

Chapter 14: Human metacognition and the déjà vu phenomenon

Takashi Kusumi

Understanding the Déjà Vu Experience

For over a century, the phenomenon of déjà vu has attracted much interest, and in recent times, it has been studied by researchers in various scientific fields (e.g., Brown, 2003, 2004; Sno & Linszen, 1990). Empirical studies of déjà vu phenomena have used interviews and questionnaires with normal people as well as psychiatric patients (e.g., Neppe, 1983; Sno & Linszen, 1990; Sno, Schalken, de Jonghe, & Koeter, 1994). In this study, we used experiments and surveys to examine human metacognition and the déjà vu phenomenon. This chapter is divided into four parts. First, we define déjà vu using notions from the fields of psychology and psychiatry. Second, we propose that déjà vu phenomena involve a component of memory monitoring and that a metacognitive approach (e.g., Chambres, Izaute, & Marescau, 2002) appears to be most suitable for its study. Third, we present highlights of the data obtained from our questionnaire (Kusumi, 1994, 1996) and experimental studies (Matsuda & Kusumi, 2001). Fourth, we propose a déjà vu model based on an analogical reminding mechanism. Finally, we discuss some of the implications of a déjà vu model that involves an adaptive metacognitive mechanism.

Definition of Déjà Vu

Déjà vu experiences have been described in many works of fiction including those by Dickens, Tolstoy, Proust and Hardy (Sno, Linszen, & de Jonghe, 1992). However, psychological studies of déjà vu in mainstream memory research are rare (e.g., Brown, 2003, 2004). Déjà vu experiences have been primarily studied as memory disorders (e.g., illusions, hallucinations, schizophrenia, temporal lobe epilepsy (TLE) in the fields of psychiatry and psychoanalysis (e.g., Neppe, 1983). Researchers have noted that most people experience déjà vu only when they are extremely fatigued; for the average individual, déjà vu is

a rare and abnormal memory experience. However, this study explains the déjà vu experience as a normal metacognitive mechanism. This approach proposes that déjà vu occurs during an analogical reminding process (e.g., Wharton, Holyoak, & Lange, 1996) in which a present experience automatically reminds an individual of similar past experiences. Therefore, the déjà vu experience is generated by similarities between a present experience and corresponding past experiences.

We will first define déjà vu based on the findings of cognitive research. Déjà vu is a French term meaning *already seen*. It refers to ‘any subjectively inappropriate impression of familiarity of a present experience with an undefined past experience’ (Neppe, 1983). The term *inappropriate familiarity* is defined as a form of false recognition in which one experiences a strong sense of familiarity with new events or objects. In déjà vu, successful reality monitoring (e.g., Johnson, Hashtroudi, & Lindsay, 1993) enables one to determine that an event is actually new although it may feel old. Such judgements of familiarity are based on metacognitive monitoring.

Recently, Brown (2004) classified scientific explanations of déjà vu into four categories: dual-processing explanations (two cognitive functions that are momentarily out of synchrony), neurological explanations (brief dysfunction in the brain), memory explanations and double-perception explanations (brief break in one’s ongoing perceptual processing). This study focuses on memory explanations. Brown wrote, ‘Memory interpretation assumed that some dimension(s) of the present setting is actually objectively familiar, but the source of familiarity is not explicitly recollected’ (p. 127). This study presents a new memory explanation of déjà vu, integrating three metacognitive components in order to explain the mechanisms involved in analogical reminding (Figure 1). The three *metacognitive* components are as follows:

1. Preliminary feelings of strong familiarity for a present experiences, involving a process of implicit memory
2. Similarity and dissimilarity judgements between the present and a retrieved past experience made after a search of explicit memory
3. Reality monitoring for the retrieved experience (prototype event), which is a decision on whether or not the present experience is identical with a retrieved experience

As illustrated in Figure 1, we postulate that the déjà vu phenomenon stems from ordinary metamemory mechanisms. Roedier (1996) suggested that déjà vu and jamais vu¹ are illusions of metacognition. Brown (2004) theorized that the déjà vu experience is a pure metamemory experience that is unconnected with the empirical world (i.e., an identifiable eliciting stimulus or a verifiable behavioural response to corroborate the subjective state). However, this study

