INTENTION-DRIVEN ILLUSORY BEHAVIORS: THE IMPORTANCE OF DETAILED VS. GIST PROCESSING IN REMEMBERING WHAT YOU HAVE DONE AND WHAT YOU HAVE YET TO DO

BY

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THESIS

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ABSTRACT

Have you ever formed an intention to reply to an email only to find that, after a short passage of time, you cannot remember if you actually did send the email, or simply intended to? The present work examines the effect of gist and detailed processing on the ability to reduce these errors of intention-behavior conflation. As detailed processing involves encoding specific features of an event, we hypothesized that intentions or behaviors encoded in more detail would be more discriminable in memory, and thus, reduce the likelihood of producing intention-driven illusory behaviors. In two experiments, we used a hiring paradigm to posit a means of attenuating this effect. Experiment 1 demonstrated that processing intentions in a detailed manner reduced the proportion of illusory behaviors reported. Experiment 2 showed that this type of processing was most effective when it was done to keep track of behaviors. Methodological limitations of exclusively relying on behavioral data are discussed, as well as future directions to both extend current work to meet the demands of technological advances that reduce the necessity to engage in internal monitoring processes, and explore conditions wherein intention-driven illusory behaviors are actually less likely to occur.

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CHAPTER 1

INTRODUCTION

Have you ever formed the intention to reply to an email, refill the parking meter, or follow a medication regimen, only to find that, at a later point in time, you cannot remember if you actually did so or simply intended to? The successful implementation of intentions thus not only requires the formation of an intention, but the ability to distinguish between unfulfilled intentions from those that have already been acted upon. The present work examines the effect of gist and detailed processing on the ability to reduce these errors of intention-behavior conflation. We expected that the ability to process intentions in greater detail would allow intentions to be more distinguishable in memory from behaviors, and thus, reduce the likelihood of producing intention-driven illusory behaviors.

The Intention-Behavior Association

A quick search of Web of Science for the search terms *intentions* AND *behavior* reveals 23,486 results across various domains, including those of consumer, health and social psychology. For example, the intention-behavior association has been used to explain childrens' participation in physical activity (Yeung, Yuan, Hui & Feresu, 2016), discreet food choice behaviors (McDermott et al., 2015), the decision to stay smoke-free (Murnaghan et al., 2009), purchase intentions of technology products (Chang, Tsai, Hung & Lin, 2015), the continued use of transit services (de Ona, d Ona, Eboli, Forciniti & Mazzulla, 2016), passengers' behaviors towards drivers who text (Wang, 2016), engagement in environmentally friendly activities (Han, Hsu & Sheu, 2010), rumor combating behavior on social media (Zhao, Yin & Song, 2016), knowledge sharing (Hung, Lai & Chou, 2015; Stewart, May & Ledgerwood, 2015), and intentions to participate in blood donations (Faqah, Moiz, Shahid, Ibrahim & Raheem, 2015).

This research reflects how common the investigation of intention-behavior association is in research, as well as the flexibility and adaptability of this relation in being able to describe a variety of different situations.

Meta-analytic reviews offer a synthesized perspective of this research. Such reviews have found that the average correlation between an intention and behavior is $r = .45$ (Albarracín, Johnson, Fishbein & Muellerleile, 2001) and $r = .57$ (Webb & Sheeran, 2006), and to vary as a function of both individual and methodological factors. For example, the intention-behavior correlation tends to increase when actual or perceived behavioral control is higher, when the behavior is not habitual in nature, when the time interval between the measurement of the intention and the behavior is short, and when self-report measures are used (Albarracín et al., 2001; Sheeran, 2002; Webb & Sheeran, 2006). These reviews describe the variety of contexts within which, and the factors that affect how, intentions are translated to behaviors.

The underlying premise of the intention-behavior literature, however, may not always be accurate. This research assumes that the pathway from intentions to behavior is linear: An intention is formed, a behavior is enacted, and a memory trace for the behavior is produced. There are, however, situations when intentions can have the ironic effect of undermining behavior. In such cases, the formation of an intention to perform a behavior can result in the behavior being bypassed to directly generate a memory trace for that behavior (see Figure 1).

To examine the existence and nature of this effect, Jones and Albarracín (2015) designed an empirical hiring paradigm, which involved the formation of both hiring decisions and intentions. This work showed that not only do intentions increase the likelihood of producing false memories of behavior (compared to a control condition), but that this effect occurs even when intentions are purely mental, behaviors are enacted in a physical manner, and behaviors

occur at a high frequency (e.g., when the number of behavioral trials are increased). This work has ruled out familiarity with behavior as a potential explanation (e.g., by varying the exposure time to form decisions vs. intentions), and revealed that the effect is not eliminated even when a response option to indicate uncertainty is introduced, or when intentions are spoken out loud. Finally, this work suggests that intention-driven illusory behaviors lead to a failure to act when the opportunity arises.

In terms of real-world applicability, false memories of medication commission, for example, can be deleterious. In fact, studies on medication non-adherence suggest that non-adherence to a mediation regimen can result in morbidity, mortality and other health-related costs (Lehane & McCarthy, 2007). Researchers now understand that medication non-adherence often occurs unintentionally, with facets such as disruptions to daily routines and forgetfulness being key in explaining such phenomenon (Johnson, 2002; Lehane & McCarthy, 2007). A qualitative study by Penza-Clyve, Mansell & McQuaid (2004) addressing children's perspective on, and adherence to, their asthma medications revealed that, a major barrier to adherence is memory: Children who formed an intention to take their medications would later forget to do so, or have difficulty remembering if they had already taken their medications or not. This suggests that intention-driven illusory behaviors may be one aspect of the prospective memory errors underlying adherence. Based on this work, and given the many relevant deleterious consequences, much work is needed to understand the mechanisms underlying intention-driven illusory behaviors, and identify the ways in which it can be attenuated.

