Available online at www.sciencedirect.com

ScienceDirect

Journal of Consumer Psychology 24, 2 (2014) 271 – 283

Research Article

When up brings you down: The effects of imagined vertical movements on motivation, performance, and consumer behavior

Massimiliano Ostinelli [a,*], David Luna [b], Torsten Ringberg [c]

[a] University of Wisconsin–Milwaukee, Lubar School of Business, 3202N. Maryland Ave., Milwaukee, WI 53211, USA
[b] Zicklin School of Business, Baruch College, CUNY, One Bernard Baruch Way, New York, NY 10010, USA
[c] Copenhagen Business School, Solbjerg Plads 3, C3.28, 2000 Frederiksberg, Denmark

Received 2 March 2013; received in revised form 2 December 2013; accepted 3 December 2013
Available online 11 December 2013

Abstract

Previous embodied cognition research suggests that "up" is associated with positivity (e.g., good, divine), whereas "down" is associated with negativity (e.g., bad, evil). We focus on the effect of vertical movements on consumer behavior and go beyond investigating mere affective associations of verticality. In five studies, we provide evidence that the mental simulation of vertical movements has counterintuitive effects on behavior—that is, imagining moving up hampers motivation and performance by boosting self-worth. A pilot study shows that the imagination of vertical movements affects self-worth. Studies 1, 2 and 3 show that imagining upward movements (e.g., taking an elevator ride up or taking off in an airplane) diminishes motivation as well as performance. Studies 4 and 5 show that imagining moving upward (downward) makes people feel better (worse) about themselves which, in turn, decreases (increases) their motivation to succeed on a subsequent task, hence worsening (improving) performance. This occurs independently of respondents' mood.

Keywords: Embodied cognition; Mental simulation; Mental imagery; Self-worth; Compensatory consumer behavior

Introduction

Advertising and other media often evoke images of vertical movements in which people move up or down (e.g., taking an elevator, taking off or landing in an airplane). As an example, consider television advertisements (ads), such as Gillette Venus "elevator ad," Delta Airlines "keep climbing," and Jimmy Johns "55th floor," that show people moving upward. We suggest that, in addition to the intended message (e.g., Jimmy John's delivers fast), ads that prompt the imagination of vertical movements might have unexpected consequences on consumers' self-worth and behavior.

The field of embodied cognition has produced considerable evidence that sensory-motor experiences can affect perception and judgment through metaphorical associations (e.g., Hung & Labroo, 2010; Krishna, 2012; Lee & Schwarz, 2010; Li, Wei, & Soman, 2010; Meier, Hauser, Robinson, Friesen, & Schjeldahl, 2007; Meier & Robinson, 2004; Schubert, 2005; Schubert & Koole, 2009; Williams & Bargh, 2008). Among the phenomena investigated by that research are the associations between *up* and positivity (e.g., good, divine, virtue, power) and between *down* and negativity (e.g., bad, vice, evil; Meier et al., 2007; Meier & Robinson, 2004; Schubert, 2005). That work, however, does not clarify the behavioral consequences of imagined vertical movements.

Our work moves beyond merely documenting metaphorical associations of sensory-motor experiences and identifies a counterintuitive phenomenon. That is, mentally simulating upward movements results in lower motivation and worse performance, whereas the opposite is true for downward movements. This finding qualifies existing embodied cognition theory that associates the concept of up exclusively with positivity and the concept of down exclusively with negativity, by showing that

* Corresponding author.
E-mail addresses: ostinell@uwm.edu (M. Ostinelli), david.luna@baruch.cuny.edu (D. Luna), tri.marktg@cbs.dk (T. Ringberg).

1057-7408/$ -see front matter
http://dx.doi.org/10.1016/j.jcps.2013.12.001

upward (downward) verticality, when experienced as movement (i.e., going up/down), can result in negative (positive) outcomes.

Furthermore, we contribute to the embodied cognition literature by uncovering theory-substantiated mediators that explain the effects of imagined vertical movements on cognitive performance. In doing so, we follow the recommendations of Meier, Schnall, Schwarz, and Bargh (2012) for research on embodied cognition by (a) examining the theoretical process behind the observed metaphorical effects, and (b) including action-relevant outcome measures.

In sum, the present research uncovers unexpected effects of vertical imagery commonly used in advertising and how they impact consumer preferences. For instance, consider an ad showing people going up in an elevator. When consumers are exposed to this ad, they may mentally simulate upward movements and be less motivated to perform a variety of tasks such as working toward a reward, successfully processing information-rich brand materials, or decoding complex pricing schemes.

Vertical movement influences performance

Vertical movement and self-worth

In general, positivity and virtue are represented as being up, whereas negativity and vice are represented as being down. These mental associations are expressed in everyday language: Happy people feel *high*, whereas sad people feel *down*, good people go *up* to Heaven, whereas *bad* people go *down* to Hell (Meier & Robinson, 2004). Evidence for an association between *up* and *good* comes from research showing that positive words (e.g., hero) are evaluated faster when presented in the upper part of the screen, whereas for negative words (e.g., liar) the opposite is true (Meier & Robinson, 2004).

Everyday expressions like feeling *high*, going *up* to Heaven or standing *up* to adversity, however, are based on different sensory-motor experiences (e.g., being up, moving up, standing up), each creating a unique metaphorical association (Lakoff & Johnson, 1980a). Metaphorical associations, in fact, are likely established when a given sensory-motor experience and an abstract concept repeatedly co-occur (Lakoff & Johnson, 1999). Therefore, to examine metaphorical effects of "up" and "down," one must make explicit the underlying sensory-motor experience. Our research focuses on upward and downward vertical movements, which are common physical experiences portrayed in advertising.

Drawing on Lakoff & Johnson (1980a), we hypothesize that imagining oneself moving up can result in positive self-worth through the UP IS MORE metaphor. The UP IS MORE metaphor is based on the mapping of vertical movement onto judgments of quantity (Lakoff & Johnson, 1980a). A metaphorical association between *up* and *more* might be created when a child repeatedly observes how adding/removing a substance to/from a container, such as water to/from a cup, increases/decreases its level (Lakoff & Johnson, 1980b). Further, since quantity is often associated with *better*, as suggested by the metaphorical association MORE IS BETTER (Lakoff & Johnson, 1980b), an object or person that moves up should be associated with more value, as indicated by expressions like "the stock market went up" (Morris, Sheldon, Ames, & Young, 2007) and "the employee climbed the corporate ladder," both connoting an association between improvement and greater amounts—of success or money—with upward movement. When an individual imagines moving either upward or downward, it is the self that *moves* up/down, and the self should then be judged as having more or less worth, respectively.

The next section provides theoretical support for the link between imagined vertical movements, self-worth, motivation, and cognitive performance.

Self-worth, motivation, and performance

Momentary changes to self-worth are likely to have motivational consequences (Crocker, Brook, Niiya, & Villacorta, 2006) as a result of one's desire to maintain the integrity of the self (Steele, 1988). Specifically, a negative change in self-worth might lead to compensatory motives aimed at restoring one's self-view, which leads people to engage in self-enhancing behaviors that can restore self-worth (Gao, Wheeler, & Shiv, 2009; Sivanathan & Pettit, 2010). One way to restore self-worth is to succeed at an ego-relevant task. In particular, the compensation hypothesis (Brunstein & Gollwitzer, 1996) suggests that after individuals' sense of worth has been threatened, they tend to intensify efforts in a subsequent task that is relevant to restoring their sense of worth. For example, Brunstein and Gollwitzer (1996) found that medical students whose sense of worth was threatened by negative feedback concerning their competence as physicians performed better, compared with students who received no feedback, on a subsequent task when this was introduced as relevant to being a successful physician. As a result, imagining downward movement should lead to greater effort spent in ego-relevant activities; that is, activities where success or failure can have repercussions for one's sense of worth.

