



# The the the the induction of jamais vu in the laboratory: word alienation and semantic satiation

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## ABSTRACT

Jamais vu is a phenomenon operationalised as the opposite of déjà vu, i.e. finding subjectively unfamiliar something that we know to be familiar. We sought to document that the subjective experience of jamais vu can be produced in word alienation tasks, hypothesising that déjà vu and jamais vu are similar experiential memory phenomena. Participants repeatedly copied words until they felt “peculiar”, had completed the task, or had another reason to stop. About two-thirds of all participants (in about one-third of all trials) reported strange subjective experiences during the task. Participants reported feeling peculiar after about thirty repetitions, or one minute. We describe these experiences as jamais vu. This experimentally induced phenomenon was related to real-world experiences of unfamiliarity. Although we replicated known patterns of correlations with déjà vu (age and dissociative experiences), the same pattern was not found for our experimental analogue of jamais vu, suggesting some differences between the two phenomena. However, in daily life, those people who had déjà vu more frequently also had jamais vu more frequently. Findings are discussed with reference to the progress that has been made in déjà vu research in recent years, with a view to fast-tracking our understanding of jamais vu.

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Jamais vu is a memory phenomenon related to the experience of déjà vu – often operationalised as the very opposite: i.e. finding subjectively unfamiliar something that we know to be familiar (Brown, 2003; Moulin, 2017). The term comes from the French “never seen”. Descriptions of this experience in daily life arise when processing or experiencing faces and places (such as the fleeting sensation that a well-known person looks different or strange, or temporarily finding a familiar environment novel). It can also arise for procedural acts such as playing a musical instrument or driving a car: one can be performing a repetitive act and suddenly have a sense of the complete loss of fluency. Perhaps the most common example is with spelling of words. Very occasionally with familiar words, we have the (usually brief) sensation that what we have written is unaccountably wrong, or that the written form of a word looks strange or peculiar.

Like déjà vu, jamais vu has been described as a symptom in epilepsy and migraine (e.g. Bigal, Lipton, Cohen, & Silberstein, 2003) and there are occasional single case reports of the symptom (e.g. Struck, 2002). Its relationship with delusional syndromes has also been evoked (e.g. Ellis, Luauté, & Retterstøl, 1994). In the

literature, it is usually described alongside déjà vu, as here with Penfield’s classic description of interpretive illusions in temporal lobe epilepsy:

An interpretive seizure is an illusion, perhaps better called an “illusory feeling”, as suggested to me by Dr. Kubie. The following are the commonest varieties; a sense of false familiarity. This illusion is often called the déjà vu phenomenon. ... The patient may have the feeling that is opposite to familiarity, and report an illusion of strangeness, or absurdity; things seen or heard may seem to come nearer or to recede to a greater distance; a patient may experience a feeling of remoteness or a change in his own relationship to his environment. (Penfield, 1955, p. 458)

The literature on jamais vu however is radically different from that on déjà vu, since there are very few scientific studies on the topic, and no common definition or theory has been advanced.

There have, however, been experimental studies on two related phenomena: word alienation and semantic satiation. Jamais vu-like sensations have proved relatively straightforward to induce in the laboratory using paradigms of repeated presentation or “dissociative staring”. In a very early experiment, Severance and Washburn (1907) examined the “loss of associative power” in words

that were stared at for three minutes. They presented words visually to six participants who had had “a fair amount of introspective training” (p. 182). They noted how the words became strange, lost their meaning and became perceptually fragmented over time. For instance, for the word “blood”, the following reports were given:

24 seconds: “... b and d look like each other turned backwards, hence meaningless”.

60 seconds: “o’s look unfamiliar, staring”.

72 seconds: “b and d look like p and q upside down”.

179 seconds: “a collection of letters”. (Severance & Washburn, 1907, p. 183)

Similarly, Titchener (cited in Smith & Klein, 1990) remarked upon this phenomenon, but in spoken form: “Repeat aloud some word – the first that occurs to you; house, for instance – over and over again; presently the sound of the word becomes meaningless and blank; you are puzzled and a morsel frightened as you hear it” (Titchener, 1919, pp. 26–27). This phenomenon is understood to be the loss or reduction in the meaning of a stimulus word following “(a) (overt) verbal repetition, (b) prolonged visual inspection or (c) repeated writing of the stimulus word” (Esposito & Pelton, 1971, p. 330).

More recently, similar experiences have been described in experiments interested in dissociative or “compulsive” staring (e.g. van den Hout, Engelhard, de Boer, du Bois, & Dek, 2008). In their research, van der Hout and colleagues sought to understand the cognitive basis of obsessive-compulsive disorders, particularly repeated checking behaviours. They state that when behaviours are repeatedly carried out, then this is counterproductive for memory confidence – we are less confident for materials that we have repeatedly checked. Firstly, van den Hout and Kindt (2003) showed that when healthy participants repeatedly “checked” (20 times) a stimulus (a virtual gas stove) they showed effects of repeated checking. Actual memory accuracy was unaffected but the vividness, detail and confidence in memory (as measured by subjective rating scales) were greatly reduced. In a follow up study, van den Hout et al. (2008) focused on perception and the effect of staring. First, participants looked at a gas stove for ten seconds and then completed a questionnaire about it. Next, they were asked to stare at the centre of the gas ring for ten minutes, and were asked “not to talk, avert their gaze, or blink their eyes” (p. 1301). Their main interest was a subjective measure of uncertainty, finding that staring at the gas stove significantly increased perceptual uncertainty, captured in the phrase: “I realised that I saw it, but the image was not clear somehow” (p. 1303).

