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Brief article

When two sources of fluency meet one cognitive mindset

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A B S T R A C T

Fluency, the subjective experience of ease associated with information processing, has been shown to affect a host of judgments. Previous research has typically focused on specific factors that affect the use of a single, specific fluency source. In the present study we examine how cognitive mindsets, or processing modes, moderate fluency emanating from two simultaneous sources of fluency. As a cognitive mindset manipulation, participants performed Jacoby's process dissociation paradigm. Subsequently, participants engaged in a metamemory task that incorporates (and can separately measure the influence of) two simultaneous sources of fluency: familiarity and accessibility. Our results confirmed that our content-unrelated mindset procedure had affected the use of fluency. Moreover, the use of both fluency sources was attenuated, demonstrating the generality of the effect. The findings highlight the causal dependency of fluency on a complex, cognitively-rich environment.

1. Introduction

Fluency, the subjective experience of the ease with which information is processed, is an important determinant of many high level processes – from establishing what is true (fluent information seems more true; Reber & Schwarz, 1999) or likeable (heightened fluency enhances likeability; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006), through risk assessments (increased fluency reduces risk evaluations; Song & Schwarz, 2009) to cognitive processing modes (reduced fluency promotes an analytical processing style; Alter, Oppenheimer, Epley, & Eyre, 2007). The first wave of documenting the vast effects of fluency (for overviews see Alter & Oppenheimer, 2009; Schwarz, 2004) has recently given way for a second wave, in which cognitive scientists examine underlying mechanisms and boundary conditions (for a recent review, see Oppenheimer, 2008).

In the current study we turn the spotlight to a new and potentially robust determinant of how fluency affects cognition: states of mind, or processing modes. The argument that we make is simple: We suggest that different cognitive states of mind are likely to alter the extent to which experienced fluency exerts its effect. Specifically, we suggest that inducing a specific state of mind in one task would change how fluency contributes to judgments made in a subsequent, seemingly unrelated task. More generally, then, we argue that in order to understand how fluency works one has to understand the cognitive context in which it operates (much like other social and cognitive phenomena; for examples, see Bless & Schwarz, 2010; Wyer & Srull, 1986). Notably, we claim that the precise nature of the fluency-based judgments is irrelevant in this case, and that certain cognitive mindsets may be able to modulate the use of a large variety of fluency cues.

1.1. Fluency: a deeper look

Previous research that explored how fluency exerts its downstream effects on cognition and emotion focused on

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examining and experimentally manipulating *specific* associations between fluency cues and these downstream processes. These associations have been shown to be sensitive to two kinds of manipulations. One influential line of research suggested that naïve theories play an important role in relating fluency with its common application, and has *explicitly* altered these theories using various experimental settings. For example, Schwarz and colleagues (Schwarz, 1998; Schwarz et al., 1991) have shown that the effects of fluency can be reduced by turning participants' attention to the irrelevance of a given fluency source to the judgment at hand. In other words, severing the association between fluency and the cognitive task to which it contributes significantly reduces the effects of fluency. To take another example, Oppenheimer (2004) was able to reverse the modal effect of fluency on frequency judgments (the more fluent a concept, the more frequent it is judged to be) simply by using stimuli that suggested a clear source for their fluency. Thus, the frequency of fluent names such as Bush or Clinton was *underestimated*, seemingly because participants attribute their fluency to fame (for similar demonstrations, see Rothman & Schwarz, 1998).

Fluency effects have also been previously modulated by *subtle and indirect* changes to the associations between specific fluency cues and their common interpretations and uses. For example, while high fluency typically leads to higher truth ratings, experimentally-created context can reverse this relationship and result in high fluency leading to lower truth ratings (Unkelbach, 2006). Similar effects have also been obtained by framing novelty (disfluency) as beneficial (or detrimental) in a specific circumstance by inducing different goal pursuit modes (Labroo & Kim, 2009; for similar effects, see also Brinol, Petty, & Tormala, 2006; Miele & Molden, 2010; Song & Schwarz, 2009). Thus, in addition to their sensitivity to availability of given naïve theories (Oppenheimer, 2004; Schwarz, 1998; Schwarz et al., 1991), fluency effects are also dependent on specific associations with stimuli properties.

1.2. The current research

The current paper extends previous research in two important ways. First, unlike previous investigations, we manipulate a *general state of mind* and examine how it modulates the use of fluency in a subsequent, content-unrelated task. In other words, the question examined here is not whether one can change the meaning of a specific fluency cue, but rather whether there are states of minds that lead to decreased (or increased) reliance on fluency. Previous research has convincingly shown that many tasks can affect the subsequent use of informative cues that are pertinent to the task at hand (for selective reviews, see Bless & Schwarz, 2010; Mussweiler, 2007; Wyer & Srull, 1986). While it has also been shown that such utilization of cues in one trial affects the use of same cues in subsequent trials even unbeknown to the subject (Day & Bartels, 2005), these experience-induced effects were typically specific to the cues tested. Here we examine whether the use of a ubiquitous metacognitive cue, such as fluency, can be altered by a preceding experience. Using a similar theoretical approach to Shah & Oppenheimer's (2009) account concerning the importance of accessible relevant information, we suggest that our cognitive mindset manipulation can be used to reduce (or enhance) the influence of the fluency cues at hand.