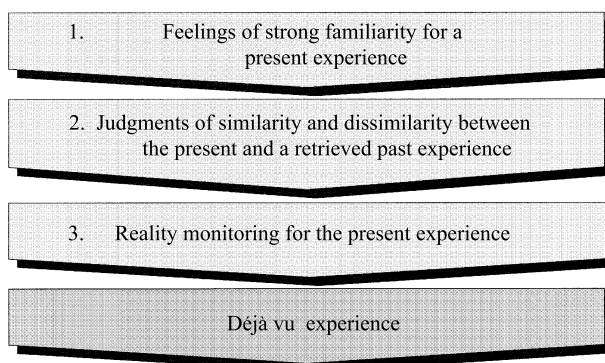


Figure 1.
Metacognitive components in déjà vu phenomena.

postulates that déjà vu is a common and adaptive metacognitive process based on the similarity between present and past experiences.

Some researchers have differentiated between types of déjà vu: auditory and visual déjà vu, event and place déjà vu, reactive (external, i.e. precipitated by brain mechanism) and endogenous (internal, i.e. elicited by brain mechanism) déjà vu and normal and pathological déjà vu (Brown, 2004). This study differentiates between place and person déjà vu—two types of déjà vu that are familiar to most subjects. Moreover, it is easy to compare the stimuli and the underlying cognitive processes associated with these types of déjà vu.

This chapter addresses the following three research questions. First, what types of déjà vu experiences are common in normal university students? Second, what are the metacognitive and analogical reminding mechanisms used when déjà vu is experienced in daily life and in the laboratory? Finally, is déjà vu the result of an adaptive metacognitive mechanism? This paper highlights the data obtained from two questionnaire surveys (Kusumi, 1994, 1996) and one from an experiment (Matsuda & Kusumi, 2002).

Survey Data of Déjà Vu Experiences

Several questionnaire studies have been conducted on the phenomenon of déjà vu. Neppe (1983) conducted interview surveys with normal subjects, subjects with TLE and patients of schizophrenia. He developed a screening questionnaire for 11 déjà vu experiences (place, situation, doing, happening, meeting, saying, hearing, thinking, reading, dreams, etc.) and a qualitative questionnaire (57

items concerning frequency, duration, feelings, etc.). The results indicated that in normal people, there are two kinds of déjà vu, namely, associative déjà vu and subjective paranormal déjà vu. Neppe found that in the average person, associative déjà vu tended to be vague and poorly remembered, was often triggered by the environment, was initially characterized by partial familiarity, lasted for a short duration and lacked outstanding qualitative features. This type of déjà vu can be explained by the mechanisms of normal memory (Neppe, 1983, p. 249). The second type of déjà vu, which occurred in subjective paranormal experiences, was characterized by time-dissociations and outstanding qualitative features (Neppe, 1983, p. 254). Neppe's results also indicated that there were some differences between subjects with TLE and schizophrenia; both déjà vu and jamais vu occurred more frequently in the TLE group. Sno, Schalken, de Jonghe and Koeter (1994) refined Neppe's questionnaire items; Adachi, Adachi, Kimura, Akamatsu and Kato (2001) translated them into Japanese and checked their reliability and validity using normal Japanese subjects and those with schizophrenia. However, these surveys did not explore the cognitive mechanisms of déjà vu such as similarity and time intervals between the source and déjà vu experiences.

Kusumi's research (1994, 1996) explored the déjà vu experience based on a metacognitive and analogical reminding mechanism that traced a present experience to similar past experiences. In one study (Kusumi, 1994), 202 Japanese university students completed an original questionnaire on déjà vu experiences and analogical reminding. The participants were asked the following questions: (a) Have you ever been in a new place and felt as if you had been there before? Or have you ever gone somewhere for the first time and yet felt it was familiar? (b) Have you ever met someone for the first time and felt as if you had met that person before? (c) If yes, when and where did you have your last experience of these particular feelings? (d) What were the surroundings and the cues for the experience? (e) Did you identify a similar past experience? (f) If yes, when and where did you have the similar past experience?