Repeated checking has been linked to the concept of semantic satiation (e.g. Giele et al., 2013), where the loss of meaning with repetition clearly has overlaps with the phenomena of word alienation and *jamais vu* (e.g. Brown, 2004). Semantic satiation has been described as “the subjective experience of loss of meaning of a word

as a result of prolonged inspection and repetition of that word” (Smith & Klein, 1990, p. 852), but it is most often applied to more specific, experimental contexts, applying particularly to semantic priming designs. For example, Balota and Black (1997) suggest that semantic satiation occurs because massed “excessive” processing of a stimulus leads to habituation or satiation. In one experiment, Balota and Black (1997) examined semantic satiation in younger and older adults using a semantic memory paradigm. Participants saw a word (e.g. dog) twice, twelve or twenty-two times and then had to make a rapid semantic relatedness judgement on a pair (such as, dog – cat or dog – chair). For younger adults, semantic satiation was shown in a reduced relatedness effect when the word was shown more times (i.e. a reduction in priming as measured by reaction times, not subjective report). Semantic satiation has also been shown for processing of faces in similar designs (Lewis & Ellis, 2000).

An examination of the semantic satiation literature demonstrates that whereas older works generally used subjective report as their dependent variable (e.g. in Don & Weld’s, 1924 work, participants simply fixated on a word and then reported any resultant meaning changes), more recent works have employed more objective methods such as examining associated word generation (where it was found that satiation leads to a decrease in relevant response words and an increase in irrelevant responses – thought to be attributed to satiation inhibiting relevant associations; Kanungo & Lambert, 1963) or measuring the impact of repeated exposure on performance in timed decision-making tasks dependent on the retention of word meaning (e.g. Lewis & Ellis, 2000; Smith & Klein, 1990). To our knowledge, however, no study has explicitly compared semantic satiation or word alienation with the subjective report of *jamais vu* or *déjà vu*, within an experiment or in the real world.

The aim of the current paper was straightforward, seeking to document that the subjective experience of *jamais vu* was akin to the strange sensation produced in word alienation tasks. Our hypothesis was that *déjà vu* and *jamais vu* are similar experiential memory phenomena, and as such we should find that incidence of *jamais vu* and *déjà vu* were related. More critically, we hypothesised that word alienation tasks lead to a subjective sensation which is readily comparable with *jamais vu*; thus the generated sensation should be comparable with experiences in the real world. Such hypotheses place a considerable burden on the objectivity of the final produced research since we are relying, as with *déjà vu* research, on a subjective report of a nebulous, fleeting sensation (see Jersakova, Moulin, & O’Connor, 2016 for a discussion of some issues with subjective report of *déjà vu*). As such, we built into our design an objective factor, word frequency, which should lead to variation in the subjective experience of *jamais vu*. We hypothesised that *jamais vu* experience should vary according to the frequency of the stimulus word: *jamais vu* should be less likely to be generated for

words which are low frequency – since they truly are bizarre. In comparison, finding that a high frequency word suddenly looks unusual is more probable given its objective status as a word which is more familiar to the participant: it is more likely to generate the conflict in evaluations inherent in the *jamais vu* experience.

## Experiment 1

### Method

#### Participants

There were 94 participants who were all undergraduate psychology students at the University of Leeds. Demographic variables were not taken. Ethics approval was given by the University of Leeds Institute of Psychological Sciences Ethics Committee. Testing occurred in a group setting under strictly supervised conditions. One participant was excluded for not following the instructions in the booklet.

#### Materials and procedure

All participants completed the experiment using an A4 study booklet. Written instructions were provided and participants had an opportunity to ask questions before starting. On each page of the booklet, there was space to copy 120 times a given word, which was clearly printed in bold at the top of the page. At the bottom of each page were a series of questions about subjective experience. The booklet was 14 pages long, and finished with a final post-experiment questionnaire and memory test.

Critically, the experiment was described as a word writing experiment, where the goal was presented as testing “how many times that you can write a word legibly in two minutes”. It was also suggested to participants that when repeatedly copying words they may begin to feel peculiar. Participants were instructed that if this occurred they were to stop immediately, note the time and then report (using the questions at the bottom of the page) why they had stopped. The instructions emphasised interest in how many words could be copied and whether the task became “weird” or “difficult in any way”.

There were 12 stimulus words, split into three groups. There were four low familiarity words (all measured by the familiarity rating from the MRC Psycholinguistic database; e.g. Coltheart, 1981): sward, usury, ting, ague; four medium familiarity words: bloom, lobby, jolt, acre; and four highly familiar words: door, money, room, drink. The words were presented in a pseudo-random order, with two different versions of the test booklet: for half of the participants the words were presented in the reverse order from the other half.