A second contribution of our study is the utilization of a task that is affected by two different sources of fluency – accessibility and familiarity – thereby allowing us to assess whether these general states of mind have a general effect on fluency (whereas previous research has shown that low level manipulations lead to very specific changes in fluency effects, e.g., Topolinski & Strack, 2010).

As the cognitive mindset manipulation we used Jacoby's process dissociation procedure (PDP; Jacoby, 1991), that allowed us to create mindsets that either increase or decrease reliance on simple fluency cues such as familiarity and accessibility. We hypothesized that this task should create a mindset that extends beyond the task itself (for extended effects of mindsets see de Vries, Holland, Chenier, Starr, & Winkielman, 2010; Miele & Molden, 2010). To examine the effect of cognitive mindset on *two* sources of fluency, we have capitalized on a metamemorial phenomenon known as the feeling of knowing (FOK), which relies on two fluency cues (familiarity and accessibility; see more in Section 2). According to our hypothesis, a mindset that decreases reliance on a ubiquitous fluency cue should (A) cause participants to provide lower FOK ratings, and (B) do so for both sources of fluency.

2. Materials and methods

2.1. Participants

Eighty-nine Hebrew-speaking undergraduate students (45 females) from The Hebrew University of Jerusalem participated in this experiment for either course credit or a payment of 10 NIS (roughly equivalent to 2.5 US$).

2.2. Stimulus materials

2.2.1. PDP task

We used a pool of 120 two-syllable, three-to-six-letter nouns with frequencies varying between 3 and 99 (Frost & Plaut, 2005). The words were divided into three sets of 40 words, and two sets were used at two incidental learning phases; Words from the third set were used as distractors in the recognition test. The use of the sets between the two study conditions and between the study and the test was counterbalanced between participants.

2.2.2. FOK task

The items used for this task were the same items used and reported by Koriat and Levy-Sadot (2001). The items consisted of 18 tetrads of questions. Each tetrad included two questions with either high or low accessibility, manipulated by large or small category terms (e.g., composers or choreographers, respectively), crossed with either a familiar or an unfamiliar reference (e.g., the ballet ''Swan Lake'' or the ballet ''The Legend of Joseph'', respectively). Thus, each tetrad contained one question for each possible combination of high and low familiarity and accessibility (for verification of this operationalization of familiarity and accessibility, see Koriat & Levy-Sadot, 2001). These 72 questions were divided into two lists, and each list included 2 of the 4 questions in each tetrad; therefore, each category term and each referent appeared only once in each list. The order of presentation of the questions in each list was randomly determined for each participant.

2.3. Procedure

2.3.1. Overview

Participants first completed Jacoby's PDP task (1991; forty-four participants in the exclusion condition). Following the completion of this part, in what was presented to them as a second and unrelated study, participants performed the FOK rating task. In this part, participants were presented with the general knowledge questions, and were asked to provide numerical ratings that indicated their confidence in their ability to identify the correct answer among four alternatives in a subsequent recognition test.

2.3.2. PDP task

Before the experiment, participants were told that the first few phases were being conducted as a pilot study to examine the categorization of Hebrew words. After incidentally encoding two lists of items, participants performed a self-paced old/new recognition test under instructions of either inclusion or exclusion of one of the lists (for additional details, see Supplementary materials).

Note that in the *exclusion* condition, relying on item fluency-cum-familiarity is potentially disadvantageous because it may lead participants to mistakenly endorse items from both lists as "old", as such items have similar (episodic) familiarity strength from their single previous exposure. The exclusion condition should, theoretically, result in a mindset that minimizes reliance on fluency and encourages participants to adopt a more cautious approach in forming their judgments (both in the recognition test, and, to the extent that the effect does carry over tasks, in the FOK judgments).

2.3.3. FOK task

Upon completion of the mindset induction task (i.e., the PDP task), participants were told that the second task belonged to a new, unrelated experiment. In this part, they were given the general knowledge questions (see Section 2.2.2), and asked to indicate their confidence in their ability to subsequently identify the correct answer from four options in a subsequent recognition test (the potential answers were not displayed). Participants indicated their confidence by providing a number between 25% (chance level) and 100%. There was no time limit for this phase, and participants were randomly assigned to one of the two lists of questions (see Section 2.2.2 for details). The FOK task was followed by debriefing, during which participants filled a questionnaire whose analysis indicated that participants were not aware of a connection between the PDP and the FOK tasks.