Prospective and Retrospective Memory

Research on prospective and retrospective memory provides some insight into the processes that may underlie the intention-driven illusory behavior effect. The Zeigarnik effect

(Zeigarnik, 1927; see Förster, Liberman, & Friedman, 2007), for example, describes how our memory for an event left unfinished or incomplete remains salient until after its completion. A related phenomenon, the intention superiority effect (Goschke & Kuhl, 1993; Marsh, Hicks & Bink, 1998), describes how the time taken to retrieve items from memory related to an incomplete intention is faster when compared to the time taken for items not associated with intentions (e.g., individuals retrieve "waiter" from memory faster than "dog" when their intention is to attend a restaurant). Therefore, intentions that have yet to be fulfilled are often hyperaccessible in memory and, it can be inferred, more easily retrievable from memory.

One issue with both the Zeigarnik effect and the intention superiority effect are that, their concern is for memory of intentions, but not memory of behaviors. As such, although these models provide a foundation for intention research, they do not directly speak to the effects of unfulfilled intentions on the memory of behavior. Additionally, the hyperaccessibility of an intention in memory does not mean that the intention will always be correctly identified as one that has been completed or not. On the contrary, we propose that, in some situations, intentions that are accessible may be mistaken as behaviors. Research on retrospective memory offers some insight into this potential fallibility of memory. Memory fabrications or distortions, so-called false memories, are often harmless (Johnson, Hashtroudi & Lindsay, 1993): Misremembering what you had for dinner last night does not have severe repercussions. Yet, there are circumstances when memory inaccuracies can be troubling, such as false reports in eyewitness testimonies (e.g., Loftus & Zanni, 1975) or child abuse cases (e.g., Loftus & Davis, 2006). Studies have found that cultural expectations (Bartlett, 1932), labels (Carmichael, Hogan & Walter, 1932; Lupyan, 2008), and the associations between related items (Deese, 1959; for a review, see Gallo, 2010) can distort memories and lead to errors in recall and recognition. In

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extreme cases, even memories of events that never happened can be implanted (Loftus & Pickrell, 1995). This demonstrates how memories are not always accurate, but rather, prone to fallacy.

Why is memory imperfect? According to the source monitoring framework (Johnson, et al., 1993; Mitchell & Johnson, 2000), failures in memory arise due to an inability to correctly discriminate the origins of some mental experiences from others. This is especially the case when information from different sources (e.g., perception and imagination) share similar characteristics. For example, since intentions often precede behaviors, the evaluations that go into intentions may also take place during the production of behavior. This can lead to difficulties discriminating between memories of the intended behavior from memories of the completed behavior.

Memories are fallible because they not only involve informational sources that are poorly differentiated, but cognitive processes that are also imperfect (Johnson et al., 1993; Brainerd & Reyna, 2002). The fuzzy trace theory (Brainerd & Reyna, 1990; Brainerd & Reyna, 2002) posits that there are two ways in which memories are represented: Verbatim traces are exact representations of events, and thus involve individuals re-experiencing the occurrence of events in specific contexts; in contrast, gist traces are vague and fuzzy representations of events, thereby only leading to feelings of familiarity. When gist traces are strong, this sense of familiarity can generate the recollection of a non-experienced event, especially when the event serves as a cue for the gist trace of an experienced event (Brainerd & Reyna, 2002). Suppose, for example, one is presented with a list of words including *carrot*, *corn* and *bean*. During a recognition test, the items *carrot* (target), *pea* (related distractor) and *knife* (unrelated distractor) are shown. Reliance on gist memory would lead to the recognition of both *carrot* and *pea*, as they are both vegetables

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and activate a similar memory trace. Reliance on verbatim memory, on the other hand, would only lead to the acceptance of *carrot*. Since intentions and behaviors involve similar cognitive processes, it is possible that the gist processing of an intention can activate memories of situations wherein the intention led to behavior, leading to the conflation of the two.

The Present Research

The fallibility of memory can be attributed to errors in encoding (via gist or detailed processing) and retrieval (via source monitoring). Intentions and behaviors may be encoded in gist form which, due to similarities in the behavioral and cognitive processes underlying the two, can lead to source monitoring errors during retrieval. As such, one way to potentially attenuate this effect would be to target one, or both, of these processes. This thesis thus seeks to investigate whether encouraging participants to engage in detailed processing can help reduce false illusions of behavior. Specifically, we hypothesized that, because detailed processing involves encoding specific features of an event, intentions encoded in more detail will be more distinguishable in memory, and thus, reduce the likelihood of intention-driven illusory behaviors.

CHAPTER 2

EXPERIMENT 1

Overview

The purpose of Experiment 1 was to investigate whether there were differences in the proportion of intention-driven illusory behaviors reported between individuals who were encouraged to process and encode their intentions in a gist vs. detailed format (compared to a control that received no instructions). Using a hiring paradigm, we asked participants to keep track of their intentions to hire or not hire an applicant by writing them down. In the gist processing condition, participants were asked to write down the unique identifier accompanying each applicant (e.g., ID: 0r398t6) and their hiring intentions regarding them (e.g., Yes or No); in the detailed processing condition, however, participants were asked to be descriptive by also elaborating on characteristics of the applicant that influenced their hiring intentions. As detailed processing allows the formation of more specific and vivid memories, we hypothesized that encouraging participants to process their intentions in detail would help them discriminate between intentions and behaviors in memory, and thus, make fewer errors conflating the two, compared to both those engaged in gist processing and those in the control condition.

Method

Participants. A hundred and twenty-eight undergraduates, recruited from the University of Illinois Subject Pool, participated for partial course credit. The sample consisted of 78 females, 35 males, 1 who identified as other, and 14 who did disclose their gender. The participants ranged in age from 18 and 23 years ($M = 19.85$, $SD = 2.39$). Informed consent was obtained from all participants before proceeding with the experiment.

