Research Article

Do Approach-Avoidance Actions Create Attitudes?

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ABSTRACT—*Do approach-avoidance actions create attitudes? Prior influential studies suggested that rudimentary attitudes could be established by simply pairing novel stimuli (Chinese ideographs) with arm flexion (approach) or arm extension (avoidance). In three experiments, we found that approach-avoidance actions alone were insufficient to account for such effects. Instead, we found that these affective influences resulted from the interaction of these actions with a priori differences in stimulus valence. Thus, with negative stimuli, the effect of extension on attitude was more positive than the effect of flexion. Experiment 2 demonstrated that the affect from motivationally compatible or incompatible action can also influence task evaluations. A final experiment, using Chinese ideographs from the original studies, confirmed these findings. Both approach and avoidance actions led to more positive evaluations of the ideographs when the actions were motivationally compatible with the prior valence of the ideographs. The attitudinal impact of approach-avoidance action thus reflects its situated meaning, which depends on the valence of stimuli being approached or avoided.*

Can bodily actions trigger affect? Darwin (1872) is sometimes associated with this view, but he primarily emphasized that emotional expressions intensify emotional response. James (1890/1950) famously claimed that we are "angry because we strike" and "afraid because we tremble" (p. 450). However, his claims concerned definitions rather than causes of emotion. Some evidence does suggest that facial expressions may trigger emotions (e.g., Coan, Allen, & Harmon-Jones, 2001; Duncan & Laird, 1980; Strack, Martin, & Stepper, 1988). In addition, Cacioppo, Priester, and Berntson (1993) suggested that approach-avoidance muscle contractions can directly influence attitudes toward novel objects.

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Cacioppo et al. (1993) demonstrated that arm muscle contraction, as in isometric exercises, influenced evaluations of novel stimuli. Arm flexion made previously evaluated Chinese ideographs more pleasant, whereas arm extension made them less pleasant. The authors theorized that a lifetime of the experience of these actions paired with differential evaluative outcomes can establish higher-order associations that facilitate biased responding when evaluating novel attitude objects, leading to the observed effects. Subsequently, arm flexion and arm extension also were shown to have differential influences on creative insight and problem solving (Friedman & Förster, 2000, 2002).

Work in this and related paradigms suggests an interactive relationship between actions and affect, however. One reason for suspecting that the effect of motor activity on evaluation may be indirect is the necessity of an evaluative context. Cacioppo et al. (1993) demonstrated that arm contraction influenced subsequent attitudes only when participants performed the action while judging evaluative features of the ideographs. No effects were observed when participants instead judged nonevaluative features (stimulus complexity). Förster and Strack (1997, 1998) demonstrated similar boundary conditions. They found that arm flexion facilitated generation of positively valenced material from memory (relative to arm extension), but again, only when people were instructed to consider the valence of the material retrieved while engaging in the action. Additionally, Cacioppo et al. found that after performing flexion and extension, people associated these actions with the words *approach* and *withdraw*, but not with *pleasant* or *unpleasant*, and suggested that the experiential associations to these actions may be motivational, rather than affective.

Neumann, Förster, and Strack (2003) proposed a bidirectional link between behavior and evaluation. The *affect-to-action* relation, whereby positive and negative stimuli elicit approach and avoidance tendencies, respectively, has been documented convincingly. Studies show that people respond faster to positive stimuli when engaging in approach behaviors (e.g., experiencing the target moving closer, flexing the arm) compared with avoidance behaviors (e.g., experiencing the target moving farther away, extending the arm); in contrast, people respond

faster to negative stimuli when engaged in avoidance behaviors compared with approach behaviors (Chen & Bargh, 1999; Neumann & Strack, 2000; Solarz, 1960). However, our focus here is the *action-to-affect* relation. Neumann et al. proposed a compatibility relationship along the lines suggested by Darwin (1872), hypothesizing that bodily expression of approach intensifies positive affective feelings, whereas bodily expression of avoidance intensifies negative affective feelings.