Figure 2 shows the results obtained from the 202 participants. The déjà vu experience was observed to be a common phenomenon. Place déjà vu, which occurred when people visited a new place and felt as if they had been there before, was observed in 63% of the participants. Person déjà vu, which occurred when people met a new person and felt as if they had met that person before, was observed in 35% of the participants. Of the individuals who had experienced person déjà vu, 89% could identify the exact situation in which it had occurred. Of the participants who had experienced place déjà vu, 61% could identify the exact situation in which it had occurred. Of the 61% who could identify an exact place déjà vu, only 23% could identify the past source experience that

might have triggered the *déjà vu* experience. On the other hand, of the 89% who could identify an exact person *déjà vu*, 36% could identify the past source person. Identifying a person requires precise information and exact matching (e.g., face and name). In contrast, place *déjà vu* occurs when a source memory is vague. Brown (2003, p. 404) explained these judgement processes based on a source-monitoring framework (Johnson, Hashtroudi, & Lindsay, 1993). For example, you meet a new person and feel a strong sense of familiarity; yet, you know that you have never met this person before. The *déjà vu* experience could arise from the conflict between two types of source-monitoring processes: the judgement based on your general knowledge and episodic memory (of never having met before) conflicts with the heuristic judgement based on the vivid representation of personal appearance from past experiences, which implies familiarity. You then search your memory for a similar person in order to resolve the strange familiarity. Subsequently, you remember an old friend who is similar to the person you have just met. In such a case, even after a considerable length of time, you might remember the strange experience of the similarity between the new and old person. On the other hand, consider the situation wherein you visit a new place and feel a strong sense of familiarity although you know that you have never before visited this place. You search your memory for similar places to resolve this strange feeling of familiarity; however, you do not remember any particular place that is similar to the current one. In this case, after a considerable length of time, you might not have an exact memory of this strange experience.

Place *déjà vu* experiences reported by the participants occurred 3 days to 10 years before the study was conducted. The reported source experiences occurred 2 to 17 years before the study was conducted. The time interval between place *déjà vu* experiences and their source (original) experiences was 2 months to 12 years. Person *déjà vu* experiences reported by participants occurred 1 month to

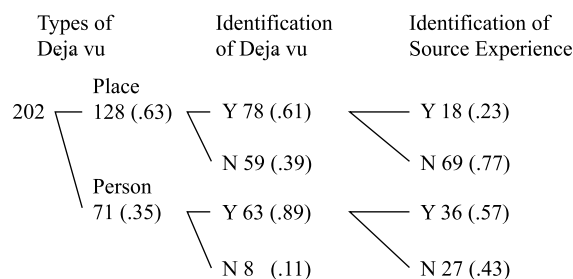


Figure 2.

Identification of *déjà vu* experiences (Kusumi, 1994).

12 years before the study and their source experiences occurred 1 to 16 years prior to it before the study. The time interval between person déjà vu experiences and their original experiences was 1 to 14 years.

Participants recalled original experiences that occurred more than 1 to 17 years before the study was conducted. Brown (2004) reported that individuals' estimates of the length of time since the original experience were distributed evenly across days, weeks, months and years. He suggested that future questionnaires should include a more detailed query on this topic. Kusumi (1994) used detailed questionnaires to ask participants about the content and time of original experiences and then calculated the retention time between the source and déjà vu experiences. The results obtained by Kusumi indicated that déjà vu experiences are based on very long-term or autobiographical memory.

Figure 3 shows similarity ratings between the source experience and the déjà vu experience on a 7-point scale, with -3 corresponding to *very dissimilar* and 3 corresponding to *very similar*. The perceived similarity ratings between source and target experiences of place déjà vu ranged from 1 to 3. When rating a person déjà vu, participants rated appearance similarity higher than personality similarity; appearance seems to be a stronger cue for reminding people of source experiences. Most source persons were acquaintances whom the subjects had not seen for a long time, for example an old classmate or a distant relative.

In Kusumi (1996), 104 Japanese undergraduates completed a questionnaire on place déjà vu experiences. They rated the frequency of déjà vu experiences for 13 places and three situations on a 5-point scale (*never, once, twice, three, four, five or more times*). In addition, they rated the effectiveness of retrieval cues for these experiences (e.g., perceptual cues, atmosphere, weather and mood).

