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Short report (original research)

Individual differences in incidental language learning: Phonological working memory, learning styles, and personality

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ABSTRACT

We investigated whether learning of word order and morphological case interacts with three individual differences: phonological working memory, learning styles, and personality. Thirty-six participants engaged with a semi-artificial language during incidental exposure. Learning was assessed by acceptability judgment and picture-matching tasks immediately after exposure and two weeks later. Participants also completed learning style and personality surveys as well as two assessments of phonological working memory. The immediate results showed a significant learning effect on acceptability judgment only. No relationships were found for phonological working memory though effects did emerge for the extraversion personality trait and several learning styles. At delayed testing, results showed maintenance of learning on acceptability judgment and significant improvement on picture-matching. At delayed testing no relationships between performance and individual differences were found. Overall, the results indicate that language learning under incidental exposure is durable and is not strongly constrained by individual differences tested here.

1. Introduction

For many researchers in the field of second language acquisition, there are two key questions: (1) which of the external conditions to which we expose learners promote learning (Norris & Ortega, 2000; Spada & Tomita, 2010) and (2) how do these conditions interact with individual variation in learners (Dornyei, 2003, 2005). Regarding the first issue, a large body of research has examined the effectiveness of input conditions on second language (L2) learning, specifically from the perspective of explicit or implicit contexts. Generally, such research has found explicit contexts, such as exposure to grammar rules or instruction to search for rules, to be more effective than non-explicit contexts, which do not provide rules or instruction to search for them (see Norris & Ortega, 2000; Spada & Tomita, 2010 for meta-analyses).

However, explicit conditions often provide learners with more input and/or more time-on-task (R. Ellis et al., 2009; Norris & Ortega, 2000; Sanz, 2005), which likely creates an artifact favoring explicit contexts. Research on the scope of learning under non-explicit exposure conditions is informative for theoretical accounts of adult language learning (e.g., Gass, 1997; Segalowitz, 2003; Schmidt, 2001; VanPatten, 2004) not least because most language likely cannot be acquired intentionally. And though individual differences (IDs) are believed to be critical in adult language learning (Dornyei, 2003, 2005) there is little research on individual variation in non-explicit exposure conditions. Here, we investigate the roles of several IDs in language learning under incidental exposure, which we define as a learning context in which subjects are not informed about the learning target, nor that they will be subsequently tested (Williams, 2009).

1.1. Additional language learning under incidental exposure

While some researchers conduct between-group comparisons on the efficacy of more or less explicit conditions (for review, see Spada & Tomita, 2010), another strand of research focuses strictly on the adult L2 user's ability to learn from exposure to language during a meaning-focused task, without explicit instruction (Williams & Kuribara, 2008; Rebuschat & Williams, 2012; Leung & Williams, 2011, 2012). Williams and Kuribara (2008), for example, used a semi-artificial language, Japlish, to investigate the acquisition of non-native syntax in native English speakers under incidental exposure. They provided subjects with written instructions about the functions of case markers *-ga* (subject), *-o* (direct object), and *-ni* (indirect object) and participants then read and listened to Japlish sentences during a semantic plausibility judgment task. The results of a grammatically judgment test revealed

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a clear learning effect, with the exposure group outperforming the no-exposure group.

Rebuschat and Williams (2012) investigated whether the learning of non-native syntax under incidental exposure is accompanied by implicit (unconscious) knowledge. In two experiments, native English speakers were exposed auditorily to a semi-artificial language which combined German syntax with English vocabulary while they made semantic plausibility judgments. The results on an acceptability judgment task with confidence and source ratings (subjective measures of awareness, Rebuschat, 2013) in experiment 1 showed that only learners who demonstrated awareness of their acquired knowledge also evidenced learning. In experiment 2, which tested fewer rules than experiment 1, there was a learning effect across all learners, and it was shown that exposure had resulted in both implicit and explicit knowledge.

These studies provide evidence for the learning of non-native syntax as a result of incidental exposure. However there remain several unaddressed issues. First, delayed effects of learning were not assessed. The learning effects found in these studies are likely dynamic and to better understand language learning under such contexts, delayed effects must be examined. Second, each study tested the learning of word order (syntax), but we know little of how other domains of grammar might fare with incidental exposure. For example, Robinson (2005b) measured the learning of three morphosyntactic rules of Samoan under incidental exposure and found clear learning effects for only one. This suggests that the learning of morphosyntax in an incidental exposure condition may be less straightforward than the findings for syntax[1]. Finally, the observed learning outcomes across subjects were variable. In Williams and Kuribara (2008) only a subset of the participants evidenced learning of syntactic scrambling and in Rebuschat and Williams (2012, exp. 1) only learners that showed awareness also showed learning. Such variability likely stems from individual differences, which may be the most reliable predictor of L2 learning success (Dornyei, 2005). To date, however, there has been surprisingly little work on the role of IDs in language learning under incidental exposure.

