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External control of the stream of consciousness: Stimulus-based effects on involuntary thought sequences

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ABSTRACT

The stream of consciousness often appears whimsical and free from external control. Recent advances, however, reveal that the stream is more susceptible to external influence than previously assumed. Thoughts can be triggered by external stimuli in a manner that is involuntary, systematic, and nontrivial. Based on these advances, our experimental manipulation systematically triggered a sequence of, not one, but two involuntary thoughts. Participants were instructed to (a) not subvocalize the name of visual objects and (b) not count the number of letters comprising object names. On a substantial proportion of trials, participants experienced both kinds of involuntary thoughts. Each thought arose from distinct, high-level processes (naming versus counting). This is the first demonstration of the induction of two involuntary thoughts into the stream of consciousness. Stimulus word length influenced dependent measures systematically. Our findings are relevant to many fields associated with the study of consciousness, including attention, imagery, and action control.

1. Introduction

Conscious thoughts often seem free from external control and divorced from ongoing action and the current environment. For example, when performing a monotonous task at work, one may think, not only about the current task, but also about other activities (e.g., skiing). Such observations have led theorists to construe consciousness as a mercurial stream (James, 1890), one that is often 'offline' and insulated from the reins of the external world (Barron, Riby, Greer, & Smallwood, 2011; Fodor, 1975; Fodor, 1983; Smallwood & Schooler, 2006; Wegner & Bargh, 1998). These theoretical views are in accord with everyday intuitions regarding the unpredictable, autonomous, and 'free-willed' nature of conscious thought—a phenomenon that appears to operate unlike the workings of a machine.

Despite these intuitions and prevalent theoretical views, some theorists (e.g., Freud, 1938; James, 1890; Miller, N.E., 1959; Vygotsky, 1962; Wegner, 1989) have proposed that conscious thoughts are more predictable and more tied to external influence than what might appear to be the case at first glance (see review in Allen, Wilkins, Gazzaley, & Morsella, 2013). Helmholtz (1856), for example, noted that conscious thoughts can arise from 'unconscious inferences' in a manner that

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resembles reflexes. Helmholtz (1856) noted that these reflex-like, unconscious inferences are at play during high-level processes such as word reading—an automatic process that forces contents (phonological forms) into the stream of consciousness. Interestingly, one is conscious of the product of these sophisticated and unintentional processes, but not of the processes themselves (Lashley, 1956; Miller, G.A., 1962).

The stream of consciousness, despite its prevalence in everyday conversation, remains an understudied topic in experimental psychology. However, the topic is of interest to many subfields within the study of mind and brain, including consciousness, attention, self-regulation, psychopathology, mental imagery, and mind wandering.

1.1. The Reflexive Imagery Task

Building on these ideas (i.e., Freud, 1938; Helmholtz, 1856; James, 1890; Miller, N.E., 1959; Vygotsky, 1962; Wegner, 1989) and on the experimental approaches of Ach (1905), Wegner (1989), and Gollwitzer (1999), Allen et al. (2013) developed a new paradigm, the *Reflexive Imagery Task* (RIT), that allows one to begin to investigate how high-level conscious thoughts can be activated unintentionally and reliably through external stimuli. In the paradigm, participants are presented with pictures of objects after being instructed to not subvocalize (i.e., name in their minds but not aloud) the name of the objects. To convey the striking nature of this effect, we will present the reader with a demonstration of such an experimental situation. Momentarily, we will present to you an object enclosed within parentheses. Your task is to not subvocalize (i.e., 'say in one's head') the name of the object. Here is the stimulus (▲). The combination of these instructions (which induce a certain *action set*) and the presentation of the stimulus renders people incapable of suppressing the conscious experience of the phonological form of the word 'triangle' (Allen et al., 2013).

The conscious thoughts elicited in the RIT are 'high-level' because, in terms of stages of processing, they are post-perceptual and require complicated transformations, as in the case of object naming, which is a multi-stage process (Allen et al., 2013; Levelt, 1989). That the effect is involuntary diminishes the likelihood of experimental artifacts stemming from strategic processing, demand characteristics, or social desirability. (See Allen et al., 2013, p. 1320, for a list of other features that render the RIT a fruitful paradigm for the study of consciousness.) Neuroimaging evidence strongly suggests that, in paradigms in which participants must report the occurrence of conscious thoughts, it is unlikely that participants confabulate the occurrence of these internal experiences (Mason et al., 2007; McVay & Kane, 2010; Mitchell et al., 2007; Wyland, Kelley, Macrae, Gordon, & Heatherton, 2003).

1.2. The encapsulated nature of the generation of conscious contents

It has been proposed that, in circumstances such as those instantiated by the RIT, conscious thoughts arise unintentionally because of the 'encapsulated' nature of the generation of conscious content (Fodor, 1983; Krisst, Montemayor, & Morsella, in press). Such encapsulation is evident, not only in the Helmholtzian unconscious inferences that are at play in perceptual processing, but also in action control, as in the case of action-related urges. In certain stimulus environments, these urges (e.g., to inhale while holding one's breath while underwater) are triggered in a predictable and insuppressible manner. For example, when one holds one's breath while underwater, or runs barefoot across the hot desert sand in order to reach water, one cannot avoid the conscious inclinations to inhale or to avoid touching the hot sand, respectively (Morsella, 2005). The conscious urges triggered by the external world cannot be turned off voluntarily, even when the urges are maladaptive (Morsella, 2005; Öhman & Mineka, 2001). The action-related urges are encapsulated from voluntary control and externally-triggered. Thus, although inclinations triggered by external stimuli can be *behaviorally suppressed*, they often cannot be *mentally suppressed* (Bargh & Morsella, 2008).

2. The current approach: External control of the stream of consciousness

Together, theorizing from diverse sources (including evidence from classic perception research, the RIT, and research on the representation of urges and action options) reveals that conscious thoughts are less unpredictable and less shielded from external influence than is often appreciated. More importantly, these advances illuminate the kinds of mechanisms that give rise to the conscious contents comprising the stream of consciousness, a central, but understudied, phenomenon.

One limitation of past research (e.g., previous versions of the RIT) is that experimental manipulations could activate, by external influence, only one unintended thought. (As far as we know, no experimental manipulation has ever systematically elicited more than one involuntary thought.) However, in everyday life, the stream of consciousness usually involves more than one thought. Thus, in our experiment, we examined whether a single external stimulus could ever systematically trigger a sequence of *two* unintended thoughts in the stream of consciousness. Specifically, in our variant of the RIT, participants were presented with visual objects and instructed to (a) not subvocalize the name of the object (as in the basic RIT paradigm) and (b) not count the number of letters comprising the name of the object. This is the kind of incremental research, involving a robust, multifaceted, and reliable phenomenon that has been investigated for years, that is important for progress in the fields of psychological science and neuroscience (Nosek, Spies, & Motyl, 2012).

For the sake of illustration, we will present the reader with a demonstration of this experimental situation. Momentarily, we will present to you an object enclosed within parentheses. Your task is to not subvocalize the name of the object and, also,