Boosting self-worth can have the opposite effect, especially when the increase in self-worth is momentary and has a "fragile" or uncertain foundation (Crocker et al., 2006; Jones & Berglas, 1978; Kernis, 2003; Rhodewalt & Davison, 1986). Self-worth that is based on noncontingent positive feedback creates uncertainty about the reasons behind one's sense of worth (Rhodewalt & Davison, 1986). Thus, individuals might engage in defensive behaviors, such as self-handicapping in the form of reduced effort toward future tasks, aimed at preemptively justifying potential failure on ego-relevant tasks (Jones & Berglas, 1978; Rhodewalt & Davison, 1986). As a result, individuals might withdraw efforts from subsequent tasks where they could fail, hedging just in case they are not able to solve the task (e.g., "I did not get it right because I did not even try"). Following this logic, Baumeister, Campbell, Krueger, and Vohs (2003) suggest that "artificially" boosted self-esteem can reduce subsequent performance. In fact, individuals with high artificial self-esteem are more likely to withdraw efforts from tasks that otherwise would provide them the opportunity to showcase their value (Tice, 1991).

We theorize that the mental simulation of upward movements is likely to result in an increase in self-worth that is "fragile," as it lacks any concrete evidence about why one's worth increased, which might lead to self-protective behaviors. Hence, imagining upward movements should result in a reduction of the efforts dedicated toward ego-relevant activities, which will hamper performance in such tasks.

Although we theorize that the effect of imagined vertical movements on motivation and performance is mediated by self-worth, we also examine whether mood plays a role in our model.

Vertical movement and mood

The concepts *up* and *down* could conceivably affect mood. This supposition is reflected in metaphorical expressions such as "things are looking up" or "I am feeling up," implying that the concept *up* is associated with positive moods and outcomes (e.g., happiness, health, feeling good). If imagined vertical movements do influence mood and emotions (e.g. joy, happiness), subsequent cognitive performance should reflect such an effect.

However, it is worth noting that the activation of positive mood caused by moving up would lead, contrary to our main prediction, to an improvement in performance. Positive emotions can broaden a person's momentary thought–action repertoires and positively impact attention, intuition and creativity, resulting in improved performance on a variety of tasks (for a review, see Abele-Brehm, 1992).[1] Hence, emotions (e.g., mood) would counter the proposed reduction in motivation and performance that derives from the imagination of upward movement. We measure mood in our studies to ensure that we elucidate the process by which vertical movements influence motivation and performance. As we show, our findings do not support an effect of vertical movements on respondents' mood and emotions, suggesting that vertical movements influence self-worth, and subsequently motivation and performance, but not the mood of respondents.

Overview of studies

We present results from a pilot and four studies that examine the influence of imagined upward and downward movements on motivation and performance. The pilot is a preliminary examination of the effect of imagined vertical movements on self-worth. Study 1 provides evidence that mental simulation of upward (downward), vertical movement reduces (increases) the effort exerted toward ego-relevant activities, and that this effect is reversed when participants are given an opportunity to self-affirm. Studies 2 and 3 show that merely imagining moving upward, for example riding an elevator or taking off in an airplane, negatively impacts performance. Studies 4 and 5 examine the underlying process suggesting that imagining upward (downward) movements leads to enhanced (diminished) self-worth, which triggers self-protective (compensatory) behaviors that decrease (increase) motivation for success and, ultimately, degrade (improve) performance.

Pilot study — imagined vertical movement and self-worth

Method

In exchange for course credit, 194 undergraduate students were informed that they would hear a story scripted to evoke mental images as part of a study that measured imagery ability. After being instructed to relax (Naparstek, 1995), participants listened to one of three audio recordings that prompted them to imagine one of the three scenarios: (a) ascending from the ground to 1000 ft and then floating at that altitude, (b) floating at 1000 ft, which functioned as the control condition, or (c) floating at 1000 ft and then descending to the ground. After listening to the audio, participants reported the vividness of their imaginations on a scale adapted from Marks (1973) ranging from 1 (*no image at all, you only know that you are thinking of an object*) to 5 (*perfectly clear and as vivid as normal vision*) as well as the altitude at which they started floating/flying (to check whether they paid attention to the audio). Observations from fourteen participants were excluded from the analysis, of which five did not report experiencing mental images and nine reported not knowing the altitude at which they were flying/floating. The final sample included 180 participants who, in a subsequent supposedly unrelated study, reported four domain-specific (e.g., Pelham & Swann, 1989; Robins, Hendin, & Trzesniewski, 2001) self-worth (compared to the average student of your University, how do you rate your: academic ability; social skills; sport skills; musical ability) from 1 (*much lower*) to 9 (*much higher*). The ratings on the four scales were averaged to build a formative score (Diamantopoulos & Winklhofer, 2001) of self-worth. Participants also reported the extent to which they felt five positive emotions (excited, confident, joy, happy, strong; $\alpha = .90$).

Results and discussion

A main effect of movement (ascending, no vertical movement, descending) supported the prediction that imagined vertical movements affect self-worth, $F(2,177) = 7.61$, $p = .001$. Participants who imagined moving upward reported higher self-worth ($M = 6.49$; $SD = 1.05$) than those who imagined no vertical movement—i.e., floating at a constant altitude ($M = 6.06$; $SD = 1.10$), ($t(177) = 2.07$, $p = .04$), whereas those who imagined going downward reported lower self-worth ($M = 5.63$; $SD = 1.32$) than those who imagined no vertical movement, ($t(177) = -2.01$, $p < .05$). These results suggest that downward and upward movements have significant, but opposite impacts on

[1] It might be argued that the opposite prediction can be derived from the feelings-as-information hypothesis (Schwarz, 1990). According to this hypothesis, positive moods can trigger a processing strategy that relies on simple heuristics which has been shown to have detrimental effects on social judgments and persuasion, such as reduced message elaboration (Schwarz, 2001). As a result, it might be argued that positive mood hampers cognitive performance. This, however, is not the case here. The feelings-as-information hypothesis suggests that positive moods affect only spontaneously adopted heuristic processing styles which can be easily overridden when these heuristics are not appropriate to perform the task at hand (e.g., solving a math problem), hence making information processing more flexible under happy than sad moods (Schwarz, 2001).

self-worth. Furthermore, the three scenarios did not differ in the amount of positive emotions elicited ($p = .64$). The null effect of movement on emotions must be interpreted with caution. First, it is possible that mood changes might require certain specific embodied experiences, other than vertical movement (Lakoff & Johnson, 1980a). For example, it has been shown that assuming an upright posture, as opposed to a drooping posture, leads to more positive general mood and pride (Stepper & Strack, 1993). These, however, are sensory-motor experiences that are not imagined in this study. Second, emotions can be affected by other aspects of the scenario, besides embodied sensory-motor experiences. For instance, some people might find the imagination of downward movements (e.g., floating down the sky) scary (e.g., vertigo), others might find it exciting (e.g., the thrill of a skydiving). These idiosyncratic effects might override embodied effects of height/movement on emotions.

The objective of the next study is to test the effect of vertical movement on effort and to provide preliminary support for our proposed underlying psychological mechanism.

Study 1 — vertical movements and effort

Study 1 tested the hypothesis that imagining vertical movements influences effort toward ego-relevant activities. The study consisted of a 3 (movement: upward, downward, control) × 2 (self-affirmation: yes, no) between-subjects experiment.

Our measure of effort was how long individuals were willing to work on an Amazon Mechanical Turk (AMT) assignment. Both success and failure on these assignments (denominated "human intelligence tasks") are likely to be ego-relevant for AMT panelists as each panelist is assigned a reputation index which expresses the percentage of times his/her work was deemed satisfactory over the total number of tasks completed.

To confirm that human intelligence tasks are indeed ego-relevant, we asked 21 panelists whether completing tasks on AMT makes them feel proud ("After completing a human intelligence task on Amazon Mechanical Turk, I feel proud about myself;" "Earning money on Amazon Mechanical Turk makes me feel good about myself," $r = .56$). The scales went from 1 (*strongly disagree*) to 7 (*strongly agree*). Average responses ($M = 5.55$, $SD = .95$) were above the mid-point scale, ($t(20) = 7.49$, $p < .001$), confirming that completing tasks on AMT can be ego-relevant.

