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# Optimizing Second Language Practice in the Classroom: Perspectives from Cognitive Psychology

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This article of the special issue provides an overview of the role of practice in a second language (L2) from both pedagogical and theoretical perspectives. The following 5 areas of research are identified for studying L2 practice from cognitive psychology perspectives: (a) the type of practice (retrieval practice, corrective feedback, modality), (b) distribution of practice, (c) schedule of practice (blocking and interleaving effects), (d) individual difference factors (aptitude-treatment interaction), and (e) effects of practice on learning trajectories and outcomes. This special issue sets a research agenda toward better understanding the learning processes and resulting knowledge through practice. That research can inform teachers about how they can optimize L2 teaching and learning for a variety of learners across different classroom contexts.

**Keywords:** practice; skill acquisition theory; cognitive psychology; distribution of practice; individual differences

PRACTICE IS AN OLD AND NEW CONCEPT in the field of second language (L2) learning. Drills and pattern practice, which constitute the central component of the audio-lingual method, are typically associated with the concept of L2 practice. Heavily form-focused practice of this kind often does not require learners to use a L2 in real-operating conditions (i.e., communication settings). This clearly limits the acquisition of knowledge and skills that can be used for communication, leading to the criticism of L2 practice in the narrow sense of drills and pattern practice. On the other hand, a communicative approach and related approaches that emphasize the importance of meaningful communication have gained popularity since the 1980s. In these

approaches, L2 practice has sometimes been considered ineffective or even unnecessary (Krashen, 1982; Prabhu, 1987; VanPatten, 2003). Although communicative language teaching in a broader sense acknowledges the need for form-focused instruction, the stronger versions stipulate that L2 learning takes place only through communication (Howatt, 1984). Krashen (1981, 1982), for instance, claims that *learning* (including deliberate practice of form) has nothing to do with *acquisition*, and learners' L2 system develops only by comprehensible (meaning-focused) input.

Since then, the concept of L2 practice has been extended and reappraised notably by DeKeyser (2007). He reconceptualized *practice* from the perspectives of applied linguistics and cognitive psychology, going beyond the older, narrow sense of mechanical drills. DeKeyser (2007) defined practice as "specific activities in the second language, engaged in systematically, deliberately, with the goal of developing knowledge of and skills in

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the second language” (p. 1). His broad definition of practice includes both form-focused and meaning-focused activities where learners engage in systematic and deliberate use of L2 knowledge, which plays an important role in L2 acquisition (DeKeyser, 2015; Johnson, 1996; Lyster & Sato, 2013; McLaughlin, 1987).

Even though meaning-focused, communicative activities no doubt play a critical role in L2 development, purely communicative tasks do not always facilitate L2 development as learners can often complete tasks with only the most superficial linguistic processing (Loschky & Bley-Vroman, 1990). Especially in the classroom context, where the nature and amount of input, interaction, and output is limited, it is often insufficient to provide communicative tasks only. One way to overcome the potential limitations of purely communication-oriented instruction may be to embrace the concept of practice in the sense of incorporating deliberate and systematic practice into the L2 curriculum (Gatbonton & Segalowitz, 2005; Newton & Nation, 2009; Rossiter et al., 2010).

Another approach is to start with explicit instruction on specific linguistic forms and initially provide opportunities for controlled practice. The control can then be gradually decreased, after which learners engage in meaning-focused activities. This approach is compatible with the presentation–practice–production model (Sato, 2010) and task-supported language instruction (Li, Ellis, & Zhu, 2016). On the other hand, a “strong” view on task-based language teaching (Long, 2015) proposes that tasks should not focus on certain linguistic forms, and explicit instruction should not be prepared by teachers, which may seem incongruent with the idea of systematic and deliberate practice. While the former approach (presentation–practice–production model) appears to resonate more with the concept of practice, the latter approach (task-based language teaching) may not be fully incompatible with the importance of practice. The concept of practice should not be tied solely to one specific model or teaching approach. Nor is it our view that one approach is superior to the others, because the effectiveness of teaching approaches is contingent on a myriad of factors (e.g., context, practice type, learners, structures, aptitude, motivation, see the coda article in this issue). Rather, we argue that adopting the broader concept of practice has so much to offer as insights gained from research into L2 practice can contribute to a wide range of L2 instructional approaches (for instance, see DeKeyser, 2018).

This new conceptualization of practice has significant ramifications in L2 research that concerns cognitive aspects of L2 learning such as form-focused and meaning-focused input and output practice (Shintani, 2015; Shintani, Li, & Ellis, 2013) and interaction and corrective feedback (Li, 2010; Lyster & Saito, 2010). Furthermore, psychologists have recently been uncovering that the practice type (Karpicke & Roediger, 2007, 2008), practice distribution (Cepeda et al., 2006), and frequency of practice (Rohrer et al., 2005) have large effects on learning in a number of domains such as visual, verbal, and motor skill learning. Individualization of L2 practice based on learners’ aptitude profiles or aptitude complexes was also theorized to inform adaptive teaching and learning (Snow, 1987). The evidence for such effective practice has accrued and been synthesized to provide guidelines for optimizing classroom instruction and learning in general (Hattie & Yates, 2013; Horvath, Lodge, & Hattie, 2016). Although there is no doubt that these insights gleaned from recent cognitive psychology research can extend the scope of research on L2 practice, their potential has not been evaluated sufficiently yet. With the aim of stimulating the cross-disciplinary connection between cognitive psychology and L2 research, the current special issue presents state-of-the-art research that explores how to optimize L2 practice by applying insights from cognitive psychology. The thematic collection of empirical research allows for formulating a unified account of L2 practice, while providing valuable pedagogical implications for L2 teaching and learning.