Figure 4 indicates that déjà vu experiences occurred frequently during conversations and dreams, when walking down a street, visiting old-style

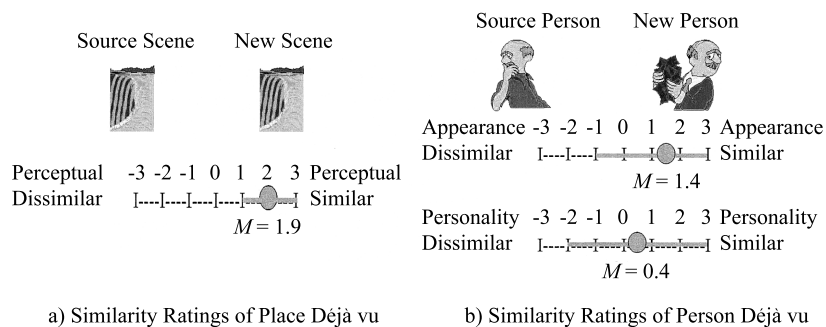


Figure 3.

Similarity ratings between source experiences and déjà vu experiences (Kusumi, 1994).

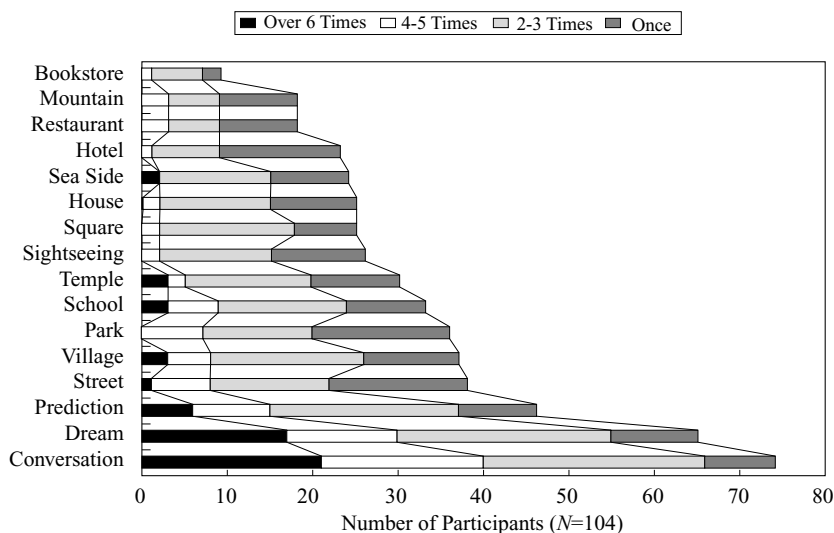


Figure 4.
Frequency of place déjà vu (Kusumi, 1996).

villages, walking in a park, visiting a school and visiting a temple or shrine. In examples of place déjà vu, there exists a high degree of similarity between elements in types of scenes. For example, many parks in Japan resemble each other. Thus, people frequently view similar park scenes. Consequently, a typical scene of a park is constructed in their memory. When visiting a new place, the new scene tends to match the typical scene in a person's memory, leading to a feeling of familiarity.

Sixty-two percent of the participants reported experiencing déjà vu during a dream. The mechanism of dream déjà vu is similar to place déjà vu; dreams are based on compressed past real experiences that are similar to typical scenes. Therefore, a dream fragment of a typical scene tends to match earlier dream experiences and evoke a feeling of familiarity. Brown (2002) also claimed that dream memory fragments might trigger a déjà vu experience when similar situations are encountered while awake. Moreover, Brown's literature review (2004) reported that the frequency of déjà vu experience has a weak positive correlation ($r_s = .22-.30$) with dream memory (e.g., recall, vividness and dream lucidity).

Déjà vu in conversation occurs when individuals feel that they have heard the words in a conversation before. Based on responses from university students, Brown (2004) found that approximately 50% of déjà vu experiences occur in

the company of friends. The sources of conversation déjà vu are similar past experiences, such as similar participants and surroundings. These similarity factors affect the conversation content, thus increasing the likelihood of a match between a current conversation and stored conversations and the impression of familiarity.

Firstly, the results of our survey indicate that déjà vu experiences are common in normal people; 72% of participants experienced déjà vu. This ratio supports the figures obtained 32 surveys of non-clinical subjects ($M = 68\%$, $Mdn = 70\%$) and is slightly higher than the figures reported in nine surveys of neuropsychiatric patients ($M = 55\%$, $Mdn = 65\%$) (Brown, 2003). Secondly, place déjà vu experiences are based on typical scenes in stored memory (Figure 4). These scenes are easy to match with a new experience, leading people to find the new experience familiar. Thirdly, the number of matching cues between source and new experiences in place déjà vu increases the sense of similarity and familiarity, and may lead to a feeling of déjà vu, although, logically, people still realize that they are experiencing a new situation.