To provide preliminary evidence for the mediating role of self-worth, approximately half of the participants were given the opportunity to self-affirm before answering the effort questions. Past research shows that affirming a person's worth (e.g., through positive feedback) increases motivation for high self-esteem individuals, but can have the opposite effect for lower self-esteem individuals (Baumeister & Tice, 1985; Shrauger & Rosenberg, 1970; Silverman, 1964). In particular, we reasoned that in the downward condition, the compensatory goal triggered by lower self-esteem would be satiated through self-affirmation (Sivanathan & Pettit, 2010), and this, in turn, would reduce subsequent effort (i.e., since the need for restoring one's sense of worth was already achieved). In the upward condition, the act of self-affirming should reduce the self-protective tendency activated by an artificial boost in self-worth (Crocker et al., 2006; Sherman & Cohen, 2002), hence increasing participants' effort toward the ego-relevant task.

As a result, the extent to which self-affirmation reduces effort for participants in the downward condition (lower self-worth) and increases effort for participants in the upward condition (higher self-worth) provides an indication that changes in self-worth, and not mood, mediate the effect of vertical movement on effort.

Method

A total of 160 Amazon Mechanical Turk participants (with approval rate of 95% or greater) were recruited for the study in exchange of a small fee. One participant failed an attention manipulation check (e.g., Oppenheimer, Meyvis, & Davidenko, 2009) and was not included in the analysis, and another participant did not complete the study, leaving a sample size of 158 participants. First, participants were asked to report how easy or difficult it was to imagine a storyboard that prompted them to imagine one of the three scenarios: moving upward, moving downward, or no movement.

In the movement scenarios, participants imagined a 100-story skyscraper and then entering an elevator inside the building to go either up from the 10th to the 30th floor or down from the 50th to the 30th floor. The destination floor was kept the same in both conditions to avoid possible confounding effects due to the height of the final destination (i.e., in both conditions participants landed on the 30th floor). The two scripts were identical except that words indicating upward movement were replaced with words indicating downward movement and the sequence of floors was inverted. The scripts instructed participants to imagine going into an elevator and continued by saying: "The elevator doors close and the elevator begins to ascend (descend) […]. Visualize the red numbers changing as the elevator goes up (down) 12…13…14…15 (49…48…47…46…45) […] Imagine the feeling of going up (down)." In the control scenario, participants were guided to imagine a nature scene. Participants then reported whether they imagined the scene described from 1 (*strongly disagree*) to 7 (*strongly agree*), the vividness of the images evoked from 1 (*no image at all*) to 7 (*perfectly clear and as vivid as normal vision*), how difficult it was to process the text from 1 (*difficult to follow*) to 7 (*easy to follow*), before describing what they imagined and reporting the amount of positive emotions experienced (excited, enthusiastic, inspired, happy, $\alpha = .85$) from 1 (*very slightly or not at all*) to 5 (*extremely*).

Participants were then thanked and introduced to the self-affirmation task under the guise of a different study, where they described either an episode in which they performed at their best (self-affirmation condition), or their last trip at the grocery store (no self-affirmation condition; [Rucker & Galinsky, 2008]). Previous research shows that elaborating on one' success affirms self-worth (Klein, Blier, & Janze, 2001).

Participants were then asked to report, as part of a different study, how many hours of survey taking on Amazon Mechanical Turk they would be willing to work to obtain each of four

products (on four horizontal sliders ranging from 0 to 200). Participants saw a picture of the following products along with their retail prices: iPad mini (retail price $329), a Klu tablet (retail price $149), a $100 Harry and David Deluxe basket, and a $100 grocery gift card. Finally, to investigate whether the results might be driven by the perceived height of the landing floor, as opposed to vertical movement, participants in the movement scenarios reported on a ten-point scale the perceived height of the floor at which they exited the elevator from 1 (*ground*) to 10 (*top floor*).

Results

We expected that imagining moving upward, as opposed to downward, decreases effort (i.e., hours of work offered), but only when participants did not have the opportunity to self-affirm.

To control for the differences in value among products, we formed an index of overall effort by averaging the standardized effort scores of the four products. The analysis of each product separately leads to similar conclusions. Table 1 includes the means and standard deviations for all products in all conditions. A two-way ANOVA with the index of overall effort as a dependent variable revealed a significant interaction between movement and self-affirmation ($F(2, 152) = 7.35$, $p = .001$). As shown in Table 1, in the absence of self-affirmation, participants in the upward condition reported fewer hours ($M = -.33$, $SD = .35$) of intended survey taking than those in the downward condition ($M = .47$, $SD = 1.39$; $t(152) = -3.60$, $p < .001$). Participants in the control condition ($M = .06$, $SD = .91$) reported more hours than those in the upward condition ($t_{1-\text{tailed}}(152) = 1.70$, $p < .05$), but fewer than those in the downward condition ($t_{1-\text{tailed}}(152) = -1.72$, $p < .05$), hence suggesting (in line with the pilot study) that upward and downward movements both affect effort, although in opposite directions.

Furthermore, when participants had the opportunity for self-affirming, as predicted, effort decreased for participants in the downward condition ($t(152) = -2.77$, $p = .01$) but increased for those in the upward condition ($t(152) = 2.54$, $p = .01$). No significant difference was found in the control condition ($t(152) = .96$, $p = .34$).

Alternative accounts

These findings cannot be attributed to a simple change in height (i.e., being up vs. being down) as opposed to movement, since the landing floor was kept constant across conditions. However, given the imagined elevator rides had different starting floors (i.e., 50th and 10th), the height of the landing floor might have been perceived differently across conditions. As such, perceived height, rather than movement, might have driven our results. To test this possibility, we examined whether perceived height differed across conditions in the no self-affirmation condition. Although participants in the upward conditions (who started from the 10th floor) perceived the landing floor as higher ($M = 5.06$, $SD = 2.42$) than those in the downward condition ($M = 4.23$, $SD = 1.27$) this difference was not significant ($t(57) = 1.58$, $p = .12$). Most important, perceived height was not correlated with effort ($r = .04$, $p = .75$), hence making it an unlikely mediator of the effect reported.

Another alternative explanation might be that upward and downward scenarios differ along dimensions other than movement (i.e., emotions, imagery evoked, vividness, process fluency) and this might have driven the reported effects. However, against this alternative explanation, we found that evoked imagery ($F(2,155) = 1.20$, $p = .30$), vividness of the imagination ($F(2,155) = 1.88$, $p = .16$), process difficulty ($F(2,155) = 1.42$, $p = .25$), and positive emotions ($F(2,155) = .76$, $p = .47$) did not differ across the three scenarios. Furthermore, in the no self-affirmation conditions, effort was not correlated with evoked imagery ($p = .69$), vividness ($p = .20$), process difficulty ($p = .55$), or positive emotions ($p = .69$). Therefore, these variables are also unlikely mediators.

Finally, another possible alternative explanation is that imagining vertical movements affected the perception of how valuable one's work was, with participants in the upward condition perceiving their work as more valuable, hence resulting in fewer offered working hours. Although this explanation could account for the results in the no self-affirmation conditions, it cannot explain the results in the self-affirmation conditions.

Discussion

Study 1 provides preliminary evidence that imagining vertical movements influences the effort dedicated toward ego-relevant activities. Participants recruited on AMT reported being willing to offer fewer (more) hours for the same products after imagining upward (downward) movement. It is worth noting that participants were informed about all product prices. With a moderation-of-process approach (Spencer, Zanna, & Fong, 2005), we provided preliminary evidence for the

Table 1
Hours of survey taking (with standardized average) participants offered for different products. Standard deviations are in parenthesis.

	Self-affirmation condition									
	iPad mini		Klu tablet		$100 Deluxe basket		$100 grocery card		Overall effort (std. average)	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Upward	41.67 (40.41)	68.28 (56.15)	17.00 (13.62)	42.84 (42.95)	8.73 (8.08)	21.72 (33.69)	15.45 (11.36)	31.76 (30.08)	−.33 (.35)	.24 (.96)
Control	63.42 (53.22)	46.46 (39.75)	32.42 (42.35)	24.08 (18.33)	15.08 (18.21)	9.96 (10.39)	29.29 (33.33)	24.42 (32.92)	.06 (.91)	−.17 (.62)
Downward	86.35 (71.14)	48.33 (31.78)	46.12 (58.22)	22.38 (20.18)	27.77 (38.33)	12.00 (13.04)	38.88 (49.18)	19.46 (17.54)	.47 (1.39)	−.19 (.53)

proposed underlying mechanism by manipulating participants' opportunity to self-affirm before answering the effort questions. In line with the hypothesis that changes in self-esteem drive exerted effort, we found that self-affirmation decreased effort for those in the downward movement condition (where self-affirmation satisfies the compensatory motive triggered by lower self-worth) but increased effort for those in the upward movement condition (where self-affirmation reduces self-protective motives triggered by the artificial boost in self-worth).

