Thought stopping through sustained imagery: Involuntary subvocalizations and the sense of agency

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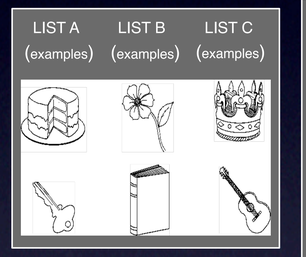
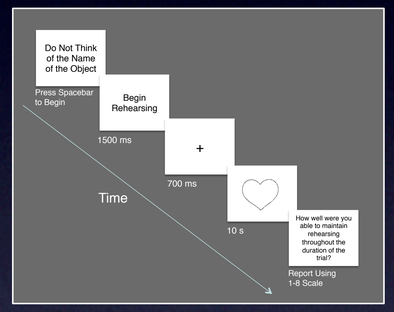
Introduction

The interactions among intentional and unintentional conscious contents (e.g., intrusive cognitions) and the sense of 'self' remain under-explored. To investigate these interactions, we conducted two studies.

Study 1 combined a clinically relevant technique (thought stopping) with the Reflexive Imagery Task (RIT; Allen et al., 2013), in which, after being instructed to *not* subvocalize the name of visual objects, participants often fail at suppressing subvocalizations. Does intentionally subvocalizing something else (e.g., da da da…) block this effect? Perhaps intrusions will still occur between syllables. Thus, we also added a condition in which the intentional subvocalization was performed continuously (i.e., daaa…).

In Study 2, participants performed mental acts (including subvocalized humming) while introspecting changes in the conscious contents and in the sense of agency (or in the 'Psychological Doer').





Method: Study 1

Participants. San Francisco State University undergraduate students (n = 64) participated for course credit.

Stimuli. Three lists (one list for each condition) of 20 objects were created (Snodgrass & Vanderwart, 1980). The order of presentation of the lists was fully counterbalanced across participants. Within each list, images were presented in random order. All conditions consisted of 20 trials.

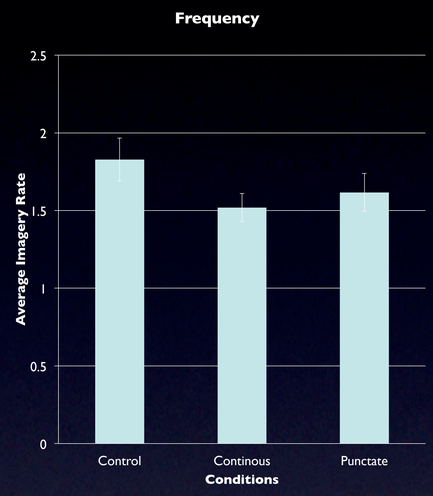
Procedures. 38 Participants completed a control condition first, in which they were instructed to not subvocalize the object name while the object appeared on the computer screen (10 s). During trials, participants indicated with a button press when they happened to subvocalize the object name. The rest of the participants (n = 26) completed this control condition last.

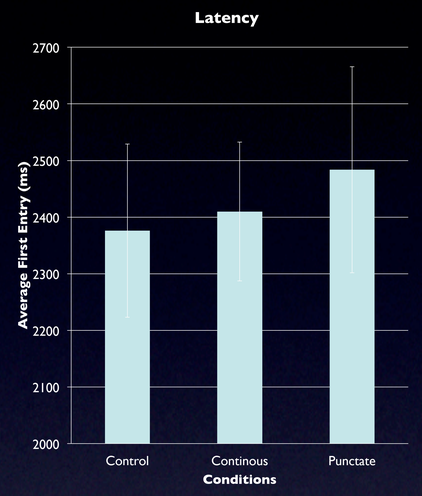
Before or after completion of the control condition, half of the participants completed a Continuous Humming condition (n = 32) first, in which they were instructed to not think the name of the object presented while they maintained subvocalization of the hum (e.g., "daaa…") for the duration of each trial. The other half completed a Punctate Humming condition (n = 32) first, in which they were instructed to do the same task, but in a broken form of hum (e.g., "da, da, da").

Following each of the humming trials, participants were asked: "*How well were you able to maintain rehearsing throughout the duration of the trial*?" Participants indicated their response to the question using a one-to-eight continuous scale.

Results: Study 1

A repeated measures ANOVA indicated that participants experienced significantly more involuntary subvocalizations in the baseline condition compared to the humming conditions, $F(2, 63) = 6.47$, $p = .002$. Additionally, a repeated measures ANOVA revealed that there was no significant difference in latency as a function of conditions, $F(2, 63) = 2.32$, $p = .102$.