Materials and procedures. Participants played the role of a manager evaluating

applications of models to hire for their company's clothing catalogue. Participants were

informed, however, that due to an error made by an intern, some of the photographs were

incorrectly paired with the application forms. For those applications that were unaffected by the

mistake, participants were told that they could make a hiring decision, wherein they officially

hired or rejected the model from inclusion in the clothing catalogue. For those applications that

were affected, participants were told that they should still determine whether the model should

be included in the catalogue based on the photograph provided. However, because of the

mismatch between the application form and photograph, participants were asked to form a hiring

intention, wherein they generated the intention to hire or reject the model once the applications

were sorted[1]. Finally, for those applications that had yet to be classified as affected or not,

participants were told to check whether the gender of the model in the photograph matched the

gender on the application form. Participants thus enacted a behavior (enact trials), formed an

intention to perform a behavior at a later point in time (intend trials), and made a judgment that

was irrelevant to behavior (control trials)[2]. All participants encountered these three trials in

random order.

In order to aid them follow-up on those applicants for whom they made a hiring intention,

participants were handed a tracking sheet. For those participants who were randomized into the

gist processing condition, participants were asked to only write down the unique identifying

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[1] It was implied to participants that applications would be later sorted for them to revisit and act upon
their hiring intentions. However, this opportunity never transpired, as the purpose of this experiment was
to assess the confusability between unfulfilled intentions and behaviors.
[2] To ensure participants understood the distinction between the three trials, a five question multiple-
choice quiz followed the instructions. Incorrect responses were followed by feedback. Accuracy was 87%
and 92% for Experiment 1 and Experiment 2, respectively, indicating that participants understood the
task, as well as what constituted a completed behavior (from an intended behavior).

number associated with each applicant and their intention to hire or not hire them. For those participants in the detailed processing condition, along with the unique identifying number and their hiring intentions, participants were also asked to write down characteristics of the applicant that may have influenced their intention (e.g., age, gender, physical features), as well as other information that was pertinent to their choice (e.g., whether the applicant resembled someone they knew). Finally, for those participants in the control condition, participants were not explicitly asked to keep track of their hiring intentions[3]. Therefore, participants were randomly sorted into three different conditions, and processed their hiring intentions in gist (gist condition), detail (detailed condition), or in a manner not specified by the experiment (control condition).

Hiring phase. During the hiring phase, participants were first presented with a pre-trial instruction screen that informed participants whether the impending application form had been affected by the intern's error, and thus, what type of response the participants were required to make. Participants had to press a unique key to demonstrate that they understood the instructions and what was expected of them (see Appendix A). To further help participants distinguish between the three trial types, the color of the main text and some application materials were consistent with the type of response participants had to make: Green for enact trials, red for intend trials and blue for control trials.

Once participants indicated their understanding of the impending trial, participants were presented with truncated mock job application forms. The form was entitled "New Hire Form," and included a section labeled "Final Hire Decision," with a box to check "Yes" or "No," a

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[3] As participants in this condition were not given a blank tracking sheet, we did not have any data on what these participants did and, as such, cannot ascertain whether, even in the absence of any prompting, participants in this condition engaged in some form of gist or detailed processing.

section that provided the applicant's gender, and a section where the applicant's photograph and unique identifying number were attached. Above each application, instructions described whether the application form had been affected by the intern's error, and thus, what type of response the participant could make. For enact trials, the instructions read, "*Correct photo / This is an official hire decision / Press 'Y' to hire. Press 'N' to not hire.*" For intend trials, the instructions read, "*Incorrect photo / Do you want to hire the applicant later? / Press 'Y' if you intend to hire them or "N" if you do not intend to hire them.*" For control trials, the instructions read, "*Unknown photo match / Press 'Y' or 'N' to indicate whether the gender on the form matches the gender of the photo*" (see Appendix A). The models were represented with 30 photographs taken from the Radboud Faces Database (Langner et al., 2010). The photographs included males, females, children and adults. Five photographs, equated for attractiveness by the database, were assigned to each of the enact, intend and control trials, resulting in the presentation of fifteen photographs total.

During the intend trials, participants were given instructions to use the tracking sheet that was provided for them to mark down their hiring intentions for the presented applicant. Participants were further informed that their tracking sheet would be returned at the end of the hiring phase, and thus, they should be aware of their responses to applicants in the intend trials. For those in the gist processing condition, instructions on the form read, "*Please write down the alphanumeric code presented with their photograph, and mark down your intended hiring decision.*" For those in the detailed processing condition, the instructions included the previous statement and "*To further assist you, please also take note of any other salient characteristics of these applicants, including their gender, physical features, whether they resemble someone you know etc. Feel free to give them a nickname, create a story about why they may have applied and*

so on. Also, take note of anything else that led you to your intention" (see Appendix B). For

those in the control condition, no tracking sheet was given. At the completion of the hiring

phase, a delay was introduced wherein participants were asked to complete individual difference

measures[4]. During this delay, participants' tracking sheets were collected.

  Recognition phase. During the recognition phase, participants were tested on their

memory of their hiring decisions. Again, participants were first presented with a pre-trial

instruction screen that informed them that the objective of this section was to determine if they

could remember those applicants for whom they had made a hiring decision for. The instructions

further emphasized that these referred to those trials for which the application forms had not

been affected, and thus, participants had been able to officially hire or reject the model from

inclusion in the clothing catalogue (enact trials). Thirty photographs were presented in random

order; fifteen displayed the photographs shown during the hiring phase, and the other 15

displayed photographs that had not been presented at any point during the experiment. Above

each photograph, participants were asked, "*Did you make an official final hire decision?*" and

given three response options: "*(1) I made an official final decision: yes, hire,*" "*(2) I made an

official final decision: no, do not hire,*" and "*(3) I did not make an official final decision*" (see

Appendix A).

