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Externally controlled involuntary cognitions and their relations with other representations in consciousness



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ABSTRACT

Percepts and action-related urges often enter consciousness inexpressibly. The Reflexive Imagery Task (RIT) was developed to investigate how high-level cognitions (e.g., subvocalizations), too, can enter consciousness in this manner. Limitations of the paradigm include (a) that no data have confirmed subjects' introspections about the involuntary subvocalizations, and (b) that, in everyday life, adaptive responses to involuntary cognitions often depend on the nature of the other contents in consciousness. To address a and b, we developed an RIT in which subjects were presented with visual objects and instructed to not think of the object names. If a subvocalization did arise, however, subjects responded motorically only if the subvocalization rhymed with a word held in memory and if there was a visual "go" cue. Subjects successfully (on 0.83 of the trials) emitted this complex, "multi-determined" response, which provides evidence for the occurrence of the involuntary subvocalizations and illuminates the function of consciousness.

1. Introduction

It is a fact of everyday experience that percepts and urges often enter one's consciousness involuntarily: The eyes open and a visual world, replete with objects and colors, is perceived instantaneously, effortlessly, and regardless of one's desires. Later in the day, one might experience, say, the desire to have a cup of coffee. To the thinker, such *conscious contents*¹ "just happen"—involuntarily and, most often, inexpressibly.

Recent theorizing (see review in Morsella, Godwin, Jantz, Krieger, & Gazzaley, 2016a) and experimental paradigms reveal that high-level cognitions, too, can arise in this involuntary and inexpressible manner. For example, in the Reflexive Imagery Task (RIT; see review in Bhangal, Cho, Geisler, & Morsella, 2016), high-level conscious thoughts are triggered involuntarily, through external control stemming from the actions of the experimenter. The RIT is based on the experimental approaches of Ach (1905/1951), Wegner (1989), and Gollwitzer (1999). It was developed to investigate experimentally the unconscious generation of high-level, involuntary conscious contents and to complement the theoretical standpoint that action inclinations experienced in consciousness

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¹ In this treatise, we are speaking about the most basic form of consciousness, such as the awareness of the color blue, of an afterimage, or of the urge to cough. From this standpoint, a "conscious content" is something that one is aware of (Merker, 2007). For example, it might be a color, an urge, or an earworm, which is a song that one "cannot get out of one's mind." The "conscious field" is all that one is aware of at one moment in time, which is the combination of all activated conscious contents (Freeman, 2004; Köhler, 1947; Searle, 2000).

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are often mentally insuppressible (Bargh & Morsella, 2008).

In the initial and most basic version of the task (Allen, Wilkins, Gazzaley, & Morsella, 2013), subjects were instructed to not subvocalize (*i.e.*, say in their head but not aloud) the names of objects (*e.g.*, line drawings from Snodgrass & Vanderwart, 1980). (*Subvocalization* occurs when one ‘talks in one’s head’ or names an object in such a manner; this mental representation has been referred to as the ‘pre-articulatory output’; Slevc & Ferreira, 2006.) In Allen et al. (2013), subjects were presented before each trial with the instruction, “Don’t Think of the Name of the Object” before an object was presented for 4 s, during which time subjects indicated by button press if they happened to have subvocalized the name of the object involuntarily. On the majority of the trials (0.86 in Allen et al., 2013; 0.87 in Cho, Godwin, Geisler, & Morsella, 2014; and 0.73 in Merrick, Farnia, Jantz, Gazzaley, & Morsella, 2015), subjects failed to suppress such subvocalizations.

In a more complex version of the task (Merrick et al., 2015), subjects were instructed to (a) not subvocalize the name of the visual object, and (b) not subvocalize the number of letters in the object name. On a significant proportion of the trials (0.30 [$SE = 0.04$]), subjects reported experiencing both kinds of imagery. Each kind of imagery arose from distinct, high-level processes (*i.e.*, that of object naming versus letter counting). In another complex version of the task, RIT effects arose even though the effect involved a word-manipulation task similar to Pig Latin (*e.g.*, “CAR” becomes “AR-CAY”). In this variant of the RIT (Cho, Zarolia, Gazzaley, & Morsella, 2016), subjects were instructed to not transform stimulus words in this way, but involuntary transformations still arose on more than a proportion of 0.40 of the trials. This effect is striking because the involuntary transformation requires complex symbol manipulation, which is known to be associated with high-level processes in frontal cortex (Miller & Cummings, 2007).

