or with stupidity (soccer players). Other participants were primed with exemplars of these categories (Albert Einstein and Lothar Matthäus, respectively) and were subsequently asked to answer a series of general knowledge questions.

METHOD

Participants. One hundred sixty-six students from the University of Würzburg (114 women, 52 men, ages 19 to 26) participated in this study. They were offered an ice-cream or a chocolate bar for their participation.

Design. The above manipulations were realized in a 3 (arm position: arm flexion versus control versus arm extension) X 2 (primed concept: intelligence versus stupidity) X 2 (standard: group versus exemplar) design. All factors were manipulated as between-participants variables. Behavioral effects were measured in an ostensibly unrelated task by a trivial pursuit game with 20 multiple choice general knowledge questions (one out of three answers was correct).

Procedure. Participants were run individually in a mobile lab. Upon arrival, participants were seated in front of a laptop computer. For participants in the arm flexion and arm extension conditions, the instructions indicated that the experiment was about the effects of hemisphere activation on thought content. They were told that in order to activate one of the hemispheres, they would have to take a certain arm position and focus on a cross in the middle of the screen while thinking about a certain target. Participants were then given a demonstration of the appropriate arm position depending on the condition to which they were assigned. For participants in the control condition, the instructions indicated that the experiment was about thought activation, but said nothing about holding a specific arm position. Subsequently, following the procedures of Macrae, Stangor, and Milne (1994), all participants were instructed to think about the typical life style and characteristics of professors (or soccer players or Albert Einstein or Lothar Matthäus) for 3 minutes. Participants in the arm flexion and arm extension conditions were reminded to keep their arm position throughout the thinking task. On completion of this task, participants were instructed to release the arm position and were subsequently asked to answer 10 filler questions (e.g., "How difficult was the task for you?"; "How creative are you?") on a scale anchored at "1" (*not at all*) and "10" (*extremely*). Then, the experimenter asked the participants whether they would mind taking part in another short experiment, ostensibly a pretest for a quiz-show experiment in which participants would have to answer 20 general knowledge questions. No one refused to participate. On completion of this task, participants were probed for suspicion regarding the arm position and a possible connection between the tasks. They were then thanked, debriefed, and dismissed. Participants expressed no suspicions that were relevant to our hypothesis.

RESULTS AND DISCUSSION

The dependent variable was the number of correct answers to the 20 general knowledge questions. A 3 (arm position) x 2 (primed concept) x 2 (standard) analysis of variance revealed a two-way Arm Position x Primed Concept interaction, $F(2, 154) = 9.67$, $p < .001$, $\eta^2_p = .112$, indicating that the primed concepts (intelligence versus stupidity) exerted different effects on participants' performance in the arm flexion, arm extension, and control conditions. Importantly, this two-way interaction was qualified by the expected Arm Position x Primed Concept x Standard interaction,

$F(2, 154) = 3.31$, $p = .04$, $\eta^2_p = .041$ (see Figure 2). Hence, the four primes had different effects depending on arm position which will be detailed below.

Replicating the results of previous studies (see Dijksterhuis & Bargh, 2001), for participants who did not assume any arm position (control condition), a two-way ANOVA Primed Concept x Standard yielded the predicted interaction between concept and standard, $F(1, 47) = 7.51$, $p = .009$, $\eta^2_p = .14$. Participants primed with professors performed better ($M = 10.19$) than those primed with soccer players ($M = 8.09$), demonstrating behavioral assimilation, $t(25) = 2.10$, $p = .02$, whereas those primed with Einstein tended to perform worse ($M = 8.13$) than those primed with Matthäus ($M = 9.67$), displaying behavioral contrast, $t(22) = -1.84$, $p = .11$. There was no main effect for primed concept in this condition, $F < 1$.

As predicted, participants in the arm flexion condition showed assimilation to the behavior of the prime. A two-way ANOVA Primed Concept x Standard for these participants yielded the expected main effect of concept, $F(1, 55) = 11.67$, $p < .001$, $\eta^2_p = .18$, with participants primed with intelligence performing better ($M = 10.63$) than those primed with stupidity ($M = 8.69$). There was neither an effect for the standard nor for the interaction between concept and standard ($F < 1$ for both). Thus, regardless of whether the prime was a group or an exemplar the behavior of the arm flexion participants was assimilated toward that associated with the prime.

