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Flash Report

# Embodied cognition and health persuasion: Facilitating intention–behavior consistency via motor manipulations

David K. Sherman [a,*], Cynthia Gangi [a], Marina L. White [b]

[a] Department of Psychology, University of California, Santa Barbara, CA 93106-9660, United States
[b] Department of Psychology and Social Behavior, University of California, Irvine, CA 92697-7085, United States

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ABSTRACT

The present research examines health persuasion from an embodied cognition perspective by proposing that engaging the motor system during health persuasion will lead individuals to engage in healthier behavior and have greater consistency between their intentions and behavior. In two studies, participants watched a health video while either imaging themselves performing the behavior or imaging themselves performing the behavior while also engaging their motor systems with minimal, relevant behaviors. In Study 1, after watching a flossing video, females (but not males) flossed more times in the following week after touching a floss and in Study 2, all participants (males and females) exercised more in the week after watching an exercise video while walking in place. In both experiments, participants who engaged the motor system had stronger intention–behavior consistency than those who merely imagined themselves performing the health behavior. Implications of the findings are discussed for theories of embodied cognition, intention–behavior consistency, and health persuasion.



## Introduction

> Muscles are out there in the open to be seen, measured, and manipulated. (Zajonc & Markus, 1982; p. 130).

Research on embodied cognition has demonstrated the ways in which the physical body is integrally related to fundamental psychological processes. Measuring and manipulating the physical body, as urged by Zajonc and Markus (1982), has yielded important insights into the relationship between embodiment, cognition, and behavior (Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). The present research examines embodiment in the context of longer-term health persuasion.

### *The embodied cognition perspective*

According to the embodied cognition perspective, attitudes, knowledge, and emotions can be acquired and processed through bodily, kinesthetic interactions with stimuli (Barsalou, 1999; Niedenthal, 2007). Performing an approach movement toward a stimulus can lead to a positive attitude whereas performing an avoidance movement can lead to a negative attitude (e.g., Cacioppo, Priester, & Berntson, 1993). Such motor movements have associative properties, activating either the approach or the avoidance system. Social judgments can also be influenced by culturally-learned movements, such as "giving the finger"; such motor movements can increase relevant construct accessibility as people who extended their middle finger rated an ambiguously hostile target as more aggressive than did people who extended their index finger (Chandler & Schwarz, 2009).

In our research, we examined the influence of bodily movement in the domain of health persuasion. We hypothesized that facilitating an embodied representation of the health information would lead to greater long term health persuasion and intention–behavior consistency.

### *Intention–behavior consistency*

Although behavioral intentions are a primary component of many theories of behavior change, the association between intentions and behavior is often weak (Sheeran, 2002). The embodiment approach offers a unique perspective on intention–behavior consistency with two lines of research indirectly supporting the hypothesis that embodiment would facilitate intention–behavior consistency.

First, the normally weak attitude–behavior relationship can be made much stronger when those attitudes are based on a direct physical interaction with the attitude object (Fazio & Zanna, 1978; Regan & Fazio, 1977). Second, the representation of an object may incorporate more developed mental imagery when multiple systems, i.e., cognitive as well as sensory-motor are engaged

* Corresponding author.
*E-mail address:* david.sherman@psych.ucsb.edu (D.K. Sherman).

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(Barsalou, 1999). Research has shown that highly developed mental imagery leads to more effective, specific intentions (Knäuper, Roseman, Johnson, & Krantz, 2009). We predicted that mental imagery accompanied by embodiment would lead to more specific representations of the stimuli, which in turn, should facilitate even stronger intention–behavior consistency.

In the current research, participants watched a health video while either imaging themselves engaging in an activity or imaging themselves engaging in an activity while also engaging their motor system- touching a dental floss (Study 1) and walking in place (Study 2).

## Study 1

### Methods

#### *Participants and design*

Sixty-five undergraduate participants (36 females) indicated in pretest that they were non-flossers and were randomly assigned to conditions.

