English Teaching, Vol. 75, No. 1, Spring 2020, pp. 93-117
DOI: https://doi.org/10.15858/engtea.75.1.202003.93
http://journal.kate.or.kr

The Impact of Task Complexity on the Development of L2 Grammar

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Jung, Ji-Yung. (2020). The impact of task complexity on the development of L2 grammar. *English Teaching, 75*(1), 93-117.

The Cognition Hypothesis postulates that more cognitively complex tasks can trigger more accurate and complex language production, thereby advancing second language (L2) development. However, few studies have directly examined the relationship between task manipulations and L2 development. To address this gap, this article reviews, via an analytic approach, nine empirical studies that investigated the impact of task complexity on L2 development in the domain of morphosyntax. The studies are categorized into two groups based on if they include learner-learner interaction or a focus on form (FonF) treatment provided by an expert interlocutor. The results indicate that the findings of the studies, albeit partially mixed, tend to support the predictions of the Cognition Hypothesis. More importantly, a further analysis reveals seven key methodological issues that need to be considered in future research: target linguistic domains, different types of FonF, the complexity of the target structure, task types, outcome measures, the use of introspective methods, and the need of more empirical studies and replicable study designs.

Key words: task complexity, Cognition Hypothesis, resource-directing and resource-dispersing dimensions, L2 development, morphosyntax

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Received 15 January 2020; Reviewed 21 February 2020; Accepted 29 February 2020

1. INTRODUCTION

In recent decades, the field of second language acquisition (SLA) has witnessed a considerable growth of interest in task-based language teaching (TBLT), a pedagogical approach in which *task* is a primary unit of second language (L2) instruction, analysis, and assessment (e.g., Bygate, Skehan, & Swain, 2001; R. Ellis, 2003; Van den Branden, Bygate, & Norris, 2009). By definition, tasks are activities "where meaning is primary, there is some communicative problem to solve; some sort of relationship with real-world activities; and the assessment of task is in terms of task outcome" (Skehan, 1998, p. 95). There are both theoretical and practical rationales underlying the use of tasks in the L2 classroom (Révész, 2019). First, tasks offer sufficient means for exposure to authentic input including targeted linguistic structures and plentiful opportunities for interaction with modified input and output (Long, 1996). Second, unlike traditional pedagogical approaches focusing only on either decontextualized linguistic forms or communicative effectiveness, a task-based approach seeks to integrate meaningful communication and a timely focus on L2 grammar (Long, 1991; Long & Robinson, 1998). Finally, pedagogic tasks learners perform are created to resemble real-world tasks they would experience outside the classroom, based on the analysis of individual learners' needs for learning the L2 (e.g., Long, 2015; Skehan, 1998).

To date, TBLT has provided a strong common ground between L2 pedagogy and research, particularly with regard to task designs and implementation factors that can affect the nature of interaction. One such attempt is demonstrated by the Cognition Hypothesis (Robinson, 2001) which postulates that more cognitively complex tasks would promote the frequency of interactional components such as feedback and negotiation of meaning, push learners to pay attention to input and produce modified output, and thereby facilitate L2 development. Motivated by the Cognition Hypothesis, a growing number of studies (e.g., Baralt, Gurzynski-Weiss, & Kim, 2016; Huh & Lee, 2018; Hyun & Lee, 2018; Kim, 2009; Lai & Zhao, 2006; Mackey, 1999; S-K. Park, 2015; Y. Park, 2018; Ryu & Bae, 2018; Samuda & Bygate, 2008) have set out to investigate the effects of task manipulations on interactional patterns and linguistic output during task performance. In general, the findings of these studies have revealed that increased task complexity seems to have a facilitative effect on task performance, suggesting that such task effects would in turn transfer to L2 developmental outcomes. However, few studies (e.g., Baralt, 2013; Kim & McDonough, 2008; Nuevo, 2006; Révész, Sachs, & Hama, 2014) have been conducted to directly explore whether manipulating the cognitive demands of tasks does lead to L2 development, in terms of "longer-term gains in L2 knowledge and/or processing skills" (Révész, 2019, p. 375). Moreover, the findings of the few studies do not appear to be conclusive because, first, the studies vary considerably in how they operationalized task

complexity, interaction, and L2 development, and second, some studies (e.g., Nuevo, 2006; Révész, et al., 2014) yielded contradictory findings against the predictions of the Cognition Hypothesis.

To address this gap in the current TBLT literature, the present article intends to examine the impact of task complexity manipulations on L2 development, focusing on the domain of morphosyntax. This research agenda is of particular importance in the Korean English as a foreign language (EFL) environment, in which learners, despite the extensive amount of input they are exposed to, generally lack grammatical competence, an essential component of communicative competence (Hymes, 1972). As tasks provide an optimal platform for simultaneous processing of form and meaning (Long, 1991), it is likely that the use of well-designed tasks based on research has a considerable benefit for the Korean EFL learners in terms of morphosyntactic acquisition.

