Please cite as:

Suzuki, Y., Nakata, T., & Rogers, J. (2023). Optimizing input and intake processing: A role for practice and explicit learning. I n Y. Suzuki (Ed.), Practice and automatization in second language research: Perspectives from skill acquisition theory and cognitive psychology (pp. 39-62). New York, NY: Routledge.

https://www.taylorfrancis.com/chapters/edit/10.4324/9781003414643-3/optimizing-input-intake-processing-yuichi-suzuki-tatsuya-nakata-john-rogers?context=ubx&refId=e77ed740-3057-40e0-83ea-8bb185506d89

Chapter 2. Optimizing input and intake processing: A role for practice and explicit learning

Yuichi Suzuki, Tatsuya Nakata, and John Rogers

Abstract

We discuss receptive and semi-productive (as opposed to open, communicative) practice that aims at optimizing second language (L2) input and intake processing mechanisms. A variety of L2 learning activities are categorized as isolated (e.g., deliberate word learning), guided (e.g., processing instruction, guided induction), and contextualized practice (e.g., reading aloud, shadowing, dictation/dictogloss). In order to examine the potential and limits of these practice activities in automatization, the extant body of empirical work is reviewed with the focus on explicit learning mechanisms. Consequently, we highlight the beneficial roles of deliberate memorization, guided instruction, noticing, hypothesis testing, explicit instruction, reconstruction, imitation, feedback, and monitoring of their own performance. We argue that the quantity of practice, as well as timing of practice variables (i.e., repetition, instruction, and feedback), plays a pivotal role in developing robust L2 knowledge and skills.

Introduction

This chapter aims at situating the concept of practice, targeting input and intake processing. Input and intake are considered as the two initial stages of L2 learning from [Input > Intake > L2 Knowledge Representation > Output] (e.g., Leow, 2015). Input is aural and/or written language that is processed by learners. Intake presumably consists of two different components (Chaudron, 1985): (a) preliminary intake, which is a subset of input that is attended to by learners, preceding any substantial learning, and (b) final intake, which is the linguistic information or exemplars to be encoded into the learner's developing grammar. Some portion of final intake is integrated with L2 knowledge (e.g., phonological, lexical, syntactic, pragmatic), which is the L2-specific linguistic resources available for production.

Input and intake processing are critical components for L2 learning. Given their receptive nature, input and intake processing are linked to L2 reading and listening skills. These receptive skills need to be learned to the extent that they are executed efficiently (automatically). Achieving automaticity is an enormous undertaking, necessitating extensive reading and listening experience. While the quantity of input is necessary, it is essential to consider the quality of input processing and the ways in which learners develop their accurate (target-like) and efficient input processing skills. For instance, declarative knowledge about specific aspects of the L2 is often instrumental in prompting learners to move away from incorrect processing strategies (e.g., McManus & Marsden, 2019).

To that end, practice highlighted in this chapter includes a host of activities that aim at (a) optimizing input processing mechanisms and (b) maximizing the (final) intake of linguistic exemplars and rules. Although the kinds of practice primarily covered in this chapter focus on receptive modes of L2 processing, some types of practice involve a form of semi-productive retrieval practice (e.g., reconstructing the text from memory). Input and intake processing should be seen as an integrated part of the input ⇔ intake ⇔ output stages of L2 learning (e.g., Leow, 2015). As these stages are interconnected and bidirectional, one component influences another. For instance, foreknowledge of an upcoming output activity may result in learners altering their input processing behaviors (Foster & Skehan, 2013). For example, when learners know they are going to be asked to engage in an output activity such as retelling the reading content, they may change their input processing behaviors during reading and pay more attention to linguistic forms (Yoshimura, 2006). Given that input–intake– output stages are tightly interlinked, this chapter includes semi-productive practice such as retelling, dictation, reading aloud, and

shadowing. These activities differ from more "free" or "communicative" practice where learners generate their own ideas and opinions using their own linguistic knowledge primarily (see Sato, this volume). The types of practice in focus here require the use and integration of a learner's own linguistic knowledge and linguistic exemplars (e.g., phonemes, single words, multi-word expressions, and sentences) embedded in loosely pre-specified passages (e.g., a model text is provided in a dictogloss task).

The practice activities reviewed in this chapter are all "deliberate" and "systematic" in the sense that they aim to expand and fine-tune learners' declarative and procedural knowledge to achieve automaticity. They do so through explicit learning mechanisms and instructional techniques. Including deliberate memorization, guided instruction, noticing, hypothesis testing, explicit instruction, reconstruction, imitation, feedback, and monitoring of their own performance. This stands in contrast to meaning-focused and/ or incidental learning (i.e., processing input for meaning without deliberate intention to learn specific linguistic forms, including phonology, vocabulary, and grammar), such as extensive reading or listening.

While acknowledging the importance of incidental learning through meaningful input (Nation & Newton, 2009), this chapter focuses on more systematic practice activities to promote input–intake processing. Because many practical constraints (e.g., class hours) present in typical classroom settings might not afford sufficient time for L2 acquisition solely from incidental learning, our scope of review is hopefully useful to evaluate the potential and limitations of more explicit, systematic components in L2 learning (e.g., Leow, 2015).