Experimental Data and a Model of Déjà Vu Experiences

Experimental research on mere exposure effects has provided new experimental paradigms through which the psychological processes of déjà vu can be explored.

Matsuda and Kusumi (2001) have investigated how prototypical stimuli and exposure frequency affect déjà vu experiences for scenes by using old-new and nostalgia judgements in a paradigm of mere exposure (Bornstein, 1989; Zajonc, 1980). Forty-three university students participated in this experiment. In the study phase, 54 photographs of obscure temples were displayed for 1 s each at four levels of exposure frequency (0, 1, 3, 6 times). Other participants had previously judged these temples as having low, moderate or high typicality. In the test phase, participants judged typicality, familiarity, liking, beauty and nostalgia for each photograph using a 9-point scale and also participated in a recognition test of new and old items.

The typicality of scenes affected the false recognition of new scenes. The false alarm rate was 46% for highly typical scenes, 29% for moderately typical ones and 16% for atypical scenes. Exposure frequency increased participants' responses of 'old' in the recognition test. Mean judgements pertaining to familiarity and nostalgia for highly and moderately typical stimuli were higher than those for atypical stimuli. Exposure frequency had an effect on both judgements; a higher exposure frequency led to higher ratings of familiarity and nostalgia. There was a high correlation between judgements of familiarity,

nostalgia, liking and beauty ($rs(516) = .30-.70, p < .01$), suggesting that the effect of mere exposure on liking extends to judgements of beauty and nostalgia.

Figure 5 presents the results of structural equation modeling (SEM). The analysis suggested that the typicality of stimuli and frequency of exposure had a positive influence on the formation of prototypes, which in turn directly promotes feelings of knowing (familiarity and nostalgia), and then affects positive judgement (liking and beauty). Similar SEM results were produced in the 1-week delay and artificial-picture condition (Matsuda & Kusumi, 2003), as well as in the incidental-learning and artificial-picture condition (Kusumi & Matsuda, 2004). Seamon, Brody and Kauff (1983) also tested whether familiarity affected preference judgement using a subliminal mere exposure paradigm. They presented 10 geometric shapes, each repeated five times with an exposure duration of 5 ms. They found that subliminal exposure enhances positive affective evaluation without conscious recognition.

Brown (2004) examined another *déjà vu* process based on affective responses by means of perceptual fluency. Reber, Winkielman and Schwarz (1998) found that the manipulation of fluency (figure-ground contrast, etc.) led to an enhanced positive effect (liking, prettiness, etc.) for a particular stimulus. If this positive affect is misidentified as familiarity, then the stimulus could lead to a *déjà vu* experience through the following four steps: (a) perceptual fluency, (b) positive effect, (c) familiarity and (d) *déjà vu* (Brown, 2004, p. 165).

Figure 6 shows the typicality and analogical reminding model of a *déjà vu* experience. Our results suggest that the *déjà vu* experience is based on similarity

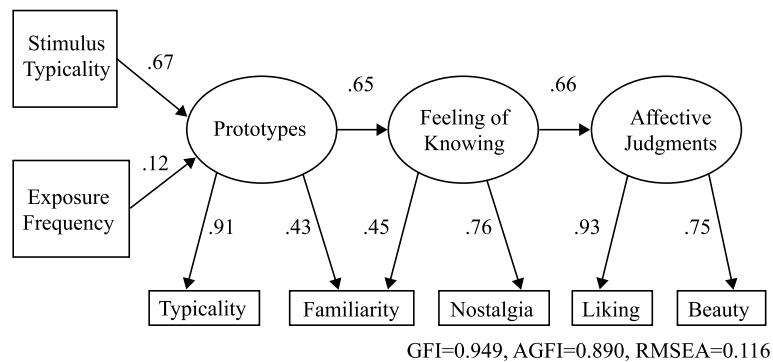


Figure 5.

Effect of typicality and exposure frequency on prototype formation and feeling of knowing (Matsuda & Kusumi, 2001).