Participants in the arm extension condition, on the other hand, showed behavioral contrast to the prime, whether an exemplar or a group. A similar analysis for these participants also yielded the predicted main effect of concept, $F(1, 52) = 8.14$, $p = .006$, $\eta^2_p = .14$, but this time participants primed with intelligence performed worse ($M = 8.44$) than those primed with stupidity ($M = 10.25$). Again there was neither an effect for the standard, nor for the interaction between concept and standard, $F < 1$. Here, regardless of whether the prime was an exemplar or a stereotype, the behavior was contrasted away from that associated with the prime. No effects other than the two- and three-way interactions described above were obtained, all Fs < 1.2, all ps > .40.

These results indicate that when primed with a group, the arm extension participants showed behavioral contrast in the face of the "default" assimilative effect of group primes (as conveyed by comparison to the control condition. In addition, for exemplar priming the behavior of the arm flexion participants was assimilated toward that of the prime in spite of the common contrastive effect of exemplars on behavior. These results thus corroborate our hypothesis that the execution of approach/avoidance behavior moderates the way in which primes affect behavior.

In line with previous research (Dijksterhuis et al., 1998, 2001), we assume that thinking about professors or about Einstein activated the stereotype of professors, thus increasing the accessibility of the mental representation of intelligent behavior. Similarly, thinking about soccer-players or about Matthäus activated the stereotype of soccer-players, thus increasing the accessibility of the mental representation of non-intelligent behavior. This, we assume, was the case both for participants in the arm flexion as well as for those in the arm extension conditions. However, participants in the arm flexion condition tended to include the prime in the same category as the self. Hence, for participants in the arm flexion condition the heightened activation of the mental representation of intelligent or of non-intelligent behavior produced behavioral assimilation toward these behaviors. In contrast, participants in the arm extension condition tended to represent them-