Practice for Input and Intake Processing and Empirical Evidence

This section reviews different ways in which practice activities can be implemented to facilitate input and intake processing. We examine the evidence from the perspective of explicit learning with a specific focus on three issues: (a) the role of deliberate memorization in automatization; (b) how explicitly guided practice facilitates the acquisition of complex linguistic features; and (c) how contextualized practice draws on cognitive processes (e.g., reconstruction, imitation, and monitoring) to fine-tune L2 knowledge.

Isolated Practice: Deliberate Memorization

Isolated practice focuses on developing a specific skill or knowledge. The examples in this section do so with the aim of promoting the final intake of linguistic constructions such as single words and multi-word expressions. They are characterized

as deliberate, in the form of rote memorization with feedback. Isolated practice may be especially beneficial for beginner-level learners who have relatively few linguistic resources at their disposal. Without sufficient declarative knowledge (e.g., lexical knowledge, basic knowledge about grammar structures), input may not be comprehended or processed for intake. Isolated practice is also relatively easily applicable for self-study and can be applied to technology (e.g., computer programs and smartphone apps) to optimize vocabulary learning (see Ruiz et al., this volume).

In a synthesis of language-focused practice research, Boers (2021) illustrated that small instructional changes concerning deliberate practice impact the learning and retention of declarative, lexical knowledge. The techniques include promoting L1–L2 contrasts (e.g., *do your homework* is literally translated into make your homework in Dutch), visualization of abstract meaning of words and phrases (e.g., linking the prepositional meaning such as *in*, *on*, *at* with pictures), and attending to phonological repetition of words (e.g., *beer* belly; see Chapter 7 in Boers, 2021, for more details).

While the extant studies of isolated, deliberate practice tend to examine the acquisition of declarative knowledge as the outcome, an important question in the field is the extent to which such deliberate practice leads to automatization. Evidence suggests that deliberate practice does result in the final intake and further consolidation of robust L2 knowledge (e.g., automaticity), provided that learners engage in sufficient practice. In one of the most cited studies on deliberate practice, Elgort (2011) examined the role of deliberate practice (i.e., using flashcards to learn new L2 [pseudo]words with L2 English definitions) on the development of automatized L2 lexical knowledge. Using a priming lexical decision task as a measure of automaticity, her study demonstrated that deliberate practice results in high-quality lexical knowledge that can be deployed automatically for word recognition and input processing. In a replication study of Elgort (2011), Elgort and Piasecki (2014) changed the deliberate practice format from L2 word–L2 definition flashcards to bilingual flashcards (L2–L1), which presumably reduced the difficulty (and/or possibly changed the nature) of retrieval practice. Interestingly, the findings indicate that deliberate practice using L2–L1 flashcards resulted in automaticity only among more proficient L2 learners. Because proficient learners have established high-quality L2 lexical representations, they may be more likely to integrate the semantic features of newly learned words from the L2–L1 flashcards into their L2 lexicon. Pedagogically speaking, this poses a dilemma because L2–L1 flashcard vocabulary practice may not necessarily be useful to develop robust lexical knowledge for beginner L2 learners, who are more likely to use L2–L1 flashcards than advanced learners.

In a more recent study, Obermeier and Elgort (2021) compared the effectiveness

of deliberate and contextual learning of L2 idioms (e.g., *once in a blue moon*) on real-time sentence processing. English learners at a Japanese university studied 36 target idioms in either a contextual learning condition, where they read the idioms embedded in short texts, or in a deliberate learning condition, where they used flashcards to study the idioms with their English definitions. Results showed that deliberate practice was more beneficial than contextualized learning on not only the acquisition of declarative knowledge (measured by a translation test) but also the development of more automatic word-to-text integration processes during reading (measured by a self-paced reading task). The authors conjecture that deliberate practice encouraged chunking or whole processing of idioms and was useful for learners with limited proficiency.

Guided Practice: The Roles of Explicit Information and Declarative Knowledge

We discuss how declarative knowledge (e.g., pedagogical grammar rules provided via explicit instruction) can best be integrated to input processing. Processing instruction (PI) is a pedagogical intervention that aims to influence the manner in which learners process input (e.g., VanPatten, 2004). PI consists of three key components (Marsden & Chen, 2011): explicit instruction, referential activities, and affective activities (referential activities and affective activities are sometimes grouped together as *structured input activities*). First, learners are provided with explicit information about a particular linguistic form, including any incorrect processing strategies that may lead them to process the input incorrectly (e.g., the first noun is not an agent in English passive sentences). Second, learners are given referential activities that represent intentional practice in which the input has been manipulated to guide learners toward correct form–meaning mappings, away from the use of incorrect processing strategies. Third, learners are provided with affective activities in which they must, for example, express their opinion about sentences in which the target forms have been embedded. Here, we focus on the first two components of PI, explicit instruction and referential activities, as these represent deliberate and systematic practice for creating form–meaning connections (see Marsden & Chen, 2011, for discussion).