#### *Procedure*

Participants watched a video on the importance of flossing. Prior to the video, participants received sealed instructions (keeping experimenters unaware of condition).

Participants in the *Imagery* condition were asked to imagine themselves flossing their teeth while watching the video whereas participants in the *Motor + Imagery* condition were asked to imagine themselves flossing their teeth and at the same time to touch the dental floss in the enclosed packet ("keep the dental floss in your hands, and touch it with your fingers (do not actually floss)."). Then participants indicated flossing intentions: "In the next week, how many times do you expect to floss?" on a scale from 0 to 8 or more. The experimenter gave participants 10 individual flosses and they were reminded about Session 2, 1 week hence.

The day before Session 2, participants received a reminder e-mail with instructions to return their *unused* flosses; they would be given 50 cents for each unused floss in this reverse-incentive system.

### Results

#### *Health behavior*

We subtracted the number returned from 10 to determine how many flosses were used and conducted a 2 (condition) X 2 (sex) Analysis of Variance (ANOVA). There was no significant main effect of condition, $F(1, 61) = 1.01$, $p = .32$, $\eta_p^2 = .02$, but there was an effect of sex that approached significance, as females ($M = 3.92$, $SD = 2.10$) flossed more times in the week after the study than did males ($M = 3.03$, $SD = 2.35$), $F(1, 61) = 3.00$, $p = .088$, $\eta_p^2 = .05$. Moreover, there was a significant sex X condition interaction, $F(1, 61) = 5.96$, $p = .018$, $\eta_p^2 = .09$.

The predicted effect emerged for women as those in the Motor + Imagery condition ($M = 4.88$, $SD = 1.58$) flossed more times than those in the Imagery condition ($M = 3.05$, $SD = 2.17$), $F(1, 61) = 6.65$, $p = .012$. For men, there was no significant difference between those in the Motor + Imagery condition ($M = 2.67$, $SD = 2.26$) and those in the Imagery condition ($M = 3.43$, $SD = 2.47$), $F(1, 61) = .93$, $p = .33$.

#### *Behavioral intentions*

Females ($M = 4.11$, $SD = 1.69$) intended to floss more times in the week after the study than males ($M = 3.00$, $SD = 1.79$), $F(1, 61) = 6.59$, $p = .013$, $\eta_p^2 = .10$. There was no main effect of condition, $F(1, 61) = .18$, $p = .67$, and no interaction, $F(1, 61) = 2.21$, $p = .14$, $\eta_p^2 = .035$.

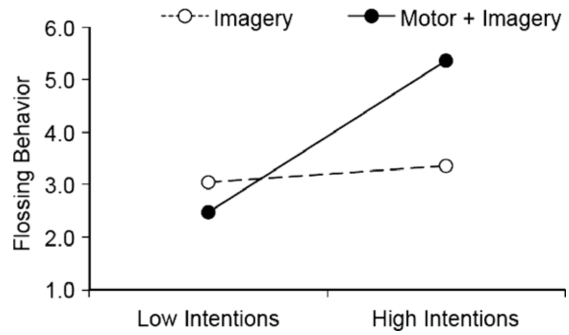


**Fig. 1.** Relations between flossing intentions and flossing behavior (number of flosses used in week after study) as a function of condition in Study 1. Points are predicted values based on 1 *SD* above and below the mean on intentions.

#### *Intention–behavior consistency*

We conducted a hierarchical linear regression analysis (Aiken & West, 1991) to see if motor engagement moderated the intentions–behavior relationship. At Step 1, we entered condition (−1, 1 for Imagery and Motor + Imagery conditions) and the intentions to floss measure (mean centered) as predictors; at Step 2, we entered the interaction. The number of flosses used was the outcome.