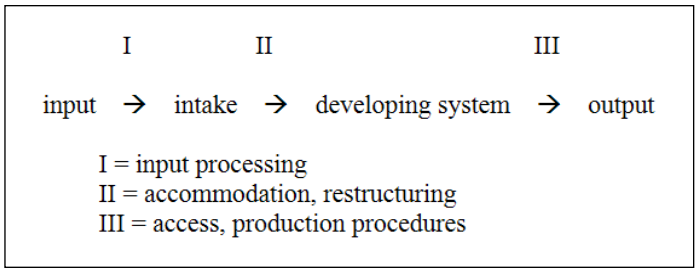
The article begins with an overview of a few concepts and notions essential in the examination of task complexity, such as attention, development, and interaction. In particular, it presents two competing accounts of how attention is deployed during task performance, namely, the single-resource model (Skehan, 1998) and the multiple-resource model (Robinson, 2001). A description then follows of the predictions of the Cognition Hypothesis, which derives from the multiple-resource model, regarding the relationship between task complexity, interactive task performance, and L2 development. Next, the article reviews nine empirical studies (e.g., Baralt, 2013, 2014; Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, 2006; Nuevo, Adams, & Ross-Feldman, 2011; Révész, 2009; Révész & Han, 2006; Révész, et al., 2014) conducted to date on the impact of task complexity on the development of L2 morhposyntax, categorizing them into two groups based on whether they include learner-learner interaction or a focus on form (FonF) treatment provided by an expert interlocutor. Finally, the task designs employed in the studies and the implementation factors are discussed critically, which reveals seven key methodological issues that need to be considered in future research. These issues concern the target linguistic domains, different types of FonF, the complexity of the target structure, task types (in relation to learners' proficiency levels, interlocutors, and the modality of interaction), outcome measures, the use of introspective methods, and the need of more empirical studies and replicable study designs.

2. TASK COMPLEXITY AND THE COGNITION HYPOTHESIS

One of the main concepts to be addressed in the examination of task complexity is *attention*. In the psycholinguistic view, the process of second language acquisition (SLA) is represented as information processing schematized in Figure 1 (VanPatten, 2004). The

initial stages of the process of SLA involve *input* and *intake.* According to Corder (1967), input refers to "what goes in," and not "what is available for going in" (p. 165). Put differently, input is not readily available for internalization by learners via mere exposure to it. Rather, only a subset of input, or intake, is internalized and cognitively *registered* in the learner's mind. In this sense, it is the conversion of input into intake (VanPatten, 1996) that can trigger further processes of L2 learning, such as hypothesis testing, accommodation of the registered knowledge, and restructuring of the existing interlanguage (IL) knowledge. Several researchers (e.g., N. Ellis, 2004; R. Ellis, 1991; Gass, 1991) note that a cognitive mechanism that drives the input-intake conversion is attention, such that the part of the input that a learner's attention is focused on turns into intake. Schmidt (1990) further argues that new linguistic forms and rules can only be used for developing the IL system if a learner can cognitively compare them with the existing IL representations, or *notice the gap* between the two, at the level of awareness (i.e., the Noticing Hypothesis). Although this strong claim associating awareness with the attentional process has been in dispute (Cf. Robinson, 1995; Simard & Wong, 2001; Tomlin & Villa, 1994), the general view appears to hold that attention or noticing is a "necessary and sufficient condition" (Schmidt, 1990, p. 129) for input to be converted into intake, and hence a preliminary process triggering IL development.

FIGURE 1
The Model of SLA



Source: VanPatten, B. (2004). *Processing instruction: Theory, research, and commentary.* Mahwah, NJ: Lawrence Erlbaum.

In the current SLA literature, there are two influential claims regarding the extent to which task characteristics can affect the allocation of learners' attention during task performance: the single-resource model (Skehan, 1998) and the multiple-resource model (Robinson, 2001). Both models are concerned with how increasing the attentional demands of tasks influence language production in terms of accuracy, fluency, and complexity. Accuracy refers to the extent to which a learner follows the rule system of the target

language; fluency concerns smoothness and the ease of expression; complexity pertains to how elaborate a learner's language is, in terms of both structure and lexicon, which suggests a personal inclination to be adventurous in using more advanced language (Bui & Skehan, 2018).

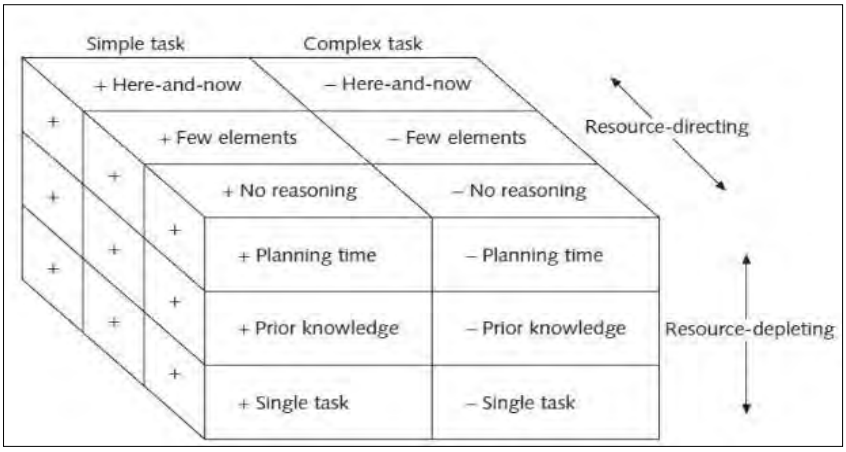
However, the two models put forth contradictory predictions about the impact of the cognitive complexity of tasks on the three aforementioned constructs. In the single-resource model, underlying the Limited Capacity Hypothesis, Skehan (1998) contends that learners' attentional resources are limited, and as such, trade-off exists between attention to form and meaning during task performance. This claim is in line with the general presumption in the field that, due to the limited processing capacity of learners' cognition, "simultaneous processing of natural, communicative input for meaning (i.e., semantic information) and form (i.e., linguistic code feature) rarely happens" (Han, 2008, p. 47) in L2 acquisition. Rather, it is generally acknowledged that learners tend to "process input for meaning before they process it for form" (VanPatten, 2004, p. 14). Correspondingly, Skehan predicts that more cognitively complex tasks will demand more attention to meaning, allowing less attentional resources to be allocated to form. Simply put, manipulating tasks would promote either accuracy or complexity of learners' output, but not both.