Results

  To identify intention-driven illusory behaviors, we calculated the proportion of responses

indicated as final hire decisions for each trial type. Participants were accurate only if they

responded in the affirmative to photographs that had been presented during the enact trials.

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[4] These measures included the Barratt Impulsiveness Scale, the Need for Cognition Scale, and the
Obsessive-Compulsive Inventory. As they were only used in this (and the subsequent) experiments to
introduce a time delay between the hiring and recognition phases, the measures are not included in any of
the analyses below.

Participants were inaccurate if they responded in the affirmative to photographs that had been presented during the intend or control trials, with affirmative responses to photographs from the former being classified as intention-driven illusory behaviors.

A mixed-factorial ANOVA was conducted to analyze the proportion of affirmative responses as a function of the three-level within-subject trial type factor (enact, intend, and control), and the three-level between-subject processing condition (gist, detailed, and control). Supporting the hypothesis of intention-driven illusory behaviors, we found a significant main effect of trial type, $F(2, 250) = 76.08$, $p < .001$, $\eta_p^2 = .38$. The proportion of affirmative responses was higher in the intend trials ($M = .68$, $SD = .31$), than control trials ($M = .36$, $SD = .30$; indicating false recall), $t(127) = 9.50$, $p < .001$, $d = 1.06$, but was equivalent to the proportion of affirmative responses reported in the enact trials ($M = .73$, $SD = .25$), $p = .11$, $d = 0.18$.

Critical to this experiment was the hypothesis that the difference in false memories between the intend and control conditions would be diminished in the detailed processing condition, compared to the gist or control processing conditions. As expected, there was a significant interaction between trial type and processing conditions, $F(4, 250) = 2.81$, $p = .03$, $\eta_p^2 = .04$ (see Figure 2). There was no significant difference in the proportion of affirmative responses for intend trials between participants in the gist ($M = .68$, $SD = .32$) and control processing conditions ($M = .80$, $SD = .21$), $p = .26$, $d = 0.44$. There was, however, a significant difference in the proportion of affirmative responses for intend trials between participants in the detailed ($M = .57$, $SD = .35$) and control processing conditions ($M = .80$, $SD = .21$), $p = .002$, $d = 0.80$. Thus, intention-driven illusory behaviors in the intend trials decreased when participants engaged in a detailed and highly descriptive form of processing.

Discussion

Consistent with previous research (Jones & Albarracín, 2015), this experiment found that participants reported more falsely-recalled behaviors in the intend, than control, trial. Yet, when participants engaged in a detailed form of processing, compared to both gist and control processing conditions, their tendency to conflate their intentions for completed behaviors reduced significantly, and the ability to discriminate between what they had done (enact trials) and what they had yet to do (intend trials) improved. This experiment thus suggests that, even though intentions play an important role in creating false illusions of behavior, this error can be reduced when intentions are processed and encoded in more detail.

CHAPTER 3

EXPERIMENT 2

Overview

While the purpose of Experiment 1 was to investigate *what* type of processing was most useful in attenuating the intention-driven illusory behavior effect, the purpose of Experiment 2 was to identify *when* it was most effective to rely on such a processing style. Specifically, the purpose of Experiment 2 was to investigate whether there would be differences in the proportion of intention-driven illusory behaviors reported between individuals who were encouraged to process their intentions in more detail vs. those who were encouraged to process their behaviors in more detail (compared to controls who received no instructions). Using the same paradigm as the first experiment, we asked participants to keep track of either their intentions or their behaviors to hire or not hire an applicant. We hypothesized that, participants who processed their intentions in more detail would report fewer illusions of behavior, compared to a control condition. In contrast, we also hypothesized that participants who processed their behaviors in more detail would report greater accuracy of memory of what they had already done, but show no changes in proportions of intention-driven illusory behaviors, compared to a control condition.

Method

Participants. A hundred and eighteen undergraduates, recruited from the University of Illinois Subject Pool, participated for partial course credit. The sample consisted of 86 females and 32 males, between the ages of 18 and 23 years ($M = 19.85$, $SD = 2.39$). Informed consent was obtained from all participants before proceeding with the experiment.

Materials and procedures. Experiment 2 was nearly identical to Experiment 1. The

novelty in this experiment was that all processing instructions facilitated detailed encoding, and

participants were randomly assigned to either process their enactments, their intentions, or

neither. Thus, this experiment offered an opportunity to directly replicate our prior finding, while

also gathering evidence of the possibility of improving correct reports of behavior in the

behavior processing condition.

Results

As with Experiment 1, we calculated the proportion of responses indicated as final hire

decisions for each type of trial. A mixed-factorial ANOVA was conducted to analyze the

proportion of affirmative responses as a function of the three-level within-subject trial type factor

(enact, intend, and control), and the three-level between-subject processing condition (during

enact trials, during intend trials, and during no trials). A Huynd-Feldt correction was used

because the data violated the assumption of sphericity. The main effect of trial type was, once

again, statistically significant, $F(1.92, 220.86) = 118.82$, $p < .001$, $\eta_p{}^2 = .51$. The proportion of

affirmative responses was higher in the intend ($M = .54$, $SD = .34$) than the control ($M = .30$, SD

$= .29$) trials, $t(117) = 7.82$, $p < .001$, $d = 0.77$, but higher still in the enact ($M = .80$, $SD = .24$)

than the intend trials, $t(117) = 6.56$, $p < .001$, $d = 0.88$.