#### THEORETICAL FRAMEWORKS FOR L2 PRACTICE: SKILL ACQUISITION THEORY AND OTHER COMPATIBLE L2 THEORIES

Although some L2 theories consider domain-general learning mechanisms irrelevant for L2 acquisition (e.g., universal grammar theory; White, 2015), the view that general cognitive mechanisms are recruited for L2 learning is now widely accepted (e.g., usage-based theory, Ellis & Wulff, 2015; emergentism, Gregg, 2003). Most relevant to the current special issue, skill acquisition theory provides useful insights into the role of deliberate practice in L2 classrooms (DeKeyser, 2015; Johnson, 1996; Lyster & Sato, 2013; McLaughlin, 1987). Skill acquisition theory has its roots in cognitive psychology theory, in particular in the adaptive control of thought-rational (ACT-R) model of the human cognitive

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2 architecture (Anderson, 1993; Anderson et al.,  
3 2004). This general skill acquisition theory stipu-  
4 lates a similar learning trajectory of development  
5 in a wide range of cognitive and motor skills.  
6 According to this theory, learning starts from the  
7 initial stage where declarative knowledge (i.e.,  
8 knowledge of THAT) is learned. In the next  
9 proceduralization stage, declarative knowledge is  
10 used as a clutch during practice to attain procedu-  
11 ral knowledge (i.e., knowledge of HOW), which  
12 leads to automatization after more extensive  
13 practice. The distinction between declarative and  
14 procedural knowledge is a useful construct un-  
15 derpinning various L2 learning theories (e.g., the  
16 neurobiological declarative–procedural model,  
17 Ullman, 2015; sociocultural theory, Lantolf, 2011;  
18 see VanPatten & Williams, 2015 for an overview);  
19 it provides a clear theoretical foundation for L2  
20 practice.

21 Previous research in the skill acquisition the-  
22 ory framework has demonstrated that deliber-  
23 ate, systematic, and extensive practice (often ac-  
24 companied by explicit instruction and/or in-  
25 tentional learning) results in proceduralization  
26 and automatization of linguistic knowledge that  
27 can be deployed in real-life communication set-  
28 tings. This has been empirically supported in  
29 various domains of L2 learning: vocabulary (El-  
30 gort, 2011), grammar (DeKeyser, 1997; Suzuki,  
31 2018), pragmatics (Li & Taguchi, 2014), and pro-  
32 nunciation (Li & DeKeyser, 2017). The knowl-  
33 edge base of L2 practice, informed by skill  
34 acquisition theory, provides important founda-  
35 tions for unified principles and rationales for  
36 a wide range of L2 teaching and learning  
37 processes.

38 Although skill acquisition theory and other  
39 theories introduced in the current special issue  
40 concentrate on cognitive aspects of L2 learn-  
41 ing, they provide foundational constructs for  
42 research in other frameworks such as sociocul-  
43 tural theory (Lantolf, 2011). Additionally, the  
44 studies from cognitive perspectives will provide  
45 unique insights into issues on L2 learning (e.g.,  
46 type of practice, individualization of practice)  
47 that can be investigated from socio-cognitive  
48 perspectives (Sato & Ballinger, 2016; Storch,  
49 2013). The present thematic issue aims to iden-  
50 tify the core research issues and seeks general-  
51 ized principles of L2 practice that can enrich our  
52 understanding of L2 learning from both cognitive  
53 and sociocultural perspectives (Hulstijn et al.,  
54 2014).

## DEFINING AND EXTENDING RESEARCH AREAS FOR L2 PRACTICE

When we attempt to draw on cognitive psychol-  
ogy research findings and apply them to L2 re-  
search, a number of important questions emerge  
as to how we can maximize the effectiveness of  
L2 teaching and learning. The following five key  
questions guide this special issue:

1. How does the type of practice and feedback affect L2 acquisition?
2. How does the distribution of practice affect L2 acquisition?
3. How does the schedule of practice affect L2 acquisition?
4. How should we cater to L2 learners' individual differences?
5. How does practice influence L2 learning processes and knowledge?

These five questions help define the emerging  
research field of L2 practice and extend the scope  
of research. In what follows, we provide a brief re-  
view of research examining the previously men-  
tioned five questions and delineate how they are  
addressed in the current special issue.

### *Types of Practice and Feedback*

The current issue examines the effectiveness of  
different types of input, output, and interactive  
practice in L2. From the perspective of cognitive  
psychology, output practice can be construed  
as retrieval. Retrieval refers to the process of  
accessing previously stored information. Both  
cognitive psychology (Karpicke & Roediger, 2007,  
2008) and L2 research (Barcroft, 2007; Nakata,  
2017) have shown that retrieval has large positive  
effects on learning. At the same time, there are  
still a number of questions regarding retrieval  
practice that warrant further investigation. In this  
issue, Strong and Boers investigate whether the  
positive effects of retrieval obtained by earlier  
studies extend to the learning of L2 phrasal verbs.  
Their study is motivated by the observation that  
most L2 textbooks employ trial-and-error practice  
for teaching phrasal verbs, where learners are  
asked to provide the phrasal verbs before they are  
exposed to them. Strong and Boers demonstrate  
that trial-and-error practice induces incorrect  
responses resulting from unsuccessful guessing  
and argue that retrieval practice should be used  
to maximize the learning of phrasal verbs.

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Although the role of input modality has enjoyed ample attention in cognitive psychology (Saffran, 2002), it has been relatively understudied in SLA, despite its obvious relevance for skill-based curriculums (e.g., reading vs. listening). Kim and Godfroid in this issue focus on the modality of integrated practice (defined as meaning-focused exposure to L2 input accompanied by implicit feedback). Their study compares the effects of aural versus written practice on the development of explicit and implicit knowledge, the distinction of which was originally proposed in cognitive psychology (Reber, 1967) and has attracted focal attention in SLA (Ellis, 2009; Rebuschat, 2015). Kim and Godfroid demonstrate that input modality influences the nature of knowledge acquired, and their study offers novel insights into the issue of modality specificity of implicit statistical learning in L2. Furthermore, Yilmaz and Granena in this issue compare the effects of explicit and implicit corrective feedback. They attempt to link the noticing of target grammatical forms and acquisition through interaction. Another novel aspect of their study is a variety of cognitive individual difference (aptitude) measurements examined to explore the aptitude-treatment interactions (see below).