At Step 1, the model was significant ($R^2 = .39$, $F(2, 62) = 5.62$, $p = .006$), with a significant main effect of intentions, $\beta = .37$, $t(62) = 3.13$, $p = .003$, and no main effect for condition, $\beta = .16$, $t(62) = 1.36$, $p = .18$. Moreover, at Step 2, the interaction between intentions and condition predicted flossing behavior, ($\beta = .28$, $t(62) = 2.52$, $p = .014$; Step 2: $\Delta R^2 = .08$, $F_{change}(1, 61) = 6.37$, $p = .014$)[1] (see Fig. 1). In the Motor + Imagery condition, intentions predicted behavior, $\beta = .64$, $t(61) = 4.10$, $p < .001$. By contrast, in the Imagery condition, there was no significant relationship between intentions and behavior, $\beta = .07$, $t(61) = .45$, $p = .65$.

### Discussion

Touching floss facilitated intention–behavior consistency, whereas merely imaging flossing did not. Females in the Motor + Imagery condition used more dental flosses in the week after seeing the flossing video than did females in the Imagery condition. Males did not differ, and one reason for this sex difference may have been that females were more open to changing their flossing behavior (as indicated by the effect of gender on intentions) and hence more receptive to the motor manipulation.

## Study 2

A health behavior for which there exists no sex difference in openness to behavioral change should produce equivalent effects of a motor manipulation for men and women. Pretesting indicated no sex differences emerged in the domain of exercise and so Study 2 examines exercise and the motor manipulation of walking in place. We predicted embodiment would enable health information and one's responses to it to be represented in multiple modalities, leading to more specific intentions that would be predictive of behavior (cf. Lang, 1979). We included multiple measures of intentions to test this prediction.

[1] There was no significant 3-way interaction between sex, condition, and intentions, $\beta = .75$, $p = .46$, and the only 2-way interaction that approached significance was the interaction between intentions and condition, $\beta = .22$, $p = .071$.

*Methods*

*Participants*

Sixty-six undergraduates were recruited. Four did not attend Session 2 and one did not exercise at all, leaving a final sample of 61 participants (36 females).

*Procedure*

During Session 1, participants watched a short video of a person demonstrating exercises. Prior to the video, participants received sealed instructions. Participants in the *Imagery* condition were instructed to imagine themselves engaging in the exercises while watching the video whereas those in the *Motor + Imagery* condition were instructed to "walk in place while you watch this video demonstrating some of these exercises, and at the same time imagine yourself engaging in the exercises."

Participants indicated their specific intentions to exercise ($\alpha = .85$): "I intend to exercise in the upcoming week," and "I intend to exercise _ times in the coming week" where they responded by putting in the appropriate number. Two general intention items were ($\alpha = .85$): "I will try to exercise next week" and "I plan to exercise next week." Besides the number of times item, all were answered on 7-point scales anchored at 1 (very unlikely) and 7 (very likely).

Participants received an exercise log to record up to four types of exercise each day and the duration of each activity in minutes. Participants returned logs at Session 2.

*Results*

*Preliminary analyses*

As in Study 1, we included sex as a factor. Although the majority of our participants were first year students ($N = 42$), there was a trend such that second year students ($N = 8$) exercised less than other students. Thus, we controlled for year in school (by creating a dummy code for second year status) in the following analyses using a 2(condition) X 2(sex) ANCOVA.

*Health behavior*

We operationalized exercise behavior as the total minutes exercised divided by the number of days exercised. The ANCOVA revealed a main effect of condition that approached significance, $F(1, 56) = 3.78$, $p = .057$, $\eta_p^2 = .06$ as those in the Motor + Imagery condition exercised on average for 75.7 min per day ($SD = 37.73$) whereas those in the Imagery condition exercised for 59.7 min per day ($SD = 24.70$). Walking in place while imaging exercising led to more exercising (16 additional minutes per session) over the subsequent week. Also, men (adjusted $M = 79.1$, $SD = 35.55$) exercised more per day than women (adjusted $M = 56.2$, $SD = 26.61$), $F(1, 56) = 7.84$, $p = .007$, $\eta_p^2 = .12$. The effect was consistent across sex, with no interaction between sex and condition, $F(1, 56) = .38$, $p = .54$, $\eta_p^2 = .01$, as (see Fig. 2).[2]