Importantly, there was a significant interaction between the trial types and the processing

conditions, $F(3.84, 220.86) = 16.41$, $p < .001$, $\eta_p{}^2 = .22$ (see Figure 3). There was no difference

in the proportion of affirmative responses in intend trials when either intentions ($M = .45$, $SD =$

$.39$) or enactments ($M = .43$, $SD = .31$) were processed in detail, $p = 0.759$, $d = -0.06$, but both

significantly differed from the proportion of affirmative responses when no detailed processing

occurred in any trial ($M = .75$, $SD = .22$), $p < .001$, $d = 0.97$ and $d = 1.18$, respectively. This

replicates the results from the previous experiment, indicating that processing information in detail is capable of reducing falsely-recalled behaviors in intend trials, compared to a condition wherein no detailed processing occurs. However, when participants engaged in detailed processing during enact trials, the accuracy in recalled enactments was higher ($M = .94$, $SD = .13$), compared to when no processing instructions were present ($M = .78$, $SD = .24$), and higher still compared to when processing took place during intend trials ($M = .65$, $SD = .25$). This was also the highest level of accuracy seen across all conditions in the two studies.

Discussion

Contrary to what was hypothesized, this experiment found that, regardless of whether participants engaged in detailed processing of their behavior or their intentions, encoding information in more detail reduced the likelihood of producing intention-driven illusory behaviors. Yet, the engagement of detailed processing of behaviors had the dual benefit of both reducing false reports of enactment, as well as improving recognition accuracy of completed behaviors. Therefore, this experiment suggests that engaging in detailed processing is most beneficial when it is done to keep track of what you have already completed.

CHAPTER 4

GENERAL DISCUSSION

We are always forming intentions that we want to act upon, whether it be to do something mundane, like placing our keys on the hook by the door when we come home, or something important, like going to pick up our family from the airport. The formation of intentions, however, can occasionally have the ironic effect of undermining behavior. In two studies, we have replicated past research to show that intentions do increase the likelihood of producing intention-driven illusory behaviors, compared to a control condition. We have also extended past work by suggesting that there are ways to attenuate this effect. Experiment 1 showed that processing intentions in a more detailed and vivid manner reduced the proportions of illusory behaviors reported. Experiment 2 demonstrated that, contrary to what was hypothesized, this type of processing was most effective when it was done to keep track of behaviors. Overall, this research suggests that encoding information in more detail reduces errors of intention-behavior conflation.

This thesis, therefore, posits two means of attenuating intention-driven illusory behaviors. First, if one needs to discriminate between an intended and completed behavior, encoding the intention in detail will be most beneficial. The rationale is that this processing facilitates discrimination between intentions and behavior in memory--that is, reducing errors associated with source monitoring during recall and recognition (Johnson, et al., 1993; Mitchell & Johnson, 2000). Second, the benefits of keeping track of behaviors during enactment is doubly beneficial, as it not only reduces the conflation between intentions and behaviors, but increases overall behavioral recognition. Monitoring presently enacted behaviors thus allows intentions to become relevant as behavioral guides without the risk of false memories.

Additionally, this research extends the understanding of the intention-behavior association. As the current model exists, the relation between intentions and behavior are seen to occur on a linear plane. Replicating some recent work conducted by Jones and Albarracín (2015), we have shown that there are instances when intentions do not serve as facilitators of behavior. Instead, the formation of an intention can lead to the belief that the behavior has already been enacted. This resonates with past work on the counterintuitive effects of intentions (e.g., situations wherein the public expression of an intention reduces the likelihood that the intention will be followed by behavior; Gollwitzer, Sheeran, Michalski & Seifert, 2009). Intentions are undeniably associated with behaviors. It is, however, important to understand the boundaries of the intention-behavior association, and when intentions might not serve as predictive of behaviors.

A limitation of our research is that we cannot disentangle what specifically led to improvements in memory for behaviors and intentions. The detailed processing condition presumably led participants to encode information in more detail, thereby facilitating their ability to discriminate between intentions and behaviors in memory. The manipulation likely reduced source monitoring errors during the retrieval of these memories. Yet, with the behavioral paradigm we have used, it is difficult to ascertain whether the effects we see are a result of encoding, retrieval or a combination of the two (as we posit). Thus, future work could address this issue by running a variant of this experiment using electrophysiological measures to gain better clarity on the processes underlying this effect. Such an approach would lend to the development of better strategies that specifically target the processes at work.

There has been an increase in the pervasiveness of technology in all aspects of life, including childhood (e.g., Plowman, McPake & Stephen, 2010), education (e.g., Li & Ma, 2010)

and health care (e.g., Vervloet et al., 2012). With this advent of technology, it is interesting to see where this research stands and what it has yet to explore. For example, with email and phone applications that can remind individuals to enact a certain behavior on a specific day and at a certain time, or keep track of what they have already completed, accurate memory for incomplete intentions may be unnecessary. If an external application can tell you what to do or what you have already done, why would you need to keep track of this yourself? We posit that, in cases of inconsistent use (e.g., forgetting to set yourself a reminder), or situations with distractions (e.g., when you are interrupted while trying to execute the intention), it is still necessary to discern whether you acted upon your intentions or not. Nevertheless, this is another interesting avenue for future research.

An important question in this line of work is to understand whether intention-driven illusory behaviors are actually less likely for ecologically relevant domains. For example, are individuals likely to confuse their intentions to feed their offspring, or their intentions to avoid detection by a predator, with behaviors they have already enacted? It seems unlikely that intention-driven illusory behaviors would occur in domains with fitness-relevant consequences, as the existence of such conflation would likely led to failures in fitness. The investigation of false illusions of behavior in such domains could help identify boundary conditions, and thus, be a relevant area of investigation in the future.