The Gestalt psychologist Fritz Heider (1958) observed that approach-avoidance motions do not, in themselves, convey any fixed meaning. He noted that simple motion might be interpreted as "following" or "chasing," depending on the meaning suggested by the context (Heider & Simmel, 1944). Heider concluded that actions must be interpreted in terms of their situated meaning. We concur with Heider and propose a motivational compatibility explanation for both affect-to-action effects (e.g., Chen & Bargh, 1999) and action-to-affect effects (Cacioppo et al., 1993). We propose that the evaluative meaning of approach-avoidance action depends not on the action alone, but on the motivational appropriateness of the action given the value of its object.

We report three experiments extending previous work in this domain. We expected to find that engaging in motivationally compatible motor action (approach positive, avoid negative) would result in more positive evaluations than engaging in motivationally incompatible motor action (approach negative, avoid positive). We expected to find no direct effect of the motor action (arm contraction) on attitude.

The first two studies investigated the effect of arm contractions on evaluations of mildly positive or negative ideographs. In Experiment 1, participants made immediate like/dislike evaluations of ideographs during arm contraction. In Experiment 2, the instructions told participants to "form an impression" of the ideographs during arm contraction, without encouraging evaluation. In both studies, participants subsequently provided memory-based (delayed) evaluations of the pleasantness of the ideographs. Experiment 3 was a conceptual replication of the original experiments of Cacioppo et al. (1993), but extended the prior work by including the valence of novel ideographs, as determined by pretesting with a different group of subjects, as a within-subjects variable.

In each study, the experimental stimuli were Chinese ideographs. In a prior testing session with participants not included in the main studies, we obtained dichotomous like/dislike judgments and pleasantness ratings for 69 ideographs, including the original 24 used by Cacioppo et al. (1993). Pleasantness ratings were obtained using an 11-point scale with the following points labeled: -5 = *very unpleasant*, 0 = *neutral*, and 5 = *very pleasant*. For use in Experiments 1 and 2, we identified two groups of 12 ideographs, the 24 most extreme items.[1] For clarity, we refer to these as the "positive" and "negative" ideographs. The positive ideographs ($M = 0.94$, $SD = 1.21$) were rated as more pleasant than the negative ideographs ($M = -0.06$, $SD = 1.32$), $t(46) = 5.33$, $p_{rep} > .99$, $\eta_p^2 = .38$. The mean rating of all 24 figures was significantly positive ($M = 0.44$, $SD = 1.09$) with regard to the scale's zero point, $t(46) = 2.78$, $p_{rep} = .96$. For Experiment 3, we used the same ideographs that Cacioppo et al. did.

EXPERIMENT 1

Method

Experiment 1 included 39 participants (31 female). One participant experienced a computer malfunction, and 2 did not complete all measures, leaving data from 36 participants (28 female).[2]

We employed a 2 (ideograph valence: positive, negative) × 2 (arm contraction: flexion, extension) between-subjects design. There were two primary dependent measures—immediate evaluations of the ideographs (proportion liked) and delayed evaluations (pleasantness ratings) of the individual ideographs at the end of the study (1 = *very unpleasant*, 7 = *very pleasant*). Participants also rated the pleasantness and effortfulness of the arm contraction, and their current mood, using 9-point rating scales.

We followed the procedure of Cacioppo et al. (1993), with minor modifications. Participants were tested in groups of 1 to 4 people and told that the experiment concerned the effects of tension achieved by adopting different arm positions. The experimenter demonstrated arm flexion and extension, and explained that the participants would perform one of the actions while making judgments about figures displayed on a computer. Participants then completed the task in individual booths within view of the experimenter.

Computer instructions indicated which arm position to use. For flexion, participants pressed the palm of their dominant hand against the bottom edge of the table. For arm extension, participants instead pressed their palm against the top surface of the table. They were instructed to maintain the arm tension, but not so much that the position became uncomfortable. While experiencing each ideograph, participants (a) initiated the arm position, (b) pressed a button using the index finger of their nondominant hand to initiate presentation of the figure, and (c) decided whether they liked or disliked the figure. After making this judgment, participants discontinued the arm position and recorded their response on a sheet. Ideographs were presented in a fixed random order. Next, participants completed several questionnaires. On the first questionnaire, they used 9-point scales to evaluate their overall mood and the degree to which they were experiencing various feelings. They also evaluated how pleasant and how effortful the arm task had been. Next,

[1] Duckworth, Bargh, Garcia, and Chaiken (2002) demonstrated previously that subtle differences in the valence of novel stimuli influence evaluation, and the evaluation-to-action link.

