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## Bias or equality? Unconscious thought equally integrates temporally scattered information



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### ABSTRACT

In previous experiments on unconscious thought, information was presented to participants in one continuous session; however, in daily life, information is delivered in a temporally partitioned way. We examined whether unconscious thought could equally integrate temporally scattered information when making overall evaluations. When presenting participants with information in two temporally partitioned sessions, participants' overall evaluation was based on neither the information in the first session (Experiment 1) nor that in the second session (Experiment 2); instead, information in both sessions were equally integrated to reach a final judgment. Conscious thought, however, overemphasized information in the second session. Experiments 3 and 4 further ruled out possible influencing factors including differences in the distributions of positive/negative attributes in the first and second sessions and on-line judgment. These findings suggested that unconscious thought can integrate information from a wider range of periods during an evaluation, while conscious thought cannot.

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## 1. Introduction

According to traditional wisdom, when confronted with a complex decision, people are accustomed to solving problems with deliberation. Nevertheless, a growing number of studies have suggested the opposite, that applying unconscious thought leads to a better decision than conscious thought (e.g., Bos, Dijksterhuis, & van Baaren, 2011, 2012; Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren, & Van Baaren, 2006; Ham, Van den Bos, & Van Doorn, 2009; Hasford, 2014). Unconscious thought is defined as “object-relevant or task-relevant cognitive or affective thought processes that occur while conscious attention is directed elsewhere” (Dijksterhuis & Nordgren, 2006, p. 96).

A typical example was demonstrated by Dijksterhuis et al. (2006), who required participants to choose the best car from four alternatives that were each assigned positive or negative attributes. Compared with participants who made decisions after a period of conscious thinking, those who did not have the opportunity to deliberate (i.e., distracted by a 2-back task; Jonides et al., 1997) actually made relatively advantageous decisions. The researchers reasoned that unconscious thought has a higher processing capacity, allowing people to simultaneously process more information and make better decisions, while conscious thought focuses on limited dimensions (see also Dijksterhuis & Nordgren, 2006) and is less effective for dealing with complex problems.

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The effects of unconscious thought have been observed across many contexts, including solving creative problems (Yang, Chattopadhyay, Zhang, & Dahl, 2012; Zhong, Dijksterhuis, & Galinsky, 2008), predicting soccer matches (Dijksterhuis, Bos, Van der Leij, & Van Baaren, 2009; González-Vallejo & Phillips, 2010), making moral judgments (Ham & Van den Bos, 2010), selecting job applicants (Messner, Wänke, & Weibel, 2011), and doing simple arithmetic (Ric & Muller, 2012). Creswell and colleagues provided evidence from cognitive-neuroscience that brain regions activated when encoding information for decision making continue to be active while the brain responds to other, irrelevant, tasks (Creswell, Bursley, & Satpute, *in press*).

In previous studies on unconscious thought, information for decision-making was presented to participants in one continuous session. However, in daily life, information frequently is delivered in a temporally partitioned way. For instance, while making a decision to purchase a mobile phone, a consumer may first ask for opinions from close friends and/or consult online assessments and then visit stores to check various models before deciding which phone to buy. Thus, when people are making a decision, time elapses between periods of information gathering. This raises the question of how unconscious thought integrates information for making an evaluation when information is presented in a temporally partitioned manner.

Studies on conscious thought have demonstrated an emphasis on the most recently presented information when making a decision, otherwise known as the recency effect (e.g., Crano, 1977; Lichtenstein & Srull, 1987). For instance, evidence presented near the end of a prosecution's defense was found to have the greatest impact on juror verdicts (Costabile & Klein, 2005). The same has been found for clinical judgments; the most recently received information has a relatively more powerful influence upon diagnoses given by junior, and even more experienced, physicians (Chapman, Bergus, & Elstein, 1996). Montgomery and Unnava (2009) explained that information presented more recently is much more easily retrieved from memory, and hence, will be regarded as the main source of information for making an overall evaluation, during which the recency effect inevitably occurs. More interestingly, previous research on conscious thought has demonstrated that whether or not information about an object is presented in a temporally partitioned way has distinct influence on people's evaluation of the object. For instance, Ariely and Zauberman (2000, 2003) showed that people preferred sequentially presented information that was improving in intensity to that of declining intensity. However, people's preferences for increasing sequences would be less favorable if information was partitioned. In addition, another experiment indicated that pleasant experiences would be more enjoyable and that unpleasant experiences would be more irritating, if pleasant and unpleasant experiences were partitioned (Nelson & Meyvis, 2008).

Given the above findings regarding conscious thought, it is intriguing to ask whether information presented in a temporally partitioned manner also would profoundly influence unconscious evaluations. In other words, will unconscious thought place particular emphasis on information presented on a given temporal session (e.g., the most recent session) when people make evaluations? Alternatively, will unconscious thought integrate all partitioned information equally regardless of the order of presentation? Usher, Russo, Weyers, Brauner, and Zakay (2011, Experiment 3) designed an experiment asking people to choose from three hypothetical individuals as a flat mate. Each individual was characterized by 12 attributes. The percentage of positive attributes for each of the potential flat mates was 66%, 50%, and 33%. Information regarding these attributes was presented to participants in three sessions, with four attributes presented within each one. In addition, each mobile phones' attributes were shown in a different color to help participants distinguish them from each other. Before the presentation, conscious thinkers were informed that "research has shown that the best decisions are the ones made using logic and rational thought," and were asked to deliberate for 1 min after each session. Unconscious thinkers, on the other hand, were told that "research has shown that the best decisions are the ones made using intuition," and were required to complete a 1-min interfering task after each session. At the end of the experiment, participants were asked to score each potential flat mate and choose the one that they most preferred. Results showed that accuracy and the discrimination rates of the unconscious thought group were more reasonable than those of the conscious thought group (Usher et al., 2011). However, this study had several limitations: First, experimental instructions differed between the two groups, which may lead to confounding influence regarding the final conclusion. It was firmly asserted that experimental instructions had a profound impact on the unconscious thought effect (Lassiter, Lindberg, González-Vallejo, Bellezza, & Phillips, 2009). Second, without a valid controlled experiment in which all information was presented in a single session, it is possible that the results were due to the different font colors rather than the partitioning of information. Third, researchers could not exclude the on-line judgment account, which might be formed due to the limited amount of information presented in each session (12 pieces per session). Finally, although the three flat mates had obvious general differences, there was no strict control of the relative merits of an individual flat mate (i.e., there was no objective data that A was better than B) in each session. This made the attributes in each session ambiguous, which may weaken each session affecting the overall evaluation. Based on these limitations, the present study intended to further examine the question of whether unconscious thought can integrate partitioned information without bias.

We used four hypothetical mobile phones as experimental materials. Information about the phones was successively presented in two temporally partitioned sessions. We manipulated the information presented in the two sessions so that participants' final evaluations would differ depending on whether information about the phones was integrated equally across two sessions or information from either session was particularly emphasized.

## 2. Experiment 1

Experiment 1 was designed to make an overall evaluation of unconscious thought by directly investigating whether it could equally integrate all temporally scattered information, or would attach particular importance to one certain piece

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