FIGURES

Figure 1
Associations between Intentions, Behaviors and Memories of Behavior

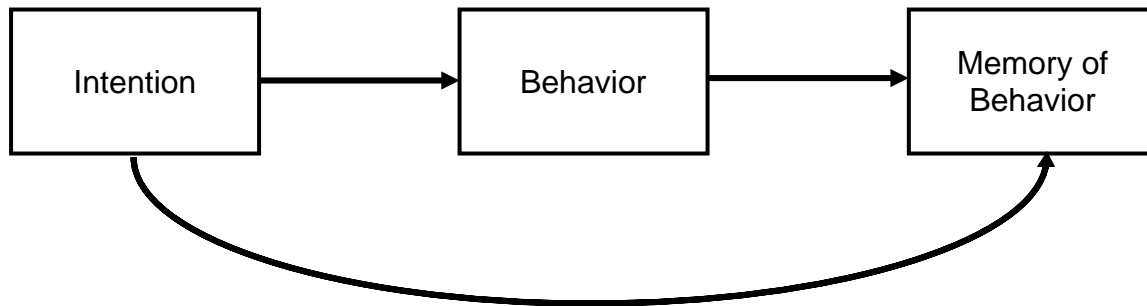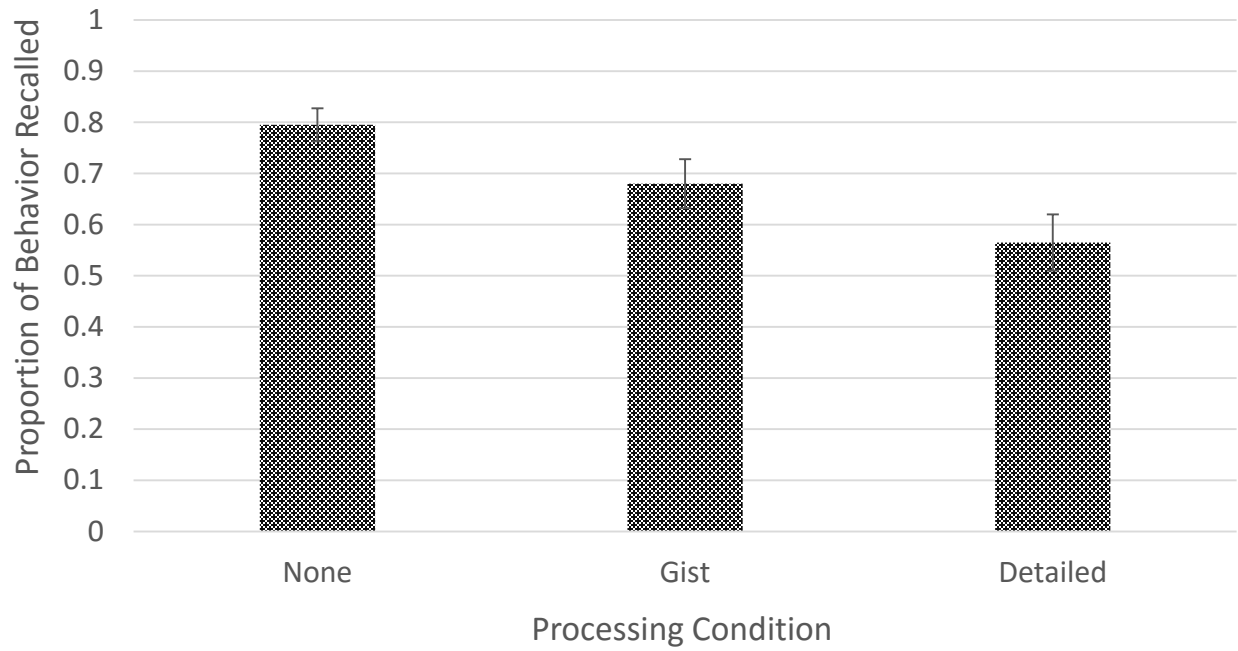| Intention	→	Behavior	→	Memory of Behavior

Figure 2

Proportion of Reported Enactments in Intend Trials for No, Gist and Detailed Processing Conditions

Note. For intend trials, higher proportions of reported enactments reflect error, specifically, intention-driven illusory behaviors.

Figure 3

Proportion of Reported Enactments in Intend Trials for No Processing, and Processing During Enact and Intend Trials
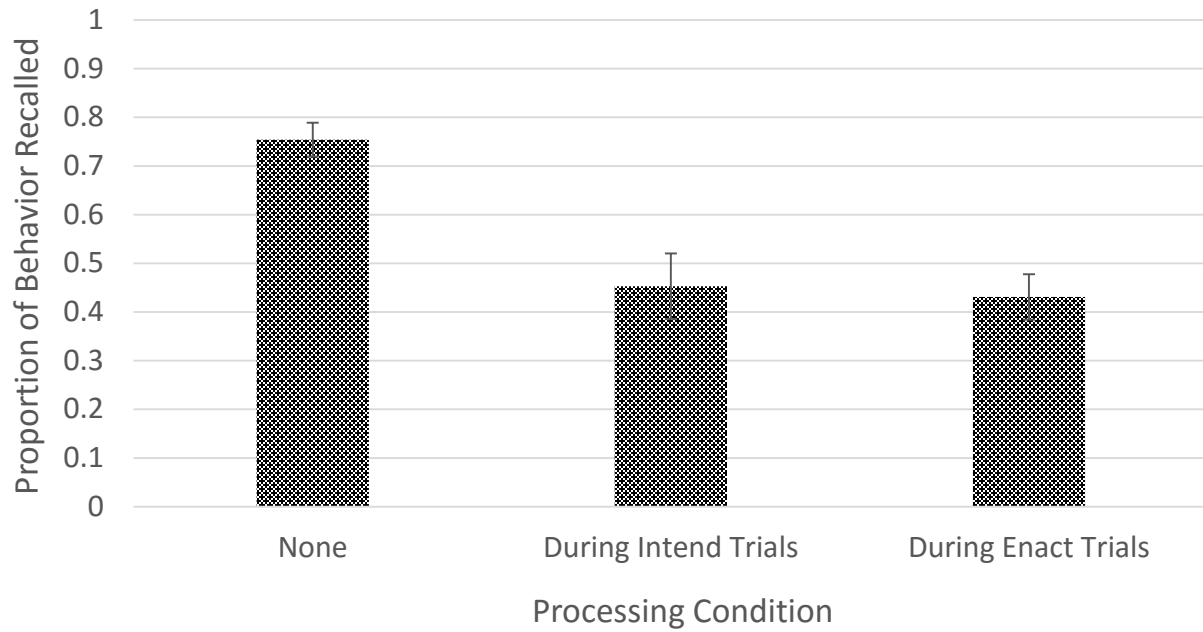
Note. For intend trials, higher proportions of reported enactments reflect error, specifically, intention-driven illusory behaviors.

