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Thinking styles in implicit and explicit learning

Qiuzhi Xie [a,b,*,1], Xiangping Gao [a], Ronnel B. King [b,c]

[a] Department of Psychology, Shanghai Normal University, No. 100 Guilin Road, Shanghai, PR China
[b] Faculty of Education, The University of Hong Kong, Pokfulam Road, Hong Kong
[c] Department of Special Education and Counselling, The Hong Kong Institute of Education, Tai Po, Hong Kong

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ABSTRACT

This study investigated whether individual differences in thinking styles influence explicit and implicit learning. Eighty-seven university students in China participated in this study. Results indicated that performance in the explicit learning condition was positively associated with Type I thinking styles (i.e. legislative and liberal styles) and the internal style and negatively associated with a Type II thinking style (i.e. conservative style) and the external style. There was no significant relationship between thinking styles and performance in the implicit learning condition. Taken together, these findings suggest that implicit and explicit learning are distinct, each influenced by different individual difference variables. It also provides support to the value-laden nature of styles, giving further evidence to the adaptiveness of Type I over Type II styles.

1. Introduction

1.1. Implicit learning

Reber (1967) categorized learning mechanisms into explicit and implicit learning. Explicit learning refers to learning that involves consciousness and effort. Implicit learning, on the other hand, is largely independent of conscious awareness of either the learning process or the learning products. Experimental tasks have been designed to study implicit learning, the three most popular ones being artificial grammar learning (Reber, 1976), sequence learning (Lewicki, Czyzewska, & Hoffman, 1987), and process control (Berry & Broadbent, 1988).

With regard to research on implicit learning, it is important to note that implicit learning is distinct from explicit learning. The dissociation between explicit and implicit learning has been supported by differences in verbal reports: participants can report explicitly acquired knowledge, but fail to report implicitly acquired knowledge (e.g. Berry & Broadbent, 1984; Cleeremans & McClelland, 1991). Several scholars have criticized such evidence as weak, arguing that verbal reports may not be sensitive enough to detect implicit learning (Dulany, Carlson, & Dewey, 1985; Shanks & St. John, 1994). The dissociation between these two learning modes, however, was also supported by studies that documented differences in behavioral outcomes (e.g. Destrebecqz & Cleeremans, 2001; Gebauer & Mackintosh, 2007; Mathews et al., 1989).

1.2. Individual differences in implicit learning and explicit learning

Reber and Allen (2000) reviewed a large body of work on implicit learning and concluded that individual differences in implicit learning do exist. They also raised the question as to whether inter-individual variation in implicit learning is distinct from that found in explicit learning. From an evolutionary perspective, Reber and Allen (2000) hypothesized that unlike explicit learning, implicit learning is independent of psychometric intelligence.

Several studies have examined whether intelligence is related to implicit and explicit learning. In general, it was found that intelligence was positively related to performance on explicit learning tasks (e.g. Gebauer & Mackintosh, 2007; Kaufman et al., 2010). However, the findings regarding the association between intelligence and performance on implicit learning tasks were rather inconsistent. Some studies reported a non-significant correlation between the two variables (e.g. Gebauer & Mackintosh, 2007; Reber, Walkenfeld, & Hernstadt, 1991), while other studies reported a significant relationship (e.g. Danner, Hagemann, Schankin, Hager, & Funke, 2011). Kaufman et al. (2010) found that performance on the implicit learning task was associated with some intelligence dimensions (i.e. verbal reasoning), while being independent of some other dimensions (i.e. perceptual reasoning and mental rotation ability). Nevertheless, Kaufman et al. (2010) concluded that the relationship between intelligence and performance was stronger for explicit learning tasks and weaker for implicit learning tasks. The relationship between intelligence and implicit learning is still equivocal; however, based on previous research outlined above, it is possible that even if

* Corresponding author at: Faculty of Education, the University of Hong Kong, Hong Kong. Tel.: +852 66876774; fax: +852 25471924.
E-mail address: qiuzhi-xie@hku.hk (Q. Xie).
[1] Qiuzhi Xie conducted this study at Department of Psychology, Shanghai Normal University.

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there is a relationship between the two variables, the relationship would be rather weak.

Several studies also examined the relationship between performance on implicit learning tasks and basic cognitive functions. For instance, it was found that implicit learning was related to processing speed, but was independent of working memory capacity (e.g. Kaufman et al., 2010). Rathus, Reber, Manza, and Kushner (1994) investigated the relationship of affective factors to both implicit and explicit cognitive processes and found that: (1) anxiety interfered with explicit memory but not implicitly acquired knowledge and (2) depressive symptoms were related to neither explicit memory nor implicit learning. Several studies also investigated the impact of personality on implicit learning. It has been argued that implicit learning and intuition are closely associated (e.g. Lieberman, 2000). Woolhouse and Bayne's (2000) study showed that when people were unaware of the underlying rules, those who preferred intuition (seeking possibility and initiation) outperformed those who preferred sensing (seeking reality and convention) in an implicit learning task. Kaufman et al. (2010) reported the associations of two lower facets of Openness to Experience – Intellect and Openness – with performance on an implicit learning task. Intellect pertains to quickness, ingenuity, and ideas, whereas Openness pertains to aesthetics, imagination, and fantasy. It was found that participants' performance on the implicit learning task was related to Openness, but not to Intellect. Kaufman et al. (2010) also claimed that implicit learning and impulsivity share a common characteristic, in the sense that both entail automatic processes. They found that the lack of premeditation (one of the dimensions of impulsivity) was positively related to performance on the implicit learning task. Pretz, Totz, and Kaufman (2010) found that the rational cognitive style, rather than the experiential one, predicted better performance on implicit learning tasks. In addition, Kassin and Reber's (1979) study showed that performance in the implicit learning condition was positively related to locus of control: those having an internal locus of control outperformed those with an external locus of control on an implicit artificial grammar learning task.

