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One Way and the Other: The Bidirectional Relationship Between Ambivalence and Body Movement

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Abstract

Prior research exploring the relationship between evaluations and body movements has focused on one-sided evaluations. However, people regularly encounter objects or situations about which they simultaneously hold both positive and negative views, which results in the experience of ambivalence. Such experiences are often described in physical terms: For example, people say they are "wavering" between two sides of an issue or are "torn." Building on this observation, we designed two studies to explore the relationship between the experience of ambivalence and side-to-side movement, or wavering. In Study 1, we used a Wii Balance Board to measure movement and found that people who are experiencing ambivalence move from side to side more than people who are not experiencing ambivalence. In Study 2, we induced body movement to explore the reverse relationship and found that when people are made to move from side to side, their experiences of ambivalence are enhanced.

Keywords

ambivalence, attitudes, body movement, Wii Balance Board, human body

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What people feel and think is often reflected in the way their bodies move. In *The Expression of Emotion in Man and Animal* (1872), Darwin defined "attitude" as a collection of motor behaviors—especially posture—that reflect an organism's evaluation of an object. Since then, an expanding body of research has investigated the relationship between body movement and evaluations.

Some of the body movements reflecting evaluations are small. Subtle changes in activity in specific facial muscles, for instance, can reveal positive and negative evaluations (e.g., Cacioppo, Petty, Losch, & Kim, 1986). Other movements, such as head nodding or head shaking to indicate agreement or disagreement, are more overt (e.g., Wells & Petty, 1980). Still other movements incorporate the whole body. A relaxed and open posture, for example, indicates liking of other people (Mehrabian, 1968); a backward tilt of the head and expansion of posture indicate pride (Tracy & Robins, 2004); slumped shoulders indicate feelings of depression (e.g., Wallbott, 1998); and a stance that leans forward or backward indicates positivity or negativity toward an affective image (Eerland, Guadalupe, Franken, & Zwaan, 2012; Hillman, Rosengren, & Smith, 2004). To summarize, body movements can reflect one's evaluations—of people (including the self), objects, and situations.

So far, research involving posture, movement, and evaluations has focused on objects or situations that elicit an obvious and unequivocal evaluation. In real life, however, people regularly encounter objects or situations about which they have both positive and negative affective evaluations, which results in ambivalence. Despite the ubiquitous nature of ambivalence, little is known about its embodiment. Knowledge about the body movements accompanying ambivalence may help people cope with the complexity of ambivalence and subsequent decision making. In the research reported here, we asked an important first question in the domain of ambivalence and body movements: How does the body behave when people experience ambivalence? To our knowledge, this study is the first to explore this intriguing question.

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Ambivalence refers to simultaneously holding both positive and negative evaluations about an object or issue (Kaplan, 1972; Thompson, Zanna, & Griffin, 1995). These evaluations are strongly associated with the object or issue in question (de Liver, van der Pligt, & Wigboldus, 2007), and this fact distinguishes ambivalence from indifference. People may think positively about eating fast food, for instance, because it is an easy option (and a cheap one), but at the same time, they may detest the fact that it tends to be fattening. Similarly, people may be in favor of abortion because they find self-integrity important, but they may also oppose the idea of killing a fetus. People experience ambivalence about a wide array of topics (for an overview, see van Harreveld, Rutjens, Schneider, & Nohlen, 2012), and experiences of ambivalence are an inherent part of daily life.

There is no empirical evidence concerning the body's response to the experience of ambivalence, but language provides a clue. Ambivalence is often expressed in physical terminology. When talking about topics that induce feelings of ambivalence, people often say that they are "torn" or "wavering" between the two sides—or perhaps "dancing between two opinions" or "straddling the issue." When they reflect on different points of view, they say, "On the one hand . . . , but on the other hand," gesturing with each hand in turn (Calbris, 2008). Conversely, when people have a nonambivalent opinion about something, they "take a stand." These verbal expressions of ambivalence (and univalence) may be more than just figures of speech; they are likely to reflect people's concrete physical experience (cf. Lakoff & Johnson, 1999).

We conducted two studies to explore the idea of side-to-side movement as a physical expression of ambivalence. In the first study, we investigated the influence of ambivalence on side-to-side movements and hypothesized that people who were experiencing ambivalence would move from side to side more than people who were not experiencing ambivalence. In Study 2, we investigated the reverse relationship, examining whether moving from side to side enhances the experience of ambivalence.