For each word, if the participant stopped early, they answered questions about their reason for stopping. First, they were asked to tick only one of four options: (1) the word felt peculiar; (2) being bored; (3) their hand hurt; or

(4) “other” (with a space to explain). If they indicated that the word felt peculiar, they were invited to tick any boxes which applied to why, from: “didn’t feel real”; “I knew it was spelt right, but it seemed wrong”; “handwriting looked strange”; “it was like I was seeing it for the first time”; “other”. They also rated on a five point scale how peculiar the sensation was from 1 (very slightly peculiar) to 5 (extremely peculiar).

Finally, there was a postexperimental questionnaire with a recognition test – with the 12 stimuli words and 12 familiarity matched distractors interspersed in a pseudorandom order. Participants were asked again if any of these 24 words “seem peculiar or look strange in any way” with a free text space to write a response. Finally, they reported how many times in the last six months they had had *déjà vu* (on a scale from 0 to more than 6 times). They were also asked if they had felt peculiar in the experiment then whether they had felt anything similar before, and if so to rate on the same scale how frequently they had experienced this in the last six months. Note that in no part of the document was the term “*jamais vu*” used.

### Results and discussion

The main goal of the analysis was to examine whether we had experimentally generated a sensation that could be identified as *jamais vu* during the word alienation task. To this end, the Results section starts with an examination of participants’ subjective reports made after having stopped writing. We then examine the antecedents and objective characteristics of stimuli that led to stoppages that we categorised as *jamais vu*-related. Finally, we interrogate the associations between experimental and real-world reports of *jamais vu* and the other self-reported variables, including the experience of *déjà vu*.

#### *Jamais vu* generation

We classified stoppages as *jamais vu*-related when participants: (i) recorded the time at which they stopped writing; (ii) reported that “the word felt peculiar”; (iii) justified the peculiarity by choosing at least one categorical option (e.g. “didn’t feel real”); and (iv) rated the peculiarity on the five-point scale. There were 18 incomplete reports, which were removed from the pool of responses and excluded from the analyses reported below.

Sixty six (70.9%) of the sample of 93 participants reported at least one stoppage we classified as *jamais vu*. There were a total of 326 stoppages consistent with *jamais vu* – a per participant mean of 3.51 ( $SD=3.30$ ) reports, equivalent to 30.0% of all complete reports. Amongst participants who reported at least one *jamais vu* stoppage, the per participant mean was 4.94 ( $SD=2.86$ ), equivalent to 42.7% of all complete reports. These overall *jamais vu* stoppages compare to a stoppage for other reasons by 36 (38.7%) of the sample. There were far fewer non-*jamais vu* stoppage reports, a total of 73 (4 with justifications of “boredom”, 39 “hand hurting”, and

30 “other”) – a per participant mean of 0.78 ( $SD = 1.24$ ), equating to 6.7% of all completed reports.

Participants justified their jamais vu experiences by selecting one or more categorical descriptions. Of the total 326 jamais vu reports, the numbers of justifications were as follows: “I knew it was spelt right, but it seemed wrong” – 141 (43.3%); “handwriting looked strange” – 128 (39.3%); “didn’t feel real” – 80 (24.5%); and “it was like I was seeing it for the first time” – 47 (14.4%). The “Other” justification was used 70 times (21.5%). We asked participants to rate the peculiarity of each jamais vu episode on a scale from 1 (very slightly peculiar) to 5 (extremely peculiar). For each of the 66 participants who reported jamais vu, we calculated a mean peculiarity rating and used these participant-level means to determine the overall peculiarity within the jamais vu reporting subsample as 2.63 ( $SD = 0.86$ ).

We designed our task such that participants were not obliged to stop writing, had many options that could be indicated as reasons for stopping, and were not directly probed about their subjective experience. Nonetheless, a sizeable proportion of trials yielded an experience that satisfies our criteria for jamais vu. Participants’ descriptions of their experience emphasise loss of meaning, unfamiliarity and dissociation e.g. “They lose their meaning the more you look at them. They just seem like a string of letters instead of a whole word”, “Know it’s familiar but it looks strange”, “It doesn’t seem right, almost looks like it’s not really a word but someone’s tricked me into thinking it is”. Finally, most (75%) of our participants indicated that if they had experienced something peculiar during the experiment they reported having already had something similar before, suggesting that our experimentally generated experience maps onto something experienced spontaneously in the real world.

### Antecedents of jamais vu

We considered all the trials where participants stopped writing, and divided them into those we categorised as

jamais vu (as defined above) and those which occurred for other reasons (see Table 1).