[2] To ensure that the ideographs were novel, we did not include data from participants who indicated they could read ideographs ($n = 8$ in the pretesting session, 0 in Experiment 1, 2 in Experiment 2, and 4 in Experiment 3).

participants completed several questionnaires unrelated to the results reported here. They then evaluated the pleasantness of each of the 24 ideographs they had experienced during the arm-contraction task. The final questionnaire included a funnel-type check for suspicion. Participants were also asked to indicate which arm position they had used and whether they could read the ideographs. Finally, they provided demographic information before being debriefed, thanked, and dismissed.

Results

Overall Evaluations

The immediate and delayed evaluations of the ideographs were reliably correlated, $r(36) = .45$, $p < .01$. We analyzed these attitudes in a mixed-model analysis of variance (ANOVA), with immediate evaluations (like/dislike judgments) and delayed evaluations (pleasantness ratings) as a repeated measure of attitude after transforming them into standardized scores. Ideograph valence and arm position were the other factors. The means for the combined evaluation measures are displayed in Figure 1. The analysis revealed only the predicted Valence × Arm Position interaction, $F(1, 32) = 5.25$, $p_{rep} = .91$, $\eta_p^2 = .14$. No main effects of arm position or ideograph valence emerged (Fs < 1.2). Attitudes were more positive when the motor action was motivationally compatible with the valence of the ideograph (approach positive, avoid negative) than when the motor action was motivationally incompatible with the valence of the ideograph. (See Table 1 for the descriptive statistics.)

The effect of approach-avoidance action on immediate evaluations (liking) was not significantly different from its effect on delayed attitudes (pleasantness). Nevertheless, the effect did appear more pronounced on the immediate measure, $F(1, 32) = 5.88$, $p_{rep} = .93$, $\eta_p^2 = .02$, than on the delayed measure, for which the same crossover interaction was not quite significant when analyzed separately, $F(1, 32) = 2.32$, $p_{rep} = .77$, $\eta_p^2 = .07$. This difference in the effect over time was explained by a significant Time × Valence within-subjects interaction, $F(1, 32) = 4.09$, $p_{rep} = .87$, $\eta_p^2 = .11$. The interaction indicated that ideograph valence had a larger effect on delayed attitudes than on immediate evaluations; although arm contraction initially moderated the effect of preexisting valence on attitudes, this effect decreased over time.

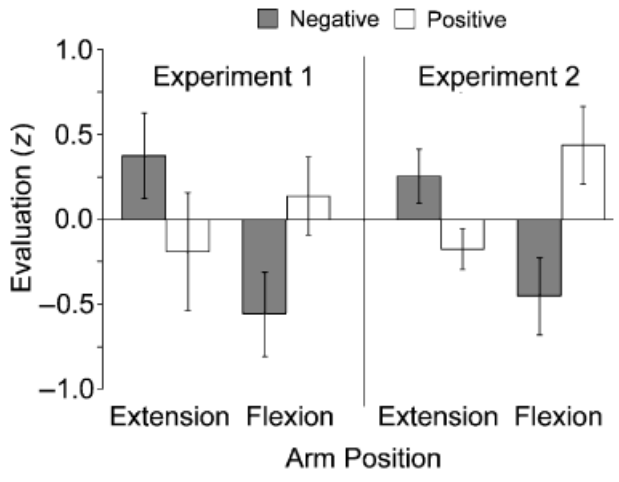

Fig. 1. Standardized mean effect of arm position and ideograph valence on combined evaluations of the ideographs (immediate liking and delayed pleasantness) in Experiment 1 (left) and on evaluation of the arm-contraction task (immediate pleasantness) and the ideographs (delayed pleasantness) in Experiment 2 (right).