Method: Study 2

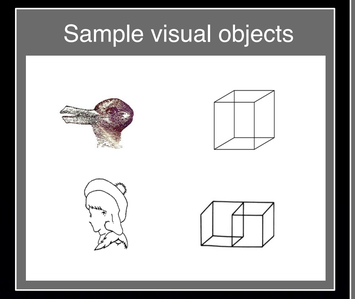
Participants. San Francisco State University undergraduate students (n = 20) participated for course credit.

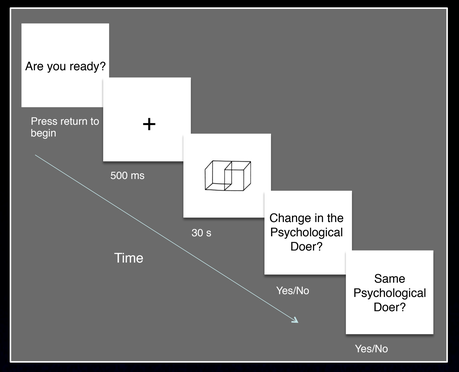
Stimuli. Visual objects were used only in one of the two conditions of the study. In this condition, participants were shown a series of 15 ambiguous objects (e.g., Necker cube, duck-rabbit). Objects were presented in random order. All conditions consisted of 15 trials.

Procedures. Participants completed two blocks in which they were instructed to perform certain mental acts. In one block, the External Object Condition, participants were instructed to sustain in mind one orientation of an ambiguous object (e.g., Necker cube) so that the object did not reverse in orientation. In another block, the Self-Generated Percept Condition, participants sustained a subvocalized hum so that the hum was continuous and unchanging.

During each trial (30 s), participants indicated by button press whenever they experienced a change in the conscious content. After each trial, participants indicated with a yes/no response whether they experienced a change in their 'Psychological Doer' and whether the Psychological Doer of the present trial was the same as that of the last trial. The 'Psychological Doer' was defined for participants as follows.

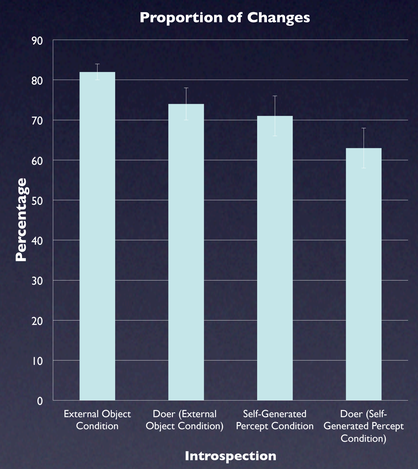
"The 'Psychological Doer' is when you intend to cause an action or event. For example, one's 'Psychological Doer,' may intend to pay more attention when searching for a lost pen or set of keys. One's 'Psychological Doer' may also experience something unintended. For example, the sight of a candy wrapper may trigger a childhood memory to pop into one's mind. This is one example in which one may feel less like the 'Psychological Doer' or the mental act."

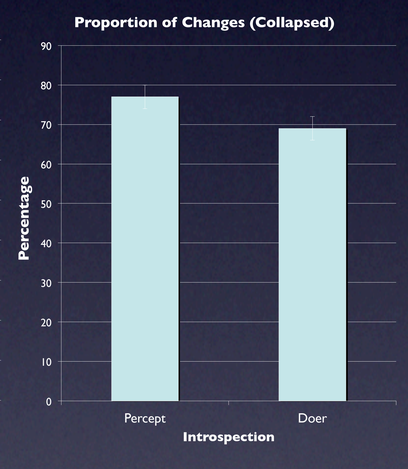




Results: Study 2

A 2x2 within-subjects ANOVA with Introspection (introspections about Percept vs. about Doer) and Percept Condition (Perceiving vs. Doing) revealed a main effect of Condition, in which more changes were reported for the External Object Condition than for the Self-Generated Percept condition, $F(1,19) = 5.59$, $p = .029$. Participants also reported across both conditions significantly more changes in the conscious content (M = 1.21, SEM = .04) than in the Psychological Doer (M = 1.08, SEM = .05), $t(39) = 2.59$, $p = .014$.





Discussion

Study 1 revealed that sustained imagery can reduce the entry into consciousness of unintended contents, though the technique is limited: Involuntary cognitions entered consciousness even when consciousness was occupied by the continuous hum, which is an interesting finding regarding the existence of two simultaneous contents (one intended and one unintended) in the conscious field. These effects require further investigation, as it is possible that the differences between blocks were due to carryover effects.

Study 2 replicated previous findings (Montemayor et al., 2013) revealing that the 'self' is perceived as an entity in the conscious field that is more stable than other conscious contents (e.g., the hum or visual stimuli). Interestingly, conditions in which conscious contents were self-generated (e.g., the subvocalized humming condition) were accompanied by fewer perceived changes in the internal 'doer.'