One way and the other: The bi-directional relationship between ambivalence and body movement.

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Abstract

So far, research exploring the relationship between evaluations and body movements has focused on one-sided evaluations. People regularly encounter objects or situations, however, about which they simultaneously hold both positive and negative evaluations, resulting in the experience of ambivalence. In language, these experiences are often expressed in a physical manner, such as being "torn" or "wavering" between two sides of an issue. Building on this, we explored the relationship between the experience of ambivalence and side-to-side movement (or, wavering) in two studies. In Study 1 we used a WII™ Balance Board to measure movement and show that when people experience ambivalence they move from side to side more than people who do not experience ambivalence. In Study 2 we induced body movement in order explore the reverse relationship and reveal that when people are made to move from side to side, experiences of ambivalence are enhanced.

Keywords: ambivalence, attitudes, body movement, WII™ Balance Board

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What we feel and think is often reflected in the way our body moves. In "The expression of emotion in man and animal" (1872), Charles 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 evaluation.

Some of the body movements reflecting our evaluations are small. Covert changes in activity in specific facial muscles, for instance, can reveal positive and negative evaluations (e.g. Cacioppo, Petty, Losch, & Sook Kim, 1986). Other movements are more overt, like head-shaking and -nodding indicating agreement or disagreement while listening to a message (e.g. Petty & Wells, 1980). Still other movements incorporate the whole body. A relaxed and open posture, for example, indicates liking of other people (Mehrabian, 1968), head tilted back and expansion of posture indicates pride (Tracy & Robbins, 2004), slumped shoulders indicate feelings of depression (e.g. Walbott, 1998) and forward or backward leaning indicates positivity or negativity towards an affective image (Hillman, Rosengren, & Smith, 2004; Eerland, Guadalupe, Franken, & Zwaan, 2012). In sum, body movements can reflect evaluations of people (including ourselves), objects and situations.

So far, research involving posture, movement, and evaluations has focused on objects or situations that were clear-cut; i.e., with 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. Because these evaluations are in conflict with each other, people experience 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. As such, this research asks an important first question in the domain of ambivalence and body movements: How does the body behave when people experience ambivalence? The current research is the first that we know of to explore this intriguing question.

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 (de Liver, van der Pligt, & Wigboldus, 2007), distinguishing ambivalence from indifference. People may think positively about eating fast food, for instance, because it is easy and cheap. At the same time, however, they detest its fattening nature. Similarly, people may be in favor of abortion because they find self-integrity important, but also oppose the idea of killing a fetus. People can 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 how our body responds to the experience of ambivalence. Language, however, provides a clue. Here, ambivalence is often expressed in a physical manner. When talking about ambivalent topics people say that they are "torn" or "wavering" between two sides of an issue. As such, they are "dancing between two opinions" and are "straddling the issue". When people reflect on different points of view regarding a topic they say: "on the one hand… but on the other hand" while gesturing with their hands alternatively (Calbris, 2004). Conversely, when people have a non-ambivalent opinion about something they are known to clearly "take a stand". These verbal expressions of ambivalence (and univalence) may be more than just a figure of speech and are likely to reflect our

concrete physical experience when experiencing ambivalence (cf. Lakoff & Johnson, 1999).

In the current research, we explore the idea of moving from side to side as a physical expression of ambivalence in two studies. In our first study, we investigate the influence of ambivalence on side to side movements and aim to show that people who experience ambivalence will move from side to side more, compared to people who are not experiencing ambivalence. In Study 2, we investigate the reverse relationship and examine whether moving from side to side also *enhances* the experience of ambivalence. Thus we aim to show that the relation between ambivalence and side-to-side movement is of a bi-directional nature.