On the contrary, positing the Cognition Hypothesis deriving from the multiple-resource model, Robinson (2001, 2003) asserts that form and meaning need not always be in competition for scarce attentional resources. According to him, task complexity is represented as a series of options that can be manipulated along resource-directing and resource-dispersing dimensions. The variables on the resource-directing dimension (e.g., [± few elements], [± Here-and-Now], and [± intentional reasoning]) increase the demands made on learners' cognitive resources, while potentially directing them to the linguistic codes that should be used for the completion of the task. Task complexity can also be increased by means of the variables on the resource-dispersing dimension (e.g., [± planning time], [± single task], and [± prior knowledge]), which add extra resource demands that cannot be met through the use of the linguistic targets (Figure 2). Robinson predicts, following Givón's (1985) arguments that "greater structural complexity tends to accompany greater functional complexity" (p. 1021) in L2 production, that the increase of task complexity along either of or both the dimensions will result in more accurate and complex speech, but at the cost of fluency.

In the next section, the predictions of the Cognition Hypothesis are examined in relation to interactive task performance. This is followed by a review of nine empirical studies (e.g., Baralt, 2013, 2014; Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, 2006; Nuevo, et al., 2011; Révész, 2009; Révész & Han, 2006; Révész, et al., 2014) which, motivated by the hypothesis, explored the impact of manipulating task variables on L2 development,

FIGURE 2

Resource-Directing and Resource-Dispersing Dimensions of Task Complexity



Source: Robinson, P. (2003). Attention and memory during SLA. In C. Doughty & M. Long (Eds.), *Handbook of second language acquisition* (pp. 631-678). Oxford, UK: Blackwell.

focusing on the domain of morphosyntax. For the purpose of the study, an analytic approach is taken, in which the studies are first categorized into two groups based on the type of interaction involved in them (i.e., learner-learner and learner-expert interaction), and then analyzed, on a granular level, focusing on the methods employed in each study and the findings produced.

3. THE IMPACT OF TASK COMPLEXITY ON THE DEVELOPMENT OF L2 GRAMMAR

3.1. Task Complexity, Interaction, and L2 Development

Several researchers (e.g., Long, 1980; Nunan, 1987) claim that language is best learned through interaction, and put differently, via tasks in which learners can exchange ideas and negotiate towards mutual comprehension of each other's meaning. According to Long's (1996) Interaction Hypothesis, negotiation during conversational interaction is likely to trigger the learner's attention to a specific part of the L2, particularly on the discrepancies between the target forms and his or her IL (e.g., N. Ellis, 2004; R. Ellis, 1991; Gass, 1991; Schmidt, 1990), a crucial mechanism that can facilitate L2 development. In particular, negotiation work that triggers "interactional adjustments" (Long, 1996, p. 451) by the native speaker or more competent interlocutor is likely to promote acquisition, as it

connects input, internal learner capacities (e.g., attention), and output in productive ways.

Expanding from Long's (1996) hypothesis, Robinson and Gilabert (2007) predict that more complex interactive tasks along the resource-directing and/or resource-dispersing dimensions described earlier will result in greater amounts of negotiation of meaning and feedback, thereby advancing L2 development. In a similar vein, the researchers argue that the inherent cognitive complexity of tasks is a strong variable affecting the efficacy of a reactive FonF technique (e.g., recasts), such that complex versions of tasks would have a greater benefit in inducing learners' attention to it. Additionally, they posit that increased task complexity would lead to the learning of developmentally more advanced forms.

Motivated by the predictions of the Cognition Hypothesis described thus far, a total of nine empirical studies (e.g., Baralt, 2013, 2014; Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, 2006; Nuevo, et al., 2011; Révész, 2009; Révész & Han, 2006; Révész, et al., 2014) have been carried out to date to explore how task complexity mediates L2 development in the domain of morphosyntax. Despite the small number, these studies are categorized into two groups based on whether they involve naturally occurring learner-learner interaction (e.g., Baralt, 2014; Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, 2006; Nuevo, et al., 2011) or a FonF treatment (e.g., recasts) provided by an expert interlocutor (e.g., a researcher, teacher, etc.) (e.g., Baralt, 2013; Révész, 2009; Révész & Han, 2006; Révész, et al., 2014).

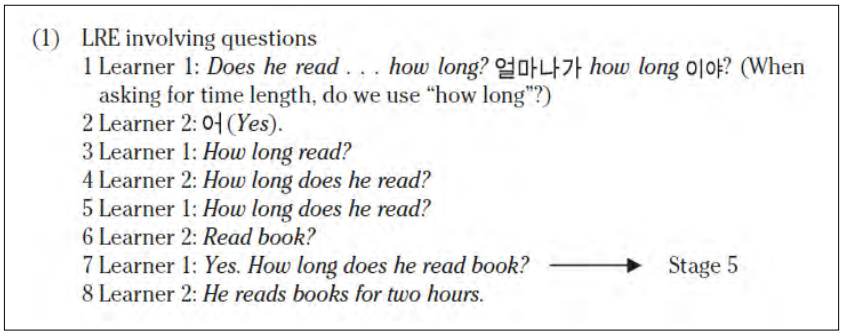
3.2. The Impact of Task Complexity on the Development of L2 Grammar in Learner-Learner Interaction

With a view to testing the validity of the Cognition Hypothesis in EFL classrooms in which there is little opportunity for output production, Kim (2012) examined the learning of English question formation with 191 Korean university students. The participants were randomly assigned to either a control group or three experimental groups with various levels of task complexity (simple, +complex, and ++complex). Whereas participants were provided with the same task input across the three groups, the simple task group was required to exchange only factual information (i.e., [- reasoning]) and the +complex and ++complex task groups were asked to make a decision (i.e., [+ reasoning]). The ++complex tasks were also manipulated to involve a greater number of factors to consider (i.e., [- few elements]). Learning opportunities were operationalized as LREs involving questions (Figure 3), wherein an LRE is defined as any part of a dialogue where learners "talk about the language they are producing, question their language use, or correct themselves or others" (Swain & Lapkin, 1998, p. 326). Learning of question formation was measured by two individual oral production tests and a paired oral production test, and learners were classified as either 'developed' or 'not developed' based on whether they

showed movement to a higher stage in the developmental sequence. The results of the study indicated that the ++complex group generated a significantly greater number of question-related LREs, and hence more learning opportunities, than the other two groups. Also, there was a significant main effect for task complexity on the occurrence of developmentally advanced questions, but no difference was found between the two complex groups. In terms of L2 development, the greatest percentage of learners advanced to a higher stage of question formation in the ++complex group, which was also statistically significant. Similar findings were yielded in a study conducted by Kim and Tracy-Ventura (2011) employing the same task complexity variables as Kim (2012) but targeting the development of the English past tense.