TABLE 1
Mean Evaluations and Ratings as a Function of Ideograph Valence and Approach-Avoidance Motor Action in Experiment 1

Ideograph valence	Motor action	
	Flexion	Extension
	Proportion of ideographs liked	
Positive	.55 (.09)	.52 (.12)
Negative	.50 (.11)	.63 (.08)
	Pleasantness rating (ideographs)	
Positive	4.33 (0.36)	4.17 (0.45)
Negative	3.93 (0.41)	4.21 (0.50)
	Pleasantness rating (arm task)	
Positive	4.50 (1.08)	5.75 (1.58)
Negative	5.29 (2.06)	5.45 (1.81)
	Effortfulness rating (arm task)	
Positive	4.30 (2.31)	2.00 (1.31)
Negative	2.57 (1.51)	3.18 (1.72)
	Mood rating	
Positive	6.20 (0.92)	6.50 (1.07)
Negative	6.57 (1.40)	6.09 (1.14)

Ratings of the Arm-Contraction Task and Mood

No effects of the manipulation on mood or pleasantness of the arm task were observed (all Fs < 1.9, n.s.). Arm contraction was rated more effortful when motivationally congruent, rather than incongruent, with ideograph valence, $F(1, 32) = 5.71$, $p_{rep} = .92$, $\eta_p^2 = .15$ (see Table 1).

Discussion

Experiment 1 revealed two novel attitude effects. First, immediate evaluations reflected the predicted effect of motivational compatibility on attitude. Second, delayed attitudes appeared to reflect additionally an influence of the a priori valence of the ideographs.

We conducted Experiment 2 to replicate these findings and to investigate a novel prediction. We eliminated the immediate like/dislike judgments and any mention of ideograph evaluation prior to collecting ratings of the ideographs' pleasantness at the end of the study. We predicted that the pattern of delayed atti-

tudes toward the ideographs would be similar to the pattern found in Experiment 1. Additionally, we tested whether the immediate pleasantness associated with engaging in motivationally compatible action would generalize to judgments of the pleasantness of arm contraction itself, or perhaps general mood.

EXPERIMENT 2

Method

Experiment 2 had 57 participants (41 female). Data from 1 participant who failed to follow the arm instruction and 3 who provided incomplete data were not analyzed, leaving data from 53 participants (38 female). The dependent measures were identical to those of Experiment 1, except that no immediate evaluations of the ideographs were collected.

The materials, design, and procedure were the same as in Experiment 1, with one exception. Rather than making immediate like/dislike judgments during arm contraction, participants were instructed to "form an impression" of each ideograph and check off that they had done so on the response sheet.

Results

Overall Evaluation

As in Experiment 1, the results were analyzed in a mixed-model ANOVA with immediate and delayed evaluations as a repeated measure. However, in this experiment, the first evaluation was of the task rather than of the ideographs. As in Experiment 1, evaluative measures were standardized before analysis, and ideograph valence and arm position were also included as factors. The analysis revealed only the predicted Valence × Arm Position interaction, $F(1, 49) = 10.13$, $p_{rep} = .98$, $\eta_p^2 = .17$. The means for the combined evaluation measures are displayed in Figure 1 (see Table 2 for the descriptive statistics).

Evaluation of the Ideographs

The absence of a higher-order interaction with evaluation indicated that approach-avoidance action affected immediate evaluations of the task and delayed evaluations of the ideographs in a similar way. Nevertheless, we also examined each measure separately. There were significant Valence × Arm Position interactions for both the ratings of task pleasantness, $F(1, 49) = 9.03$, $p_{rep} = .98$, $\eta_p^2 = .16$, and the delayed evaluations of the ideographs, $F(1, 49) = 3.95$, $p_{rep} = .87$, $\eta_p^2 = .07$. There was no main effect of arm position by itself, $F < 1$. Eliminating immediate like/dislike evaluations during stimulus presentation did not eliminate the attitude effect. Comparable compatibility effects emerged for immediate evaluation of the pleasantness of arm contraction itself. Arm flexion with positive ideographs and arm extension with negative ideographs were experienced as more pleasant than were the motivationally incompatible pairings.