Study 1 supports our theorizing with a measure of intended effort. In the next study we examine the behavioral consequences of the different levels of effort triggered by imagined vertical movements.

Study 2 — the puzzle task

The objective of Study 2 was to test the effect of imagining moving upward and downward on cognitive performance. Participants imagined taking an elevator ride that went either 20 floors up or 20 floors down before solving several mathematical puzzles. A sample (n = 105) from the same population as in the main study reported to what extent solving a math puzzle would make them feel (good/proud/satisfied, α = .92) from 1 (*not at all*) to 7 (*very much*). The average of the responses (M = 5.72, SD = 1.16) was significantly greater than the mid-point scale, ($t(104)$ = 15.19, $p < .001$), indicating that solving a math puzzle is an ego-relevant task. We expected participants who imagined going up to solve fewer puzzles than those who imagined going down.

Method

In exchange for course credit, 81 undergraduate students were informed that they would hear a story scripted to evoke mental images as part of a study that measured imagery ability. After being instructed to relax, participants listened to one of two audio recordings describing upward or downward elevator rides, adapted from Study 1.

After listening to the audio, participants reported the floors on which they entered and exited the elevator. This served both as a manipulation check and as an assurance that they paid attention to the audio. Three participants were discarded for having reported starting and landing floors that were not consistent with the movement manipulation. We also measured the extent to which respondents felt positive (joy, happy; r = .76) and negative emotions (nervous and irritable; r = .39) from 1 (*not at all*) to 7 (*extremely*). Participants were then introduced to a supposedly unrelated study and informed they had the opportunity to enter a lottery with a chance to win a $20 cash prize. To do so, they had to solve the highest number of math puzzles among the study's participants. The puzzles used in this study were adapted from Mazar, Amir, and Ariely (2008) and consisted of a series of 3 by 3 tables, where each table contained 9 numbers. For each table, participants had to identify two numbers that added up to 10 (e.g., 1.71 and 8.29). After being shown an example, participants were informed they had 3 min to solve as many tables as possible.

Results and discussion

We expected participants who imagined moving up to solve fewer tables than those who imagined moving down. This prediction was supported. Those who imagined moving 20 floors down solved on average 4.15 tables (SD = 2.05), whereas those who imagined moving up 20 floors solved on average 3.18 tables (SD = 2.19), $t(76) = -2.03$, $p < .05$. That is, downward movement resulted in an improvement in performance of about 30% compared to the upward movement. No significant difference in positive (p = .23) or negative emotions (p = .55) was observed across the two groups. Furthermore, no correlation was found between performance and positive (p = .16) or negative emotions (p = .59), hence failing to provide evidence that mood mediates performance.

Results from Study 2 provide evidence that imagining upward, as opposed to downward, movements can be detrimental to performance. We suggest that this effect is driven by a reduction (increase) in motivation to succeed on ego-relevant tasks.

An alternative explanation might be that boosting (threatening) self-worth through upward (downward) movement might lead respondents to overestimate (underestimate) their ability (i.e., the number of puzzles they are capable of solving), hence reducing (increasing) the effort they exert on the task (Baumeister, Heatherton, & Tice, 1993). To rule out this possibility, after imagining going up or down but before starting the test, participants estimated the number of tables they thought they could solve (from 0 to 11). The analysis of participants' expectations speaks against the overestimation hypothesis, since no significant difference was found between the two conditions (M_{up} = 6.13, SD = 2.48; M_{down} = 6.26, SD = 1.89), $t(76) = -.26$, p = .80. In the next study, we further discount the alternative "overestimation" hypothesis and test the robustness of the reported effect.

Study 3 — the scramble task

Study 3 introduces two changes to the protocol used in Study 2 aiming at: (a) providing evidence against the overestimation account of upward movement and (b) further investigating the effect of upward movement versus a control condition.

First, participants in Study 3 chose the level of difficulty/reward of the task performed. As mentioned above, boosting self-worth by imagining upward movements might lead to overestimating one's ability and future performance. Hence, a reduction in the exerted effort on the task might be the result of an "honest" overestimation of one's ability (the *overestimation* explanation), as opposed to the motivation to protect one's sense of worth (our favored account, the *motivational* explanation). Preliminary evidence against the overestimation explanation was provided in Study 2, where the estimates of the number

of puzzles solved did not differ across conditions. In Study 3, we seek further evidence in this direction.

If lower performance in the upward movement condition was driven by an overestimation of one's ability to perform, people who imagined moving upward should choose more challenging and rewarding tasks. This would then explain this group's lower performance. However, our hypothesized motivational account could accommodate a variety of behaviors in the upward movement condition. For example, to protect their sense of worth, people might either choose to engage in easier tasks (as a way to reduce the probability of failure) or more difficult ones, as a way to externalize possible failure (i.e., I failed because the task I chose was too difficult).

Therefore, the choice of harder tasks after upward simulation would be compatible with both the overestimation and the motivational explanation. Any other effect (a null result or a choice of easier tasks) would be compatible only with the motivational explanation and would allow us to further discount the overestimation explanation.

The second change introduced in Study 3 is to provide further evidence that upward movement reduces performance compared to a control condition. This is especially relevant because most of the vertical mental simulations portrayed in adverting are related to upward movements. Study 3 tests the effect of imagined upward movement against a control condition that did not entail vertical movements.

Method

Following Study 2's procedure, 147 undergraduate students were guided to imagine one of the two scenarios with audio recordings. The "ground" scenario described the sequences from boarding an aircraft to taxiing toward the runway and the "takeoff" scenario described the sequences from being on the runway to the takeoff phase that took the airplane to a cruising altitude. Of the two, only the takeoff scenario entailed the imagination of an upward movement. After listening to the audio, they were asked three questions about the content of the audio (e.g., from which city the flight departed, where it connected, and its final destination) to insure they actually listened to it. Observations from four participants who answered wrong on all three questions were excluded from the analyses. Participants were then introduced to a supposedly unrelated study that gave them the opportunity to enter a lottery for cash reward provided that they successfully solved one of the six scrambles that varied both in difficulty and potential payoffs. A pretest confirmed that solving scrambles can restore self-worth. In particular, a sample (n = 104) from the same population reported how solving a scramble would make them feel (good, proud, satisfied, $\alpha = .88$) from 1 (*not at all*) to 7 (*very much*). The average of the responses ($M = 5.17$, $SD = 1.40$) was significantly greater than the mid-point scale ($t(103) = 8.52$, $p < .001$). For this reason, we expected people who imagined moving upward to solve fewer puzzles than those in the control condition. The six scrambles (Appendix 1) ranged from easy, with a potential reward of $3, to very difficult, with a potential reward of $24.

Results and discussion

Level of difficulty/reward chosen

First, we analyzed whether the imagined scenario affected the difficulty/reward of the scramble chosen which varied from 1 (very easy/$3) to 6 (very difficult/$24). A one sample t-test analysis showed that the difficulty/reward chosen did not differ between the two airplane scenarios ($M_{up} = 3.96$, $SD = 1.47$; $M_{control} = 3.83$, $SD = 1.52$), $t(141) = .51$, $p = .61$. Even when considering the level of difficulty/reward chosen as an ordinal measure (rather than interval as in the t-test analysis above), we found no difference between the two scenarios (Wald Chi-Square (1) = .20, $p = .66$). These findings suggest that imagining moving upward does not affect the level of difficulty/reward chosen. Not having found evidence contrary to our proposed motivational account in either Study 2 or Study 3, we can discount the overestimation explanation for the effect of imagined upward movement on performance.