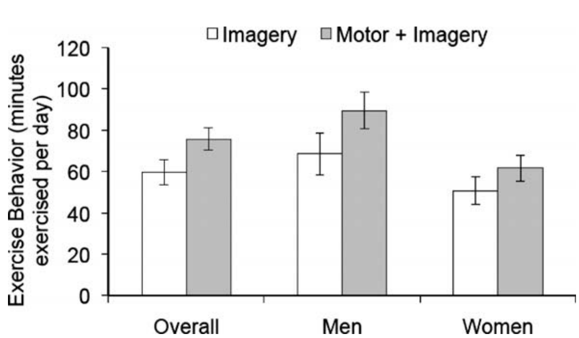


**Fig. 2.** Exercise behavior as a function of condition, overall, and for men and women, in Study 2. Error bars refer to the standard error for the mean of that cell.

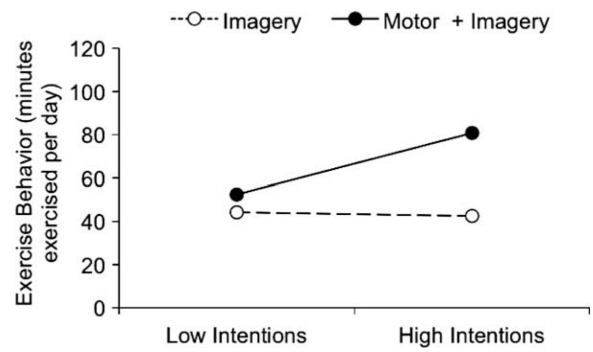


**Fig. 3.** Relations between exercise intentions and exercise behavior in Study 2 as a function of condition. Points are predicted values based on 1 *SD* above and below the mean on intentions.

*Intentions*

We standardized and averaged the intentions measures into a specific intentions composite and a general intentions composite. There were no main effects or interactions on either composite, $F$ ranging from .03 to 1.92, $p$ ranging from .17 to .86.

*Intention–behavior consistency*

We analyzed intention–behavior consistency as in Study 1, including the dummy coded variable of second year status and with minutes exercised per day as the outcome. In terms of specific intentions, at Step 1, the model was significant ($R^2 = .31$, $F(3, 57) = 8.39$, $p < .001$), as the main effect of specific intentions was significant, $\beta = .45$, $t(57) = 4.03$, $p < .001$, as well as the main effect for condition, $\beta = .35$, $t(57) = 3.14$, $p = .003$. Moreover, the interaction between specific intentions and condition entered at Step 2 was a significant predictor of exercise behavior, ($\beta = .33$, $t(56) = 2.07$, $p = .044$; Step 2: $\Delta R^2 = .049$, $F_{change}(1, 56) = 4.26$, $p = .044$).[3] There was a strong relationship between specific intentions and behavior in the Motor + Imagery condition, $\beta = .65$, $t(56) = 4.47$, $p < .001$. By contrast, in the Imagery condition, intentions did not significantly predict behavior, $\beta = .20$, $t(56) = 1.23$, $p = .22$ (see Fig. 3).

The same analysis with general intentions yielded a main effect of general intentions, $\beta = .31$, $t(57) = 2.38$, $p = .02$, a main effect of condition, $\beta = .36$, $t(57) = 3.01$, $p = .004$, but no interaction between general intentions and condition, $\beta = .13$, $t(56) = .99$, $p = .33$.