TABLE 2

Mean Ratings as a Function of Ideograph Valence and Approach-Avoidance Motor Action in Experiment 2

Ideograph valence	Motor action	
	Flexion	Extension
	Pleasantness rating (ideographs)	
Positive	4.55 (0.64)	4.33 (0.45)
Negative	4.05 (0.56)	4.42 (0.50)
	Pleasantness rating (arm task)	
Positive	5.17 (0.94)	4.13 (1.25)
Negative	4.08 (1.32)	5.00 (1.15)
	Effortfulness rating (arm task)	
Positive	2.92 (1.56)	2.87 (1.13)
Negative	4.85 (2.03)	4.08 (1.85)
	Mood rating	
Positive	6.67 (1.07)	5.93 (1.16)
Negative	6.46 (1.33)	5.85 (1.28)

Other Effects

Arm contraction was evaluated as more effortful with unpleasant ideographs ($M = 4.46$) than with pleasant ideographs ($M = 2.89$), $F(1, 49) = 11.75$, $p_{rep} = .99$, $\eta_p^2 = .19$. In addition, participants reported a more positive mood after arm flexion ($M = 6.56$) than after arm extension ($M = 5.89$), $F(1, 49) = 4.05$, $p_{rep} = .88$, $\eta_p^2 = .08$ (see Table 2). We take this to indicate that because of the overall positivity of the sample of ideographs, the net effect of approach was positive and that of avoidance was negative.

Discussion

As in Experiment 1, the evaluative impact of motor action depended on the preexisting value of the object of the action. There was no main effect showing a positive influence of arm flexion. Rather, ideographs were evaluated more positively whenever actions were motivationally compatible, rather than incompatible, with the value of the ideographs. In Experiment 1, participants explicitly focused on evaluating the ideographs by making like/dislike decisions during arm contraction. In Experiment 2, we first asked participants to evaluate the arm task, instead of the ideographs. As a result, they attributed the affective consequences of motivationally compatible (or incompatible) action to the arm task, as well as to the ideographs. More critically, we also replicated the compatibility effect for delayed attitudes toward the ideographs.

The results of the first two experiments were consistent. Motivationally compatible actions enhanced evaluations of novel ideographs compared with motivationally incompatible actions. We found no direct influence of arm contraction on attitude formation. Rather, the effects of arm contraction depended on how appealing the ideographs themselves were. Previous stud-

ies may have minimized potential effects of differences in ideograph valence by randomly assigning pairs of ranked ideographs to arm condition using individual participants' pretest evaluations. Furthermore, preexposure to the ideographs may have enhanced their overall positivity somewhat. As long as stimuli are at least mildly positive, approach should bias evaluations positively and avoidance negatively. In our sample, the same set of ideographs was judged by pretest participants to be somewhat positive overall, which explains how arm contraction could have influenced general mood in Experiment 2. However, the critical effect on attitudes toward the ideographs reflected only the motivational compatibility between the actions and ideograph valences.

The first two experiments used stimuli selected to be (relatively) positive or negative. Experiment 3 was conducted to determine whether similar effects would emerge with the ideographs originally used by Cacioppo et al. (1993).

EXPERIMENT 3

Method

Experiment 3 had 34 participants (17 female). The 24 ideographs from the original experiments by Cacioppo et al. (1993) were used. Overall, the mean pretesting pleasantness rating for these ideographs ($M = 0.34$) was nonsignificantly more positive than the neutral point of the rating scale, $t(23) = 1.52$, $p_{rep} = .77$.

We varied ideograph valence within subjects to investigate potential effects of not only the most positive and negative ideographs within the set, but also figures in the midrange. To obtain a neutral category, we used the pretest pleasantness ratings to identify four subsets of ideographs (6 ideographs each): very positive ($M = 1.25$, $SD = 1.36$), positive ($M = 0.46$, $SD = 1.32$), neutral ($M = 0.01$, $SD = 1.28$), and negative ($M = -0.36$, $SD = 1.37$). To test the hypothesized effects, we focused on the three ideograph sets that were symmetrical around zero.