A number of studies have set out to disentangle the effects of explicit information on input processing by comparing structured input activities with and without being preceded by explicit information. Early research (e.g., Benati, 2004; VanPatten & Oikkenon, 1996) has provided some support for structured input activities as standalone activities (i.e., without explicit information) with the finding that explicit information was neither necessary nor facilitative for learning. However, more recent studies, some utilizing reaction-time and eye-tracking methods, have painted a more nuanced picture

(for a review, see DeKeyser & Prieto Botana, 2015). This body of research suggests that, for relatively simple structures, structured input alone may be sufficient for learners to induce the grammatical rules easily, thus allowing for declarative knowledge to develop and then become proceduralized (and possibly further automatized) from the remaining structured input practice. Although the provision of explicit information may still have a facilitative effect for simple structures, in the case of more complex linguistic structures, explicit information may be essential as the target rules are unlikely to be induced by learners from input alone (e.g., Fernández, 2008; Henry et al., 2009; Prieto Botana & DeKeyser, 2019).

The extent to which linguistic rules can be induced by learners, and whether the act of induction is beneficial for L2 development, has been examined in a body of research comparing two common pedagogical approaches: (a) deductive instruction (DI) and (b) guided induction (GI). In DI, the rules are presented first, followed by examples of language that exemplify the rule, whereas GI is a form of inductive learning in which teachers help learners by, for example, asking guiding questions with the aim of promoting noticing and raising metalinguistic awareness. An exemplary study by Cerezo et al. (2016) compared the effectiveness of GI versus DI on the learning of L2 grammar (Spanish gustar structures) via an educational video game. Think-aloud protocols were also used in this study to examine learners' online cognitive processes. The results indicated that the GI condition led to deeper processing. Further, the GI condition showed greater long-term learning gains compared to the DI condition. The superiority of GI might be attributable to the deeper process of generating metalinguistic knowledge (e.g., rule formulation) leading to more elaborated declarative knowledge that may be robust over time. However, this benefit of GI may be limited to the cases in which learners possess high language analytic ability (Erlam, 2005).

Martin et al. (2019) compared the differential effects of processing instruction (PI) versus guided induction (GI) on a complex L2 structure (Spanish accusative clitics). The results of this study indicated differential effects of the two forms of practice at immediate testing, with the PI group outperforming the GI group on interpretation tasks, but the GI group outperforming the PI group on translation tasks. The results of think-aloud protocols revealed a deeper level of processing (e.g., hypothesis testing and rule formulation) in the GI condition. Though speculative, it appears that the PI condition may have promoted learners' ability to interpret the target structures, potentially as a result of the nature of the practice afforded by this experimental condition. In contrast, the GI condition led to deeper processing and better understanding of the underlying rule, which manifested in significantly higher performance on translation tasks, suggesting that self-

generated declarative knowledge may differ qualitatively from declarative knowledge that is explicitly taught. Furthermore, Toth's (2022) longitudinal research project of L2 Spanish grammar acquisition in US high schools highlights the importance of the teacher's role in systematically guiding learners to making sense of grammatical rules (otherwise, some learners without the teacher's guidance may not reach sufficient understanding of the target language functions). This higher-quality declarative knowledge, combined with judicious and continued teacher support, may allow the learners to direct their attention to relevant form–meaning relationships during L2 practice, which can pave the way to automatize their knowledge during subsequent communicative activities.

Taken as a whole, results from studies examining the effects of PI, DI, and GI suggest that these interventions have differential effects on learners' input processing and subsequent L2 development. Further, these studies may point to the different nature of declarative knowledge (e.g., teacher-provided before practice vs. self-generated during practice; see "Support Timing" section) on subsequent L2 development, the roles of which may merit further investigation for the acquisition of different types of linguistic structures.

Contextualized practice: Reconstruction, Imitation, Feedback, and Monitoring

Contextualized practice aims to expand and fine-tune L2 knowledge and skills while processing the rich input found in spoken or written texts. Representative contextualized practice activities are the retelling of texts such as narrative stories (Nguyen & Boers, 2019), reading aloud (Ding, 2007), shadowing (Hamada & Suzuki, 2022; Kadota, 2019), and dictation/dictogloss (Nation & Newton, 2009). These contextualized practice activities contribute to the 9781032539904_pi-282.indd 44 16-Jun-23 4.32.18 PM Optimizing Input and Intake Processing 45 development and fine-tuning of L2 knowledge and input/intake processing skills in two ways.1 First, model passages provide contextualized input consisting of holistic target language at all levels of the discourse. Reconstruction of the model passage through dictogloss, for instance, requires the integrated practice of listening and writing (sub)skills such as decoding of words and phrases, sound–spelling matching, morphosyntactic processing, etc. It further promotes various cognitive processes such as noticing of lexical items and grammatical constructions embedded in the passage (Timmis, 2018). In a different combination of reading/listening and speaking skills, research evidence suggests that retelling a story text allows learners to "mine" the input text for linguistic items (e.g., formulaic sequences) to improve their speaking skills (Hoang & Boers, 2016). Second, focused practice can

provide opportunities for learners to identify areas in need of further improvement. To notice those weak points (gaps in knowledge and/or subskills), deliberate self-monitoring and corrective feedback can be beneficial. For instance, having learners check recordings of their own reading aloud performance as well as provision of teachers' corrective feedback has been found to promote monitoring and sustained performance improvement (Wong & Shintani, 2021).