#### *Temporal Distribution of Practice*

Proceduralization of L2 knowledge requires an extensive amount of repeated practice (DeKeyser, 2015; Ellis & Wulff, 2015). A practically important question is then how we should systematically distribute repeated practice opportunities for developing such L2 knowledge. A number of cognitive psychology studies have been conducted to identify the most effective practice schedule (see Cepeda et al., 2006 for review). This line of investigation also has potential to enhance L2 learning, and the field has seen a surge of interest in this issue (Bird, 2010; Nakata, 2015; Nakata & Suzuki, 2019; Rogers, 2015; Serrano & Huang, 2018; Suzuki, 2017a). The current special issue presents two innovative studies that further advance our understanding of the role of practice distribution. A laboratory-based study by Li and DeKeyser extends the scope of research to identify the optimal learning distribution for a linguistic domain that has not been examined previously: pronunciation (Mandarin tone). As a majority of previous research on practice distribution has focused on lexis and grammar, research examining the generalizability of previous findings to other linguistic domains is warranted. Intriguingly, Li and DeKeyser also examine the ef-

fects of practice distribution on the acquisition of both declarative and procedural knowledge (see the following text). Another study reported by Kasprovicz, Marsden, and Sephton in this issue compares the effectiveness of different practice schedules (3.5-day vs. 7-day intervals) on the acquisition of French morphosyntactic structures in a classroom setting. The previous research mainly tested the effects of practice distribution among university students in controlled, laboratory settings. Kasprovicz et al. test young students (8–11 years old) in French classrooms in the United Kingdom, which allows us to explore the practice distribution effects in a more realistic L2 teaching context.

#### *Practice Schedules: Interleaving Effects*

Whether to use blocked or interleaved schedules is also an important consideration for systematic L2 practice. In interleaving, learners are exposed to multiple exemplars from different categories at once, whereas in blocking the exemplars are blocked by category. Cognitive psychology research shows that interleaving often results in better retention than blocking, findings referred to as *interleaving effects* (Kang, 2016; Taylor & Rohrer, 2010). Only a handful of studies, however, have investigated the effects of blocking and interleaving on L2 acquisition (pronunciation: Carpenter & Mueller, 2013; vocabulary: Finkbeiner & Nicol, 2003; Schneider et al., 1998, 2002). In this issue, Nakata and Suzuki report the first empirical study to examine the effects of blocking and interleaving on L2 grammar learning. They explore to what extent mixing practice exercises on five grammatical rules of the English tense-aspect-mood system facilitates acquisition. This embarkment of research into interleaving effects is timely as it happens to coincide with a recent study by cognitive psychologists, who also examined the interleaving effects for Spanish morphological features (Pan et al., 2019). Both studies (Nakata & Suzuki and Pan et al.) showed advantages of interleaved practice for L2 grammar acquisition. The benefits of interleaving found in these studies may encourage researchers to further explore interleaving effects in order to arrive at a better understanding of the phenomenon (Suzuki & Sunada, 2019).

#### *Individualization of Practice: Trainability of Aptitude and Aptitude-Treatment Interaction*

We have recently seen growing enthusiasm in research on aptitude for L2 learning (Granena,

2 Jackson, & Yilmaz, 2016; Gurzynski–Weiss, 2017;  
3 Skehan, 1989, 2017; Wen et al., 2019). This rising  
4 interest is in part influenced by the development  
5 of a number of new aptitude test batteries (e.g.,  
6 Hi-LAB, LLAMA), including assessment tools of  
7 domain-general cognitive abilities, in addition to  
8 Carroll’s traditional aptitude components (Linck  
9 et al., 2013; Wen, Mota, & McNeill, 2016). Most  
10 notably, working memory abilities have been  
11 found to be a strong predictor of L2 learning  
12 (Linck et al., 2014). Cognitive psychologists have  
13 accumulated evidence supporting that working  
14 memory abilities can be improved by intervention  
15 (Au et al., 2015; Soveri et al., 2017). This ques-  
16 tions the widely held assumption that aptitude  
17 is stable over long periods of time and not sus-  
18 ceptible to training (Carroll, 1981; Snow, 1991).  
19 This fundamental issue has been tackled by some  
20 empirical studies (Chalmer, 2017; Politzer &  
21 Weiss, 1969; Rogers et al., 2017), but the evidence  
22 is inconclusive; more research is warranted to  
23 investigate the stability or malleability of aptitude.

24 If aptitudes, however, are indeed malleable by  
25 intervention such as working memory training,  
26 does the aptitude training effect transfer to L2  
27 learning? This thought-provoking idea is tested  
28 in this issue by Hayashi, who examines the extent  
29 to which intensive, 5-week working memory train-  
30 ing improves L2 skills. These underresearched,  
31 yet fundamental issues on L2 aptitude may open  
32 new directions for L2 researchers because apti-  
33 tude training could potentially level out individ-  
34 ual differences, for instance, among at-risk and  
35 not-at-risk students in the L2 classroom (Sáfár &  
36 Kormos, 2008; Sparks et al., 1997).