For trials where participants reported jamais vu, they stopped writing significantly sooner in terms of both time and word repetitions, meaning that jamais vu was produced after approximately one minute, or 30 word repetitions. Because it is possible that words were written at varying rates, we also calculated the rate at which words were written prior to stopping, by dividing the number of repetitions by the time elapsed. For this variable, there was also a significant difference – participants had a faster writing rate on those trials which elicited jamais vu than for stopping for another reason. But note that the jamais vu rate is the same as the trials where there was no stoppage. This finding should therefore be interpreted as representing slowing (due to boredom or discomfort) in the non-jamais vu trials rather than speeding for the jamais vu trials. The recognition rate (Table 1) is the proportion of words correctly recognised on our postexperimental test, divided into those words which elicited jamais vu and those which did not (or where the participant had stopped for other reasons). There was no significant difference in postexperimental recognition rate, and if anything, recognition was better for words which had elicited jamais vu. Finally, the postexperimental peculiarity rate (words spontaneously recalled as being peculiar) did not differ for those words which previously did and did not elicit jamais vu.

### Word frequency effects

We examined jamais vu and non-jamais vu trials according to the frequency of word stimuli that elicited them. Given the three levels of word frequency (high, medium, low) we looked in turn at stoppages relating to jamais vu and stoppages not related to jamais vu.

In the 66 participants who reported at least one jamais vu episode, a one-way ANOVA of jamais vu trials found a significant difference in the proportion of jamais vu experiences according to frequency,  $F(2,130) = 5.51$ ,  $p = .005$ ,

**Table 1.** Participant-level summary statistics according to stoppage report.

Mean ( <i>SD</i> )	No stoppage ( <i>n</i> = 92)	Stoppage		JV-No JV comparison ( <i>n</i> = 33)
		JV ( <i>n</i> = 66)	No JV ( <i>n</i> = 36)	
Time to stop (s)	–	68.6 (17.4)	82.6 (23.2)	$t(32) = -3.92$ , $p < .001$ , $d = -.687$ [JV: 66.5 (18.9), No JV: 83.0 (22.6)]
Words repetitions	60.1 (6.7)	33.6 (9.5)	40.2 (14.7)	$t(32) = -2.86$ , $p = .007$ , $d = -.512$ [JV: 33.2 (9.7), No JV: 39.5 (13.3)]
Writing rate (words/s)	.50 (.06)	.50 (.09)	.48 (.09)	$t(32) = 2.28$ , $p = .029$ , $d = -.400$ [JV: .51 (.09), No JV: .47 (.08)]
Recognition rate	.94 (.11)	.96 (.10)	.91 (.22)	$t(32) = 1.18$ , $p = .248$ , $d = .223$ [JV: .96 (.13), No JV: .92 (.22)]
Postexperimental peculiarity rate	.07 (.12)	.13 (.20)	.19 (.33)	$t(32) = -1.61$ , $p = .118$ , $d = -.284$ [JV: .10 (.14), No JV: .19 (.33)]

Note: JV is stoppages we classified as jamais vu-related. No JV is stoppages we classified as not jamais vu-related. Recognition rate is the proportion of words in each stoppage category that were correctly recognised in the postexperimental test. Postexperimental peculiarity rate is the likelihood that a word in each stoppage category would be identified as “peculiar” in a free text response collected following the administration of all experimental trials. The JV-No JV comparison column shows paired-samples  $t$ -tests using data from the 33 participants reported both stoppages which could be classed as due to jamais vu and due to reasons other than jamais vu. Means and  $SD$ s shown in parentheses in this column are from this subsample of 33 participants.

$\eta_p^2 = .078$ . Bonferroni-corrected pairwise comparisons found that low frequency words ( $M = .240$ ,  $SD = .182$ ) were significantly less likely to trigger jamais vu stoppages than both high ( $M = .356$ ,  $SD = .256$ ) and medium frequency words ( $M = .404$ ,  $SD = .265$ ), both  $ps < .033$ . There was no significant difference between medium and high frequency words,  $p = 1.00$ . A different pattern of results emerged from an equivalent analysis of stoppages not related to jamais vu in the 36 participants who reported them. These stoppages were not significantly more likely to be triggered by words of any particular frequency,  $F(2,70) = 2.61$ ,  $p = .081$ ,  $\eta_p^2 = .069$ . There were no significant differences in Bonferroni-corrected pairwise comparisons across high ( $M = .236$ ,  $SD = .341$ ), medium ( $M = .289$ ,  $SD = .376$ ), and low frequency words ( $M = .474$ ,  $SD = .418$ ), all  $ps > .115$ , though it is notable that the numeric trend was towards low frequency words being more likely to trigger stoppages not related to jamais vu. To fully explore this potential difference according to stoppage type, we ran a  $2 \times 3$  stoppage type  $\times$  word frequency ANOVA on the small sample of 33 participants who experienced both types of stoppage. The effect of interest, the interaction, was significant,  $F(2,64) = 4.17$ ,  $p = .020$ ,  $\eta_p^2 = .115$  (the two main effects were both non-significant,  $ps > .323$ ). Figure 1 illustrates the difference in the pattern of stoppages from this final analysis, showing the different rates at which word frequency stimuli triggered the different types of stoppage. Thus, our aim of demonstrating that subjective jamais vu report was related to an objective stimuli characteristic was relatively conclusive, and in the direction predicted: objectively less familiar stimuli were less likely to elicit jamais vu.