We take up shadowing, which is rarely discussed in the instructed SLA literature, as an example of contextualized practice for input–intake processing. It is an aural–oral imitation task in which learners listen to a recording of a text passage and, while listening, repeat the auditory sentences simultaneously until they can closely imitate the input passage in terms of segmental and suprasegmental pronunciation features. The deliberate and systematic engagement of shadowing has been shown to improve L2 listening/speaking subskills such as phoneme perception and pronunciation (Hamada & Suzuki, 2022; Kadota, 2019). In a study by Foote and McDonough (2017), L2 English learners in Canada engaged in self-directed shadowing practice over 8 weeks. Audio materials were (only sound) dialogues from popular sitcoms (e.g., *Friends*, *The Big Bang Theory*, *How I Met Your Mother*). They practiced at least four times per week for a minimum of ten minutes each time and recorded themselves while shadowing. Not just their shadowing performance improved after their self-directed study; their spontaneous speaking task performance (i.e., picture story narrative) also improved in terms of comprehensibility and fluency. Participants gradually became positive about the shadowing activities toward the end of the study. At the same time, they requested more variety of materials such that they could choose gradually more difficult dialogues by themselves.

Some Considerations for Explicit Learning

Although the previous review was not exhaustive, there is a wide range of practice activities that promote input and intake processing. Improvement of performance on these kinds of practice activities (e.g., remembering the meaning of many L2 words) is not the ultimate goal of L2 learning, of course. Practice, of this type and others, is a necessary means to an end, which is to acquire the target, desired L2 (sub)skills. Therefore, it is important for learners to understand that they engage in the focused practice activities with real goals and purposes in mind.

The kinds of receptive and semi-productive practice activities highlighted in the previous sections are intentional, utilizing explicit learning mechanisms to efficiently learn robust L2 knowledge. The knowledge acquired via these explicit learning

mechanisms, in particular automatized knowledge, might also promote subsequent learning, including via *incidental* learning. Increased automatization presumably frees up attentional resources that learners might draw upon to notice and attend to lexical and grammatical form in the input. For instance, Elgort and Warren (2014) demonstrated that automaticity in lexical processing contributes as an individual difference factor in moderating the effectiveness of incidental vocabulary learning. They examined incidental learning gains as a result of reading several chapters from a nonfiction book. The results of the study indicated that learners who began the study with more automatized lexical processing skills benefited more from repeated exposure. This finding can be viewed, firstly, as a "Matthew Effect" (Murphy et al., 2021) in that there is a cumulative advantage for learners with stronger lexical processing skills already in place. This underscores the importance of underlying knowledge that supports reading and listening comprehension. For learners without such robust knowledge, the kind of activities reviewed in this chapter (e.g., deliberate memorization) might allow them to engage in future incidental learning more effectively. Explicit learning and any other types of learning, including incidental learning, are never a zero-sum game in reality.

Another potential criticism toward some of the activities in this chapter (e.g., reading aloud, shadowing) may be levied against their "repetitiveness." It is thus important to consider how we can sustain learners' motivation and engagement during repeated practice. It is crucial to examine whether learners see systematic repetition as a beneficial means or just mindless routine work. Evidence suggests that learners do appreciate repeated engagement of practice for fine-turning their L2 skills, but it takes an extended period of time (e.g., one semester) until learners' perception toward repeated practice (e.g., shadowing) tends to become more positive (Foote & McDonough, 2017; Martinsen et al., 2017). Researchers (and practitioners!) should take great care about the fact that excessive repetition can easily be detrimental for engagement and motivation, which, though often discussed anecdotally, is rarely examined empirically in the context of systematic L2 practice in real classrooms. In order to further our understanding of systematic practice in L2 teaching, we need a more comprehensive, socio-cognitive-affective approach to investigate multifaceted dimensions of systematic practice in real classrooms.

Principles of Effective Practice

As highlighted by Suzuki (this volume), timing is a crucial factor for maximizing the effects of systematic practice for fine-tuning L2 knowledge and skills. In this section, we provide an in-depth review on (a) how timing influences L2 learning because it affects

input and intake processing, particularly when learners engage in repeated practice and (b) how explicit learning mechanisms are utilized. We first review how L2 learning can be enhanced by manipulating distribution of practice. Second, the effects of linguistic support timing can be examined. Last, research on feedback timing is reviewed.

Practice Distribution

Studies in cognitive psychology have reliably shown that introducing temporal spacing between practice opportunities, as opposed to massing them, increases learning, a phenomenon known as the spacing effect or, more broadly, distributed practice effect (Cepeda et al., 2006). This vast body of research has uncovered a number of key findings about the nature of the practice distribution effects on learning, most notably a relationship between the amount of time between training sessions and how long information is subsequently retained (for a full review of such issues, see Wiseheart et al., 2019).

However, with regard to L2 learning, findings across the instructed SLA literature have been mixed across different linguistic domains, including pronunciation, vocabulary, and grammar, leading a growing number of L2 researchers to start exploring the generalizability of cognitive psychology research findings to SLA (Serrano, 2022; Suzuki, 2021) and the replicability of previous L2 research findings (Rogers, 2021). Here, we provide a focused discussion on the emerging patterns of findings that practice distribution effects in L2 learning may depend on a number of factors related to both the product and process of learning, including whether the learners develop declarative or procedural knowledge, as well as whether the learning process brings about (un-)desirable difficulties in learning.