Study 1

The primary aim of Study 1 was to investigate whether people spontaneously engage in side-to-side movement when experiencing ambivalence. We used a Wii Balance Board (WBB) to measure participants' movements during the experiment. The extent of side-to-side movement was operationalized as the number of *x*-flips (Dale & Duran, 2011)—that is, the number of directional changes in mediolateral balance (shifting balance from left to right, and vice versa). We expected that participants would exhibit more *x*-flips when they experienced ambivalence than when they did not. As a secondary goal, we wanted to investigate whether participants would move more or less from side to side when they had to explicitly evaluate an issue about which they felt ambivalent. We anticipated two possible outcomes. First, if the experience of ambivalence is most pronounced when people have to make a discrete choice (van Harreveld, Rutjens, Rotteveel, Nordgren, & van der Pligt, 2009), explicitly evaluating the issue might increase side-to-side movement. Alternatively, people might resolve their ambivalence and "take a stand" when asked to choose between sides, in which case we could expect to see less side-to-side movement when participants explicitly evaluated the issue.

Participants and design

Sixty-one students at the University of Amsterdam (17 males, 44 females; mean age = 20.64 years, SD = 2.24 years) participated in this experiment for course credit. The experiment had a two-factor (valence: ambivalence or univalence; phase: manipulation, questionnaire, or evaluation) mixed design, with the latter factor as a within-subjects variable. The main dependent variable was the number of *x*-flips.

Apparatus

To measure body movement, we used a WBB, which has been established as a reliable and valid way to record the center of pressure (COP), a measure of balance (Clark et al., 2010). We used custom software to record changes in the COP. Mediolateral balance was calculated from the weight distribution on the left and right sensors; anterior-posterior balance was measured by the weight distribution on the front and back sensors. Data were sampled at a rate of 33 Hz.

Materials and measures

To manipulate ambivalence, we presented participants with a purported newspaper article (cf. van Harreveld et al., 2009) concerning a proposal to abolish minimum wages for young adults. In the ambivalent version of this article, the pros and cons of the proposal were discussed. In the univalent condition, only positive aspects of the proposal were discussed. The two articles were of similar length.

As a manipulation check, we assessed the extent to which participants experienced ambivalence after reading the article. We did this by means of three items. Participants indicated whether their thoughts and feelings with regard to the issue were conflicting (scale from 1, *no conflicting thoughts and feelings at all*, to 7, *maximum conflicting thoughts and feelings*), were indecisive (scale from 1, *not indecisive at all*, to 7, *extremely indecisive*), and were mixed (scale from 1, *no mixed feelings at all*, to 7, *extremely mixed feelings*; Priester & Petty, 1996; α = .88).[1]

To rule out the possibility that any effects of ambivalence on movement were driven by the ambivalent text seeming more complex than the univalent text, we measured the complexity of both texts with two statements ("Language use in this article is clear" and "The content of this article is easy to understand"). The 7-point rating scales ranged from 1, *completely agree*, to 7, *do not agree at all;* r = .85. We also asked participants to report their age and sex.

We measured side-to-side movement by recording the *x*- and *y*-coordinates of the COP during the experiment. We then used these coordinates to determine the number of *x*-flips and—to be able to discriminate between side-to-side movements and other movements—*y*-flips (directional changes in anterior-posterior balance). Finally, we recorded time to completion, to allow us to control for duration.

Procedure

Upon entering the lab, participants were randomly assigned to either the univalent condition or the ambivalent condition. They were told that they would participate in an experiment on comprehensive reading. Prior to the start of the experiment, we calibrated the WBB to the neutral body posture of each individual participant; we then recorded the COP throughout the experimental session. Instructions appeared on a screen at a distance of 150 cm from the participants while they were standing on the WBB. Participants read either the ambivalent or the univalent text (manipulation phase) and then filled out a questionnaire consisting of the manipulation check, the complexity measure, and some demographic variables (questionnaire phase). After this, they were instructed to think about the topic of the article for 30 s, after which they indicated their evaluation of the topic (either positive or negative) by leaning to the left or right on the WBB (evaluation phase).