REFERENCES

Albarracín, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin, 127*, 142-161. doi:10.1037//0033-2909.127.1.142

Bartlett, F. C. (1932). *Remembering: An experimental and social study*. Cambridge: Cambridge University.

Brainerd, C. J., & Reyna, V. F. (1990). Gist is the grist: Fuzzy-trace theory and the new intuitionism. *Developmental Review, 10*(1), 3-47. doi:10.1016/0273-2297(90)90003-M

Brainerd, C. J., & Reyna, V. F. (2002). Fuzzy-trace theory and false memory. *Current Directions in Psychological Science, 11*(5), 164-169. doi:10.1111/1467-8721.00192

Carmichael, L., Hogan, H. P., & Walter, A. A. (1932). An experimental study of the effect of language on the reproduction of visually perceived form. *Journal of Experimental Psychology, 15*(1), 73. doi:10.1037/h0072671

Chang, C., Tsai, J., Hung, S., & Lin, B. (2015). A hybrid decision-making model for factors influencing the purchase intentions of technology products: The moderating effect of lifestyle. *Behavior & Information Technology, 34*(12), 1200-1214. doi:10.1080/0144929X.2015.1019566.

Deese J. On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology, 58*, 17–22.

De Oña, J., De Oña, R., Eboli, L., Forciniti, C., & Mazzulla, G. (2016). Transit passengers' behavioural intentions: The influence of service quality and customer satisfaction. *Transportmetrica A: Transport Science, 12*(5), 385-412. doi:10.1080/23249935.2016.1146365

Faqah, A., Moiz, B., Shahid, F., Ibrahim, M., & Raheem, A. (2015). Assessment of blood donation intention among medical students in Pakistan: An application of theory of planned behavior. *Transfusion and Apheresis Science, 53*(3), 353-359. doi:10.1016/j.transci.2015.07.003

Förster, J., Liberman, N., & Friedman, R. S. (2007). Seven Principles of Goal Activation: A Systematic Approach to Distinguishing Goal Priming From Priming of Non-Goal Constructs. *Personality and Social Psychology Review, 11*(3), 211-233. doi:10.1177/1088868307303029

Gallo, D. A. (2010). False memories and fantastic beliefs: 15 years of the DRM illusion. *Memory & Cognition, 38*(7), 833-848. doi:10.3758/MC.38.7.833

Gollwitzer, P. M., Sheeran, P., Michalski, V., & Seifert, A. E. (2009). When intentions go public: Does social reality widen the intention-behavior gap? *Psychological Science*, *20*, 612-618. doi:10.1111/j.1467-9280.2009.02336.x

Goschke, T., & Kuhl, J. (1993). Representation of intentions: Persisting activation in memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19*, 1211-1226.

Han, H., Hsu, L., & Sheu, C. (2010). Application of the Theory of Planned Behavior to Green Hotel Choice: Testing the Effect of Environmental Friendly Activities. *Tourism Management, 30*(3), 325-334. doi:10.1016/j.tourman.2009.03.013

Hung, S., Lai, H., & Chou, Y. (2015). Knowledge-sharing intention in professional virtual communities: A comparison between posters and lurkers. *Journal of the Association for Information Science and Technology, 66*(12), 2494-2510. doi:10.1002/asi.23339

Johnson, M. J. (2002). The Medication Adherence Model: A guide for assessing medication taking. *Research and Theory for Nursing Practice, 16*(3), 179-192.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin, 114*(1), 3-28. doi:10.1037/0033-2909.114.1.3

Jones, C., & Albarracín, D. (2015). *False memories about the self: Mistaken reports of behavioral enactment induced by behavioral intentions*. Unpublished manuscript.

Langner, O., Dotsch, R., Bijlstra, G., Wigboldus, D. H. J., Hawk, S. T., & van Knippenberg, A. (2010). Presentation and validation of the Radboud Faces Database. *Cognition & Emotion, 24*(8), 1377-1388. doi:10.1080/02699930903485076

Lehane, E., & McCarthy, G. (2007). Intentional and unintentional medication non-adherence: A comprehensive framework for clinical research and practice? A discussion paper. *International Journal of Nursing Studies, 44*(8), 1468-1477. doi:10.1016/j.ijnurstu.2006.07.010

Li, Q., & Ma, X. (2010). A meta-analysis of the effects of computer technology on school students' mathematics learning. *Educational Psychology Review, 22*, 215-243. doi:10.1007/s10648-010-9125-8

Loftus, E. F., & Davis, D. (2006). Recovered memories. *Annual Review of Clinical Psychology, 2*, 469-498. doi:10.1146/annurev.clinpsy.2.022305.095315

Loftus, E. F., & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals, 25*, 720-725.