Performance

Following Baumeister et al. (1993), we measured performance as the sum of money hypothetically won, which equated either "0" when the participant did not solve the chosen word scramble, or the amount of money associated with the scramble when the participant successfully solved it. Results showed that participants in the upward scenario won an average of $2.5 less than those in the control (ground taxiing) condition ($M_{up} = \$5.53$, $SD = \$6.27$; $M_{control} = \$8.03$, $SD = \$8.04$), $t(141) = -2.08$, $p = .04$. That is, the upward movement resulted in a decrease of about 31% in the amount of money won compared to the control scenario.

Interestingly, however, the overall number of correct answers was not significantly different across conditions (upward = 53% vs. control = 63%; χ^2 (1) = 1.65, $p = .20$). This suggests that imagining upward movements had a stronger effect on performance among difficult/rewarding scrambles. To examine participants' performance across levels of difficulty, while ensuring a sufficient number of observations in each group, we grouped the data across the six scrambles into three categories representing easy (very easy and easy scrambles), medium (somewhat easy and somewhat difficult scrambles) and difficult scrambles (difficult and very difficult scrambles). Results showed that the success rate did not differ across conditions for the easy scramble (upward = 82%; control = 73%, χ^2 (1) = .26, $p = .61$) and the medium scramble (upward = 69%; control = 62%; χ^2 (1) = .33, $p = .57$). This result can be explained by the fact that these scrambles were easy and limited effort was required to solve them (e.g., "A–S–W–P," solution: wasp, and "H–K–I–N–T," solution: think). Therefore, differences in motivation did not play a significant role in solving the scrambles. However, in the difficult condition (e.g., "R–B–D–A–E–G," solution: badger, and "R–C–I–A–V–G–N," solution: craving), participants assigned to the upward condition were significantly less likely to succeed (19%) than those in the control condition (58%), (χ^2 (1) = 7.16, $p = .01$).

Altogether, Studies 2 and 3 suggest that imagining moving upward decreases performance, even when people can choose

the level of difficulty/reward of the task solved. The implications of this study have both theoretical and practical relevance since people often have the opportunity to choose the level of difficulty/reward to engage in, such as when one has to decide whether to apply to a selective graduate program, invest in a more sophisticated financial instrument, or choose a technologically complex product that requires significant efforts to set up but would increase quality of life in the home (e.g., networked wireless video streaming).

Furthermore, results from Study 3 indicate that the effect on performance of imagining upward vertical movements is stronger when the task to be solved is at least moderately demanding (i.e., it requires effort to be successfully completed). Note that the task used in Study 2, although conceptually simple (e.g., finding two numbers that added up to 10), was also computationally demanding since each table included many (36) possible comparisons between pairs of numbers. For non-demanding tasks such as a simple scramble, differences in effort may not play a determining role for a person's chance to succeed. The next study examines the mediating role of self-worth and effort.

Study 4 — vertical movements and the GMAT

Study 4 had the objective to test the psychological mechanism underlying our results. That is, imagining moving upward, as opposed to downward, makes people feel better (worse) about themselves which, in turn, decreases (increases) their motivation to succeed on a subsequent task, hence resulting in worse (better) performance.

Method

Participants were 142 undergraduate students who satisfied two requirements. First, they reported being fluent English readers by answering above the mid-point on a question about their proficiency in reading English from 1 (*very low*) to 5 (*like a native speaker*). Second, they reported not being currently studying for a standardized test (e.g., GMAT, GRE, SAT). At the beginning of the study, participants were asked a few questions including a self-assessment of their math ability; "I usually do well in mathematics" from 1 (*strongly disagree*) to 7 (*strongly agree*). This variable was used as a covariate in the analyses described later. Participants were then randomly assigned to one of the two elevator scripts used in Study 2.

After listening to the audio, they reported the floors at which they entered and exited the elevator. Observations from seven participants who reported wrong both the starting and landing floors were discarded. Participants were then introduced to a supposedly unrelated study entitled "A few questions about you," that included the measure of self-worth. According to the literature discussed earlier (Baumeister et al., 2003; Brunstein & Gollwitzer, 1996; Tice, 1991), motivation to succeed in a task is affected by changes in self-worth in domains related to the task that was performed (i.e., ability). That is, if a threat/boost to one's self-worth is perceived in domains unrelated to academic ability (i.e., sports), it is unlikely that tests like the GMAT/SAT will be construed as ego-relevant. Consequently, we employed two domain-specific measures (r = .65) of self-worth related to academic ability (adapted from Pelham & Swann, 1989); Compared to the average student of your University how do you rate (a) your overall ability, and (b) your academic ability, from 1 (*much lower*) to 7 (*much higher*)?

Participants also reported how much they felt positive emotions (interested, excited, and enthusiastic; α = .81) from 1(*very slightly*) to 5 (*extremely*). As in Study 1, the amount of positive emotions experienced was not affected by the direction of movement ($t(133) = -.71$, p = .48). Participants were then introduced to a "Math Problems Study" and informed that the objective of the study was to determine how many math problems, similar to those found in the SAT and GMAT, could be solved in a few minutes. Participants were given 5 min to solve as many problems as possible. They were also informed that they could skip the task at any time they wanted to. To make the test performance more relevant to their sense of worth, participants were informed that, at the end of the task, they would be informed about how many problems they had answered correctly.

They then moved on to the next page and found 21 multiple choice problems, each with five possible answers, taken from sample SAT/GMAT (e.g., "Tom is four years older than Kate. In two years, Kate will be twice as old as Marianne, who is now four. How old is Tom?"). Participants were informed that to solve the problems they could use only the pen and the blank sheets provided on their computer station. After participants completed the task, but before they knew the number of correct answers, effort was measured with two questions (r = .71): "How much effort did you put in this task?" from 1 (*a little*) to 7 (*a lot*) and "How important was it for you to be successful on this task?" from 1 (*not at all important*) to 7 (*extremely important*). Participants were then shown the problems they had solved correctly. Finally, participants reported their gender and GPA.

Results and discussion

As in previous studies (Oswald, Proto, & Sgroi, 2009), we statistically controlled for exogenous variables that may influence performance in GMAT-style problems by including four covariates in all the analyses reported below: Gender (following Hancock, 1999), positive emotions, GPA, as well as self-assessment of math skills (measured before the elevator scenario). With the exception of gender, all covariates were mean-centered.

Vertical movement and problems solved

To correct for random guessing to multiple choice questions, we applied the standard correction for guessing (Diamond & Evans, 1973). This procedure increases the validity of multiple choice quizzes (Prihoda, Pinckard, McMahan, & Jones, 2006) and entails granting 1 point for each correct answer, 0 for non-answers, and subtracting .25 points (determined as 1 over the number of choices per question [i.e., five] minus one) for each incorrect answer. Participants' guessing-correct scores

were regressed on a dummy variable indicating whether the movement was upward (1) or downward (0), and on the covariates discussed above. Results suggest that the direction of movement had an impact on participants' performance ($\beta = -.62$, $t(129) = -2.01$, $p < .05$). Specifically, participants who imagined moving 20 floors downward reported a better score (adjusted $M = 2.97$) than those who imagined going up 20 floors (adjusted $M = 2.35$). This represents an increment of approximately 26% in participants' score from the upward to the downward condition.

The underlying mechanism

We tested the proposed underlying mechanism with a mediation analysis. Traditionally, mediation analysis tests the extent to which a variable (i.e., the mediator) accounts for the relation between a dependent variable and an independent variable (Baron & Kenny, 1986). The model we propose, however, differs from the traditional mediation process because it entails a three-path mediation (Taylor, MacKinnon, & Tein, 2008) consisting of two consecutive mediators (see Fig. 1). As previously discussed, we suggest that direction of movement (independent variable) affects self-worth (mediator 1), which affects effort (mediator 2), which in turn affects performance (dependent variable).