### Correlations between experimental and postexperimental questionnaire variables

We conducted a series of parametric correlations examining the relationships between and within experimentally-induced stoppages and postexperimental reports of dissociative experiences. First, we found no significant correlation between the number of stoppages related to jamais vu and not related to jamais vu,  $r(91) = .021$ ,  $p = .843$ . We next examined the relationships between jamais vu stoppages and postexperimental reports of jamais vu and déjà vu, using a set of equivalent analyses involving stoppages not related to jamais vu as a control. There were no significant relationships between the frequency of either stoppage type and postexperimental reports of déjà vu outside the experimental setting – jamais vu stoppage  $r(90) = .079$ ,  $p = .456$ ; non-jamais vu stoppage  $r(90) = .191$ ,  $p = .068$  – and there was no significant difference between the correlation coefficients derived from Fisher's  $r$ -to- $z$  transformations,  $z = .076$ ,  $p = .447$ . However, there was a significant relationship between jamais vu stoppages and the postexperimental item assessing whether or not participants had experienced a similar sensation outside the experimental setting,  $r(78) = .319$ ,  $p = .004$ . This contrasted with no significant difference when non-jamais vu stoppages were substituted into the analysis,  $r(80) = .168$ ,  $p = .136$ , although it should be noted that this difference in coefficients was not significant,  $z = 1.00$ ,  $p = .317$ . Finally within this series of correlations, there was no significant difference in the point biserial correlation coefficients when stoppages were related to the frequency with which participants reported experiencing sensations similar to jamais vu

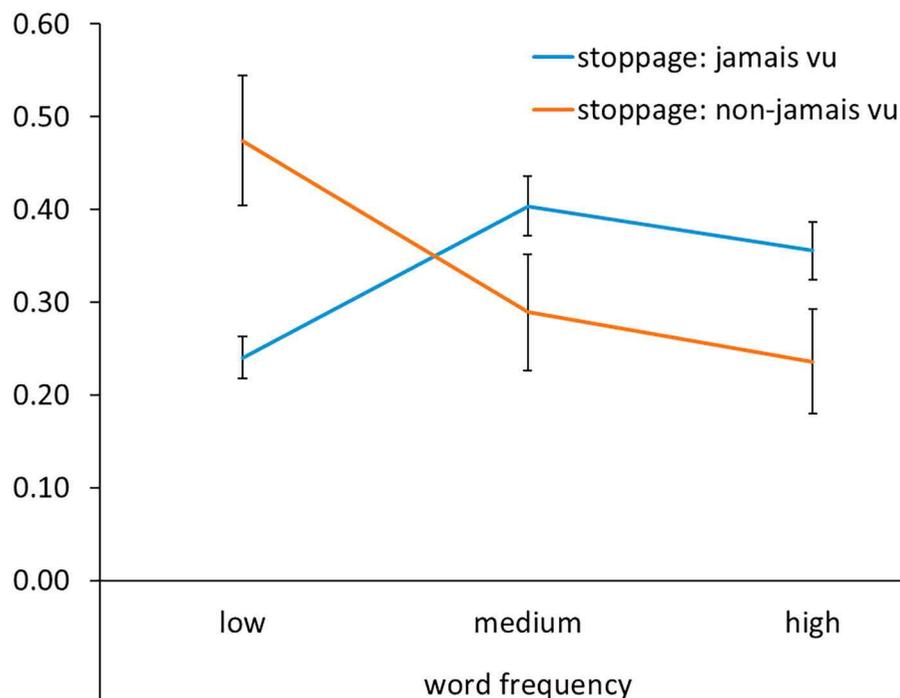


Figure 1. Stoppage type according to word frequency. Error bars are standard errors of the mean.

outside the experimental setting – jamais vu stoppage  $r(56) = .250$ ,  $p = .058$ ; non-jamais vu stoppage  $r(58) = .276$ ,  $p = .037$  –  $z = 0.14$ ,  $p = .889$ . As a final, critical, analysis, we examined the relationship between postexperimental reports of déjà vu and jamais vu frequency outside the experimental setting, finding a significant positive association,  $r(56) = .359$ ,  $p = .006$ . Thus, although there was some evidence pointing towards a positive relationship between the likelihood of experiencing jamais vu in an experimental setting, and its experience in the real world, the key finding here was the positive relationship between jamais vu and déjà vu occurrence. Our self-report measures provided results consistent with our hypothesis of a relationship between déjà vu and jamais vu – those who reported déjà vu in the real world were also more likely to have experienced jamais vu in the same setting.