To understand the mechanisms underlying practice distribution effects, skill acquisition and retention theories offer a useful theoretical vantage point (DeKeyser, 2020; Kim et al., 2013). Empirical L2 research has suggested that the optimal practice distribution may be influenced by the type of knowledge and skills being targeted. For the acquisition of declarative knowledge, a number of studies have found longer spacing to be more effective (e.g., Bird, 2010, Nakata, 2015a, Nakata & Suzuki, 2019; Rogers, 2015). In contrast, for the acquisition of procedural/automatized knowledge, some studies have also indicated that shorter spacing is sometimes effective (e.g., Li & DeKeyser, 2019; Suzuki, 2017a). This is in part due to the nature of procedural knowledge development, which takes more practice to develop in comparison to declarative knowledge, which is typically acquired following brief periods of practice. Massed and/ or shorter-spaced practice may be more beneficial for procedural

knowledge development in that they allow for greater amounts of practice over a shorter period of time. In contrast, given the relatively short training interventions common in the majority of SLA research, longer-spaced conditions may not provide sufficient practice at the initial stages of learning to establish procedural knowledge that is robust against the effects of time.

According to the desirable difficulty framework, a learning condition that induces the right amount of difficulty leads to superior long-term retention (Bjork, 1994; Suzuki et al., 2019). Although increasing temporal spacing between practice initially increases learning (because longer spacing leads to desirable difficulty), after a certain point, shorter spacing may be more effective than longer spacing (because when spacing is too long, training will be undesirably difficult, for instance in the case whether the target information has been forgotten). Furthermore, individual difference factors such as L2 proficiency (Serfaty & Serrano, 2022) and cognitive aptitudes such as language analytic ability and working memory (Suzuki & DeKeyser, 2017) interact with the difficulty of the practice task at hand; hence, the optimal practice distribution should be determined by learner-related and other (e.g., linguistic) factors.

Methodologically, learning difficulty should be assessed via multiple ways (Rogers & Leow, 2020). For instance, L2 distributed practice research has utilized subjective judgments of learning difficulty after learning (Nakata & Suzuki, 2019) and objective tests administered over several time points during the learning phase (Suzuki, 2017a). These retrospective data also need to be triangulated with concurrent processing measures such as think-aloud protocols, reaction times, or eye-tracking techniques (Koval, 2019). Future research with methodological rigor in these aspects offers important insights into *why* one practice timing is (or isn't) more beneficial than other(s).

The level of learning difficulty induced by spacing may also interact with the level of learning achieved during the training stage (e.g., declarative–procedural–automatization). Cognitive psychology research suggests that developing robust declarative knowledge through a high amount of training at the *initial* stage is critical for retention (Rawson & Dunlosky, 2011). If declarative knowledge is more firmly established in the early stages of learning, the effects of longerspaced practice may become more durable (Toppino et al., 2018). As delineated earlier, procedural knowledge may, in some instances, also initially benefit more from shorter-spaced conditions. Taken together, the tentative evidence suggests that it is important to establish declarative and (incipient) procedural knowledge in the earlier stages of learning, although importantly, the amount of practice needed may differ greatly for

these two types of knowledge.

With a recent surge of interest in the spacing effect in L2 research uncovering a number of outstanding issues, further investigations should be conducted, with some theoretical guidance covered in this section. The previous studies examined in this review reflect the research trend of studying the effects of vocabulary and grammar practice in somewhat decontextualized forms. It is thus important to extend L2 distributed practice research to skill-based, contextualized practice involving reading (Namaziandost et al., 2018; Serrano & Huang, 2021) and listening skill development (McBride, 2011). Furthermore, extant L2 research to date tends to examine the different time distributions within a single lesson or across several lessons, which still limits our understanding of how practice distribution impacts L2 learning outcomes at the curriculum level (see Marsden & Hawkes, this volume, for discussion). There is a long history of curricularlevel research on practice distribution (see Serrano, 2022, for a review). One such study was conducted by Serrano et al. (2015), who demonstrated that an intensive foreign language program (110 hours distributed over 1 month) is more effective in developing speaking skills (assessed via formulaic language use) than a regular program (110 hours over 7 months) for intermediate learners than beginner or advanced learners. This suggests intensive practice might have been most effective to push intermediate learners to proceduralize their skills, as they had sufficient declarative knowledge compared to beginner learners and more room for proceduralization than advanced learners. Such findings are in line with curricular-level spacing studies that have honed in on the effects of spacing on L2 fluency development (French et al., 2020). Given these findings, skill acquisition theory may offer a useful lens to study larger program-level research on practice distribution.

Support Timing

The relative timing that language-focused support (e.g., word glosses or metalinguistic explicit information about grammatical structures) is provided has been shown to influence learning outcomes as a result of practice. For instance, vocabulary support provided *before* (e.g., Pellicer-Sánchez et al., 2022), during (e.g., Yanagisawa et al., 2020), and *after* reading a text (Min, 2008) has all been found to increase vocabulary learning.