We tested the three-path mediation proposed with two approaches: A joint significance test (Taylor et al. 2008) and the bias-corrected bootstrap estimation of the mediated effect (Hayes, 2012). The joint significance test is a generalization of Baron and Kenny (1986)'s approach and entails estimating three regression models. In model 1, the measure of self-worth was regressed onto a dummy variable indicating whether people imagined moving upward or downward along with the covariates. Results suggest that self-worth was affected by the direction of movement ($\beta_1 = .30$, $t(129) = 2.31$, $p = .02$). People who imagined going down reported lower self-worth than those who imagined going up. In model 2, the measure of effort was regressed onto self-worth, a dummy variable indicating the direction of movement and the covariates. Results show that self-worth was negatively associated with effort ($\beta_2 = -.35$, $t(128) = -2.34$, $p = .02$). This finding indicates that people with lower self-worth reported spending more effort on the GMAT task. In model 3, participants' guessing-correct score was regressed onto the measure of effort, self-worth, a dummy variable indicating the direction of movement and the covariates. Results show that higher levels of effort result in a better score ($\beta_3 = .31$, $t(127) = 2.52$, $p = .01$). Evidence for three-path mediation is provided by the significance of the coefficients β_1, β_2, and β_3 presented in models 1 to 3 (Taylor et al., 2008). In addition, we tested the overall significance of the indirect effect ($=\beta_1 \times \beta_2 \times \beta_3$) of the three-path model with the bootstrap procedure proposed by Hayes (2012). Results showed that the 95% confidence interval of the three path mediation ($-.127$ to $-.003$) did not include zero, hence indicating statistical significance at $p < .05$ level. In summary, both analyses provide evidence that the effect of movements on preference is mediated by two sequential mediators: self-worth and effort.

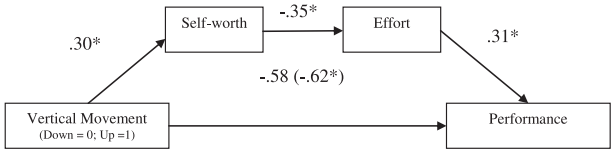

Fig. 1. Regression coefficients for the three-path mediation model. The effect of vertical movement on performance is mediated by two sequential moderators: Self-worth and motivation. The regression coefficient for the direct effect of movement on performance is in parenthesis. Only relevant estimates are shown for ease of presentation. * = $p < .05$.

Other explanations of process

We propose that the effect of vertical movement on self-worth results from an embodied metaphorical association between vertical movements and the concept of "more/less." Still, our claim could be countered with the argument that the effect on self-worth stems from other metaphorical associations, such as the association between the abstract concept of "good" and "up." However, the "good is up" argument can be dismissed on an empirical basis given the results in Studies 1 and 3 showing that our manipulations of vertical movements did not affect positive or negative emotions.

Another potential explanation for the process observed in our studies is that, in the upward movement, the increase in self-worth could stem from a metaphorical association with personal power. "Power is up" stems from a relative vertical position in which being higher up than someone else symbolizes physical dominance (i.e., "the winner in a fight typically winds up atop the loser;" Lakoff & Johnson, 1980a, *p*. 204). This alternative explanation also seems unlikely since a change in personal power would not account for the observed changes in effort in our studies. Power, in fact, is defined as the capacity to influence others and exert control over valuable resources (Anderson & Galinsky, 2006) and, contrary to self-worth, it is unlikely to be restored or enhanced by succeeding in tasks such as GMAT, puzzles, or scrambles.

Our last study shows direct consumer behavior implications of our theorizing and uses an objective measure of effort to confirm our hypothesized process.

Study 5 — vertical movement and smart shoppers

Securing a "good deal" can make consumers feel proud, smart or competent (Schindler, 1989, 1998), hence making it an ego-relevant task. Therefore, imagining either upward or downward vertical movements might affect the effort exerted toward securing good product deals. Study 5 tested this prediction. We expect that imagining upward movements reduces the effort spent on securing good product deals (e.g., choosing the best product available) as well as the chance of actually getting those deals.

The second objective of the study was to test our hypothesis through a more objective measure of effort that does not rely on a self-reported assessment. To this end, we recorded the time participants spent working on getting a good deal as a proxy of the effort exerted in the task.

Method

Thirty-eight undergraduate students participated in the study in exchange for course credit or monetary compensation. Observations from six participants who failed an attention manipulation check (e.g., Oppenheimer et al., 2009) were discarded. Following the procedure in Study 1, participants read one of the two elevator scenarios used in that study, then described the scene imagined and reported the altitude at which they started and ended their imagined elevator ride.

After a filler task, participants were introduced to a task entitled "Can you get a good deal?" The task was presented as a separate study of how difficult it is to obtain good product deals. Participants then saw four different cell-phone plans and were asked to select the best deal (i.e., most convenient plan) given specific communication needs (e.g., call time, messages, and data consumption). To help with the computations, each participant was provided with a booklet and a pencil. To increase the ego-relevance of the task, participants were informed, before working on the task, that they would later find out whether they chose the best plan. They then moved on to specific information about the four plans (e.g., monthly cost, minutes include; see Appendix 2) and made their selection. The time spent on this page to select a plan was used as a measure of effort. To check whether securing a good deal is ego-relevant, participants answered two questions before being informed about their performance on the cell-phone plan task: "after getting a good deal I feel good about myself" and "I feel good about myself when I get a good deal" (r = .80) from 1 (*strongly disagree*) to 7 (*strongly agree*). Finally, participants reported on a ten-point scale the perceived height of the exiting floor, from 1 (*ground*) to 10 (*top floor*).

Results and discussion

Deals as self-enhancers

Participants agreed that getting good deals is ego-relevant as suggested by average responses (M = 6.19, SD = .95) well above the mid-point scale ($t(31)$ = 13.05, p < .001). No difference was found across movement conditions (p = .82).

Effort

As expected, participants who imagined moving downward worked longer on getting the best deal (M = 159.1 s., SD = 106.7 s.) than those who imagined moving upward (M = 80.3 s., SD = 63.6 s.), $t(30) = -2.44$, p = .02.

Who got the best deal?

The best plan given the constraints and goals of the task was plan C (see Appendix 2). Participants' choices were coded as "1," when the best plan was chosen, or as "0" otherwise and used as dependent variable in a logistic regression with direction of movement as the independent variable. As expected, participants who imagined moving upward were less likely to "get the good deal" (7% vs. 50%, respectively; $\beta = -2.56$, Wald χ^2 (1) = 5.06, p = .02). Note that the probability of guessing the best plan by chance alone was 25%, since participants had four options to choose from. The large difference between the upward and the downward conditions is likely due to the fact that the task was rather demanding and the upward respondents might have used less effortful choice strategies that reduced performance. In fact, the magnitude of the effect found here is in line with the effects for the more difficult scrambles (19% vs. 58%) reported in Study 3. That is, when choosing a phone plan, participants might have adopted different strategies, each requiring a different amount of effort. The first, most effortful strategy requires making the calculation to choose the best-deal (i.e., plan C). This strategy would result in a greater number of correct answers, and was chosen by respondents in the downward condition 50% of the time. This result was consistent with our theory that respondents in the downward condition would be motivated to search for the best deal. A second possible strategy is less effortful and uses a simple heuristic. Plan D included several "unlimited" features so it would naturally be the favored option if respondents were choosing based on simple heuristics. Consistent with our theory that respondents in the upward condition would not be highly motivated to solve the task, 57% of respondents in that condition chose plan D and the remaining responses were distributed across plans A, B and C.

Mediation

To provide evidence for the mediating role (Baron & Kenny, 1986) of effort on performance, we regressed the dummy variable for whether the answer was correct or incorrect onto direction of movement, whose coefficient became non-significant ($\beta = -2.31$, Wald χ^2 (1) = 2.34, p = .13), and effort (i.e., time), whose coefficient was significant (β = .03, Wald χ^2 (1) = 5.87, p = .02). Further, a bootstrap analysis (Hayes, 2012) found that the bias-corrected 95% confidence interval (−12.75 to −.36) of the indirect effect (i.e., the effect through the mediator) did not include zero, hence suggesting significance at p < .05 level. As in Study 1, neither did perceived height differ across conditions, (p = .60; one missing value) nor was it correlated with time spent on the task (p = .98), or the probability of getting a good deal (p = .72).

Overall these results suggest that imagining vertical movements has important consumer implications. Simply imagining upward (downward) movements can decrease (increase) consumer's effort to obtain better product deals. This, in turn, can (reduce) increase the probability that consumers obtain better deals.