Study 1

The 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 to measure participants' movements during the experiment. Side-to-side movement was operationalized as the amount of x-flips (Dale & Duran, 2011); that is, the number of directional changes in medio-lateral balance (i.e. shifting balance from left to right and vice versa). We expected participants to show more x-flips when experiencing ambivalence compared to when they did not experience ambivalence. As a secondary aim we wanted to investigate whether participants would move more or less from side to side when they had to explicitly evaluate the topic. Two possible outcomes could be expected. First, based on the idea that the experience of ambivalence is most pronounced when people have to make a discrete choice (van Harreveld et al., 2009), one could expect more side-to-side movement when people are explicitly asked to evaluate the topic. On the other hand, people might also resolve

their ambivalence and "take a stand" when asked to choose between sides, which would lead to less side-to-side movement.

Participants and Design

Sixty-one students (17 males, M_{age} = 20.64, SD_{age}= 2.24) of the University of Amsterdam participated in this experiment for course credit. The experiment was a two-factor (valence: ambivalence vs. univalence and phase: manipulation, questionnaire, evaluation) mixed design with the latter factor as within subjects variable and x-flips as main dependent variable.

Apparatus

To measure body movement we used a Wii™ Balance Board (WBB). The WBB 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 COP. Medio-lateral balance was calculated by the weight distribution on the left and right sensors, whereas 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 self-composed newspaper article (cf. van Harreveld, Rutjens, Rotteveel, Nordgren, & van der Pligt, 2009) concerning the proposal to abolish minimum wages for young adults. In the ambivalent version of this article, pros and cons of the proposal were discussed. In the univalent condition, only positive aspects of the proposal were discussed. Both 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 which all began with: "With regards to this topic I experience….". The 7-point scales ranged from *no conflicting thoughts and feelings at all* (1) to *maximum conflicting thoughts and feelings (7)*; *not indecisive at all* to *extremely indecisive*, and *no mixed feelings at all* to *extremely mixed feelings* (Priester & Petty, 1996, α = .88). To rule out that any effects of ambivalence on movement were driven by the ambivalent text potentially being more *complex* than the univalent text, we measured complexity of both texts with two statements ("*Language use in this article is clear"* and *"The content of this article is easy to understand", r* = .85*)*. The 7-point scales ranged from *"completely agree"* to *"do not agree all"*. We also asked participants' age and sex.

We measured side-to-side movement by recording the x- and y-coordinates of the COP during the experiment from which we then calculated x-flips and - to be able to discriminate between side-to-side and other movement - 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 or ambivalent condition. They were told they would participate in an experiment concerning comprehensive reading. Prior to the start of the experiment, the WBB was calibrated on the neutral body posture of each participant individually after which the COP was recorded throughout the experimental session. Instructions appeared on screen at 150 cm in front of the participants while they were standing on the WBB. Participants read either the ambivalent or univalent text (manipulation phase) and then filled out the questionnaire with the manipulation check, complexity measure and demographic variables (questionnaire phase). After this, they were

instructed to think about the topic of the article during 30 seconds, after which they evaluated the topic (either positive or negative) by leaning left or right on the WBB (evaluation phase).

Results and Discussion

Preliminary analysis. To make sure our experimental groups did not differ with regard to their agility, we compared x-flips between the two groups while they were reading the neutral instruction screen, and found no differences ($F < 1, p = .60$). Including this baseline as a covariate did not alter any of the obtained results and therefore this will not be discussed further. To control for differences between participants in time spent on the experiment, we divided the amount of x-flips by the amount of time each participant spent to complete the experiment and used this measure to test our hypothesis.

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

Main analyses. As expected, a repeated measures analyses with ambivalence versus univalence of the text as between subjects variable revealed a main effect of text, $F(1, 59) = 13.25$, $p = .001, \eta^2_p = .18$. This means that participants who had read the ambivalent text moved more from side to side than those who did not. Additionally, the degree to which participants experienced ambivalence was positively correlated with side-to-side movement, $r = .38, p = .003$, indicating that the more ambivalence the participants experienced, the more they moved from side to side.

We also found a revealed a main effect of phase, $F(1, 59) = 29.46$, $p < .001$, $\eta^2_p = .33$. Post-hoc tests employing a Bonferroni correction showed that participants, made *less* directional changes in the medio-lateral direction in the evaluation phase, indicating that during this phase side-to-side movement was less, compared to the other two phases (all *p's* < .001), which did not differ from each other ($p = 1$). Means and standard deviations are displayed in Table 1. Finally, there were no effects of condition on y-flips for any of the phases (all *p*'s > .08).