37 Another important issue pertaining to aptitude  
38 concerns a situation-specific view of aptitude. This  
39 view originally comes from a cognitive psychol-  
40 ogist, Richard Snow (1994). His dynamic per-  
41 spectives seek to optimize learning by matching  
42 treatment to person characteristics (Cronbach &  
43 Snow, 1977), and this idea was taken up by L2 re-  
44 searchers, most notably by Peter Robinson, who  
45 underscores the value of catering to individual dif-  
46 ferences such as cognitive aptitudes for design-  
47 ing L2 practice. Following Snow’s view of aptitude,  
48 Robinson (2007) proposed the aptitude complex  
49 hypothesis, which stipulates that multiple apti-  
50 tude components in combination illuminate the  
51 effect of L2 instructional techniques on learning  
52 processes (see, for instance, Suzuki, 2019 for an  
53 empirical study). For example, a combination of  
54 “memory for contingent speech” and “noticing  
55 the gap” represents an aptitude complex for fo-  
56 cus on form via recasts. A case in point, Yilmaz and  
57 Granena in this issue elucidate whether learners’

cognitive aptitudes moderate the effectiveness of  
explicit and implicit feedback during L2 Spanish  
communicative tasks. Yilmaz and Granena show  
that a myriad of aptitude tests from Hi-LAB (Linck  
et al., 2013) and LLAMA (Meara, 2005) differ-  
entially predict the effects of explicit and im-  
plicit corrective feedback on L2 learners’ notic-  
ing and grammatical development. Furthermore,  
Kasprowicz et al. in this issue examine whether  
a major component of aptitude (e.g., language-  
analytic ability) influences the effects of different  
practice distributions.

While aptitude is often narrowly construed as  
cognitive aptitudes in the L2 acquisition litera-  
ture (i.e., cognitive abilities that predict the suc-  
cess of L2 learning), in the psychology litera-  
ture, the word “aptitude,” following Cronbach  
and Snow (1977), is often used to embrace any  
types of abilities that learners possess including  
prior levels of target knowledge as well as affect-  
ive factors (e.g., motivation, personality). Draw-  
ing on this extended view of “aptitude,” Nakata  
and Suzuki in this issue demonstrate how prior  
knowledge of the target grammar (English tense-  
aspect–mood system) influences the effectiveness  
of blocked, interleaved, and increasing (blocking  
followed by interleaving) schedules of grammar  
practice. The findings of the aptitude–treatment  
interaction studies not only provide pedagogical  
implications but also help uncover the cogni-  
tive processes engaged under different practice  
conditions.

#### *Understanding the Learning Processes and Knowledge Learned Through L2 Practice*

The previous sections explore factors pertain-  
ing to L2 practice. The learning processes and  
outcomes of different practice conditions also  
need to be understood from a variety of angles.  
First, research on the effectiveness of L2 prac-  
tice should reveal the learning process or trajec-  
tory, as well as the outcome of practice (Nakata  
& Suzuki, 2019; Suzuki, 2017a). According to the  
desirable difficulty framework in cognitive psy-  
chology (Schmidt & Bjork, 1992; Soderstrom &  
Bjork, 2015), performance level during the prac-  
tice phase does not always predict the retention  
of knowledge and skills over time. In this spe-  
cial issue, Strong and Boers examine how gener-  
ating errors during practice influences the reten-  
tion of vocabulary knowledge. Nakata and Suzuki  
demonstrate that although a demanding learn-  
ing condition leads to poor performance dur-  
ing the practice phase, it yields superior learn-  
ing and retention. Li and DeKeyser also reveal L2

learning trajectories under different practice distributions. Examining performance during the practice phase, as well as on outcome measures, leads to a deeper and richer understanding of the nature of L2 practice.

When it comes to the outcomes of practice, L2 research has developed a significant body of literature on different types of knowledge and skills. The distinction between explicit and implicit knowledge has been one of the central constructs in L2 research (DeKeyser, 2015; Ellis, 2009, 2015; Suzuki & DeKeyser, 2017; Van Patten & Williams, 2015). For practical purposes, this explicit–implicit distinction is largely equivalent to the declarative–procedural distinction (DeKeyser, 2017). The definition of explicit and implicit knowledge primarily concerns consciousness (Reber, 2013; Williams, 2009). When L2 learners are aware of linguistic knowledge, the knowledge is explicit. Declarative knowledge (i.e., knowledge THAT) is primarily explicit in L2 classroom learning in the sense that learners are typically aware of linguistic targets (explicit and declarative) and use their knowledge for practice (declarative knowledge can be considered implicit as in “competence” of universal grammar). Systematic practice leads to more correct and rapid use of their knowledge (i.e., procedural knowledge and/or automatization), and after an extended period of practice, learners may not necessarily be aware of their knowledge any longer (i.e., implicit knowledge). Validation research of measurements to distinguish implicit knowledge from partially automatized (speeded-up) declarative-explicit knowledge that still requires consciousness is still in progress (Suzuki & DeKeyser, 2015; Suzuki, 2017b). It seems fruitful at this point to utilize multiple measures to capture different aspects of procedural-implicit knowledge (e.g., processing speed, lack of awareness), as well as declarative-explicit knowledge.

The declarative–procedural framework permeates this special issue. Li and DeKeyser examine the effects of different practice schedules on the acquisition of declarative and procedural knowledge of L2 pronunciation. They find that the distribution of practice has a robust effect on the acquisition of procedural, but not declarative, knowledge. Similarly, other researchers in this issue utilize multiple assessment tools to gauge differential effects of practice. Aural sentence-picture matching (Kasprowicz et al.) and oral production tasks (Yilmaz and Granena), together with written tests, allow researchers to elucidate how practice influences the development of declarative and procedural knowledge. From

the explicit–implicit vantage point, Kim and Godfroid in this issue triangulate an objective test (grammaticality judgement test) with a subjective measure (source attribution) and verbal reports to capture the explicit and implicit nature of L2 knowledge acquired through integrated practice. Understanding the outcome of practice that emerges from the complex interaction between practice conditions, types of knowledge and even individual difference factors helps to uncover the learning processes that take place during practice and informs L2 classroom instruction (DeKeyser, 2012, 2016; also see the coda article in this issue).

While the current issue focuses largely on cognitive aspects of practice, we zoom out now and highlight the importance of understanding L2 practice from broader perspectives. First, L2 learning is a complex phenomenon intertwined with a myriad of factors beyond cognitive processes. In addition to cognitive aspects of L2 learning, teachers’ and learners’ perceptions of practice, as well as socio-cultural contexts, are essential parts of research into L2 practice. We consider it important to delve into teacher cognition in relation to the current concept of L2 practice, because “language teachers are to fully embrace and enact theoretically consistent instructional practices in the L2 classrooms where they teach” (Johnson, 2018, p. 262, see also thematic issues on teacher cognition in the *Modern Language Journal* [Kubanyiova & Feryok, 2015] and *Language Teaching Research* [Johnson, 2018]).