The design differed from that of the first two experiments in two respects. First, the critical comparisons involved three valence categories: positive, neutral, and negative ideographs. Second, three levels of arm contraction were manipulated between subjects: flexion, extension, and relaxation. For the relaxed arm condition, we instructed participants to rest their dominant arm comfortably on the table in such a way that they did not feel any tension in their arm. The procedure was identical to that of Experiment 1, except that each participant experienced the 24 ideographs from Cacioppo et al. (1993), in a fixed random order. The dependent measures were the same as those in Experiment 1.

Results

Evaluation of the Ideographs

We predicted a linear interaction between valence and arm position, and therefore tested the interaction contrasts, as recommended by Rosenthal and Rosnow (1985). For the ideograph-valence factor, the contrast weights were +1 for positive, 0 for neutral, and −1 for negative. For the arm factor, the contrast weights were +1 for flexion, 0 for relaxation, and −1 for extension. These contrasts were used in each of the analyses conducted.

As in Experiment 1, the immediate and delayed evaluations of the overall set of ideographs were reliably correlated, $r(34) = .63$, $p < .001$. We analyzed the predicted interaction contrasts for ideograph evaluations in a mixed-model analysis, using the PSY statistical program (Bird, Hadzi-Pavlovic, & Isaac, 2000), which is suitable for conducting contrast analyses within a mixed-model design. Immediate evaluations (liking) and delayed evaluations (pleasantness ratings) were transformed into standardized scores and served as repeated measures of attitude. Ideograph valence and arm position were also included as factors.[3]

The analysis yielded a significant main effect of valence, $F(1, 31) = 4.35$, $p_{rep} > .88$, $\eta_p^2 = .12$, which was qualified by the predicted higher-order Valence × Arm Position interaction, $F(1, 31) = 4.95$, $p_{rep} > .89$, $\eta_p^2 = .14$. The interaction residuals are displayed in Figure 2 (see Table 3 for obtained means and standard deviations).

We also conducted separate analyses of the predicted contrasts for both the immediate and the delayed evaluations. As predicted, the contrast analysis for the immediate evaluations (like/dislike judgments) confirmed the Valence × Arm Position interaction, $F(1, 31) = 9.66$, $p_{rep} > .96$, $\eta_p^2 = .24$. Positive ideographs were liked more when paired with approach than when paired with avoidance, whereas negative ideographs were liked more when paired with avoidance than when paired with approach. Arm contraction, by itself, had no effect on attitudes. The Valence × Arm Position interaction for delayed evaluations was similar in form to the effect on immediate evaluations, but not significant by itself, $F(1, 31) = 1.51$, $p_{rep} = .52$, $\eta_p^2 = .05$. There was a significant main effect of ideograph valence on delayed evaluations, $F(1, 31) = 6.53$, $p_{rep} > .94$, $\eta_p^2 = .17$.

Ratings of the Arm-Contraction Task

There was a significant main effect of arm position on ratings of the pleasantness of the arm-contraction task, $F(2, 31) = 22.06$, $p_{rep} > .99$, $\eta_p^2 = .06$. Post hoc tests (LSD contrast) indicated that relaxation was more pleasant ($M = 7.23$, $SD = 1.69$) than both flexion ($M = 4.73$, $SD = 0.91$) and extension ($M = 3.80$, $SD = 1.03$). Pleasantness ratings for flexion and extension did not differ. Arm contraction had no effect on ratings of the task's effortfulness.

[3] We also tested the full set of ideographs, using orthogonal linear contrasts of −3, −1, 1, and 3 (negative, neutral, positive, and very positive), and found the same reliable Valence × Arm Position interaction for delayed attitudes, $F(1, 31) = 5.68$, $p_{rep} = .91$, $\eta_p^2 = .15$. The analysis of combined attitudes showed a trend for the same interaction, $F(1, 31) = 3.14$, $p_{rep} > .82$, $\eta_p^2 = .09$.