In sum, these results show that people move their body from side to side when they experience ambivalence. When people are forced to come to a dichotomous evaluation, however, they will decrease 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 when body movement is congruent with the valence of the topic people are thinking about, their responses are enhanced. 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, this movement could also enhance feelings of ambivalence. Building on this, we hypothesized that side-to-side movement would enhance experiences of ambivalence when reflecting on an ambivalent topic (cf. Strack et al., 1988). Thus, in Study 2 we manipulated bodily movement and expected that people would experience more ambivalence when making a side-to-side movement, compared to another type of movement or no movement.

Participants and Design

Seventy-four participants (31 males, $M_{age} = 27.3$, $SD_{age} = 8.8$) were recruited in a city park of 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, not from side to side, but up and down. Finally, we included a control condition in which participants did not move. As such, the experiment followed a one factor (movement: side to side, up and down, control) between-subject design with experienced ambivalence as main dependent variable.

Materials

We created three film clips to use as instruction videos for our participants in each condition. Each film clip showed one of the three-movement conditions; side to side, up and down, or no movement. The same actor performed in all the clips.

To induce ambivalence participants were instructed to think of a topic they felt ambivalent about. Next they were asked to write down their thoughts and/or feelings regarding this topic (cf. van Harreveld et al., 2012).

Experience of ambivalence was measured by three items which all began with: "With regards to this topic I experience….". The 100-point continuous line-scales ranged from *no conflicting thoughts and feelings at all* to *maximum conflicting thoughts and feelings*, *not indecisive at all* to *extremely indecisive*, and *no mixed feelings at all* to *extremely mixed feelings* (cf. Priester & Petty, 1996, $\alpha = .59$).

To be able to control for differences in the amount of effort each movement required, we measured effort on the task by means of two items asking participants to indicate how hard and how tiring they had found the movement task on a 100-point continuous line-scale ($r = .60$). Because of the informal setting of our experiment (a

city park) one item asked participants how seriously they had participated in the task. Finally, we asked participants' age and sex.

Procedure

Participants were approached by the experimenter and asked whether they would like to participate in an experiment concerning Tai-Chi movements and information processing. The experimenter would then hand the participant a clipboard holding the questionnaire. Next, the experimenter showed the film clip on a mobile video device and instructed the participant to perform the shown movement while filling out the questionnaire on a clipboard. After participants finished they were rewarded and debriefed.

Results and discussion

Three participants were removed because their scores on the item assessing serious participation was below mid-point; one did not complete the questionnaire and two were removed because their score deviated more than 2.5 *SD* from the mean on the main dependent variable.

As expected, a one-factor ANCOVA with movement as between factor and experienced ambivalence as dependent variable revealed a main effect of movement, $F\,(3,64) = 3.11, p = .05, \eta^2_p = .09$, controlling for effort[1]. Post-hoc tests revealed that participants moving from side to side experienced more ambivalence ($M = 59$, $SD = 15$) compared to 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 marginally significant. Participants in the up and down condition did not differ in their experienced ambivalence from the participants standing still ($p = .45$). This means that when participants were instructed to move from side to side, they felt more ambivalent.

Discussion

Results of both experiments show that the experience of ambivalence is accompanied by specific body movement. Using an objective measure of body movement, our work reveals that when people experience ambivalence, they move more from side to side (Study 1). Additional support for this relationship was provided by the finding that 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; Petty & Wells, 1980; Tracy & Robbins, 2004; Walbott, 1989) and vice versa (e.g. Jostmann, Schubert, & Lakens, 2009; Rotteveel & Phaf, 2004; Strack et al., 1988; Topolinski & Sparenberg, 2011).