Second, although the current volume primarily concerns quantitative analysis of the process and outcome of L2 practice, qualitative components, for example, data on teachers’ and learners’ perspectives, can be informative too. As a case in point, Nakata and Suzuki in this issue attempt to gauge learners’ perceptions of blocked and interleaved practice, because cognitive psychologists have revealed that learners often perceive blocked practice to be more effective as they perform better *during* practice, although blocked practice is actually not effective in terms of *retention* of knowledge (Kornell & Bjork, 2008).

Last, there is a critical yet underexplored problem concerning the outcomes of the practice: transfer of learning. Transfer is a familiar concept in everyday life. Sports coaches, for instance, are concerned with whether skills practiced during training can be transferred to actual games. Driving instructors need to know whether learning how to park a car in a particular parking lot helps people park a car in another. Transfer of learning is also an important issue for L2

2 practice and teaching (see James, 2018, for a re-  
3 cent review). In both research and education, we  
4 always need to ask the extent to which learners  
5 can use what they learned through practice to new  
6 skills and/or contexts. Two major questions are  
7 the following: Does practicing one skill such as  
8 listening transfer to the acquisition of other skills  
9 such as reading or speaking (DeKeyser & Sokalski,  
10 1996; Li & DeKeyser, 2017; Suzuki & Sunada,  
11 2019)? Does practicing target structures in a re-  
12 latively controlled, form-focused context facilitate  
13 the more accurate use of the target structures  
14 in less controlled, meaning-focused context (Tuz,  
15 1993)? Successful transfer is considered the holy  
16 grail of L2 practice; future research should delve  
17 into this new territory of L2 research from multi-  
18 ple theoretical frameworks (see, e.g., Spada et al.,  
19 2014 for research testing the transfer appropriate-  
20 processing model on the acquisition of L2  
21 grammar).

## 23 CONCLUSIONS

25 This special issue showcases a collection of em-  
26 pirical studies that are united under the common  
27 theme of applying insights from cognitive psy-  
28 chology to L2 practice. The experiments draw on  
29 a diverse range of L2s (English, Chinese, Span-  
30 ish, German, and French) and linguistic domains  
31 (pronunciation, lexis, and grammar as well as  
32 nonlinguistic abilities such as aptitudes and work-  
33 ing memory). Yet, the targeted domains are still  
34 concentrated on formal linguistic aspects. Other  
35 diverse areas of L2 learning (e.g., pragmatic, soci-  
36 olinguistic, or interactional competence) are be-  
37 yond the scope of this volume. This collection of  
38 empirical research, however, exemplifies a variety  
39 of research designs and provides directions for fu-  
40 ture research.

41 Another significant aspect of this issue is re-  
42 search contexts. The studies reported in this  
43 special issue include those conducted in both  
44 laboratory and classroom contexts. Given the  
45 complexity of real-life classrooms, laboratory-  
46 based research, which allows strict control over a  
47 number of extraneous variables, can help identify  
48 underlying learning processes and principles that  
49 serve as a basis for improving the effectiveness  
50 of L2 practice. The classroom research enables  
51 researchers to examine the effects of practice in  
52 real-life situations and may potentially provide  
53 more direct suggestions for L2 learning and  
54 instruction. The laboratory and classroom studies  
55 reported in this issue will eventually complement  
56 each other when they are integrated with pre-  
57 vious and future research (Horvath et al., 2016;

Hulstijn, 1997), allowing us to isolate factors that  
affect L2 acquisition, while at the same time, pro-  
viding practical guidelines for effective practice.

In conclusion, the studies reported in this  
thematic issue expand on what we already know  
about practice and help us to inform teachers and  
learners about how we can optimize L2 teaching  
and learning for adolescent or young adult learn-  
ers in classroom contexts. To facilitate this, the  
seven empirical articles are followed by a com-  
mentary by Lightbown, which highlights how the  
research findings in the current volume link to  
classroom practice. The coda article by the guest  
editors then summarizes the current findings  
in light of principles from cognitive psychol-  
ogy research as well as theoretical accounts of L2  
learning. Some of the findings reported by studies  
in this issue are not necessarily aligned with those  
in cognitive psychology, probably largely because  
of the complex nature of L2 learning. Evidence  
gained from psychology research using simple  
tasks may not be generalizable to the learning of  
complex skills such as L2 (Wulf & Shea, 2002). We  
call for a more systematic, rigorous, and intensive  
research program that aims to better understand  
L2 practice from cognitive psychology perspec-  
tives, which in return contributes to a better  
understanding of both psychological and SLA  
theories that serve the purpose of maximizing  
the effectiveness of classroom practice.

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## REFERENCES

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- Anderson, J. R. (1993). *Rules of the mind*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Anderson, J. R., Bothell, D., Byrne, M. D., Douglass, S., Lebiere, C., & Qin, Y. (2004). An integrated theory of the mind. *Psychological Review*, 111, 1036–1060.
- Au, J., Sheehan, E., Tsai, N., Duncan, G. J., Buschkuhl, M., & Jaeggi, S. M. (2015). Improving fluid intelligence with training on working memory: A meta-analysis. *Psychonomic Bulletin & Review*, 22, 366–377.
- Barcroft, J. (2007). Effects of opportunities for word retrieval during second language vocabulary learning. *Language Learning*, 57, 35–56.
- Bird, S. (2010). Effects of distributed practice on the acquisition of second language English syntax. *Applied Psycholinguistics*, 31, 635–650.
- Carpenter, S. K., & Mueller, F. E. (2013). The effects of interleaving versus blocking on foreign language pronunciation learning. *Memory & Cognition*, 41, 671–682.
- Carroll, J. B. (1981). Twenty-five years of research on foreign language aptitude. In K. C. Diller (Ed.), *Individual differences and universals in language*