## Experiment 2

The aim of the second experiment was to extend and replicate our findings in a sample more representative of the general population than is typically recruited for psychology studies. We were also interested whether our experimentally induced jamais vu would be related to individual difference variables typically shown to correlate with déjà vu frequency: dissociative experiences and age. Given the relationship between semantic satiation and dissociative staring, it was predicted that jamais vu would be related to the tendency to experience dissociation. Indeed, one often used measure of dissociation, the Dissociative Experience Scale (DES; Bernstein & Putnam, 1993), includes questions which resonate with déjà vu-like phenomena such as jamais vu (“Some people have the experience of being in a familiar place but finding it strange and unfamiliar”). Sno, Schalken, de Jonghe, and Koeter (1994) report a chi-squared analysis of those people who do and do not report having déjà vu and their scores on the DES: people who reported never having had déjà vu produce lower scores on the DES. However, more recently, Adachi et al. (2008) have concluded that déjà vu was not a dissociative experience. Unlike Sno et al. who tested a range of different clinical and healthy participants, Adachi et al. examined 227 healthy participants. In their sample, dream recall, precognitive dreams and depersonalisation all correlated with the frequency of experiencing déjà vu. In a comparison of those people reporting déjà vu and those who did not, a significant difference in DES scores was found (replicating Sno et al.’s result above). However, given that age, and other factors also significantly contribute to déjà vu experience, Adachi et al. carried out a multiple regression analysis seeking to explain the DES scores. Using stepwise procedures, a model with age, jamais vu, depersonalisation and precognitive dreams produced the best fit ( $r = .43$ ), and déjà vu was not a significant predictor in this model. On face value, therefore, we might propose that déjà vu experiences are related to dissociative

phenomena, but it is not known whether jamais vu, and in particular the induction of jamais vu in an experimental task, will be related to individual differences in DES scores.

## Method

### Participants

There were 120 participants. The data were collected by enrolling psychology undergraduates to each collect a sample of people who were not psychology undergraduates, but who were known to them. The mean (and standard deviation) age of the participants was 22.4 (7.9) years (range 18–56). Participants had had a mean of 15.0 (2.0) years of education. Ethics approval was given by the University of Leeds Institute of Psychological Sciences Ethics Committee.

### Materials and procedure

In the experiment, participants underwent one jamais vu induction using the word “the”. The instructions again emphasised that the word may begin to feel peculiar, but that the participant may “never feel peculiar”, and we again asked participants to stop if they felt peculiar (or for any other reasons they wanted to stop). On this task, participants copied a maximum of 60 repetitions, and they carried out the task individually, with an experimenter. The same four reasons for stopping writing as for Experiment 1 were given as options. If the participant reported stopping because they felt peculiar, they were able to select from seven options which were different to those offered in Experiment 1: “it didn’t feel real”; “it seemed to be spelt wrong”; “handwriting looked strange”; “it was like I was seeing it for the first time”; “it split into separate letters”; “I felt disconnected from it” and “other”. The experimental induction was embedded into a longer questionnaire asking about a range of memory and metacognitive phenomena, including questions about déjà vu. Participants also completed the Dissociative Experiences Scale (DES).

## Results and discussion

Here we again analyse jamais vu as inferred by stoppage and subjective report, using the definitions above. Using such an analysis we seek to replicate the results found above, and critically, in a final section look at how our operationalisation of jamais vu in the experimental task correlates with other population characteristics.

### Jamais vu generation

We classified stoppages as related to jamais vu when participants: (i) wrote the word “the” fewer than 60 times; and (ii) reported that the stoppage was driven by a “peculiar” feeling.

Sixty six (55.0%) of the sample of 120 participants reported a stoppage that we classified as jamais vu in the single trial. This compares to stoppage for other reasons

by 26 people (21.7%) and no stoppage in the remaining 28 people (23.3%). Whilst one might have expected the jamais vu rate to be far lower in participants completing 1/12th of the number of trials as in Experiment 1, it should be considered that the stimulus used in the single trial here is the most frequently occurring word in the English language. The finding from Experiment 1 that high frequency words were more likely to trigger jamais vu stoppages motivated our use of “the” as the only stimulus in this experiment, demonstrating that even in very short experiments, it is possible to generate a sensation akin to jamais vu in upwards of 50% of the sample. When jamais vu was reported by participants, it was produced after a mean of 27.7 repetitions (see Table 2), comparable to the 33.6 repetitions reported in Experiment 1. Their descriptions of the experience as measured by the options which they endorsed are given in Table 3. Verbal reports supported those gathered in the first experiment, with participants reporting they “seemed to lose control of hand” and “I forgot the meaning”.

### Antecedents of jamais vu

We grouped participants according to whether or not they stopped before they had written the word 60 times or not,

**Table 2.** Summary statistics according to stoppage report.

Mean (SD)	No stoppage (n = 28)	Stoppage		JV-No JV comparison
	JV (n = 66)	No JV (n = 26)		
Age	25.6 (11.3)	21.4 (5.6)	21.6 (7.6)	$t(90) = 0.14$ , $p = .891$ , $d = .030$
Years of education	15.6 (2.2)	15.0 (1.3)	15.0 (0.6)	$t(90) = 0.29$ , $p = .797$ , $d = 0$
Last déjà vu occurrence	4.7 (1.8)	5.8 (1.6)	5.3 (1.6)	$t(90) = 1.11$ , $p = .269$ , $d = .313$
DES Score	14.8 (13.0)	18.6 (17.9)	18.5 (10.6)	$t(90) = 0.02$ , $p = .987$ , $d = .007$
Word repetitions	60 (0)	27.7 (13.9)	38.6 (13.7)	$t(90) = 3.38$ , $p = .001$ , $d = .790$

Note: JV is stoppages we classified as jamais vu-related. No JV is stoppages we classified as not jamais vu-related. The last déjà vu occurrence was a categorical variable with response options. DES score is the score on the Dissociative Experiences Scale. The JV-No JV comparison column shows independent-samples *t*-tests using data from the 66 participants whose stoppages could be classed as due to jamais vu and the 26 participants who stopped for other reasons.