To illustrate the basic version of the RIT effect, momentarily, we will present to you an object enclosed within parentheses. Your task is to *not* subvocalize the name of the object. Here is the stimulus (▲). When presented with this instruction (which induces a certain *action set*) and then presented with this stimulus, most people cannot suppress the conscious experience of the phonological form of the word “triangle.” This RIT effect requires the sophisticated process of object naming, in which only one of tens of thousands of phonological representations is selected for production in response to a visual stimulus (*e.g.*, CAT yields /k/, /æ/, and /t/; Levelt, 1989). After the presentation of the stimulus, the RIT effect arises after a few moments ($M = 1451.27$ ms [$SD = 611.42$] in Allen et al., 2013; $M = 2323.91$ ms [$SD = 1183.01$] in Cho et al., 2014; $M = 1745.97$ ms [$SD = 620.86$] in Merrick et al., 2015).

It is important to appreciate that the RIT provides an additional method to contrast the capacities of conscious and unconscious processes. This method does not involve subliminal stimuli, which are problematic: Subliminal stimuli are not only unconscious, but they are also of very weak strength, unlike the supraliminal representations that unconscious mechanisms often process (Bargh & Morsella, 2008). Thus, the RIT involves what can be regarded as the Helmholtzian-Freudian unconscious, which operates over supraliminal stimuli (see related account in Nisbett & Wilson, 1977). With this in mind, it is important to consider the observation that, in a pilot study ($n = 8$, trials = 8; see Acknowledgment), no RIT effects were observed when the stimuli (orthographs) were rendered subliminal through visual masking. Hence, it seems that the automatic and unconscious processes giving rise to the RIT effect require that the stimuli be supraliminal.

1.1. Evidence that the RIT effect resembles a reflex

Empirical evidence and theory (including Wegner’s (1994) model of *ironic processing*; see discussion of relationship between Wegner’s (1994) model and the RIT in Bhargal, Cho, et al., 2016) suggest that, for subjects, the effect “just happens” and is not an artifact of high-level strategic processes on their part. Corroborating this conclusion, in one version of the RIT, subjects reported on the majority of trials that the involuntary subvocalization felt “immediate” (Bhargal, Merrick, & Morsella, 2015). There is other evidence supporting the view that the effect is not an artifact of strategic processes. First, the nature of the subvocalizations is influenced systematically by factors such as word frequency (Bhargal et al., 2015). Such an artifact of experimental demand would require subjects to know how word frequency should influence responses in an experiment. Second, on some trials, the effect arises too quickly to be caused by strategic processing (Allen et al., 2013; Cho et al., 2014). Third, the effect still arises under conditions of cognitive load, in which it is difficult for subjects to implement strategic processing (Cho et al., 2014). Fourth, the RIT effect habituates (*i.e.*, is less likely to arise) after repeated presentation of the same stimulus object, which suggests that the RIT effect is activated in a reflex-like manner and involuntarily (Bhargal, Allen, Geisler, & Morsella, 2016).

1.2. Two limitations of the RIT

The RIT effect reveals that high-level conscious contents can enter the conscious field in an insuppressible, non-trivial, and reflex-like manner. Although the evidence accumulated thus far suggests that the effect is both robust and reliable, some important questions remain concerning the validity of the effect. For instance, one major criticism of the RIT is that it relies on the technique of self-report. This technique has well-known limitations. For example, self-reports can be inaccurate as a result of subjects basing their reports on a strategy of how to comport oneself during an experiment (see discussion in Morsella et al., 2009). In addition, inaccurate memories of fleeting conscious contents can lead to incorrect self-reports (Block, 2007). Evidence from neuroimaging studies in which subjects must report about the occurrence of involuntary conscious contents suggests that subjects are not confabulating about the occurrence of these mental events (Mason et al., 2007; McVay & Kane, 2010; Mitchell et al., 2007; Pasley et al., 2012; Wyland, Kelley, Macrae, Gordon, & Heatherton, 2003). However, this neuroimaging-based evidence stems from tasks that are different in significant ways from the RIT. For instance, the dependent measures in these paradigms do not involve the involuntary naming (subvocally) of stimulus objects. In addition, the neural correlates of subvocalizing remain controversial (Hickok, 2009; Schomers,

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