Finally, when both specific and general intentions were entered into a regression predicting behavior in the Motor + Imagery condition, only specific intentions emerged as a significant predictor of behavior, $\beta = .55$, $t(29) = 2.50$, $p = .019$, whereas general intentions did not, $\beta = .11$, $t(29) = .50$, $p = .62$. The motor manipulation only facilitated greater consistency between specific intentions and exercise behavior.

## General discussion

The present studies demonstrate that minimal, health-relevant motor manipulations can facilitate health behavior change and

[2] Minutes exercised total (summed over the week), yielded a main effect in the same direction that approached significance, $F(1, 56) = 2.94$, $p = .092$. There were no effect on number of days exercised (condition: $F(1, 56) = .72$, $p = .40$; sex: $F(1, 56) = .09$, $p = .77$; interaction: $F(1, 56) = .04$, $p = .84$), as participants overall exercised on average, 4.41 days ($SD = 1.51$). The pattern of results remains the same with sophomore status not included as covariate.

[3] There was no significant 3-way interaction between sex, condition, and intentions, $\beta = -.17$, $p = .31$, and the only 2-way interaction that approached significance was the interaction between intentions and flossing condition, $\beta = .22$, $p = .058$.

greater intention–behavior consistency. In so doing, we sought to advance embodied cognition and health persuasion research in three ways.

First, the current work focused on the *specific role of the motor system* in influencing health intentions and behaviors (cf., Zajonc & Markus, 1984). To the extent the motor system is examined in the health behavior change literature, the focus is on rehearsal or practice. Such studies confound learning associated with behavioral activity with the incidental consequences of embodiment. Embodied manipulations, such as touching floss, that involve no practice can influence health persuasion independently of the motor skills learned.

Second, the current work contributes a novel perspective on *intention–behavior consistency*. Motor activities during persuasion can lead individuals to form intentions more predictive of behavior (see Webb and Sheeran (2006) for review of other relevant factors), and thus, the embodied perspective may have implications for prior research on direct experience and attitude–behavior consistency (Regan and Fazio, 1977).

Third, the current work demonstrated effects over a *relatively long period of time*. The present studies provide longer term tests and potentially useful applications of the embodied persuasion approach in the context of health behavior change.

*Questions of underlying mechanism*

When multiple systems are engaged – sensory, motor, and cognitive – during the acquisition of knowledge and the formation of attitudes about a stimulus, the stimulus representation (e.g., health information in the current studies) may incorporate more developed mental imagery and thus be more accessible (Barsalou, 1999). The motor movements in the present studies may have thus led to increased accessibility of the information presented in the video over a period of time, serving as an additional cue to engage in the behavior. It may have been harder to forget the invocations to exercise, for example, when more developed representations of the persuasive information are accessible. Future research should explore accessibility as a possible mediator of effects of motor manipulations on health persuasion as well as other means, such as elaboration, by which motor manipulations have been shown to influence persuasion (Briñol & Petty, 2008).

Furthermore, it is important in future work to confirm that a feature of the motor manipulations—that they are relevant to and congruent with the goals of the health video—was in fact crucial to facilitating health persuasion and intention–behavior consistency. Based on other research, we speculate that engaging in an incongruent motor manipulation would disrupt the formation of the specific intentions that were predictive of behavior, in much the same way that disrupting facial mimicry reduces the memory for faces (e.g., Oberman, Winkielman, & Ramachandran, 2007). Future research should examine dimensions of compatibility, such as the valence and meaning of the motor activity, and the relevance of the motor activity for the behavior advocated in the persuasion attempt.

*Closing: Mere motor manipulations*

The present studies integrated the embodied cognition approach with research on intention–behavior consistency in the domain of health persuasion. This integration offers utility to all three areas of inquiry. Simply including minimal, health-relevant motor activities may be sufficient to boost the efficacy of health persuasion attempts. The present findings help point the way for further integration of these areas of social and health psychology to understand the potentially beneficial effects of "manipulating muscles" during health persuasion.

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