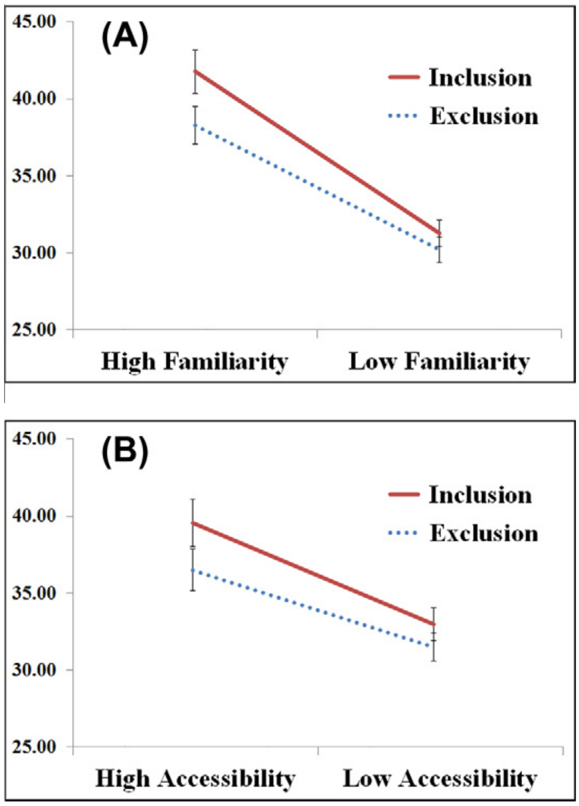

Fig. 1. Mean FOK ratings (±SE) at each mindset (exclusion/inclusion) as a function of (A) Familiarity (high/low) or (B) Accessibility (high/low).

3. Results

Results are reported based on data from 85 participants (for data preparation and confirmatory analyses see Supplementary materials). To test our main hypothesis concerning the effect of mindset on the impact of fluency, we conducted a 2 (Familiarity: high vs. low) × 2 (Accessibility: high vs. low) × 2 (PDP condition: inclusion vs. exclusion) mixed design ANOVA with FOK ratings as the dependent variable. The PDP condition had a significant main effect ($F_{(1,83)} = 4.42$, MSE = 99.21, $p < 0.04$). This effect was the result of participants in the exclusion condition ($M = 34.26$, SD = 4.79) providing lower ratings than participants in the inclusion condition ($M = 36.53$, SD = 5.16), confirming our first prediction of a lesser reliance on fluency in the exclusion condition.

Our second prediction was concerned with the generality of the effect over both fluency sources (i.e., familiarity and accessibility). Thus, our second prediction was examined by looking at the interactions of mindsets with each of the fluency sources[1]. As for familiarity, an mixed-design ANOVA contrasting high and low familiarity (collapsed across levels of accessibility) with mindsets revealed a significant interaction ($F_{(1,83)} = 5.54$, MSE = 22.25, $p < 0.03$; See Fig. 1). More specifically, the difference between high and

[1] We chose to look for the interaction, rather than the main effect, as the items used for the low fluency conditions were items that were expected to yield little or no fluency (see Koriat & Levy-Sadot, 2001, for stimuli construction). Thus, the PDP task manipulation was expected to bear little influence on low-fluency items as no initial fluency was apparent in these items, and to result in differences mainly for higher-fluency items.

low familiarity items in the inclusion condition was bigger than the same difference in the exclusion condition (see Fig. 1). Post hoc contrasts indicated that this interaction was the result of a significant difference between mindsets for high familiarity items ($M_{\text{inclusion-high-familiarity}} = 41.78$, $M_{\text{exclusion-high-familiarity}} = 38.3$, $t_{(83)} = 2.48$, $p < 0.02$), but not for low familiarity items ($M_{\text{inclusion-low-familiarity}} = 31.28$, $M_{\text{exclusion-low-familiarity}} = 30.21$, $t_{(83)} = 1.13$, $p > 0.26$). The ANOVA examining high and low accessibility (collapsed across levels of familiarity) with mindsets did not yield a significant interaction of mindset with accessibility ($F_{(1,83)} = 2.23$, MSE = 23.18, $p < 0.14$), yet the patterns observed were in the predicted directions. Given our a priori hypothesis concerning the generality of the mindset effect, post hoc contrasts were conducted and revealed a significant difference between the mindsets for high accessibility items ($M_{\text{inclusion-high-accessibility}} = 39.79$, $M_{\text{exclusion-high-accessibility}} = 36.74$, $t_{(83)} = 2.25$, $p < 0.03$; no effect was found for the low accessibility items, $M_{\text{inclusion-low-accessibility}} = 33.26$, $M_{\text{exclusion-low-accessibility}} = 31.77$, $t_{(83)} = 1.46$, $p > 0.14$; See Fig. 1).[2]

To explore whether we had sufficient power to detect the crucial interaction effects, we conducted power analyses that led us to add 33 participants to our study. The results obtained were identical in nature: A significant Familiarity × Mindset interaction ($F_{(1,112)} = 4.16$, $p < 0.05$), with no Accessibility × Mindset interaction ($F_{(1,112)} = 1.96$, $p < 0.17$)[3].