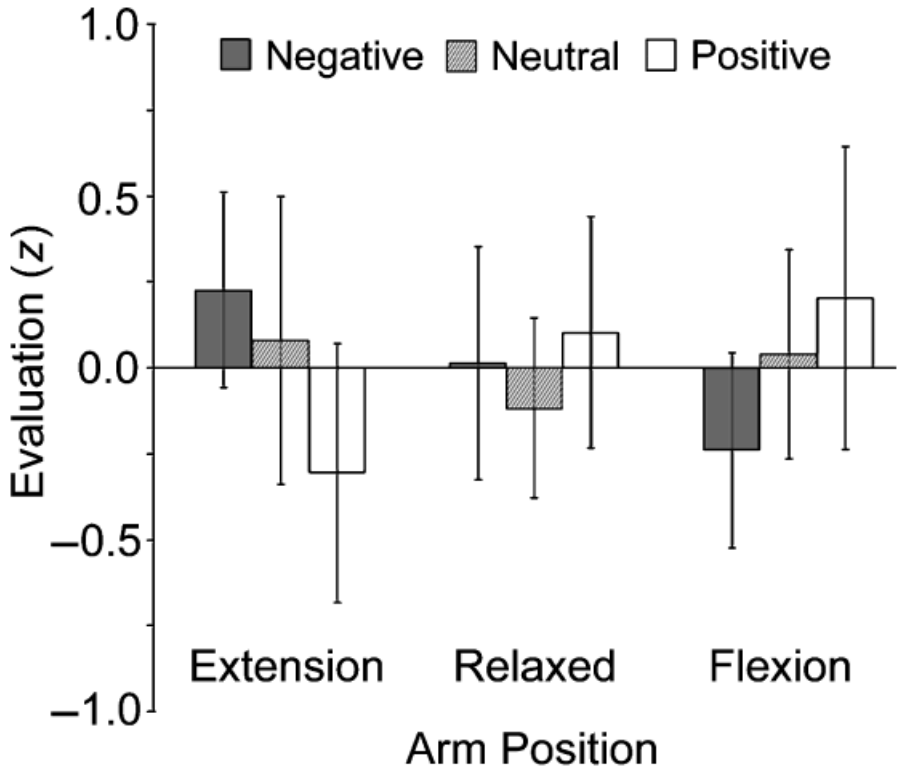

Fig. 2. Standardized interaction residuals for the mean effect of arm position and ideograph valence on the combined evaluations of the ideographs (immediate liking and delayed pleasantness) in Experiment 3.

GENERAL DISCUSSION

We hypothesized that attitudes toward novel stimuli (ideographs) experienced during approach or avoidance motor actions would depend on the motivational compatibility of stimulus and action. Three experiments supported this hypothesis in demonstrating that attitudinal effects indeed depended on the subtle preexisting values of the novel stimuli that had been approached or avoided.

TABLE 3

Mean Evaluations and Ratings as a Function of Ideograph Valence and Approach-Avoidance Motor Action in Experiment 3

Ideograph valence	Motor action		
	Flexion	Relaxation	Extension
	Proportion of ideographs liked		
Very positive	.515 (.204)	.654 (.209)	.618 (.249)
Positive	.606 (.282)	.667 (.215)	.550 (.236)
Neutral	.515 (.217)	.590 (.161)	.557 (.251)
Negative	.439 (.214)	.603 (.250)	.650 (.183)
	Pleasantness rating (ideographs)		
Very positive	4.36 (.609)	4.19 (.874)	3.95 (.550)
Positive	4.44 (.914)	4.45 (.812)	4.25 (.699)
Neutral	3.94 (.680)	3.83 (.601)	4.02 (.811)
Negative	3.89 (.783)	4.12 (.958)	4.12 (.758)

Also of interest was whether the actions by themselves would have direct attitudinal effects. We found no evidence to support that conclusion. Attitudinal objects do appear to call for particular actions, but by themselves, particular actions did not imply attitude. Cacioppo et al. (1993) proposed that affective value was transferred to neutral ideographs from positive (approach) or negative (avoidance) action. Our results extend, but also modify, those conclusions.