FIGURE 3

An Example of an LRE


(1) LRE involving questions
1 Learner 1: *Does he read . . . how long?* 얼마나가 *how long* 이야? (When asking for time length, do we use "how long"?)
2 Learner 2: 어 (*Yes*).
3 Learner 1: *How long read?*
4 Learner 2: *How long does he read?*
5 Learner 1: *How long does he read?*
6 Learner 2: *Read book?*
7 Learner 1: *Yes. How long does he read book?* ⟶ Stage 5
8 Learner 2: *He reads books for two hours.*

Source: Kim, Y. (2012). Task complexity, learning opportunities, and Korean EFL learners' question development. *Studies in Second Language Acquisition, 34*(4), 627-658.

In a similarly designed study, however, Nuevo (2006) found contradictory evidence against the predictions of the Cognition Hypothesis. The study involved two linguistic targets, the English past tense and locative prepositions. Similar to Kim (2012) and Kim and Tracy-Ventura (2011), the researcher operationalized cognitive complexity as [± causal reasoning], and examined how task complexity affects the learning opportunities during interaction (e.g., learners' use of confirmation checks, recasts, clarification requests, etc.) as well as resultant L2 development. Three groups of learners (N=113) participated in the study, who engaged in two different tasks (picture narration and decision making tasks) with different levels of complexity. Learning was measured with a grammaticality judgment and an oral production test, and the results of the tests demonstrated no association between task complexity and the learning of the two target structures. In addition, different conditions of task complexity promoted different types of learning opportunities in that the simple versions of narrative tasks led to not only more uptake of

recasts provided by peers but also more comprehension checks, clarification requests, and metalinguistic talk, whereas the complex narrative tasks resulted in more confirmation checks. The researcher concluded that learners who engaged in low complexity tasks had more attentional resources available to monitor the output of their peer interlocutors and to provide feedback than those who engaged in high complexity tasks.

Yet, targeting the same linguistic targets in a similar study design, Nuevo, et al. (2011) yielded findings, albeit partially mixed, in support of the Cognition Hypothesis. The study explored the impact of task complexity, operationalized as [± reasoning], on modified output and the relationship between output modifications and L2 development. Seventy-nine adult English as a second language (ESL) learners were divided into two groups, one involving low reasoning demands and the other involving high reasoning demands, and engaged in two sets of tasks created to induce the English past tense and locative prepositions. The analyses of the learners' performance revealed that, while they modified their output using a variety of modification moves (e.g., self-repair, pushed output, and modified output), those who completed more complex tasks produced more self-repair than those who completed less complex tasks. Furthermore, self-repair was associated with the learning of locatives in the high complexity group as measured by delayed posttest grammaticality judgment and oral production. Pushed output, as well as the total amount of modified output, was associated with the learning of the past tense in the low complexity group as measured by delayed posttest grammaticality judgment.

Additional support for the Cognition Hypothesis came from Baralt (2014), who examined the impact of task complexity and sequencing on the learning of the Spanish past subjunctive in both traditional (face-to-face) and online classes. Ninety-four university students learning L2 Spanish in the U.S. participated in the study. The students were assigned to either the traditional (N=48) or online (N=46) class, and each class was in turn divided into four experimental conditions including CCS (complex-complex-simple tasks), SSC (simple-simple-complex tasks), CSC (complex-simple-complex tasks), and SCS (simple-complex-simple tasks), with task complexity operationalized as [±intentional reasoning]. Learning opportunities, operationalized as LREs, during task performance were analyzed, so was the participants' performance on paired oral and written reconstruction tests to measure the learning of the target structure. In the traditional, face-to-face classes, students who engaged in the CCS and CSC sequences were found to produce significantly more LREs, as well as performing significantly better using the Spanish past subjunctive, than those who engaged in the SSC and SCS sequences. On the other hand, no single LRE took place in the online classes across the different experimental conditions, thus producing no data to measure the LREs and the learning of the Spanish past subjunctive. Table 1 presents a summary of the methods employed in the studies and their findings analyzed thus far.

TABLE 1

Studies Examining the Impact of Task Complexity on the Development of L2 Grammar

Study	Target Feature	Task Complexity	Interaction	Results
Baralt (2013)	Spanish past subjunctive	± intentional reasoning	Learner-expert interaction	Complex groups with recasts in the face-to-face mode and simple groups in the online mode exhibited greatest gains
Baralt (2014)	Spanish past subjunctive	± intentional reasoning	Learner-learner interaction	Complex groups exhibited greatest gains in the face-to-face mode; No LRE was observed in the online mode
Kim (2012)	English question formation	± reasoning ± few elements	Learner-learner interaction	++Complex group exhibited greatest gains
Kim & Tracy-Ventura (2011)	English past tense	± reasoning ± few elements	Learner-learner interaction	++Complex group exhibited greatest gains
Nuevo (2006)	English past tense, locative prepositions	± causal reasoning	Learner-learner interaction	No difference was found between complex and simple groups
Nuevo, et al. (2011)	English past tense, locative prepositions	± reasoning	Learner-learner interaction	Complex group exhibited greatest gains in locatives; Simple group exhibited greatest gains in the past tense
Révész (2009)	English past progressive	± here-and-now	Learner-expert interaction	Complex groups with recasts exhibited greatest gains
Révész & Han (2006)	English past progressive	± prior knowledge	Learner-expert interaction	Complex groups with [+ prior knowledge] with recasts exhibited greatest gains
Révész, et al. (2014)	English past counterfactual	± causal reasoning	Learner-expert interaction	Simple groups exhibited greatest gains