Results and discussion

Preliminary analysis and data preparation. To make sure our experimental groups did not differ with regard to agility, we compared the number of *x*-flips between the two groups while they were reading the neutral instruction screen; we found no differences ($F < 1$, $p = .60$). Inclusion of this baseline as a covariate did not alter any of the results, and it is not discussed further. To control for differences between participants in time spent on the experiment, we divided each participant's number of *x*-flips by the time he or she took to complete the experiment; we used this measure to test our hypothesis.

A *t* test with valence (ambivalent vs. univalent) as a between-subjects factor and experienced ambivalence as the dependent variable revealed that participants in the ambivalent condition experienced more ambivalence (M = 4.34, SD = 1.13) compared with participants in the univalent condition (M = 3.33, SD = 1.31), $t(59) = 3.22$, $p = .002$, $r = .38$. The texts did not differ in their rated complexity (overall M = 1.75, $p > .95$).

Main analyses. As expected, a repeated measures analysis of variance with valence as a between-subjects variable and phase as a within-subjects variable revealed a main effect of valence on the adjusted number of *x*-flips, $F(1, 59) = 13.25$, $p = .001$, $\eta_p^2 = .18$. This means that participants who had read the ambivalent text moved more from side to side than did those who had not. In addition, the degree to which participants experienced ambivalence was positively correlated with side-to-side movement, $r = .38$, $p = .003$; thus, the more ambivalence the participants experienced, the more they moved from side to side.

We also found a main effect of phase, $F(1, 59) = 29.46$, $p < .001$, $\eta_p^2 = .33$. Post hoc tests employing a Bonferroni correction showed that participants made fewer directional changes in the mediolateral direction in the evaluation phase compared with the other two phases (both *p*s < .001); the adjusted number of *x*-flips did not differ between the manipulation and questionnaire phases ($p = 1$). (Means and standard deviations are displayed in Table 1.) Finally, there were no effects of condition on the number of *y*-flips (adjusted for time taken to complete the experiment) for any of the phases (all *p*s > .08).

In sum, these results show that people move their bodies from side to side more when they experience ambivalence than when they do not. When people are forced to come to a dichotomous evaluation, however, they will reduce their side-to-side movement and "take a stand."

Study 2

The aim of Study 2 was to further test our idea that ambivalence is accompanied by side-to-side body movements. Previous research has shown that one's evaluation is enhanced when one's body movement is congruent with the valence of the topic being considered. When people read a cartoon, for instance, they find the cartoon funnier when their facial muscles are fixed in a smile (cf. Strack, Martin, & Stepper, 1988), because smiling and experiences of joy are strongly linked. Thus, if people indeed have a general tendency to move from side to side when they experience ambivalence, engaging in such movement could also increase feelings of ambivalence. Building on this idea, we hypothesized that side-to-side movement experienced when reflecting on a topic that induced ambivalence would enhance people's feelings of ambivalence. Thus, in Study 2, we manipulated body movement and tested whether participants experienced more ambivalence when they moved from side to side than when they made another type of movement or did not move at all.

Table 1. Mean Number of Adjusted *x*-Flips in Each of the Phases of Study 1

Phase	Ambivalent condition	Univalent condition
Manipulation	0.41 (0.06)	0.35 (0.08)
Questionnaire	0.41 (0.06)	0.35 (0.07)
Evaluation	0.35 (0.09)	0.30 (0.08)

Note: Standard deviations are in parentheses. The adjusted number of *x*-flips is the total number of *x*-flips made, divided by the total time to complete the experiment.

Participants and design

Seventy-four participants (31 males, 43 females; mean age = 27.3 years, *SD* = 8.8 years) were recruited in a city park in Amsterdam and received a cold drink for their participation. The experiment had three conditions. In the experimental condition, people moved from side to side. To be able to control for the effect of any movement, we included a condition in which participants moved up and down, rather than from side to side. Finally, we included a control condition in which participants did not move at all. Thus, the experiment followed a one-factor (movement: side to side, up and down, or control) between-subjects design; experienced ambivalence was the main dependent variable.

Materials

We created three film clips to use as instructional videos for the participants. Each film clip showed one of the three movement conditions—side to side, up and down, or no movement—and the same actor performed in all the clips. To induce ambivalence, we created a questionnaire that instructed participants to think of a topic they felt ambivalent about. They were asked to write down their thoughts or feelings regarding this topic (cf. van Harreveld et al., 2012).