- learning aptitude (pp. 83–118). Rowley, MA: Newbury House.
- Cepeda, N. J., Pashler, H., Vul, E., Wixted, J. T., & Rohrer, D. (2006). Distributed practice in verbal recall tasks: A review and quantitative synthesis. *Psychological Bulletin*, *132*, 354–380.
- Q4 Chalmers, J. (2017). *How stable is second language aptitude? Effects of second language learning and language analysis training on second language aptitude test scores* (Unpublished doctoral dissertation). Griffith University, Australia.
- Cronbach, L. J., & Snow, R. E. (1977). *Aptitudes and instructional methods: A handbook for research on interactions*. New York: Irvington Pub.
- DeKeyser, R. M. (1997). Beyond explicit rule learning. *Studies in Second Language Acquisition*, *19*, 195–221.
- DeKeyser, R. M. (2012). Interactions between individual differences, treatments, and structures in SLA. *Language Learning*, *62*, 189–200.
- DeKeyser, R. M. (2015). Skill acquisition theory. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (2nd ed., pp. 94–112). New York: Routledge.
- DeKeyser, R. M. (2016). Of moving targets and chameleons: Why the concept of difficulty is so hard to pin down. *Studies in Second Language Acquisition*, *38*, 353–363.
- DeKeyser, R. M. (2017). Knowledge and skill in ISLA. In S. Loewen & M. Sato (Eds.), *The Routledge handbook of instructed second language acquisition* (pp. 15–32). New York: Routledge.
- DeKeyser, R. M. (2018). Task repetition for language learning: A perspective from skill acquisition theory. In M. Bygate (Ed.), *Learning language through task repetition* (pp. 27–42). Philadelphia/Amsterdam: John Benjamins Publishing Company.
- DeKeyser, R. M., & Sokalski, K. J. (1996). The differential role of comprehension and production practice. *Language Learning*, *46*, 613–642.
- Elgort, I. (2011). Deliberate learning and vocabulary acquisition in a second language. *Language Learning*, *61*, 367–413.
- Ellis, R. (2003). *Task-based language learning and teaching*. Oxford: Oxford University Press.
- Ellis, R. (2009). Implicit and explicit learning, knowledge and instruction. In R. Ellis, S. Loewen, C. Elder, R. Erlam, J. Philp, & H. Reinders (Eds.), *Implicit and explicit knowledge in second language learning, testing and teaching* (pp. 3–25). Tonawanda, NY: Multilingual Matters.
- Ellis, N. C. (2015). Implicit and explicit language learning: Their dynamic interface and complexity. In P. Rebuschat (Ed.), *Implicit and explicit learning of languages* (pp. 3–24). Philadelphia/Amsterdam: John Benjamins Publishing Company.
- Ellis, N. C., & Wulff, S. (2015). Usage-based approaches to SLA. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (2nd ed., pp. 75–93). New York: Routledge.
- Gatbonton, E., & Segalowitz, N. S. (2005). Rethinking communicative language teaching: A focus on access to fluency. *The Canadian Modern Language Review*, *61*, 325–353.
- Granena, G., Jackson, D. O., & Yilmaz, Y. (2016). *Cognitive individual differences in second language processing and acquisition*. Philadelphia/Amsterdam: John Benjamins Publishing Company.
- Gregg, K. R. (2003). The state of emergentism in second language acquisition. *Second Language Research*, *19*, 95–128.
- Gurzynski-Weiss, L. (2017). *Expanding individual difference research in the interaction approach*. Philadelphia/Amsterdam: John Benjamins Publishing Company.
- Hattie, J., & Yates, G. C. (2013). *Visible learning and the science of how we learn*. New York: Routledge.
- Horvath, J. C., Lodge, J. M., & Hattie, J. (2016). *From the laboratory to the classroom: Translating science of learning for teachers*. New York: Routledge.
- Howatt, A. P. R. (1984). *A history of English language teaching*. Oxford: Oxford University Press.
- Hulstijn, J. H. (1997). Second language acquisition research in the laboratory. *Studies in Second Language Acquisition*, *19*, 131–143.
- James, M. A. (2018). Teaching for transfer of second language learning. *Language Teaching*, *51*, 330–348.
- Johnson, K. (1996). *Language teaching and skill learning*. Oxford, UK: Blackwell Publishers.
- Johnson, K. E. (2018). Studying language teacher cognition: Understanding and enacting theoretically consistent instructional practices. *Language Teaching Research*, *22*, 259–263.
- Kang, S. H. (2016). The benefits of interleaved practice for learning. In J. C. Horvath, J. M. Lodge, & J. Hattie (Eds.), *From the laboratory to the classroom: Translating science of learning for teachers* (pp. 79–93). New York: Routledge.
- Karpicke, J. D., & Roediger, H. L. (2007). Repeated retrieval during learning is the key to long-term retention. *Journal of Memory and Language*, *57*, 151–162.
- Karpicke, J. D., & Roediger, H. L. (2008). The critical importance of retrieval for learning. *Science*, *319*, 966–968.
- Kornell, N., & Bjork, R. A. (2008). Learning concepts and categories: Is spacing the “enemy of induction”? *Psychological Science*, *19*, 585–592.
- Krashen, S. D. (1981). *Second language acquisition and second language learning*. Oxford, UK: Pergamon Press.
- Krashen, S. D. (1982). *Principles and practice in second language acquisition*. Oxford, UK: Pergamon Press.
- Kubanyiova, M., & Feryok, A. (2015). Language teacher cognition in applied linguistics research: Revisiting the territory, redrawing the boundaries, reclaiming the relevance. *Modern Language Journal*, *99*, 435–449.
- Lantolf, J. P. (2011). The sociocultural approach to second language acquisition. In D. Atkinson (Ed.),