Vocabulary support provided before, during, or after practice presumably differentially influences lexical learning processes and facilitates learning to varying degrees. Pre-teaching vocabulary influences attentional processes during reading. This process has been described by Schmidt (2001) as “preparatory attention” (p. 14) in that it

relates to a form of attention subject to voluntary control and of high pedagogical relevance in that "a great deal of language teaching practice is founded on the premise that learners can attend to different aspects of the target language and that one of the important functions of teaching is to help focus learners' attention" (Schmidt, 2001, p. 14). As a case in point, Pellicer-Sánchez et al. (2022) compared the effects of a pre-reading instruction condition (where L2 learners received explicit instruction on six new words before reading a passage) and reading-only condition (where L2 learners read a passage without pre-teaching). Eye-movement data suggested that pre-reading vocabulary instruction functioned as an *attention-drawing technique* and increased initial attention to target words, resulting in more vocabulary learning. Despite an increased interest in the role of vocabulary support in L2 comprehension, the relative effectiveness of different timing is not yet clear, due to the dearth of empirical work that compared the three timings in a single study design.

There is also a growing number of studies that examined the effects of explicit grammar instruction timing. In instructed SLA research, explicit instruction is typically provided *before* practice activities (Goo et al., 2015; Norris & Ortega, 2000; Spada & Tomita, 2010). As in the case of the PI literature reviewed earlier, pre-practice explicit instruction does not always have additional benefits over and above what is gained from task-essential practice where a target grammatical form needs to be processed to complete a given task (e.g., Stafford et al., 2012). It may well be plausible that the instruction provided during and/ or after practice has unique benefits on L2 grammar learning.

A few empirical studies have systematically investigated the effects of explicit instruction timing. Shintani (2017) suggested that the optimal timing of explicit instruction may be moderated by levels of prior knowledge. She compared the effects of timing of explicit information to be provided before, during, or after grammar practice. The target structure was the English pastcounterfactual conditional (e.g., *If I had left 10 minutes earlier, I would have caught the last train*), which was embedded in text passages and practiced through a dictogloss task. Findings suggest that for participants with no or little prior knowledge of the target structure, pre-practice instruction was more effective than post-practice instruction. This suggests that accessing explicit knowledge prior to the dictogloss task facilitated proceduralization. For participants with some prior knowledge of the target structure, in contrast, post-practice and during-practice instruction were more effective than pre-practice instruction. These learners might have benefited from the delayed language support, because they first used the target linguistic form and then noticed the gap between their output and the correct form, possibly promoting monitoring of their own knowledge during practice.

A recent study by Khezrlou (2021) further compared the three timings of explicit instruction (before, before + during, after) for the acquisition of English passive construction via a dictogloss task. The participants were adult Iranian EFL learners who partially had prior knowledge of the passive structure. The results indicated that the learners who accessed the explicit information during the dictogloss task showed the largest improvement in accuracy of the target structure. This suggests that accessing explicit information *during* practice helped learners to monitor their accurate use of the passive construction. However, provision of explicit information during practice resulted in the least fluency development (i.e., the number of words produced per minute). Possibly, the provision of explicit information during the text reconstruction could have overloaded learners' working memory and disrupted the fluent generation of text. Timing of instruction presumably influences not only accuracy but also fluency and complexity of linguistic production. These putative trade-off effects of instruction timing on complexity, accuracy, and fluency need to be examined in relation to individual difference factors such as working memory.

Taken together, the evidence suggests that the timing of providing linguistic support plays a role in promoting explicit learning processes. Given a dearth of research in this domain, more research is clearly needed to better understand the roles of explicit instructional timing in relation to several key factors, including L2 proficiency, types of grammatical structures, and levels of prior knowledge.

Feedback Timing

Feedback is defined as information regarding learners' performance. It promotes learning and retention of knowledge particularly in isolated, deliberate practice (e.g., learning of L2 words using flashcard software). Studies suggest that the timing of feedback (i.e., immediate vs. delayed feedback) may affect learning. Although immediate feedback is more common than delayed feedback (Karpicke et al., 2009), some non-L2 studies indicate that delaying feedback may enhance retention of L1 vocabulary or prose passages (e.g., Butler et al., 2007; Metcalfe et al., 2009). L2 vocabulary studies, however, have produced mixed results regarding the benefits of delaying feedback (Karpicke et al., 2009; Nakata, 2015b).

In a study conducted by Karpicke et al. (2009), 39 American college students learned 24 Swahili–English word pairs under immediate and delayed feedback conditions. In the immediate feedback condition, the correct answers were provided immediately after each trial, whereas in the delayed feedback condition, the correct answers were

provided after all items were practiced. One-week delayed posttest results showed the advantage of the delayed over immediate feedback. Results of their study, however, may be partly due to the fact that delayed feedback occurred closer to the posttest than immediate feedback. To address this limitation, Nakata (2015b) added the final review to both immediate and delayed feedback conditions, where all target items were presented one at a time at the end of the training phase, thus equating the intervals between the last exposure to the target items and posttest. Immediate and 1-week delayed posttest results showed no statistically significant difference in posttest scores between the two feedback conditions. Nakata's findings suggest that the advantage of delayed over immediate feedback in the earlier studies may be partly due to differential lag to test (i.e., delayed feedback occurs closer to the posttest than immediate feedback), rather than feedback timing per se. In sum, because most L2 studies on feedback timing so far have examined computer-based vocabulary learning, further feedback research examining the learning of other aspects of grammar and pronunciation (see Suzuki, this volume, for oral and written corrective feedback timing) in other learning systems (see Ruiz et al., this volume, for an application of intelligent CALL) is warranted.