Experience of ambivalence was measured by three questionnaire items. On 100-point, continuous-line scales, participants indicated whether their thoughts and feelings on the topic were conflicting (scale from *no conflicting thoughts and feelings at all* to *maximum conflicting thoughts and feelings*), indecisive (scale from *not indecisive at all* to *extremely indecisive*), or mixed (scale from *no mixed feelings at all* to *extremely mixed feelings* (cf. Priester & Petty, 1996; $\alpha = .59$).[2]

To control for differences in the amount of effort each movement required, we measured effort on the task by means of two questionnaire items asking participants to indicate, on 100-point, continuous-line scales, how hard and how tiring they had found the movement task ($r = .60$). Because of the informal setting of our experiment (a city park), one additional item asked participants how seriously they had taken their participation in the task. Finally, we asked participants to report their age and sex.

Procedure

The experimenter approached people in the park and asked if they would like to participate in an experiment concerning tai-chi movements and information processing. If a person agreed to participate, the experimenter handed him or her a clipboard holding the questionnaire. Next, the experimenter showed one of the three film clips (randomly chosen) on a mobile video device and instructed the participant to perform the movement shown, while filling out the questionnaire. After the participant finished, he or she was rewarded and debriefed.

Results and discussion

Data from 6 participants were not included in analysis: Three participants were excluded because their scores on the item assessing serious participation were below the scale's midpoint, 1 participant did not complete the questionnaire, and 2 were removed because their ambivalence scores were more than 2.5 standard deviations from the mean.

As expected, a one-factor analysis of covariance with movement as a between-subjects factor, effort as a covariate, and experienced ambivalence as the dependent variable revealed a main effect of movement, $F(3, 64) = 3.11$, $p = .05$, $\eta_p^2 = .09$.[3] Post hoc tests revealed that participants moving from side to side experienced more ambivalence ($M = 59$, $SD = 15$) than did participants moving up and down ($M = 52$, $SD = 18$; $p = .02$) and participants standing still ($M = 49$, $SD = 17$; $p = .07$), although the latter difference was only marginally significant. Participants in the up-and-down condition did not differ in experienced ambivalence from participants in the control condition ($p = .45$). Thus, participants felt more ambivalent when they moved from side to side than when they did not.

General Discussion

Results of both experiments show that the experience of ambivalence is indeed accompanied by specific body movement. Using an objective measure of movement, we found that when people experience ambivalence, they move more from side to side (Study 1). Further, we found that the reverse is also true: When people move from side to side, they experience more ambivalence (Study 2). Our findings confirm and extend research showing that evaluations influence body posture and movement (e.g., Eerland et al., 2012; Hillman et al., 2004; Mehrabian, 1968; Tracy & Robins, 2004; Wallbott, 1998; Wells & Petty, 1980) and vice versa (e.g., Jostmann, Schubert, & Lakens, 2009; Phaf & Rotteveel, 2009; Strack et al., 1988; Topolinski & Sparenberg, 2011).

It is possible that the arousal associated with ambivalence (van Harreveld et al., 2009) is what caused the observed effect of ambivalence on movement. However, this alternative explanation seems unlikely, given the fact that in Study 1, participants in our ambivalent condition moved more from side to side, but not from front to back, compared with participants in our univalent condition. An arousal account would predict more movement in all directions.

A related alternative account of our findings in Study 1 may lie in the differences in negativity created by our manipulation. One could argue, for instance, that participants in the ambivalent condition moved more from side to side because of the negativity associated with ambivalence rather than because of ambivalence per se. This account, too, seems unlikely. There is empirical evidence that people confronted with images of negative stimuli—angry faces—demonstrate a "freeze" response in body movement, reflected by changes in the COP (Roelofs, Hagenaars, & Stins, 2010). Considering that the ambivalent text discussed both negative and positive aspects of the proposal (in contrast to the univalent text, which discussed only positive aspects), and considering that ambivalence has been associated with negative affect (van Harreveld et al., 2009), one would thus expect less movement in the ambivalent condition, rather than more. Our results, however, show the opposite. People in the ambivalent condition moved more from side to side than did those in the univalent condition. Nevertheless, future research should add an additional (negative) condition to investigate more fully the influence of negative affect on the effects we observed in the present research.

Finally, it should be noted that even though ambivalence leads specifically to side-to-side movement, the reverse relationship need not be so exclusive. In Study 2, we induced side-to-side movement and found that people experiencing it expressed more ambivalence, compared with people who experienced up-and-down movement and people who stood still. The possibility remains, however, that other types of motion, such as front-to-back motion, may also induce ambivalence.