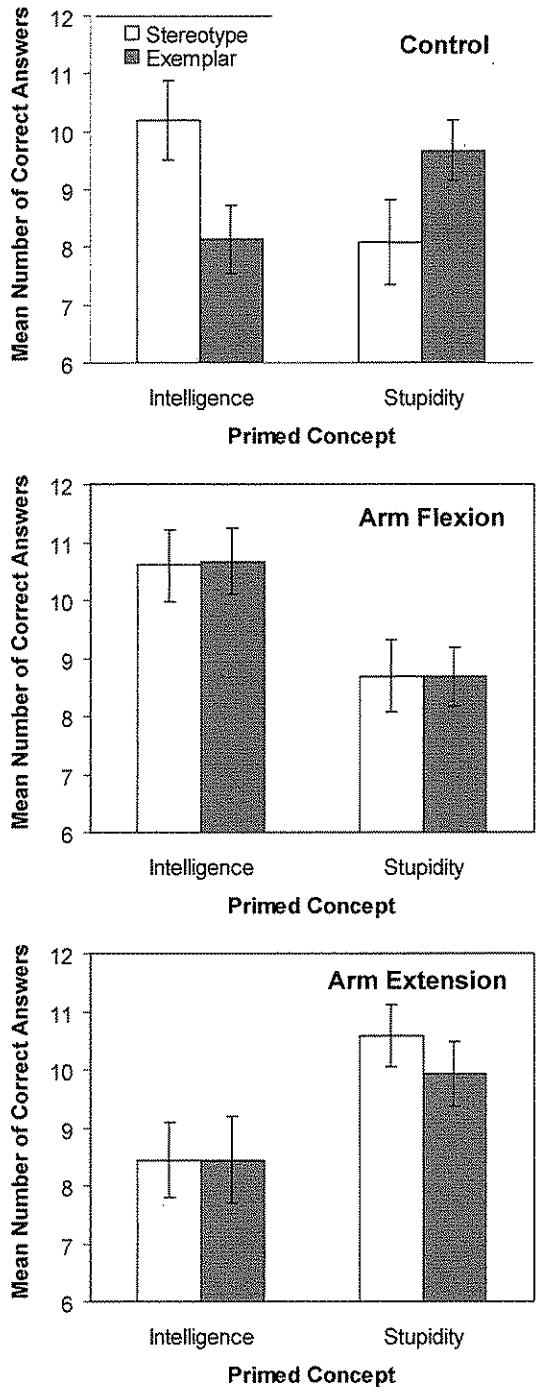

FIGURE 2. Mean number of correct answers as a function of concept and standard plotted separately for the control (top panel), arm flexion (middle panel) and arm extension (bottom panel) positions. Error bars represent 1 SEM (Study 3).

selves and the prime as belonging to different categories and therefore showed behavioral contrast.

Over and above the fact that these results strongly support our hypothesis, they are interesting in yet another respect: Despite the fact that approach and avoidance motivations are usually strongly associated with positive or negative valence respectively (e.g., Chen & Bargh, 1999), in the present results both variables dissociate. Stated differently, even in conditions where the induced motivation was incompatible with the valence of the primed target concept (e.g., approach and dumbness), approach versus avoidance movements still lead to assimilation versus contrast, speaking to the generality and stability of the effect.

GENERAL DISCUSSION

In three studies, we tested the idea that the execution of approach and avoidance motor actions changes the perceived similarity between self and others. Study 1 provides evidence that individuals activating a muscle associated with an approach motor action experience others as more psychologically similar to themselves than those activating a muscle associated with an avoidance motor action. Based on pictures of their faces only, participants flexing their arm rated unknown others as more similar to themselves in terms of personality and psychological characteristics than participants extending their arm. This effect was replicated in Study 2. However, when asked to judge how quiet these individuals were, no effect of arm position emerged. Finally, Study 3 examined the implications of our reasoning for behavioral assimilation and contrast. As in previous studies, the performance of control participants in a general knowledge test showed behavioral assimilation toward primes of groups and behavioral contrast away from primes of individual exemplars (Dijksterhuis et al., 1998, 2001). The performance of participants in arm flexion, however, was assimilated toward stereotypically smart or dumb social primes, no matter whether groups or exemplars were primed, and the performance of participants in arm extension was contrasted away from these primes. We will now discuss the three proposed mechanisms described in the introduction in light of the data.

WHAT IS THE MECHANISM BEHIND THESE EFFECTS?

Because approach and avoidance facilitate the processing of positive and negative concepts, respectively, they could influence similarity ratings, either because similarity is itself more positive than dissimilarity, or because people tend to see themselves in a more positive light and, when perceiving another person also in a positive light under approach motivation, similarities could be more salient.

That similarity and closeness are particularly positive in the social realm has been demonstrated extensively in earlier research: people value their in-group, value belonging, friendship, family bonds, but hate loneliness, exclusion, and being ostracized. Similarity with others entails the chance to compare and learn about oneself (Festinger, 1954), and it is an important basis for group formation (Montoya et al., 2008). Thus, approach might very well be tied to the positive state

of belonging. If this was the case, individuals might perceive similarities particularly for those traits and characteristics that they value. However, the results of Study 3 show no moderation of the effect by the valence of the trait: the degree of assimilation and contrast was the same for dumbness and smartness. It might be that the positivity of belonging outweighs the negativity of a few traits, but it could also be that the effects are not purely affectively driven.

The second possible mechanism for our effects assumes that approach and avoidance influence psychological closeness and distance via *effect priming* and thereby lead to perceiving greater similarity and difference, respectively. Specifically, we argued that the performance of an approach motor action facilitates the processing of cues indicating psychological closeness such as cues indicating similarity between the self and a target person. On the other hand, performance of an avoidance motor action facilitates the processing of cues indicating psychological distance such as cues indicating difference.