**Table 3.** Descriptions of jamais vu provided by 66 participants in Experiment 2.

Descriptor	Number of endorsements	Percentage
“It didn’t feel real”,	21	32%
It seemed to be spelt wrong	30	45%
Handwriting looked strange	33	50%
It was like I was seeing it for the first time	5	1%
It split into separate letters	12	18%
I felt disconnected from it	15	23%
Other	9	14%

Note: participants could select more than one option.

and if they stopped, according to whether this was because of jamais vu or for other reasons (see Table 2).

There were no differences in the demographic characteristics of age, years of formal education between those who stopped due to jamais vu and those who stopped for other reasons. Nor were there any differences in how recently participants had experienced déjà vu, or their DES scores. The only significant difference was between the number of words that were written before a stoppage, such that participants who experienced jamais vu stopped after writing fewer repetitions than those who did not, consistent with Experiment 1.

### Correlations between experimental and questionnaire variables

We conducted a series of parametric correlations examining the relationships between the variables presented in Table 2.

Firstly we sought to replicate known patterns of correlations from the déjà vu literature. We found the expected negative relationship between age and reports of the last occurrence of déjà vu,  $r(118) = -.239$ ,  $p = .009$ , such that younger participants were more likely to have experienced déjà vu more recently. There was, however, no significant correlation between age and the DES score  $r(118) = -.147$ ,  $p = .108$ . The DES score was positively correlated with reports of the last occurrence of déjà vu,  $r(118) = .297$ ,  $p = .001$ , such that those who scored higher on the DES were more likely to have experienced déjà vu more recently, as has been previously shown. The DES was also significantly negatively correlated with years of education,  $r(118) = -.237$ ,  $p = .009$ .

The critical issue was, given the relationships with déjà vu in daily life, whether these measures correlated with jamais vu in our experimental manipulation. To this end, we used the number of word repetitions completed, since people with jamais vu completed significantly fewer repetitions. We found a weak nonsignificant negative correlation between the number of word repetitions made and reports of the last occurrence of déjà vu,  $r(118) = -.159$ ,  $p = .082$ , suggesting a trend towards those who experienced déjà vu more recently having been more likely to have stopped before completing the 60 word repetitions. All remaining correlations with word repetitions were also nonsignificant, all  $ps > .128$ .

Finally, the DES includes one question which focuses on the jamais vu experience (“Some people have the experience of being in a familiar place but finding it strange and unfamiliar”). We ran bivariate correlations with this one question, and found that it did not correlate significantly with age,  $r(120) = -.163$ ,  $p = .075$ ; years of education,  $r(120) = -.146$ ,  $p = .112$  or the number of word repetitions,  $r(120) = -.055$ ,  $p = .549$ . It was, however, as with our first experiment, correlated with our question about the déjà vu experience,  $r(120) = .190$ ,  $p = .037$ .

Overall, these results found that reports of déjà vu showed the expected relationships with age and DES

score. However, the likelihood of stoppage within this experiment was not related to any of the demographic variables considered. This was also the case when we conducted the same analyses on the jamais vu stoppage subsample alone. There is some evidence that the frequency of jamais vu and déjà vu are related outside of the laboratory (from the analysis of the DES question and the recency of the last déjà vu experience), but no indication that jamais vu induced in the experimental task is related to the experience of déjà vu outside of the experimental context.

### **General discussion**

In two experiments we generated a subjective experience through repeated writing, which we propose is comparable to the experience of jamais vu. In our first experiment, 75% of our sample described this peculiar feeling as like something they had experienced prior to the experiment. Participants endorsed a range of statements about the experience, ranging from the spelling of the word appearing unusual (the most common), comments about the orthographical form or meaning, to feelings of strange novelty and unreality (the least frequent endorsements). In both experiments, we showed a significant correlation between déjà vu experience and jamais vu experience: those people who had had one experience more frequently in the last six months were likely to have had the other (as measured in Experiment 1) and one measure of the DES focused on jamais correlated with the most recent déjà vu experience. As such, we conclude that jamais vu can be provoked by word alienation tasks. We use this discussion to comment upon what our results suggest jamais vu might be. Future research should adopt our operationalisation of jamais vu, and much like with research on déjà vu (e.g. Jersakova et al., 2016; Moulin et al., 2014) use this definition with participants to see how they describe their subjective experiences – note that in these two experiments we did not present participants with the term “jamais vu”.