Future research

Although our research focused on ambivalence specifically, these findings may be equally valid for conflict in the broad sense. As stated earlier, ambivalence refers to the existence of positive and negative evaluations of one attitude object (e.g., "The hamburger is delicious, but also fattening"; Kaplan, 1972; Thompson et al., 1995). The components that make up the experience of ambivalence—such as indecision, conflict, and mixed feelings—may not be exclusive to ambivalence per se. Instead, the effects we observed may also extend to other forms of conflict, such as conflict between two possible attitude objects (e.g., "Should I order the salad or the hamburger?"). Although our study is an important first step, future research is needed to determine the way the body responds to different types of conflict.

Our research revealed interesting effects concerning ambivalence and body movement. The question remains, however, why people move specifically from side to side when they are experiencing ambivalence. At this point, we can only speculate. A topic that induces ambivalence by definition involves opposites and activates both positive and negative evaluations at the same time (de Liver et al., 2007). Research on the spatial representation of evaluations shows that opposites are often represented on a horizontal plane in mental space. Representing concepts on the horizontal dimension facilitates mental reasoning and processing efficiency (Chatterjee, 2011; see also Lakens, Schneider, Jostmann, & Schubert, 2011). Consequently, it may be that thinking about an ambivalent topic automatically activates mental representations of positives and negatives on different sides of the horizontal plane. Such mental representations, in turn, may activate accompanying motor patterns (cf. Miles, Nind, & Macrae, 2010), and therefore lead to side-to-side movement (or oscillation).

Conversely, side-to-side movement may activate the mental representations of opposing evaluations (cf. Eerland, Guadalupe, & Zwaan, 2011), causing people to experience more ambivalence. This would be consistent with a motor-congruency explanation of the observed effects (cf. Förster & Strack, 1997), according to which compatible motor movements (i.e., side-to-side movements) facilitate the retrieval of valence information (i.e., ambivalence). These congruency effects may even occur without explicit body movement. Merely showing a video clip of someone moving from side to side may evoke mental simulations of this movement and activate opposing evaluations (e.g., Barsalou, Niedenthal, Barbey, & Ruppert, 2003). Future research could further investigate the underlying process driving the side-to-side movement accompanying experiences of ambivalence.

Additional studies could also explore the functionality of this specific motor pattern. Goldin-Meadow, Nusbaum, Kelly, and Wagner (2011) suggested that body movements reduce cognitive load because they help people structure their thoughts. When people's speech, for instance, has spatial content, body movement facilitates lexical access (Rauscher, Krauss, & Chen, 1996). Body movements accompanying ambivalence may serve a comparable function in helping to resolve the ambivalence. Moreover, resolving ambivalence may be more difficult when body movements are restricted.

Body movements also influence motivational tendencies, regardless of positivity and negativity (for an overview, see Price, Peterson, & Harmon-Jones, 2012). For example, leaning forward activates stronger approach motivation compared with leaning backward or sitting upright (Price & Harmon-Jones, 2010). It would be interesting to investigate the motivational tendencies arising from the side-to-side movement observed in our studies.

Conclusions

The present research adds to current understanding of how experiences of ambivalence are tied to body movements, and how these movements in turn influence experiences of ambivalence. We have demonstrated that the experience of ambivalence is associated with specific, side-to-side movements. In addition, we have shown that moving from side to side can cause people to experience more ambivalence. Taken together, this work reveals that body movements are part and parcel of the experience of ambivalence.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Notes

1. Additional measures of mixed emotions and potential ambivalence did not yield any informative results and are not reported here. For more information on these results and measures, please contact the first author.

2. As in Study 1, we do not report results for additional measures of mixed emotions and potential ambivalence that did not yield informative results. Information on these results and measures is available from the first author.

3. An analysis of variance showed that participants found up-down movement more effortful ($M = 27.50$, $SD = 20.10$) than side-to-side movement ($M = 7.77$, $SD = 8.59$) and no movement ($M = 7.23$, $SD = 13.04$), $F(2, 67) = 13.96$, $p < .01$. To control for this difference, we included effort as a covariate in our analyses. However, in accordance with the recommendations made by Simmons, Nelson, and Simonsohn (2011), we also report here that the effect of movement was significant when the analyses did not include the covariate, $F(2, 65) = 1.69$, $p = .19$, $\eta_p^2 = .05$.

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