General discussion

Within the domain of embodied cognition and metaphor-enriched cognition (e.g., Meier & Robinson, 2004; Meier et al.,

2007; Schubert, 2005) research shows that the notion of "up" is generally associated with concepts like "good," "divine," and/or "power." Our work extends previous research in two main ways. First, we consider a specific sensory-motor experience of verticality (i.e., movement) and examine its effects on motivation and performance. Second, we present counterintuitive results showing that imagining upward movements can have negative consequences for consumers. Merely imagining oneself moving up, for example taking an elevator ride or taking off on an airplane, can hinder motivation and performance on tasks including SAT/GMAT math problems as well as securing good product deals.

We provide evidence that the effects of imagined vertical movements on performance are caused by changes to self-worth, which enhance/inhibit efforts to succeed on a subsequent task. We propose that these effects result from an embodied metaphorical association between vertical movements and self-worth. We also provide theoretical and empirical arguments against the role of emotions as a possible alternative explanation by showing that our manipulations of vertical movements do not affect positive or negative emotions. We also rule out the possibility that the impact of vertical movements in our studies might be attributed to other related metaphorical associations, such as "power is up" (Schubert, 2005).

Our results extend research on embodied cognition by showing that mentally simulating upward movement increases self-worth and, in turn, reduces motivation and performance. This finding has important implications for decision making and advertising. In particular, advertisements often include scenes depicting people experiencing vertical movements (e.g., taking an elevator, taking off or landing in an airplane, taking an escalator) which might prompt the imagination of vertical sensory motor experiences among viewers. This could have unintended consequences in the marketplace. For example, a consumer who is prompted to imagine going up in an elevator, when watching a character doing so in an ad, might experience a boost in self-worth. This effect then faces a potential tradeoff, as higher self-worth might inhibit the motivation to process relevant information-rich marketing materials (e.g., long-term consequence of financial decisions, the side-effects of a medication, or complex pricing schemes).

Additionally, our work contributes to the limited literature showing that merely imagining sensory-motor experiences may affect perception and judgment (e.g., Elder & Krishna, 2012). Previous research on embodied and metaphorical enriched cognition has focused mostly on actual perception (e.g., seeing an object in an upward position) or an actual sensory experience (e.g., moving upward). Neuroscience research shows that imagining a sensory-motor experience activates the same neurological structures as the actual experience (Lotze et al., 1999; Pfurtscheller & Neuper, 1997). Showing that imagined, as opposed to actual, sensory-motor experiences can impact judgments, has the advantage that it can be more easily used in the context of communication (e.g., an ad that prompts people to imagine themselves moving upward or downward) and thus facilitate or hinder complex decisions.

Our findings open several avenues for future research. For example, research might explore the effect of imagining sensory-motor experiences on compensatory consumption due to changes in people's self-worth. In fact, one way to restore self-worth is to acquire products with positive self-associations (Sivanathan & Pettit, 2010). As a result, moving downward (upward) might increase (reduce) preferences for products with positive self-associations that can enhance one's positive self-view. Future research might also explore whether the effects of mentally simulating sensory-motor experiences go beyond the self. For instance, images of a product moving upward might convey greater value to the product.

Future studies should also replicate the effects of vertical movements in contexts other than imaging being in an elevator moving upward or downward. Preliminary evidence that the effects presented here are not specific to the elevator scenario is provided in the pilot study as well as in Study 3, where participants' imagined movements were manipulated with different scenarios (i.e., floating up or down, taking off in an airplane). However, replications in other contexts are warranted.

Our studies show effects that can have real and tangible consequences, like the ability of consumers to identify the best plan for their needs. This suggests that marketers need to consider the cognitive effect of vertical mental simulations. An open issue concerns the practical implications of vertical movements in real-world situations. For example, one might expect more human errors when performing upward movements, such as when driving uphill, taking-off on airplane, or simply going up in an elevator. On the basis of the results presented here, we cannot positively draw such conclusions. Even though our results were replicated even when performance was potentially rewarded with monetary compensation (i.e., Studies 2 and 3), we are unable to evaluate the effects of vertical movements relative to other variables that affect performance or motives in real-life situations (i.e., importance of the reward, people's ability). In real life, many variables influence human behavior and performance. In this paper, we focus on one of them: the simulation of vertical movements. This, we believe, is worthy of scientific inquiry because it takes us closer to understanding the embodied effects of upward vertical movement, which is generally assumed to be positive. Future research might investigate whether the phenomenon we documented has sizable effects in real-world situations. For example, studies could examine whether overall standardized test scores are lower for tests administered on higher, rather than lower, floors, or whether airplane pilots are more likely to make communication mistakes during the take-off, rather than while cruising or landing in the real world.

Future research could also explore other aspects of how moving upward versus downward affects self-worth. For instance, it could investigate the short versus long-term effects of embodied cognition on self-worth; that is, for how long does the effect remain after a person has imagined moving

vertically? Another issue is how self-worth is impacted by the speed during the movement and the distance covered. Is there a tradeoff such that a slower moving or shorter vertical-difference elevator ride will lead to different changes to self-worth than an imagined experience of a faster moving, or higher vertical difference? Another issue to understand is the relative impact of vertical inclination (moderate versus steep) of bodily movements on self-worth. Is there a correlation between inclination and self-worth? Similarly, when is the ceiling reached to changes in self-worth? Addressing these and related issues would contribute to a deeper understanding of the impact of metaphorical imagery on self-worth and consumption choices.

Appendix 1. Lottery options presented in Study 3

Very easy: $3	Four-letter scramble to be completed in 30 s. More than 95% who those who have attempted this scramble have completed it successfully
Easy: $7	Five-letter scramble to be completed in 40 s. Approximately 85% who attempt this scramble can complete it successfully
Somewhat easy: $9	Five-letter scramble to be completed in 30 s. Approximately 65% who attempt this scramble can complete it successfully
Somewhat difficult: $13	Six-letter scramble to be completed in 40 s. Approximately 45% who those who have attempted this scramble have completed it successfully
Difficult: $17	Six-letter scramble to be completed in 30 s. Approximately 35% who attempt this scramble can complete it successfully
Very difficult: $24	Seven-letter scramble to be completed in 40 s. Less than 25% who attempt this scramble can complete it successfully.

Appendix 2. Phone plan task used in Study 5

	Plan A	Plan B	Plan C	Plan D
Activation fee (paid only once)	$25	$50	$0	$50
Cost of the phone	$500	$400	$200	$150
Minutes included per month	1000	500	900	Unlimited
Extra minutes	$.1	$ .05	$.2	
Messages included per month	1000	450	900	Unlimited
Extra messages	$.02	$.05	$.03	
Data included per month	100 MB	400 MB	250 MB	Unlimited
Extra MB	$.02	$.03	$.05	
Monthly cost	$45	$40	$50	$75

All plans are monthly contract and offer the same phone.

Choose the plan with the lowest total cost for the next 20 months given that you exactly need:

- Call time: 750 min/month
- Messages: 600/month
- Data: 300 MB/month
- Time horizon: 20 months

References

Abele-Brehm, A. (1992). Positive versus negative mood influences on problem solving: A review. *Polish Psychological Bulletin*, *23*(3), 187–202.

Anderson, C., & Galinsky, A. D. (2006). Power, optimism, and risk-taking. *European Journal of Social Psychology*, *36*(4), 511–536.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest*, *4*(1), 1–44.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1993). When ego threats lead to self-regulation failure: Negative consequences of high self-esteem. *Journal of Personality and Social Psychology*, *64*(1), 141.

Baumeister, R. F., & Tice, D. T. (1985). Self-esteem and responses to success and failure: Subsequent performance and intrinsic motivation. *Journal of Personality*, *53*(3), 450–467.

Brunstein, J. C., & Gollwitzer, P. M. (1996). Effects of failure on subsequent performance: The importance of self-defining goals. *Journal of Personality and Social Psychology*, *70*(2), 395–407.

Crocker, J., Brook, A. T., Niiya, Y., & Villacorta, M. (2006). The pursuit of self-esteem: Contingencies of self-worth and self-regulation. *Journal of Personality*, *74*(6), 1749–1772.