#### **What is jamais vu?**

People’s descriptions of the experience point to feelings of strangeness and unfamiliarity, but most frequently perceptual and orthographic anomalies related to the handwriting and spelling. Present, but less frequent were sensations of novelty and unreality. In both experiments we gathered subjective reports which pointed to unusual experiences. Previous research has suggested that semantic satiation occurs for materials in the auditory modality, and we also acknowledge Titchener’s example about repeatedly speaking a word, so we suggest that jamais vu, like déjà vu is not restricted to the visual modality (O’Connor & Moulin, 2006).

Our starting point was that jamais vu is a dissociative experience related to déjà vu. It is alike to déjà vu in that it is infrequent (we asked how many times in the last six months people had experienced it, in Experiment 1, and

for both déjà vu and jamais vu, the estimate was approximately 3 times). They seem to be related in that they are also correlated: people who experience more déjà vu also experience more jamais vu. However, there are some differences which warrant further examination, since these experiments were not set up to address these issues directly. Firstly, whereas age appeared to correlate with the incidence of déjà vu outside the laboratory, it did not correlate with our question about jamais vu. Moreover, the relationship with the DES was not the same for déjà vu and jamais vu.

#### **Terminological issues**

One issue to resolve is terminology. We here suggest that jamais vu is a useful term which can be used to describe the phenomenological experience of unfamiliarity and loss of meaning in experimental and real world contexts. We suggest that semantic satiation is the cognitive process by which this arises (but which leads to both experiential [“subjective”] experiences and objectively measureable changes in performance). Where lexical materials are used, word alienation is a useful term for the experimental procedure used to generate the subjective experience of jamais vu.

#### **Laboratory induction and real world experience**

An issue which is critical for research into infrequent and unusual experiences such as déjà vu, the tip-of-the-tongue (TOT) state and jamais vu, is the extent to which the laboratory task captures the nature of the experience in daily life. One limitation of this study, common to research in other subjective experiences, is the relative ease with which we can produce jamais vu compared to how infrequently it is experienced in daily life (for an example in TOT, see Heine, Ober, & Shenaut, 1999). This is possibly problematic for two reasons. First, it could be that questioning about jamais vu (or any kind of undefined unusual experience, as we did here) alters the report of it. Jersakova et al. (2016) have suggested that demand characteristics may play a role in elevated reports of déjà vu, and it is likely the same occurs in jamais vu. Second, the laboratory phenomenon may not capture the strangeness and richness of the real world equivalent, or may be somewhat unidimensional, based only on one type of task or stimulus. For instance, in the experiment here we have used the written word, but it is clear that jamais vu can occur for repetitive speech and even face recognition, in the laboratory, and in the real world it occurs for locations and motor tasks, as well as for words and faces, and moreover, it appears that repetition – the key process in semantic satiation – is not required to experience jamais vu in daily life.

#### **Future research**

For future research into jamais vu, there are two critical considerations. Firstly, it is not known whether repeated exposure is critical for jamais vu in daily life. It seems that

jamais vu is a sensation that can be experienced without dissociative staring or repeated exposure. Indeed, when it has been described in temporal lobe epilepsy (Bigal et al., 2003), it seems to be just as unpredictable and esoteric as the déjà vu experience. Second, the critical issue for jamais vu appears, as with déjà vu, to be its strange, subjective phenomenology. In Balota and Black's experiment, for instance, it is not clear whether participants felt any unusual sensations during the task, even if their cognitive performance was altered. Thus, future research should ascertain the similarity and differences between everyday versions of the jamais vu experience and those that are experimentally induced by repetition. Moreover, future research should examine whether underlying changes in the dynamic activation of semantic concepts leads to changes in phenomenological experience: does semantic satiation (as indexed by changes in objective RT measures, for instance) indeed give rise to the feeling of jamais vu? One critical issue to tackle in future research is the subjective experience of loss of meaning, which we did not measure directly here, although this was a spontaneously generated description of the experience by our participants, as cited above. Asking questions about the loss of meaning seems pertinent to our goal of relating jamais vu to semantic satiation.

In this way, the development of jamais vu research needs to take on board the lessons learned from the rapidly growing déjà vu literature. There is a need to reconcile neuropsychological and pathological accounts of jamais vu with the experimental analogues of the experience. There is also a need to converge on a definition of the term, such as proposed here; and to adopt common laboratory tasks to explore the phenomenon. As a motivation for the research, we should consider that, like déjà vu, we can conceptualise jamais vu as an epistemic feeling which signals a dissociation in the cognitive system: it is evidence that a metacognitive evaluation compares the current activity against expectancies and processing goals – this is a hypothesis in line with Metcalfe and Schwartz (2016, p. 407): "... metacognitions are conscious. They spontaneously occur when something goes wrong, and a conflict-based 'feeling state' is manifest". In the case of word alienation, it may be that the repeated processing of a stimulus leads to an over-stimulation of a concept, which leads to a mismatch between processing fluency and the state of the current cognitive system: the feeling of jamais vu acts to check this over-activation and reset the state of arousal and attention. This is a hypothesis which is a natural continuation of the concept of satiation, and one that needs further examination, but it seems to us that word alienation tasks will be a useful means to examine the metacognitive nature of jamais vu in the laboratory.

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