1.2. Individual differences

The role of individual differences in L2 learning following incidental exposure has recently received attention from the perspective of working memory capacity, though its role in such a context is unclear. Tagarelli, Borges Mota, and Rebuschat (2011) found no relationship between working memory and learning under incidental exposure to a semi-artificial German-like language (exposure and test measures presented aurally). Working memory was assessed by an operation word span task and a letter–number ordering task (both written). In contrast, Robinson (2005b) found that working memory positively correlated with an aural grammaticality judgment test (GJT) and a guided production task following written incidental exposure to Samoan. Robinson suggested that the auditory GJT may have involved working memory because learners listen to the sentence and hold it in memory to make a judgment about grammaticality but notes that "the measure of working memory was a reading-span test and is not a measure of aural phonological working memory capacity" (p. 260). Thus, a clear connection between working memory as assessed in the written modality (Robinson, 2005b; Tagarelli et al., 2011) and learning following incidental exposure as assessed in the aural modality is difficult to make.

To address this, the present study investigated the role of phonological working memory (PWM) in language learning under an incidental exposure context. In Baddeley and Hitch's (1974) multi-component model of working memory, PWM is maintained by the phonological loop in the working memory system. The phonological loop consists of two separable sub-components: a temporary storage system which holds memory traces for a period of seconds and a sub-vocal rehearsal system (see Baddeley, 2003; Baddeley & Logie, 1999). Phonological working memory underlies the storage and processing of familiar and novel verbal and acoustic information and is considered critical for language learning, with implications for L2 vocabulary learning (Baddeley, Gathercole, & Papagno, 1998; French, 2006) as well as L2 grammar learning (Speciale, Ellis, & Bywater, 2004). It may also be a key component of general language aptitude (Juffs & Harrington, 2011; Kormos & Sáfár, 2008; Robinson, 2005a; Sawyer & Ranta, 2001). A sizable portion of language learning takes place as a result of exposure to auditory sequences but the role of PWM in the learning of auditorily-presented language during incidental exposure has yet to be addressed.

Phonological working memory, however, is just one ID that may be important. There exists a broad spectrum of IDs that interact with variability in language learning outcomes (Dornyei, 2003, 2005), but how these IDs may interact with learning under incidental exposure is largely unknown. Therefore, the study included additional ID measures to better characterize the potential impact of individual differences on learning under incidental exposure.

The first of these IDs is personality. In 1978, Naiman and colleagues described the "good" language learner as likely being more extraverted, but following their null effects for Extraversion (Naiman, Frohlich, Stern, & Todesco, 1996) personality research remained relatively unattended in SLA. In the last decade, however, personality has been increasingly studied in L2 speech production research (Dewaele 2005; Dewaele & Furnham, 1999; van Daele, Housen, Pierrard, & Debruyn, 2006) where Extraversion has been found to positively correlate with fluency and complexity measures. Interestingly, a recent study in psychology by Kaufman et al. (2010) found that intuition, openness to experience, and impulsivity personality traits were related to implicit learning ability, suggesting that personality may interact with learning in addition to L2 production.

We also investigated learning styles. Learning styles, or "an individual's natural, habitual, and preferred ways of absorbing, processing, and retaining new information and skills" (Kinsella, 1995, p. 171), seem to vary systematically as a function of L2 proficiency. For example, early work by Hyland (1993) and Violand-Sanchez (1995) found that higher proficiency learners tended to be field-independent and intuitive, with a reliance on their own judgment. This research assessed the impact of learning styles on the ongoing language learning process: low proficiency L2 learners were compared to their higher proficiency peers. To our knowledge, no study has expressly examined whether learning styles influence learning from *no knowledge* of the language to a learning effect —and this study addressed that gap.

The current study brought together work on IDs and learning under incidental exposure by investigating the role of PWM, learning styles, and personality on the learning of additional language (L3[2]) morphosyntax in late L2 learners of Spanish. We investigated the durability of IDs on such learning by assessing the relationship between our IDs and performance immediately after exposure and following a two-week delay.

[1] Note that Robinson (2005b) did in fact administer 1 week and 6 month delayed post-tests to his Samoan learners. However, no results of the performance at these testing sessions are reported, only correlations between task performance and the individual differences assessed in the study (Modern Language Aptitude Test and working memory) are discussed. Thus, this study cannot inform on delayed effects of incidental exposure.

[2] Third language acquisition has also been referred to as TLA (Cenoz, 2011; De Angelis, 2007). In this paper, the term L3 refers to any language acquired after the first and second, but does not strictly refer to the third sequential language acquired by the subjects. For a detailed discussion on multilingualism and third language terminology see Hammarberg (2010).