Insights into automatization: The role of explicit instruction

The question as to what extent explicit instruction facilitates L2 acquisition is one of the central problems in instructed SLA research. To date, several metaanalyses (Goo et al., 2015; Kang et al., 2018; Norris & Ortega, 2000; Spada & Tomita, 2010) have been conducted to estimate the effectiveness of explicit instruction (i.e., an intervention involving rule explanation or instruction directing attention to specific forms to formulate metalinguistic rules) relative to implicit instruction (i.e., an intervention without any rule explanation or intentional instruction on specific forms).

Consistent with the prior meta-analyses, Goo et al. (2015), one of the most comprehensive meta-analyses (1980–2011) to date, revealed that explicit instruction leads to substantial gains in L2 acquisition. However, the generalizability and implications of this finding are severely limited in part due to a methodological issue, which is how outcomes (dependent variables) from explicit and implicit instruction are typically assessed. In Goo et al.'s meta-analysis, a majority of the primary studies (over 70%) employed offline, controlled tasks as the primary outcome assessment task (i.e., the dependent variable). Such tasks allow for the use of explicit-declarative knowledge to a large extent. Because our primary interest lies in the effectiveness of explicit instruction on the acquisition of "fluent, spontaneous use of contextualized language" (Norris & Ortega, 2000, p. 486), we limit our focus here to the effectiveness of explicit instruction

on automatization, excluding discussion of studies that have focused on the acquisition of explicit (declarative), metalinguistic knowledge.

The outcome assessment type that presumably requires high levels of automaticity is a free-spoken task. Although the focus of this chapter is receptive modes of practice and knowledge, measurements of production skills may draw on a common knowledge base that necessitates some levels of automaticity in receptive skills. Out of 34 studies meta-analyzed by Goo et al. (2015), however, only four studies used free oral tasks: (a) role-play tasks eliciting pragmatically appropriate speech (Ghobadi & Fahim, 2009; Martínez-Flor & Fukuya, 2005) or (b) oral story/picture description tasks eliciting specific grammatical structures (Muranoi, 2000; J. Williams & Evans, 1998). The average effect sizes (Hedge's g) of these four studies were large: 2.00 and 1.00 for explicit and implicit instruction conditions, respectively.2 This evidence tentatively suggests that explicit instruction is effective for automatization. Theoretically, the kind of knowledge elicited by free spoken tasks may be described as *speeded-up/ automatized explicit knowledge* (Suzuki & DeKeyser, 2015), as non-advanced L2 learners tend to apply their explicit knowledge consciously during speech processes (Marsden & Chen, 2011). Yet, other researchers (e.g., Ellis, 2009) may argue that free spoken tasks draw on implicit knowledge (i.e., knowledge without awareness) that developed independently from conscious learning processes. From a research perspective, the distinction between speeded-up explicit knowledge and implicit knowledge may be significant, because automatization is achieved by two different explicit and implicit learning processes (see Suzuki, this volume).3 Therefore, by measuring speeded-up explicit knowledge and implicit knowledge separately as an outcome of instructional effects, we can better understand how explicit instruction impacts explicit and implicit learning mechanisms that differentially lead to automatization.

Although it is challenging to measure implicit knowledge, recent studies (not included in the meta-analyses cited earlier) have drawn upon methodological innovations in fine-tuned processing tasks to minimize the use of explicit (declarative) knowledge (Marsden et al., 2018; Suzuki, 2017b). A growing number of studies utilize reaction-time and eye-tracking data to investigate real-time grammar processing as a way to assess automatic knowledge (see Suzuki & Elgort, this volume for a methodological review).

A recurring pattern of findings indicates that it is difficult for beginner learners to automatize L2 morphosyntactic structures in short-term experiments. Andringa and Curcic (2015) conducted the first study that examined the effects of explicit instruction on real-time grammar processing measured by a visual-world eye-tracking task. Fifty-one native speakers of Dutch were exposed to auditory input consisting of 52 instances of a

target structure (as well as 52 fillers). Half of the participants received a rule explanation with two examples and the other half did not. The posttest results from the visual-world eye-tracking task showed that neither group of learners showed real-time processing of the target structure (cf., Ito & Wong, 2019). Granena and Yilmaz (2019) compared the effects of explicit corrective feedback and implicit corrective feedback (recast) on real-time processing using a self-paced reading task. One hundred and thirty-five L2 Spanish learners who had taken two semesters of Spanish courses at a US university participated in 2-day laboratory sessions. In each session, two communicative tasks eliciting 32 instances of the target structure (differential object marking) were conducted. The immediate posttest results showed that neither explicit nor implicit feedback conditions resulted in significant learning gains, measured by a self-paced reading task. In a similar vein, Dracos and Henry (2021) examined the extent to which task-essential practice (part of PI) leads to sensitivity among 122 beginner-level (second-semester) L2 Spanish learners in an American university. They engaged in task-essential training sessions involving Yes/No and metalinguistic feedback on Spanish verbal inflections (person–number agreement and tense) over five 20-minute sessions in 2.5 weeks. Learning outcomes were measured by both offline (interpretation task) and online measures (self-paced reading task). Results showed that learning gains were observed on the offline interpretation test only. No online sensitivity was observed on either immediate or delayed tests.