- 1 *Yuichi Suzuki et al.* 9
- 2 *Alternative approaches to second language acquisition*  
3 (pp. 24–47). New York: Routledge.
- 4 Li, S. (2010). The effectiveness of corrective feedback in  
5 SLA: A meta-analysis. *Language Learning*, 60, 309–  
6 365.
- 7 Li, M., & DeKeyser, R. M. (2017). Perception prac-  
8 tice, production practice, and musical ability in  
9 L2 Mandarin tone-word learning. *Studies in Second*  
10 *Language Acquisition*, 39, 593–620.
- 11 Li, S., Ellis, R., & Zhu, Y. (2016). Task-based versus task-  
12 supported language instruction: An experimental  
13 study. *Annual Review of Applied Linguistics*, 36, 205–  
14 229.
- 15 Li, S., & Taguchi, N. (2014). The effects of practice  
16 modality on pragmatic development in L2 Chi-  
17 nese. *Modern Language Journal*, 98, 794–812.
- 18 Linck, J. A., Hughes, M. M., Campbell, S. G., Silbert,  
19 N. H., Tare, M., Jackson, S. R., ... Doughty, C. J.  
20 (2013). Hi-LAB: A new measure of aptitude for  
21 high-level language proficiency. *Language Learn-*  
22 *ing*, 63, 530–566.
- 23 Linck, J. A., Osthus, P., Koeth, J. T., & Bunting, M. F.  
24 (2014). Working memory and second language  
25 comprehension and production: A meta-analysis.  
26 *Psychonomic Bulletin & Review*, 21, 861–883.
- 27 Long, M. H. (2015). *Second language acquisition and*  
28 *task-based language teaching*. Oxford, UK: Wiley-  
29 Blackwell.
- 30 Loschky, L., & Bley-Vroman, R. (1990). Creating  
31 structure-based communication tasks for second  
32 language development. *University of Hawai'i Work-*  
33 *ing Papers in English as a Second Language*, 9, 161–  
34 212.
- 35 Lyster, R., & Saito, K. (2010). Oral feedback in class-  
36 room SLA. *Studies in Second Language Acquisition*,  
37 32, 265–302.
- 38 Lyster, R., & Sato, M. (2013). Skill acquisition the-  
39 ory and the role of practice in L2 development.  
40 In M. G. Mayo, J. Gutierrez-Mangado, & M. M.  
41 Adrián (Eds.), *Contemporary approaches to second lan-*  
42 *guage acquisition* (pp. 71–92). Philadelphia/  
43 Amsterdam: John Benjamins Publishing Company.
- 44 McLaughlin, B. (1987). *Theories of second-language learn-*  
45 *ing*. London: Routledge.
- 46 Meara, P. M. (2005). *LLAMA language aptitude tests: The*  
47 *manual*. Swansea, UK: Lognostics. Accessed at  
48 [http://www.lognostics.co.uk/tools/llama/llama\\_](http://www.lognostics.co.uk/tools/llama/llama_manual.pdf)  
49 [manual.pdf](http://www.lognostics.co.uk/tools/llama/llama_manual.pdf)
- 50 Nakata, T. (2015). Effects of expanding and equal spac-  
51 ing on second language vocabulary learning: Does  
52 gradually increasing spacing increase vocabulary  
53 learning? *Studies in Second Language Acquisition*, 37,  
54 677–711.
- 55 Nakata, T. (2017). Does repeated practice make perfect?  
56 The effects of within-session repeated retrieval on  
57 second language vocabulary learning. *Studies in*  
*Second Language Acquisition*, 39, 653–679.
- 58 Nakata, T., & Suzuki, Y. (2019). Effects of massing and  
59 spacing on the learning of semantically related  
60 and unrelated words. *Studies in Second Language Ac-*  
61 *quisition*, 41, 287–311.
- 62 Pan, S. C., Tajrana, J., Loveletta, J., Osuna, J., & Rickard,  
63 T. (2019). Does interleaved practice enhance for-  
64 eign language learning? The effects of training  
65 schedule on Spanish verb conjugation skills. *Jour-*  
66 *nal of Educational Psychology*. Advance online pub-  
67 lication. <https://doi.org/10.1037/edu0000336>
- 68 Politzer, R. L., & Weiss, L. (1971). *Improving achievement*  
69 *in foreign language*. Stanford, CA: The Center for  
70 Curriculum Development.
- 71 Prabhu, N. S. (1987). *Second language pedagogy*. Oxford:  
72 Oxford University Press.
- 73 Reber, A. S. (1967). Implicit learning of artificial gram-  
74 mars. *Journal of Verbal Learning and Verbal Behavior*,  
75 6, 855–863.
- 76 Reber, P. J. (2013). The neural basis of implicit learn-  
77 ing and memory: A review of neuropsychological  
78 and neuroimaging research. *Neuropsychologia*, 51,  
79 2026–2042.
- 80 Rebuschat, P. (2015). *Implicit and explicit learning of lan-*  
81 *guages*. Philadelphia/Amsterdam: John Benjamins  
82 Publishing Company.
- 83 Rogers, J. (2015). Learning second language syntax un-  
84 der massed and distributed conditions. *TESOL*  
85 *Quarterly*, 49, 857–866.
- 86 Rogers, V., Meara, P. M., Barnett-Legh, T., Curry, C., &  
87 Davie, E. (2017). Examining the LLAMA aptitude  
88 tests. *Journal of the European Second Language Assci-*  
89 *ation*, 1, 49–60.
- 90 Rohrer, D., Taylor, K., Pashler, H., Wixted, J. T., &  
91 Cepeda, N. J. (2005). The effect of overlearning  
92 on long-term retention. *Applied Cognitive Psychol-*  
93 *ogy*, 19, 361–374.
- 94 Sáfár, A., & Kormos, J. (2008). Revisiting problems with  
95 foreign language aptitude. *International Review of*  
96 *Applied Linguistics in Language Teaching*, 46, 113–  
97 136.
- 98 Saffran, J. R. (2002). Constraints on statistical language  
99 learning. *Journal of Memory and Language*, 47, 172–  
100 196.
- 101 Sato, R. (2010). Reconsidering the effectiveness and  
102 suitability of PPP and TBLT in the Japanese EFL  
103 classroom. *JALT Journal*, 32, 189–200.
- 104 Sato, M., & Ballinger, S. (2016). *Peer interaction and*  
105 *second language learning: Pedagogical potential and*  
106 *research agenda*. Philadelphia/Amsterdam: John  
107 Benjamins Publishing Company.
- 108 Schmidt, R. A., & Bjork, R. A. (1992). New conceptual-  
109 izations of practice: Common principles in three  
110 paradigms suggest new concepts for training. *Psy-*  
111 *chological Science*, 3, 207–217.
- 112 Serrano, R., & Huang, H. Y. (2018). Learning vocabu-  
113 lary through assisted repeated reading: How  
114 much time should there be between repetitions  
115 of the same text? *TESOL Quarterly*, 52, 971–  
116 994.
- 117 Shintani, N. (2015). The effectiveness of processing in-  
118 struction and production-based instruction on L2  
119 grammar acquisition: A meta-analysis. *Applied Lin-*  
120 *guistics*, 36, 306–325.
- 121 Shintani, N., Li, S., & Ellis, R. (2013). Comprehension-  
122 based versus production-based grammar