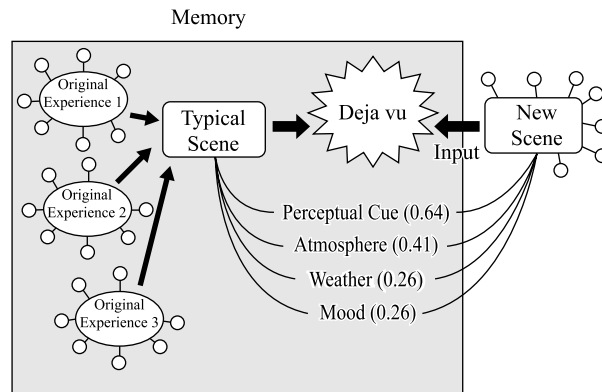


Figure 6.
Typicality and analogical reminding model of déjà vu (Kusumi, 1998).

between typical source experiences and new experiences; similar source experiences are compressed in memory into a single typical representation. This typical representation shares similarities with each original experience. During the construction of typical representations, unimportant cues or indices are omitted and important cues are preserved. One study revealed that the four most common retrieval cues were perceptual attributes (64%, as a percentage of the participants), atmosphere (41%), weather (26%) and mood (26%) (Kusumi, 1996). A matching process between cues would determine familiarity and could result in a déjà vu experience. When people experience a new situation, matched retrieval cues between a typical representation and the new representation increase, thus increasing the feeling of familiarity with the new scene and leading to a feeling of déjà vu. This model is consistent with the gestalt familiarity explanation of déjà vu (Brown, 2004); the gestalt of a present experience (the general visual organization of the elements in a scene) configures similarity to a previous experience, triggering a déjà vu experience.

Different Conceptualizations of Déjà Vu

Our study proposed a typicality and analogical reminding model of déjà vu based on data from two surveys and one experiment. The model provides a satisfactory account of the déjà vu phenomenon, in which a person experiences an inappropriate feeling of familiarity. In the field of psychiatry, the déjà vu phenomenon has been treated as a memory disorder. However, we conclude

that this phenomenon is based on normal metacognitive mechanisms because (a) 70% of normal adults experience the phenomenon; (b) déjà vu experiences of locations, highly nostalgic experiences and false alarms of recognition often involve prototypical scenes stored in memory; and (c) feelings of familiarity increase as exposure frequency, typicality and the number of cues that match between past and new experiences increase.

The phenomenon of déjà vu appears to be a component of adaptive human behaviour and sheds light on human metacognitive mechanisms. Déjà vu phenomena are based on the metacognitive components of feelings of familiarity and recognition memory. Both ontogenetically and evolutionarily, recognition memory develops earlier than recall memory (Todd & Gigerenzer, 2000). Gigerenzer (2000) theorized that familiarity is the principal heuristic during the initial, rapid stage of retrieval. How are déjà vu phenomena related to recognition heuristics? When individuals feel a sense of familiarity with a present experience or problem, they retrieve past experiences or problems by matching cues. They evaluate the similarity and dissimilarity between the two experiences and then transfer useful information from past experiences to the present one. This process performs the same function as analogical problem solving (Holyoak & Thagard, 1995), in which a similar old problem provides a solution to a new one. This metacognitive mechanism appears to be adaptive in humans and is an aspect for future research.

Summary

This paper has presented a model that integrates three metacognitive components to explain the mechanisms involved in analogical reminding, and the reporting of relevant empirical data. These three metacognitive components are (a) feelings of knowing and monitoring reality during new events, (b) judgements of similarity and dissimilarity between new and retrieved events and (c) monitoring of reality in prototype events. The model provides a satisfactory account of the déjà vu phenomenon, in which individuals experience an inappropriate feeling of familiarity with a current situation because they erroneously believe that a similar situation has occurred in the past. In the field of psychiatry, the déjà vu phenomenon has been treated as a memory disorder. However, we conclude that this phenomenon is based on normal memory mechanisms in view of the following results: (a) 70% of normal adults experience the phenomenon, (b) prototypical scenes stored in memory are frequently involved in déjà vu experiences of locations (i.e. 'I have been here before') and (c) the feeling of familiarity increases as the number of cues that match between past and new experiences increase. Thus, this phenomenon appears to be a part of adaptive

human behaviour and sheds light on human metamemory and knowledge representation.

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Notes

1. The jamais vu experience involves an objectively familiar situation that feels unfamiliar. It is the opposite of déjà vu (Brown, 2004).