3.3. The Impact of Tack Complexity on L2 Development Involving Focus on Form

Révész and Han (2006) took the first step to examine how task complexity involving FonF affects L2 development, by investigating the impact of task content familiarity and task type on the efficacy of recasts. According to Robinson's (2001) framework of complexity, task content familiarity is a type of prior knowledge (i.e., [+ prior knowledge]), and hence a [- resource-dispersing] variable. As such, increased task familiarity is expected to trigger an expansion of resource pools, leading to enhanced attention to input (e.g., recasts). Task content familiarity in the study was operationalized as subjecting participants repeatedly to the same version of the same task type during the treatment sessions. Thirty-six adult ESL learners were randomly assigned to one of the four experimental groups (the Same Video group, the Different Video group, the Same Notes group, or the Different Notes group), all of which received recasts targeting the English past progressive. The participants' performance on fill-in-the-blank, written picture description, and oral production tests indicated significant main effects for both task content familiarity and task type. That is, the learners who received recasts through tasks with familiar content significantly outperformed those who received recasts without such content familiarity, and the Video treatment, in which the use of visual images may have lessened the cognitive complexity, had a clear advantage over the Notes treatment.

Révész (2009) conducted another study examining the combined effects of the variable [± contextual support] (i.e., [± here-and-now] along the resource-directing dimension), operationalized as the availability or unavailability of a photo during its description, and recasts, on the development of the English past progressive. Ninety adult EFL learners were randomly assigned to either a control group or one of four experimental groups with different treatment conditions: [+ recast/ + photo], [+ recast/ - photo], [- recast/ + photo], and [- recast/ - photo]. The subjects' scores on written picture description and oral photo description tests suggested that the predictions of the Cognition Hypothesis were borne out in the study. Learners who received recasts without viewing photos outperformed those who received recasts while viewing photos, and the learners who viewed photos without receiving recasts achieved greater L2 gains than those who neither viewed photos nor received recasts.

Similar findings were obtained in Baralt's study (2013), which employed a similar design to that of Baralt (2014) with the addition of the use of recasts. More specifically, the study explored how cognitive complexity in face-to-face (FTF) versus computer-mediated communication (CMC) environments mediates the efficacy of recasts in promoting L2 development. Participants were 84 adult EFL learners of Spanish, randomly assigned to one of four experimental groups ([FTF/ + intentional reasoning], [FTF/ - intentional

reasoning], [CMC/ + intentional reasoning], and [CMC/ - intentional reasoning]) or a control group. The experimental groups engaged in one-on-one interaction with the researcher and received recasts on the target structure, the Spanish past subjunctive. However, the groups differed as to the level of task complexity involved, operationalized as [± intentional reasoning], and the environment for interaction (FTF and CMC). Two oral production and a multiple-choice tests were administered, the results of which exhibited that, in the FTF mode, performing the cognitively complex task while receiving recasts led to the most learning. Interestingly, however, the cognitively simple task led to the most development in the CMC mode.

Complicating the general picture further, Révész, et al. (2014) yielded findings against the predictions of the Cognition Hypothesis. The researchers examined the effects of task complexity, operationalized as [± causal reasoning], along with input frequency distribution, on the acquisition of the English past counterfactual while recasts were provided. Fifty-one adult ESL learners were randomly assigned to one of four experimental groups or a control group. All experimental groups received recasts but varied depending on whether they performed simple tasks with lower reasoning demands or complex tasks with higher reasoning demands, and whether they received skewed (i.e., higher token frequency of a prototypical exemplar) or balanced (i.e., relatively equal token frequency across exemplars) input of the target construction. The results of an oral production and two written receptive tests revealed no effects for the input frequency manipulations. However, participants achieved higher oral production gains under the simple task condition, seemingly corroborating Skehan's (1998) Limited Capacity Hypothesis. As with the studies involving learner-learner interaction, a summary of the methods employed in these studies and their findings is provided in Table 1.

4. DISCUSSION

To date, Robinson's (2001) Cognition Hypothesis has motivated a growing amount of research in the field of SLA (e.g., Bygate, et al., 2001; R. Ellis, 2003; Kim & McDonough, 2008; Van den Branden, et al., 2009). The most prolific line of this research (e.g., Baralt, et al., 2016; Huh & Lee, 2018; Hyun & Lee, 2018; Kim, 2009; Lai & Zhao, 2006; Mackey, 1999; S-K. Park, 2015; Y. Park, 2018; Ryu & Bae, 2018; Samuda & Bygate, 2008) has looked at the effects of task complexity on the interactional patterns and linguistic output during task performance. So far, few studies (e.g., Baralt, 2013, 2014; Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, 2006; Nuevo, et al., 2011; Révész, 2009; Révész & Han, 2006; Révész, et al., 2014) have explored whether manipulating the cognitive demands of tasks has an impact on L2 development or learning. Besides, it appears to be difficult to

aggregate the findings of the few studies in a clear-cut fashion, due to the varying operationalizations of task complexity, interaction, and L2 development, let alone the partially mixed findings yielded.