Q5

Q6

- instruction: A meta-analysis of comparative studies. *Language Learning*, 63, 296–329.
- Skehan, P. (1989). *Individual differences in second language learning*. London: Edward Arnold.
- Snow, R. E. (1987). Aptitude complexes. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning and instruction* (pp. 13–59). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Snow, R. E. (1991). Aptitude-treatment interaction as a framework for research on individual differences in psychotherapy. *Journal of Consulting and Clinical Psychology*, 59, 205–216.
- Snow, R. E. (1994). Abilities in academic tasks. In R. J. Sternberg & R. K. Wagner (Eds.), *Mind in context: Interactionist perspectives on human intelligence* (pp. 3–37). Cambridge: Cambridge University Press.
- Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance an integrative review. *Perspectives on Psychological Science*, 10, 176–199.
- Soveri, A., Antfolk, J., Karlsson, L., Salo, B., & Laine, M. (2017). Working memory training revisited: A multi-level meta-analysis of n-back training studies. *Psychonomic Bulletin & Review*, 24, 1077–1096.
- Sparks, R. L., Ganschow, L., Artzer, M., & Patton, J. (1997). Foreign language proficiency of at-risk and not-at-risk learners over 2 years of foreign language instruction. *Journal of Learning Disabilities*, 30, 92–98.
- Storch, N. (2013). *Collaborative writing in L2 classrooms*. Bristol, UK: Multilingual Matters.
- Suzuki, Y. (2017a). The optimal distribution of practice for the acquisition of L2 morphology: A conceptual replication and extension. *Language Learning*, 67, 512–545.
- Suzuki, Y. (2017b). Validity of new measures of implicit knowledge: Distinguishing implicit knowledge from automatized explicit knowledge. *Applied Psycholinguistics*, 38, 1229–1261.
- Suzuki, Y. (2018). The role of procedural learning ability in automatization of L2 morphology under different learning schedules: An exploratory study. *Studies in Second Language Acquisition*, 40, 923–937.
- Suzuki, Y. (2019). Individualization of practice distribution in second language grammar learning: A role of metalinguistic rule rehearsal ability and working memory capacity. *Journal of Second Language Studies*.
- Suzuki, Y., & DeKeyser, R. M. (2015). Comparing elicited imitation and word monitoring as measures of implicit knowledge. *Language Learning*, 65, 860–895.
- Suzuki, Y., & DeKeyser, R. M. (2017). The interface of explicit and implicit knowledge in a second language: Insights from individual differences in cognitive aptitudes. *Language Learning*, 67, 747–790.
- Suzuki, Y., & Sunada, M. (2019). Dynamic interplay between practice type and practice schedule in a second language: The potential and limits of skill transfer and practice schedule. *Studies in Second Language Acquisition*.
- Taylor, K., & Rohrer, D. (2010). The effects of interleaved practice. *Applied Cognitive Psychology*, 24, 837–848.
- Tuz, E. (1993). From controlled practice to communicative ability: Does training transfer? *Temple University Japan Research Studies in TESOL*, 1, 97–108.
- Ullman, M. T. (2015). The declarative/procedural model: A neurobiologically-motivated theory of first and second language. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (2nd ed., pp. 135–158). New York: Routledge.
- VanPatten, B. (2003). *From input to output: A teacher's guide to second language acquisition*. New York: McGraw-Hill.
- VanPatten, B., & Williams, J. (2015). *Theories in second language acquisition: An introduction* (2nd ed.). New York: Routledge.
- Wen, Z., Biedroń, A., & Skehan, P. (2017). Foreign language aptitude theory: Yesterday, today and tomorrow. *Language Teaching*, 50, 1–31.
- Wen, Z., Mota, M. B., & McNeill, A. (2016). *Working memory and second language learning: Towards an integrated approach*. Bristol, UK: Multilingual Matters.
- Wen, Z. E., Skehan, P., Biedroń, A., Li, S., & Sparks, R. L. (2019). *Language aptitude: Advancing theory, testing, research and practice*. New York: Routledge.
- White, L. (2015). Linguistic theory, universal grammar, and second language acquisition. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (2nd ed., pp. 34–53). New York: Routledge.
- Williams, J. N. (2009). Implicit learning in second language acquisition. In W. C. Ritchie & T. K. Bhatia (Eds.), *The new handbook of second language acquisition* (pp. 319–353). Bingley, UK: Emerald Group Publishing.
- Wulf, G., & Shea, C. H. (2002). Principles derived from the study of simple skills do not generalize to complex skill learning. *Psychonomic Bulletin & Review*, 9, 185–211.