An alternative explanation of our findings could be that not ambivalence, but the arousal associated with it (van Harreveld et al., 2009) causes people to move more. However, this seems unlikely given the fact that our ambivalent participants moved more from side to side but not from front to back. An arousal account would predict more movement in all directions; our findings only revealed differences in movement from side-to-side.

A related alternative account of our findings may lie in the differences in negativity between our manipulations. One could argue, for instance, that participants in the ambivalence condition moved more from side to side as a consequence of the negativity associated with ambivalence and not ambivalence per se. This account, too, seems unlikely. There is empirical evidence showing that people confronted with images of negative stimuli (angry faces) rather than positive stimuli, show a ‘freeze’ response in their body movement, as shown by changes in the center of pressure (Roelofs, Hagenaars, & Stins, 2010). Considering that the ambivalent text was more

negative as a result of the arguments (because it had both negative and positive aspects compared to only positive aspects in the univalent text) and because ambivalence has been associated with negative affect (van Harreveld et al., 2009), one would thus expect *less* movement in the ambivalent condition. Our results, however, show the opposite. People in the ambivalent condition moved more from side to side than those in the univalent condition. Nevertheless, future research should add an additional (negative) condition in order to be able to shed more light on the influence of negative affect on our effects.

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

Future research

Although our research focuses on ambivalence specifically, these processes may be equally valid for conflict in the broad sense. As stated earlier, ambivalence refers to the existence of positive and negative evaluations within one attitude object (e.g. "*The pink pump is pretty, but also very expensive")* (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, these effects may also expand to other forms of conflict, such as conflict *between* two possible attitude objects (e.g. *"Should I buy the pink pump or rather the black stiletto pump?")*. Although we provide a first step, future research should determine the way in which the body responses to different types of conflict.

Our research reveals interesting effects concerning ambivalence and body movement. The question remains, however, *why* people move in this specific manner when they are experiencing ambivalence. At this point, we may only speculate about this. An ambivalent topic is by definition made up of opposites, activating both positive and negative evaluations at the same time (de Liver, van der Pligt, & Wigboldus, 2006). 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 provides processing efficiency (Chatterjee, 2011, see also Lakens, Schneider, Jostmann, & Schubert, 2011). As such, it may be that thinking about an ambivalent topic automatically activates mental representations of each of the oppositions at different sides of the horizontal plane. This mental representation in turn, activates accompanying motor patterns (cf. Miles, Nind, & Macrae, 2010), leading to side-to-side movement (or, oscillation). Conversely, the side-to-side movement may activate the mental representations of each of the opposing evaluations (cf. Eerland, Guadalupe & Zwaan, 2011), causing people to experience more ambivalence. This would also be in accordance with a motor congruency explanation (cf. Förster & Strack, 1997), in 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 clip of someone moving from side to side, may evoke mental simulations of this movement and in turn activate opposing evaluations (e.g. Barsalou, Niedenthal, Barbey, & Ruppert, 2003).

Besides further exploring the underlying process driving the side-to-side movement accompanying experiences of ambivalence, future research 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 it helps people structure their thoughts. When people's speech, for instance, has a spatial content, body movement facilitates lexical access (Rauscher, Krauss, & Chen, 1996). Body movements accompanying ambivalence may serve a comparable function, and as such help resolve the ambivalence. Alternatively, resolving ambivalence may be more difficult when bodily movements are restricted.

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

Conclusions

The present research adds to our understanding of how experiences of ambivalence are tied to body movements, and how these movements in turn influence our experiences of ambivalence. We have shown that the experience of ambivalence is associated with specific side-to-side movements. Additionally, we also showed that moving from side to side caused people to experience more ambivalence. Taken together, this work reveals that our body movements are both part and parcel of the experience of ambivalence.

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Footnotes

[1] An ANOVA showed that participants found the up-down movement more effortful ($M = 27.50$ $SD = 20.10$) than the 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 this variable as a covariate in our analyses. However, in accordance with the recommendations made by Simmons, Nelson, & Simonsohn (2011) we also report here the test results of the analyses without the covariate: $F(2,65) = 1.69$, $p = .19$, $\eta^2_p = .05$.