Loftus, E. F., & Zanni, G. (1975). Eyewitness testimony: The influence of the wording of a question. *Bulletin of the Psychonomic Society, 5*(1), 86-88. doi:10.3758/BF03336715

Lupyan, G. (2008). From Chair To "Chair:" A Representational Shift Account Of Object Labeling Effects On Memory. *Journal of Experimental Psychology, 37*(2): 348-369. doi:10.1037/0096-3445.137.2.348

Plowman, L., McPake, J., & Stephen, C. (2010). The technologisation of childhood? Young

    children and technology in the home. *Children and Society, 24*(1), 63-74.

    doi:10.1111/j.1099-0860.2008.00180.x

Marsh, R. L., Hicks, J. L., & Bink, M. L. (1998). Activation of completed, uncompleted, and

    partially completed intentions. *Journal of Experimental Psychology: Learning, Memory,*

    and Cognition, 24, 350-361.

McDermott, M. S., Oliver, M., Svenson, A., Simnadis, T., Beck, E. J., Coltman, T., ... Sharma,

    R. (2015). The theory of planned behaviour and discrete food choices: A systematic

    review and meta-analysis. *International Journal of Behavioral Nutrition and Physical*

    Activity, 12, 1-11, doi:10.1186/s12966-015-0324-z

Mitchell, K. J., & Johnson, M. K. (2000). Source monitoring: Attributing mental experiences. In

    E. Tulving, & F. I. M. Craik (Eds.), *The Oxford handbook of memory* (pp. 179-195). New

    York, NY: Oxford University Press.

Murnaghan, D. A., Blanchard, C., Rodgers, W., La Rosa, J., Macquarrie, C., MaClellan, D., &

    Gray, B. (2009). The influence of student-level normative, control and behavioral beliefs

    on staying smoke-free: An application of Ajzen's theory of planned behavior. *Addiction*

    Research & Theory, 17(5), 469-480. doi:10.1080/16066350802011649

Penza-Clyve, S. M., Mansell, C., & McQuaid, E. L. (2004). Why don't children take their asthma

    medications? A qualitative analysis of children's perspectives on adherence. *Journal of*

    Asthma, 41(2), 189-197.

Sheeran, P. (2002). Intention-behavior relations: A conceptual and empirical review. *European*

    Review of Social Psychology, 12(1), 1-36. doi:10.1080/14792772143000003

Stewart, W. H., May, R. C., & Ledgerwood, D. E. (2015). Do You Know What I Know? Intent

    to Share Knowledge in the Us and Ukraine. *Management International Review, 55*(6),

    737-773. doi:10.1007/s11575-015-0252-9

Vervloet, M., Linn, A. J., van Weert, J. C. M., de Bakker, D. H., Bouvy, M. L, & van Dijk, L.

    (2012). The effectiveness of interventions using electronic reminders to improve

    adherence to chronic medication: A systematic review of the literature. *Journal of the*

    American Medical Informatics Association, 19, 696-704. doi:10.1136/amiajnl-2011-

    000748

Wang, X. (2016). To Communicate or Not to Communicate: Factors Predicting Passengers'

    Intentions to Ask a Driver to Stop Text Messaging While Driving. *Health*

    Communication, 31(5), 617-625. doi:10.1080/10410236.2014.981666

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior

    change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132*(2),

    249. doi:10.1037/0033-2909.132.2.249

Yeung, D. C., Yuan, X., Hui, S. S., & Feresu, S. A. (2016). Determinants of moderate to

    vigorous physical activity and obesity in children: a structural equation modeling

    analysis. *World Journal of Pediatrics, 12*(2), 170-176. doi:10.1007/s12519-015-0057-8

Zeigarnik, B. (1927). Das behalten erledigter und unerledigter handlungen [The memory of

    completed and uncompleted actions]. *Psychologische Forschung, 9*, 1-85.

Zhao, L., Yin, J., & Song, Y. (2016). An exploration of rumor combating behavior on social

    media in the context of social crises. *Computers in Human Behavior, 58*, 25-36.

    doi:10.1016/j.chb.2015.11.054

APPENDIX A

MATERIALS FOR HIRING PARADIGM

The pre-trial screen seen by participants in the intend trials.

The truncated job application forms seen by participants in the intend trials.

Red paperclip: Incorrect photo.

Do you want to hire the applicant later?

Press "Y" if you intend to hire them or "N" if you do not intend to hire them.

0r398t6

New Hire Form: Fall Catalogue

Catalogue: Male and Female, Adults and Children Needed

Applicant Information

Gender: Male ☐   Female ☐

The post-trial screen seen by participants during the recognition phase.

Did you make an official final hire decision?

1. I made an official final decision: **yes**, hire.
2. I made an official final decision: **no**, do not hire.
3. I did not make an official final decision.

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APPENDIX B

MATERIALS FOR PROCESSING CONDITIONS

Handout given to participants in the gist processing condition.

*In order to help you with your hiring decisions, the following sheet has been provided for you. For those applicants who you are only able to make an **intention to hire or not hire**, please write down the alphanumeric code presented with their photograph, and mark down your intended hiring decision.*

Applicant's Information (alphanumeric code):   **Intention (intention to hire/not hire):**

_____   _____

_____   _____

_____   _____

_____   _____

_____   _____

Handout given to participants in the detailed processing condition.

*In order to help you with your hiring decisions, the following sheet has been provided for you. For those applicants who you are only able to make an **intention to hire or not hire**, please write down the alphanumeric code presented with their photograph, and mark down your intended hiring decision. However, to further assist you, please also take note of any other salient characteristics of these applicants, including their gender, physical features, whether they resemble someone you know etc. Feel free to give them a nickname, create a story about why they may have applied and so on. Also, take note of anything else that led you to your intention.*

Applicant's Information (alphanumeric code, gender, features etc.):   **Intention (intention to hire/not hire):**

_____   _____

_____   _____

_____   _____

_____   _____

_____   _____