To date, there is still a dearth of research about individual differences in implicit learning. In addition, extant studies are plagued by a methodological problem. Most studies, except for two (Gebauer & Mackintosh, 2007; Maybery, Taylor, & O'Brien-Malone, 1995), used different tasks to measure performance under the implicit learning condition and the explicit learning condition. Therefore, it is possible that their different relationships to individual differences factors might have been due to task differences (Gebauer & Mackintosh, 2007; Reber & Allen, 2000). This study addresses this weakness by using the same task for both learning conditions.

1.3. Thinking styles

Sternberg's (1997) theory of thinking styles, also known as the theory of mental self-government, is one of the most recent and influential theories on styles (Zhang & Sternberg, 2005). According to Sternberg (1997), thinking styles refer to mental tendencies to approach tasks in a certain manner. Sternberg (1997) used societal organization as a metaphor for understanding thinking styles. He proposed five dimensions of thinking styles: function (legislative, executive, and judicial styles), form (monarchic, hierarchic, oligarchic, and anarchic styles), level (global and local styles), scope (internal and external styles), and leaning (liberal and conservative styles). Descriptions for each of these styles can be found in Appendix A. Insomuch as the 13 thinking styles are subsumed into five dimensions, the theory can furnish a general profile of styles, instead of just relying on one or two style categories to describe an individual (Sternberg, 1997).

Zhang and Sternberg (2005) categorized the 13 thinking styles into three types. Thinking styles (i.e. legislative, judicial, hierarchical, global, and liberal styles) pertinent to creativity and cognitive complexity are classified as Type I. Thinking styles (i.e. executive, monarchic, local, and conservative styles) which are related to a preference for norms and cognitive simplicity are categorized as Type II. Type I thinking styles are regarded as more adaptive and are related to some positive attributes such as higher cognitive-developmental level and the use of a deep learning approach. Type II styles are considered to be less adaptive and are related to lower cognitive-developmental level and the use of a surface learning approach (e.g. Zhang & Sternberg, 2005). The other four styles (i.e. oligarchic, anarchic, internal, and external styles) are largely reckoned as value-differentiated and, thus far, no clear relationship has been found between them and important educational outcomes. These styles are labeled as Type III styles. They may express the characteristics of either Type I or II styles, depending on situational contingencies.

The relationship between thinking styles and academic achievement has been widely investigated in Western and Eastern countries (e.g. Cano-Garcia & Hughes, 2000; Zhang, 2004). It was consistently found that thinking styles contribute to learning achievement beyond intelligence. Furthermore, Zhang (2004, 2007) found that the contribution of thinking styles to academic achievement varied as a function of subject matter. Although the predictive power of thinking styles for learning performance has been widely investigated, in all these studies, learning performance was tested through students' examination scores in schools rather than through learning tasks under rigorous experimental controls. Therefore, the contribution of thinking styles to the specific underlying learning processes has not yet been investigated.

1.4. Research purpose and hypotheses

The current study aims to investigate whether differences in thinking styles influence implicit and explicit learning. First, it was hypothesized that Type I styles and the internal (Type III) style would be positively related to performance on the explicit learning task, whereas Type II styles and the external style would be negatively related to it. This prediction was based on the cognitive-complexity/simplicity characteristic of Type I and II styles. In addition, those preferring the internal style tend to be more introverted, whereas those preferring the external style tend to be more extraverted (Sternberg, 1997). The introverts usually have a higher resting level of arousal (Eysenck & Eysenck, 1985) and thus may outperform the extraverts in tasks requiring reflection (Chamorro-Premuzic & Furnham, 2005; Matthews, 1992). The explicit learning task, therefore, would facilitate those preferring the internal style to the external style.

Moreover, we did not expect any relationship between thinking styles and performance on the implicit learning task. Because thinking styles arise from both cognition and personality (Sternberg, 1997), we reckoned that styles on the dimensions of function, level, and leaning should be pertinent to the subscale of Intellect under the broader trait of Openness to Experience. Additionally, thinking styles on the dimension of form should be relevant to the subscale of Orderliness under the broader trait of Conscientiousness (DeYoung, Quilty, & Peterson, 2007). However, Intellect and Orderliness were found to be unrelated to implicit learning (Kaufman et al., 2010; Norman, Price, & Duff, 2006). Thus, we did not posit any relationship between thinking styles and performance on the implicit learning task.

2. Method

2.1. Participants and research design

Eighty-seven students (6 males and 81 females) between ages 20 years and 24 years ($M = 21.3$ years, $SD = 1.03$) in a university in Shanghai, China participated in this research. Thirty-four students were sophomores, 22 were juniors, and 31 were seniors. These students majored in Humanities, Science, and Management.