Yet, it can be extrapolated from the review carried out in the present article that empirical research (e.g., Baralt, 2013, 2014; Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, et al., 2011; Révész, 2009; Révész & Han, 2006) tends to support the predictions of the Cognition Hypothesis, suggesting that more cognitively demanding tasks result in greater negotiation of meaning, thereby promoting learning opportunities and L2 development. Analyses of the LREs observed during task performance generally revealed that increased task complexity had a significant impact on both the incidence of language learning opportunities (e.g., the number of LREs) and L2 development (e.g., production of more advanced forms of the linguistic targets). Similarly, participants' performance on the independent measures of learning outcome (i.e., grammaticality judgment, multiple-choice, and oral and written production tests) generally exhibited substantially greater gains as to the target structures under complex, than under simple, task condition.

Overall, these findings seem to lend support for the effectiveness of task complexity to enhance attention to, and subsequent internalization of, forms inherent to task demands (Baralt, 2014). As stated previously, attention or noticing can encourage a learner to make a cognitive comparison between the erroneous and correct L2 forms, which, according to Schmidt (1990), is a "necessary and sufficient condition" (p. 129) to trigger L2 development. Robinson and Gilabert (2007) explain that, in complex versions of tasks, learners often seek external assistance to fill in the gap between the high cognitive demands of the task and the existing IL knowledge, and thus, have better opportunities to notice the forms made salient through negotiation or the use of a FonF treatment. Put differently, "task demands are a powerful determinant of what is noticed" (Schmidt, 1990, p. 143), in that more complex tasks are likely to elicit more linguistically complex input and output that "may not be comprehensible" (Nuevo, 2006, p. 70) to the interlocutors, which would necessitate a greater amount of interactive negotiation theorized to facilitate L2 acquisition.

On the other hand, Nuevo (2006) and Révész, et al. (2014) did not find a beneficial effect for complex tasks. In terms of learning opportunities, low complexity tasks led to more uptake of recasts and a more variety of negotiation (e.g., comprehension check, clarification request, and metalinguistic talk). As for L2 development, no difference was found between low and high complexity groups in the learning of the linguistic targets, or low complexity tasks induced greater gains, as measured by grammaticality judgment and oral production tests. These results may well be taken as a piece of counter-evidence against the Cognition Hypothesis, but a closer examination reveals a group of factors that may have influenced them. To begin with, researchers (e.g., Kim, 2012; Nuevo, 2006;

Révész, 2019) stipulate task type and proficiency level effects with regard to the occurrence of LREs. Kim (2012) found that low proficiency learners in her study produced significantly more LREs on simple narrative tasks, while high proficiency learners produced significantly more LREs on complex narration tasks; in the picture difference tasks, the same low proficiency learners were found to produce significantly more LREs in the complex task condition. Similarly, although Nuevo did not address proficiency in her analysis, she found that learners who engaged in simple narrative tasks produced more metalinguistic talk than those who engaged in complex tasks; those who performed simple decision-making tasks also produced more metalinguistic talk than those who performed simple decision-making tasks.

Also, there may have been what Robinson and Gilabert (2007) call "synergetic effects" (p. 167), meaning that when tasks are made complex along both resource-directing and resource-dispersing dimensions, the beneficial impact of increasing task complexity on speech production may be weakened or even negated, compared to the same task made simpler along the latter dimension (e.g., [+planning time], [+ single task], and [+ prior knowledge]). This prediction is seemingly in consistence with Skehan's (1998) Limited Capacity Hypothesis, as well as the findings of a body of previous studies (e.g., Baralt, 2013; Kormos, 2011; Révész, et al., 2014), which propose potential trade-offs of attentional resources among different stages of speech production (i.e., conceptualization, formulation, articulation, and monitoring). Yet, the Limited Capacity Hypothesis does not make the distinction between the resource-directing and resource-dispersing dimensions, indicating that tasks manipulated more complex along either dimension may degrade accuracy, fluency, and complexity simultaneously.

An additional explanation for the lack of the benefit of complex tasks may concern the notion of transfer-appropriate processing (TAP) (e.g., Blaxton, 1989; Lightbown, 2008). The underlying principle of TAP is that learners tend to better remember what they have learned "if the cognitive processes that are active during learning are similar to those that are active during retrieval" (Lightbown, 2008, p. 27). It thus follows that learning to use language in a communicative context may improve the ability to retrieve it in such contexts. According to Révész, et al. (2014), TAP may account for the findings of their study which exhibited no significant differences between the simple and complex conditions on written production tests but a significant difference in favor of the simple condition on oral production tests.

The discussion now turns to more general issues identified in the overall studies examined in this article, which provide crucial suggestions for future empirical research on task complexity and L2 grammatical development.

4.1. The Linguistic Target

The studies in general dealt with only a handful of linguistic targets, particularly morphological features. Generative SLA research (e.g., Slabakova, 2006, 2013; Slabakova & Gajdos, 2008) suggests that functional morphology does appear to be the *bottleneck* of L2 acquisition. According to Reinhart (2006), the language faculty is composed of such domains as lexicon, semantics, phonetics-phonology, and discourse-pragmatics, with morphosyntax, especially functional lexicon, positioned in the center, operating as a computational system where syntactic operations combine lexical items into phrases. It is thus posited that functional morphemes are the linguistic elements in which most language variation is encoded, and even that "in order to acquire syntax and meaning in L2 acquisition, the learner has to go through functional morphology" (Slabakova, 2013, p. 7). However, these arguments are not meant to defy the importance and complexity of acquiring syntactic constructions. In fact, VanPatten (2011) contends that syntax is "stubborn" (p. 9) in nature because the learning of syntax is derived from the interaction of environmental data and learning mechanisms (e.g., Universal Grammar), and evolves over time as the mechanisms that create and recreate language in the mind function. Furthermore, according to Sorace's (2005) Interface Hypothesis, linguistic constructions involving an interface between syntax and other cognitive domains such as semantics and pragmatics (i.e., interface syntax) are less – or possibly never – likely to be acquired completely than constructions that do not involve such an interface (i.e., narrow syntax). Given the different nature of linguistic domains, more empirical studies are warranted exploring the impact of task manipulations on a wider variety of linguistic targets, including both morphological features and syntactic constructions.