In our daily life approach behavior is repeatedly directed toward social objects who are relatively psychologically close to us: We reach to hug or kiss our beloved ones; feed our children; sexually interact with our partners; tend to help others who are similar to ourselves and who are members of our in-group (Burnstein, Crandall, & Kitayama, 1994; Form & Nosow, 1958); and in general maintain a smaller physical distance from those with whom we feel close (Byrne, Baskett, & Hodges, 1971). Avoidance behavior, in contrast, is mainly shown vis-à-vis psychologically distant others (e.g., Macrae, Bodenhausen, Milne, & Jetten, 1994). Thus, decreased/increased psychological distance seems to trigger approach/avoidance behavior, respectively.

Conversely, our daily experience is also rich with situations in which approach/avoidance behavior affects the physical distance from others. Those we nurture, smile to, or help out do have a higher chance of becoming part of our social world so that we see them more regularly than those that we ignore, turn our back to, or stay away from. These experiences should shape a strong link between approach/avoidance and psychological closeness/distance.

One might wonder whether psychological closeness with others necessarily entails similarity. Can't individuals feel close to others who are quite different from them, for example, babies? It seems to us that even in these cases, people still focus as much as possible on similarities, for example through extensive imitation and playful behavior. Indeed, Brass, Derfuss, and Cramon (2004) found that "inhibition of imitative responses involves cortical areas that are required to distinguish between self-generated and externally triggered motor representations" (p. xx). If approach comes with a tendency not to make this distinction, and avoidance with a tendency to make it, then approach should lead to more imitation, but maybe also less self–other differentiation when just thinking about the other, leading to more perceived similarity. So, even though the differences between adults and babies outnumber the similarities, a proneness to imitate, focus on similarities, and disregard differences can still make parents feel similar to their babies.

Finally, our findings also fit predictions from the *global/local processing style model* (GLOMO, Förster et al., 2008). Förster, Friedman, Özelsel, and Denzler (2006) found enhanced global processing under approach motivation, and enhanced local processing under avoidance motivation. The GLOMO (Förster et al., 2008) predicts that global processing is characterized by a wide perceptual and concep-

tual scope, which should lead to assimilation, broader categories, the activation of more abstract concepts, and to searching for similarities. Conversely, local processing is characterized by a narrow perceptual and conceptual scope, which should lead to contrast, narrower categories, the activation of more concrete concepts, and to searching for differences. Thus, it is possible that our results are mediated by a change in processing style (more global or more local).

Where does this leave us? We do not have data to distinguish between the three accounts. Future research will have to show whether it is the warm feeling of belonging, the sensitivity to cues indicating closeness and distance or the processing style that drives these effects. We feel, however, that effect priming is an interesting possibility that has so far been neglected in research on approach and avoidance, even though there are good reasons to assume that it does play a role.

THE ROLE OF APPROACH AND AVOIDANCE BEHAVIOR IN THE EMBODIMENT OF PSYCHOLOGICAL DISTANCE

Before we end in our conclusion, we wish to also briefly discuss the implications of our results to research on embodiment. Our research has focused on the effect of approach and avoidance behavior on one manifestation of psychological distance—namely, perceived similarity of others to self—but the rationale for our hypothesis suggests that approach/avoidance behavior plays an important role in the embodiment of psychological distance in general. Embodied theories of cognition hold that mental representations of concepts are still very much linked to their perceptual basis. In Barsalou's (1999) theory knowledge consists of modal representations called *perceptual symbols*. Our analysis suggests that the embodied mental representation of the psychological dimension of closeness versus distance involves, among other things, motor programs that are used to decrease or to increase one's physical distance from others. We would hence expect that other manifestations of psychological closeness versus distance such as empathy, experienced closeness, and even prejudice would also be affected by the activation of muscles associated with approach/avoidance motor actions.

CONCLUSION

Our studies contribute to a growing body of research that discerns the effect of executing approach and avoidance motor actions on perception (Förster et al., 2006; Friedman & Förster, 2000, 2002). It extends this body of research by demonstrating the effect of executing approach and avoidance motor actions (a) on behavior (see also Förster, 2003), and (b) in the social domain. We hope that understanding the processing styles associated with approach and avoidance behavior in terms of distance-reduction and distance-enhancement would encourage the examination of other behavioral and experiential effects of the orientations such as prejudice and empathy.

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