In contrast, McManus and Marsden (2019) demonstrated that explicit instruction, plus L2 practice in processing form–meaning mappings, if sufficiently implemented, led to significant learning gains for real-time grammar processing. In their study, 50 advanced L2 French learners (CEFR B2) at a UK university were trained on the target *imparfait* construction, a difficult structure particularly for L1 English speakers. They engaged in form–meaning mapping practice (where interpretation of the target form was *essential*) of 552 instances over four sessions (about 210 minutes). In addition to the typical provision of explicit information about the target L2 construction, they examined the effects of providing explicit information about L1 (i.e., how their L1 English expresses the meanings about tense/aspect). The results showed that only the training condition with both L1 and L2 explicit information resulted in automatic processing.

Taken together, the findings indicate a clear pattern: no evidence of sufficient automatization without sufficient understanding of the underlying grammatical rules and structural regularities (e.g., awareness at the level of understanding), even including that of similar L1 features. This pattern may appear to contrast a different line of research that has examined the role of implicit learning on automatization. Implicit learning refers to

learning without conscious awareness (Rebuschat, 2013); it is construed as an opposite concept of explicit learning. Implicit learning does not require depth of processing, high cognitive effort, or the ability to verbalize the rules. The strand of implicit learning research has yielded tentative evidence that some levels of automatic L2 processing were attained among learners who remained unaware of a target linguistic structure (e.g., Leung & Williams, 2011; Godfroid, 2016). Although the evidence of implicit learning in these studies for automaticity is encouraging, it remains unclear if the learning process was indeed implicit, in part due to a methodological limitation (e.g., Leow, 2015). When verbal reports are used to determine unaware learners, some learners may be misclassified as unaware learners due to their inability to articulate their awareness of structures even if they were actually aware of some aspects of linguistic structures. This methodological concern echoes the conflicting evidence from a recent study by Maie and DeKeyser (2020), who cast doubt on the robustness of the learning effects reported in implicit learning research from the perspective of automaticity.

Despite an incipient phase of this research domain on the effects of explicit instruction on automaticity (operationalized as real-time processing) as well as implicit learning, several methodological considerations should be taken into account for studying the effects of explicit instruction for automatization. First, higher proficiency learners may benefit more from interventions as they are more likely to integrate and automatize their grammatical knowledge (e.g., French learners in McManus & Marsden, 2019, possessed some levels of prior knowledge). Second, studies addressing the issue of automaticity need to include delayed posttests, given that a type of knowledge that is automatized should be robust and available after an extended period of time (e.g., Leow, 2015). No studies that were discussed previously, except for Muranoi (2000), administered delayed posttests and demonstrated a durable learning effect. Third, individual differences in cognitive aptitudes may account for automatization and/or the lack thereof. For instance, implicit language aptitude (Granena & Yilmaz, 2019) and working memory (Dracos & Henry, 2021) were found to moderate the effectiveness of learning under some conditions.

Most critically, the role of the amount of practice and sufficient metalinguistic information (and possibly task-essential practice that mandates the form– meaning mapping process) is often overlooked and cannot be overemphasized (e.g., compare 10 minutes in Andringa & Curcic, 2015, vs. 210 minutes in McManus & Marsden, 2019). On this point, in the aforementioned four studies that examined the spontaneous production in Goo et al.'s (2015) meta-analysis, the interventions were 90 minutes (Muranoi, 2000), 180 minutes (Ghobadi & Fahim, 2009), and 12 hours (Martínez-Flor &

Fukuya, 2005).4 As Leow (2007) pointed out over a decade ago, "whether amount of practice plays a role in L2 development remains to be investigated, given that this variable has not been empirically explored" (p. 42). There is still a dearth of empirical investigations with a limited number of grammatical structures investigated. A few studies started to closely examine how deliberate practice with declarative-explicit information changes L2 processing and production speed and stability using reaction time (McManus & Marsden, 2019) and eye-movement data (Indrarathne et al., 2018).

In sum, this focused survey of literature suggests that explicit instruction that leads to sufficient understanding of rules can facilitate automatization in grammar processing, as well as relatively spontaneous accurate productive use of target structures in free-constructed tasks. Because automatization is a gradual process and there may not even be an end-state, it would be useful to document how the amount of practice leads to faster and more efficient L2 processing over the course of learning.

Conclusion

The current chapter delineated key aspects of explicit learning for optimizing input and intake processing and how this learning mechanism can be exploited systematically to contribute to automatization in L2. It takes not only a sheer amount of practice but also various types of cognitive processes to fine-tune L2 knowledge, which paves the way for efficient or automatic input and intake processing. For maximizing input and intake processing, we proposed that the broad categorization of practice—isolated, guided, and contextualized practice—underscores the importance of repeated engagement of L2 activities that promote explicit learning through deliberate memorization, imitation, noticing, hypothesis testing, feedback, and monitoring. Despite the vital roles of declarative knowledge for L2 development in many learning situations, the benefits of explicit instruction and the lack thereof need to be examined more extensively for the acquisition of robust L2 knowledge that is well characterized from the definition of automaticity.

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