4.2. Focus on Form

More empirical studies need to be conducted using a variety of FonF techniques in addition to recasts. As stated previously, tasks provide a platform for meaningful L2 use while simultaneously offering opportunities for a timely focus on grammar (Long, 1991). In this sense, the utilization of a pedagogical intervention such as FonF may be essential in TBLT, which attempts to reallocate, "overtly" (Long, 1991, p. 45), the learners' attentional resources to the processing of form (Long & Robinson, 1998). Although Long's (1991) original definition characterizes FonF as incidental and reactive in nature, Doughty and Williams (1998) propose that FonF can also occur intentionally and proactively, which can be delivered through a range of distinctive pedagogical procedures. According to Robinson and Gilabert (2007), the Cognition Hypothesis postulates a similar prediction for both reactive and proactive FonF techniques in that they will be of greater use in complex,

rather than on simple, versions of tasks. The validity of this prediction needs to be tested by future empirical research. Additionally, whereas some studies examined in this article treated the efficacy of recasts as a dependent variable (e.g., Révész & Han, 2006), others treated it as a covariate (e.g., Baralt, 2013; Révész, 2009; Révész, et al., 2014), suggesting the importance of investigating the relationship between FonF and other interactional components (e.g., input frequency distributions) in complex and simple task conditions.

4.3. The Complexity of the Target Structure

This line of research calls for a finer-grained examination of the relationship between task complexity and the complexity of target structures, particularly with regard to the interactions involving FonF. In the SLA literature (e.g., R. Ellis, 2002; Spada & Tomita, 2010), there appears to be a general consensus that the complexity of the target structure is one of the main variables that may determine the effectiveness of an instructional treatment. Spada and Tomita's (2010) meta-analysis, examining 41 primary studies on L2 English grammar acquisition, reveals that complexity in terms of the number of transformational rules to be applied to produce a grammatically correct form tends to be associated more positively with an explicit, than with an implicit, learning condition. It thus seems to be possible that recasts (i.e., implicit FonF) utilized in Révész, et al., (2014) might not have been an optimal pedagogical option for the English past counterfactual, a syntactic construction which by nature involves a greater number of transformations compared to a morphological feature.

Yet, Spada and Tomita acknowledge that their meta-analysis may have yielded different findings had a different conceptualization of complexity been adopted, such as the order of acquisition (e.g., Pienemann, 1989) or the perceived ease or difficulty of learning a target structure (e.g., Williams & Evans, 1998). The saliency and communicative redundancy of the target structure are additional factors likely to influence the success of a pedagogical treatment, or lack thereof, during task performance (e.g., Baralt, 2014; Kim, 2012; Révész, 2019). Kim (2012) elaborates that non-target-like utterances involving physically non-salient and communicatively redundant structures are less likely to generate communication breakdowns, and thus, might be less affected by differences in task complexity. Therefore, it is important to note the various ways to characterize a given linguistic structure, in order to investigate how cognitive complexity in tandem with different types of FonF may affect L2 development in an interactive task condition.

4.4. Task Designs

A greater variety of task designs should be examined in view of the multiple

components of task complexity. So far, the majority of the studies in this line of research investigated only one or two components of Robinson's (2001) framework (e.g., [± reasoning], [± few elements], and [± prior knowledge]), and the task types employed were generally limited to picture narrative tasks or picture difference tasks (e.g., Nuevo, 2006; Révész & Han, 2006; Révész, 2009; Révész, et al., 2014). To gain better insights and more pertinent data for the Cognition Hypothesis, future studies need to consider various task manipulations along both the resource-directing and resource-dispersing dimensions, as well as various task types such as jigsaw, problem-solving, decision-making, information gap, and opinion-exchange frequently addressed in the TBLT literature (e.g., Pica, Kanagy, & Falodun, 1993). As pointed out earlier, however, if resource dispersion is involved in addition to resource direction, "synergetic effects" (Robinson & Gilabert, 2007, p. 167) may occur, which may negate the positive impact for enhanced task complexity. In a similar vein, although information gap is known to be more apt at engendering interactive conditions than problem-solving and decision-making, the latter task types are speculated to induce higher levels of cognitive processing (e.g., evaluation), while the former is likely to be carried out with relatively lower levels of processing (e.g., describing or restructuring). Future empirical research should look into such offsetting effects that may accompany the various task types and components operationalizing task complexity.

Task designs also concern the interlocuters and the modality of interaction. According to Baralt (2013, 2014), task complexity may not work online the same way as it does face-to-face. In the two studies conducted by the researcher, complex tasks generated more negotiation work, heightened attention to form, and incorporation of the form necessary to complete the task, but in the face-to-face mode only. A major difference between the two studies, however, was the efficacy of simple tasks in the online mode. In Baralt (2013), simple tasks were found to be effective online, leading to the most learning of the targeted form, the Spanish past subjunctive. In contrast, Baralt (2014) found that learners who performed simple tasks online did not produce a single LRE, nor attempted to use the linguistic target on the assessment tests. The researcher explains that these disparities have to do with how learners perceived their interlocutor's proficiency level. In the former study, learners interacted with an expert (the researcher) who provided them with recasts, and such power relationship appeared to greatly amplify the noticing of the form. In the latter study, learners interacted with their peers, and it is likely that they did not view each other as providers of feedback, did not have sufficient knowledge to give feedback, or were not comfortable correcting a peer (e.g., Lai & Zhao, 2006; Ortega, 2009).