Value appears not to be fixed in direct associations to these actions, but rather to depend on the motivational compatibility of action and stimulus value. Our results showed that arm contractions had no effect when stimuli were neutral, in that the predicted interaction of arm position and ideograph valence was confirmed when neutral ideographs were tested with a contrast weight of 0 across all levels of arm position. Whether each action (approach or avoidance) led to more positive or less positive evaluations depended on the a priori valence of the ideographs. Although arm contractions do influence attitudes toward their objects, whether the resulting attitude change is in a positive or negative direction depends not on the approach-avoidance action per se, but on whether the action is motivationally compatible with stimulus valence.

Solarz (1960) and Chen and Bargh (1999) previously examined the *attitude-to-action* effect, as opposed to the *action-to-attitude* effect studied here. They found that responses to attitude objects (valenced words) are faster when positive words are

"pulled" (a card displaying a word or a joystick is moved toward oneself) and negative words are "pushed" (a card displaying a word or a joystick is moved away from oneself), compared with the alternative pairings of action and valence. This result appeared to reflect an influence of affective compatibility, and current explanations assume that approach is relevant to positive value and avoidance is relevant to negative value. From this perspective, our results might be explained by assuming that stimuli and actions each contributed a positive or negative value. Compatibility would then involve the experience of a match between affective cues. However, we found no evidence for a direct effect of arm contraction on attitude, and (in Experiment 3) attitudes toward neutral stimuli were reliably modeled by a contrast coding of 0 (across all levels of arm contraction). Thus, motor action alone does not appear to have conveyed affective value, as required by such an account.

We interpret prior findings as reflecting instead a motivational compatibility between stimulus value and participants' (presumably automatic) tendency to approach pleasant, and avoid unpleasant, stimuli. A virtue of the motivational compatibility explanation is that it integrates the action-to-attitude effects of Cacioppo et al. (1993) with the attitude-to-action results of Chen and Bargh (1999) and of Solarz (1960). We also see it as extending Neumann and Strack's (2000) account of motor compatibility by suggesting a unidirectional account of observed effects that previously appeared to require a bidirectional explanation. Note that our motivational account explains why avoidance of unpleasant stimuli should result in both fast responding and positive experience.

We expect motivational compatibility effects on attitudes to be strongest when preexisting attitudes are already weak. With strong attitudes, direct influence of prior attitude should overshadow any compatibility, as suggested in our findings for delayed attitudes, and in Förster's (2004) findings for strong attitude objects. That said, we have provided evidence that the compatibility experience itself can generalize beyond attitudes toward objects to evaluations of the experience itself (i.e., pleasantness of the arm task in Experiment 2). This suggests that motivational compatibility may be experientially similar to other phenomena, such as fluency (Winkielman & Cacioppo, 2001; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). An action may serve as experiential evidence that one is responding appropriately (Clore & Gasper, 2000). By extension, if appropriate (motor) action represents a form of regulatory "fit," our findings would also be consistent with Higgins's (2000) "value from fit" account.

Additional studies from our lab have demonstrated that arm contraction crossed with indirect priming of affective words can also produce interactive effects on a secondary task (recall; Centerbar, Schnall, Clore, & Garvin, 2005). Other researchers have shown similar reversals in the effects of other motor actions (Briñol & Petty, 2003; Tamir, Robinson, Clore, Martin, & Whitaker, 2002), demonstrating that low-level motor influences such as the influences of head shakes and nods are likewise not direct, but rather are dependent on their situated meaning. Similarly, the affective influences of mood are also not direct, but context dependent (e.g., Clore & Gasper, 2000; Martin, 2001; Schwarz & Clore, 1983).

In agreement with Heider (1958), we suggest that approach-avoidance actions can have context-dependent "meanings." The affective meaning of such actions depends on the match between approach-avoidance and the desirability of the object itself.

Acknowledgments—We acknowledge the support of National Institute of Mental Health Grant MH-50074. We thank Brian Nosek, Simone Schnall, and Tim Wilson for helpful comments on the manuscript and give special thanks to John Cacioppo for providing the ideographs used in the original research.

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(Received 8/9/04; Revision accepted 6/13/05;
Final materials received 6/29/05)