4. Discussion

Our results show that a general mindset, unrelated in content to the focal task, can have an effect on a ubiquitous cue, namely, fluency. We have demonstrated that our mindset manipulation can affect the extent to which fluency is used: Participants primed to rely more (inclusion condition) or less (exclusion condition) on fluency performed differentially on a subsequent fluency-dependent task. Furthermore, the results show that the effects of mindsets are non-specific and can be concurrently demonstrated in two different measures of fluency: Participants in the exclusion condition provided lower FOK ratings for both high-familiarity and high-accessibility items.

Previous studies have indicated that the *interpretation* attached to the experienced fluency can be reversed by an experimental manipulation (Brinol et al., 2006; Unkelbach, 2006). For example, low levels of fluency were interpreted as low confidence under a concrete processing style, and as high confidence under an abstract processing style (Tsai & McGill, 2011; for similar examples, see de Vries et al., 2010; Miele & Molden, 2010). Our induced cognitive mindset, in contrast, influenced *the extent* to which existing fluency was relied upon, but not the interpretation given to it; had the interpretation been reversed, the effect of the PDP manipulation should have been observed (in different directions) in both high and low fluency conditions. However, the contrasts conducted revealed that this was not the case, suggesting that the interpretation attributed to fluency was constant across both experimental conditions (although, being based in part on a null result, this conclusion is tentative and awaits further direct evidence).

In addition, our study may suggest that different fluency sources – in this study, familiarity and accessibility – are differentially susceptible to (cognitive mindset) manipulations: While mindset significantly interacted with familiarity, its interaction with accessibility did not reach significance. A formal comparison of these interactions was precluded in the current experimental design, but future research could explore manipulations that might selectively affect accessibility-based judgments.

Our results bear significance to the study of metamemory judgments as well. We show that (a) FOK judgments, in addition to being influenced by direct cue- or target-related manipulations (e.g., Schreiber, 1998; Schreiber & Nelson, 1998; Schwartz & Metcalfe, 1992; Schwartz & Smith, 1997), can also be sensitive to the general cognitive context in which they are given, and (b) the heuristics that underlie FOK ratings can be flexibly applied: when participants were implicitly discouraged from relying on fluency, its weight was diminished.

One caveat that could potentially account for our results is experimental fatigue. Inclusion merely requires knowledge that a prompted item was seen, whereas exclusion requires an additional ability to identify in which list the item was seen. This added difficulty could lead to excess fatigue in the exclusion task. As cognitive load and fatigue have both been shown to influence fluency use (Oppenheimer & Monin, 2009; Schmeichel & Baumeister, 2004), one could suggest that the effects obtained were the result of fatigue rather than cognitive mindset. However, fatigue should result in an *increased* use of fluency and a reduced use of higher-order processes (Oppenheimer & Monin, 2009; Schmeichel & Baumeister, 2004); participants in the exclusion condition, however, were *less* susceptible to fluency information and provided lower fluency based ratings. Moreover, while fatigue should result in slower reaction time (Gunzelmann, Moore, Gluck, Van Dongen, & Dinges, 2005; but see Schellekens, Sijtsma, Vegter, & Meijman, 2000), participants exhibited slower reaction times for all fluency levels following the *inclusion* condition (see Supplementary materials). Finally, contrary to the ratings, mindset did not interact with familiarity in affecting reaction times. Thus, it seems unlikely that fatigue could have resulted in our observed pattern of fluency based judgments.

To conclude, fluency is known to affect many cognitive processes, including processing style (Alter et al., 2007); here we demonstrated that fluency itself, like many other cognitive phenomena (i.e., Bless & Schwarz, 2010; Wyer & Srull, 1986) is susceptible to external factors, and can be influenced by an (experimentally induced) processing mode. Our study extends a recent line of work suggesting that fluency is causally situated in the current cognitive environment; the interplay between the well established consequences of fluency and the cognitive context within

[2] The triple interaction of familiarity × accessibility × mindset was not significant ($F < 1$).

[3] The pattern of results for this new group of participants was identical to that described above, but due to the small sample size none of the results reached significance. For the full analyses of the larger sample size, see Supplementary materials.

which fluency is experienced will no doubt prove to be invaluable to our understanding of the socially interactive individual.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.cognition.2012.04.001.

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