Diamantopoulos, A., & Winklhofer, H. M. (2001). Index construction with formative indicators: An alternative to scale development. *Journal of Marketing Research*, *38*(2), 269–277.

Diamond, J., & Evans, W. (1973). The correction for guessing. *Review of Educational Research*, *43*(2), 181–191.

Elder, R. S., & Krishna, A. (2012). The "visual depiction effect" in advertising: facilitating embodied mental simulation through product orientation. *Journal of Consumer Research*, *38*(6), 988–1003.

Gao, L., Wheeler, S. C., & Shiv, B. (2009). The 'shaken self': Product choices as a means of restoring self-view confidence. *Journal of Consumer Research*, *36*(1), 29–38.

Hancock, T. (1999). The gender difference: Validity of standardized admission tests in predicting MBA performance. *Journal of Education for Business*, *75*(2), 91–93.

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [electronic version]. Retrieved from. http://www.afhayes.com/public/process2012.pdf

Hung, I. W., & Labroo, A. A. (2010). From firm muscles to firm willpower: Understanding the role of embodied cognition in self-regulation. *Journal of Consumer Research*, *37*(6), 1046–1064.

Jones, E. E., & Berglas, S. (1978). Control of attributions about the self through self-handicapping strategies: The appeal of alcohol and the role of underachievement. *Personality and Social Psychology Bulletin*, *4*(2), 200–206.

Kernis, M. H. (2003). Toward a conceptualization of optimal self-esteem. *Psychological Inquiry: An International Journal for the Advancement of Psychological Theory*, *14*(1), 1–26.

Klein, W. M. P., Blier, H. K., & Janze, A. M. (2001). Maintaining positive self-evaluations: Reducing attention to diagnostic but unfavorable social comparison information when general self-regard is salient. *Motivation and Emotion*, *25*(1), 23–40.

Krishna, A. (2012). An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior. *Journal of Consumer Psychology*, *22*(3), 332–351.

Lakoff, G., & Johnson, M. (1980a). The metaphorical structure of the human conceptual system. *Cognitive Science: A Multidisciplinary Journal*, *4*(2), 195–208.

Lakoff, G., & Johnson, M. (1980b). *Metaphors we live by.* Chicago and London: The University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought.* New York: Basic Books.

Lee, S. W. S., & Schwarz, N. (2010). Washing away postdecisional dissonance. *Science*, *328*(5979), 709.

Li, X., Wei, L., & Soman, D. (2010). Sealing the emotions genie. *Psychological Science*, *21*(8), 1047–1050.

Lotze, M., Montoya, P., Erb, M., Hülsmann, E., Flor, H., Klose, U., et al. (1999). Activation of Cortical and cerebellar motor areas during executed and imagined hand movements: An fMRI study. *Journal of Cognitive Neuroscience*, *11*(5), 491–501.

Marks, D. F. (1973). Visual imagery differences in the recall of pictures. *British Journal of Psychology*, *64*(1), 17–24.

Mazar, N., Amir, O., & Ariely, D. (2008). The dishonesty of honest people: A theory of self-concept maintenance. *Journal of Marketing Research*, *45*(6), 633–644.

Meier, B. P., Hauser, D. J., Robinson, M. D., Friesen, C. K., & Schjeldahl, K. (2007). What's" up" with God? Vertical space as a representation of the divine. *Journal of Personality and Social Psychology*, *93*(5), 699–710.

Meier, B. P., & Robinson, M. D. (2004). Why the sunny side is up. *Psychological Science*, *15*(4), 243–247.

Meier, B. P., Schnall, S., Schwarz, N., & Bargh, J. A. (2012). Embodiment in Social Psychology. *Topics in Cognitive Science*, *4*(4), 705–716.

Morris, M. W., Sheldon, O. J., Ames, D. R., & Young, M. J. (2007). Metaphors and the market: Consequences and preconditions of agent and object metaphors in stock market commentary. *Organizational Behavior and Human Decision Processes*, *102*(2), 174–192.

Naparstek, B. (1995). *Staying well with guided imagery.* : Warner Books.

Oppenheimer, D. M., Meyvis, T., & Davidenko, N. (2009). Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology*, *45*(4), 867–872.

Oswald, A. J., Proto, E., & Sgroi, D. (2009). *Happiness and productivity: IZA Discussion Papers, no. 4645.*

Pelham, B. W., & Swann, W. B. (1989). From self-conceptions to self-worth: On the sources and structure of global self-esteem. *Journal of Personality and Social Psychology*, *57*(4), 672–680.

Pfurtscheller, G., & Neuper, C. (1997). Motor imagery activates primary sensorimotor area in humans. *Neuroscience Letters*, *239*(2–3), 65–68.

Prihoda, T. J., Pinckard, R. N., McMahan, C. A., & Jones, A. C. (2006). Correcting for guessing increases validity in multiple-choice examinations in an oral and maxillofacial pathology course. *Journal of Dental Education*, *70*(4), 378–386.

Rhodewalt, F., & Davison, J. (1986). Self-handicapping and subsequent performance: Role of outcome valence and attributional certainty. *Basic and Applied Social Psychology*, *7*(4), 307–322.

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg self-esteem scale. *Personality and Social Psychology Bulletin*, *27*(2), 151–161.

Rucker, D. D., & Galinsky, A. D. (2008). Desire to Acquire: Powerlessness and Compensatory Consumption. *Journal of Consumer Research*, *35*(2), 257–267.

Schindler, R. M. (1989). The excitement of getting a bargain: Some hypotheses concerning the origins and effects of smart-shopper feelings. *Advances in Consumer Research*, *16*, 447–453.

Schindler, R. M. (1998). Consequences of perceiving oneself as responsible for obtaining a discount: Evidence for smart-shopper feelings. *Journal of Consumer Psychology*, *7*(4), 371–392.

Schubert, T. W. (2005). Your highness: Vertical positions as perceptual symbols of power. *Journal of Personality and Social Psychology*, *89*(1), 1–21.

Schubert, T. W., & Koole, S. L. (2009). The embodied self: Making a fist enhances men's power-related self-conceptions. *Journal of Experimental Social Psychology*, *45*(4), 828–834.

Schwarz, N. (1990). In E. T. Higgins, & R. Sorrentino (Eds.), *Feelings as information: Informational and motivational functions of affective states. Handbook of motivation and cognition: Foundation of social behavior*, *vol. 2*, . New York: Guilford Press.

Schwarz, N. (2001). Feelings as Information: Implications for Affective influences on information processing. In L. L. MartIN, & G. L. Clore (Eds.), *Theories of mood and cognition: A User's Guidebook* (pp. 159–176). Mahwah, NJ: Lawrence Erlbaun Associate.

Sherman, D. K., & Cohen, G. L. (2002). Accepting threatening information: Self-affirmation and the reduction of defensive biases. *Current directions in psychological science*, *11*(4), 119–123.

Shrauger, J. S., & Rosenberg, S. E. (1970). Self-esteem and the effects of success and failure feedback on performance. *Journal of Personality*, *38*(3), 404–417.

Silverman, I. (1964). Self-esteem and differential responsiveness to success and failure. *The Journal of Abnormal and Social Psychology*, *69*(1), 115–119.

Sivanathan, N., & Pettit, N. C. (2010). Protecting the self through consumption: Status goods as affirmational commodities. *Journal of Experimental Social Psychology*, *46*(3), 564–570.

Spencer, S. J., Zanna, M. P., & Fong, G. T. (2005). Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology*, *89*(6), 845–851.

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. *Advances in Experimental Social Psychology*, *21*, 261–302.

Stepper, S., & Strack, F. (1993). Proprioceptive determinants of emotional and nonemotional feelings. *Journal of Personality and Social Psychology*, *64*(2), 211–220.

Taylor, A. B., MacKinnon, D. P., & Tein, J. Y. (2008). Tests of the three-path mediated effect. *Organizational Research Methods*, *11*(2), 241–269.

Tice, D. M. (1991). Esteem protection or enhancement? Self-Handicapping motives and attributions differ by trait self-esteem. *Journal of Personality and Social Psychology*, *60*(5), 711–725.

Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, *322*(5901), 606.