Thus, more research is needed to explore the effectiveness of tasks involving learner-learner interaction, because, after all, it is "the most ecological interactant-set-up to classroom contexts" (Baralt, 2014, p. 117). Perhaps, this line of research would benefit from the sociocultural theory of the Zone of Proximal Development (Vygotsky, 1978),

which proposes that potential development comes about through problem-solving "in collaboration with more capable peers" (Gass & Selinker, 2008, p. 86). Still another observation to pay attention to in Baralt (2013) is that turn taking appeared to be problematic in the online complex task condition, because both the participants and the researcher were sending or typing another message simultaneously. The researcher explains that this resulted in notably longer and greater number of turns, and the participants often seemed to experience "cognitive overload and frustration" (p. 718) and even missed the feedback provided entirely.

4.5. Outcome Measures

The next issue pertains to the validity of the outcome measures to assess the quantity and quality of L2 development resultant from task manipulations. According to Bialystok (1981), L2 acquisition or learning comprises two processing dimensions: knowledge and control. Knowledge is defined as the level of analysis and mental organization of linguistic information; control refers to the efficacy with which that information can be accessed or retrieved. Correspondingly, a range of outcome measures should be utilized to assess the change, or lack thereof, in learners' IL along the different processing dimensions depending on different task conditions. Also, most studies examined in the present article did not include a delayed posttest (e.g., Baralt, 2014; Révész, et al., 2014), or administered the delayed posttest only one to two weeks after the treatment period (e.g., Kim, 2012; Kim & Tracy-Ventura, 2011; Nuevo, et al., 2011). In order to see whether L2 development has in fact occurred, more robust research designs are needed with further delayed posttests. In addition, there is a need for longitudinal case studies to thoroughly examine the extent to which performing simple and complex tasks can lead to successful knowledge gains transferrable to the real-world task performance.

4.6. Data Analysis

A more detailed approach to analysing data would be helpful to obtain a more nuanced understanding of the relationships between task complexity, interactional patterns, and L2 development. As Kim (2012) and Révész (2019) note, transcripts on learner-learner interactions could be coded for specific feedback types such as recasts, confirmation checks, comprehension checks, and clarification requests, in addition to identifying LREs, as conducted in Nuevo (2006) and Nuevo et al. (2011). Yet, studies in this line of research (e.g., Baralt, 2013, 2014; Révész, 2009; Révész & Han, 2006; Révész, et al., 2014) have concentrated on aggregated group data, without presenting as many sample episodes as one could examine the quality of the interactions more closely with. Furthermore, employing

introspective methods would be valuable to examine the cognitive processes in which participants engaged while performing the treatment tasks (Révész, 2019). The addition of a stimulated recall (Gass & Mackey, 2016), for instance, would better enable researchers to assess the validity of the explanations regarding the impact of task complexity on attentional processes and the nature of the processing skills gained.

4.7. Generalizability of the Studies

Lastly but most importantly, more empirical studies are needed, as well as their replications, to ascertain the generalizability of the findings of previous studies. For this, a number of points need to be considered, in addition to the several methodological issues discussed thus far. For example, studies should include detailed descriptions of the instruments and methodological procedures, so as to make replication feasible. Also, the studies should address various learner characteristics (e.g., proficiency levels, age, aptitude, working memory, etc.) and educational contexts (e.g., ESL, EFL, etc.). In order to boost ecological validity, there is a particular need of studies conducted in actual classroom, rather than in laboratory, settings. Additionally, more empirical studies (e.g., Huh & Lee, 2018; Hyun & Lee, 2018; Kim, 2012; S. Park, 2015; Y. Park, 2018; Ryu & Bae, 2018) need to explore how task manipulations influence the Korean students' learning of EFL. The first language (L1) is acknowledged to be a main cognitive constraint in L2 processing (e.g., Gregg, 1996; Kellerman, 1995; Sorace, 2005), and therefore, the relationship between task complexity and L2 acquisition may well differ depending on the learners' L1 background (e.g., Révész, 2019).

5. CONCLUSION

The role of tasks in L2 acquisition has received growing attention from both researchers and teachers in recent years. So far, however, research addressing the impact of task complexity on L2 development is scarce. It is still gaining currency, since it sheds light on a deeper understanding of the processing mechanisms underlying the cognitive complexity of tasks. Furthermore, this line of research has important pedagogical implications with regard to the use of tasks, especially in the EFL classrooms in Korea.

First, as examined in the present article, tasks seek to trigger grammar learning with no or minimal intrusion into the comprehension of meaning. Accordingly, tasks could serve as a useful alternative to grammar instruction in the classrooms the predominant focus of which is on reading comprehension. Second, designing tasks should be conducted in an informed manner, considering the findings of research which suggest that more cognitively

complex tasks likely induce more accurate and complex production, and thereby advancing L2 development. It should also be noted, however, that tasks rendered overly complex along both the resource-directing and resource-dispersing dimensions may have a negative impact on learning. In a similar vein, the impact of task complexity interacts with a variety of learner-internal and learner-external factors discussed in this article, such as the learners' proficiency levels, linguistic targets, interlocuters, and the types of FonF instruction incorporated into task performance. Thus, more effective, as well as efficient, implementation of tasks would be possible if English teachers are aware of these variables, following the up-to-date trends of research on TBLT. After all, task complexity is an objective construct, concerning the inherent nature of the tasks, which cannot be defined simply by the amount of difficulty learners perceive during task performance (Robinson, 2001). Finally, by engaging learners in tasks in an informed manner noted above, a more "learner-centred approach to language teaching" (Van den Branden, et al., 2009, p. 3) would be possible in the EFL classrooms in Korea. Yet, teachers should play an important role as well, such as a co-communicator and an expert interlocutor who provides a timely interactional feedback. Therefore, future studies should continue to expand the scope of this line of research, considering, crucially, the group of methodological issues discussed in the present article.

Applicable levels: Secondary, tertiary

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