

Cite this Article: Zainab, T., & Gill, A. (2026). Cognitive Processing of Task Complexity by ESL Learners with Varying Capacity of Working Memory and Second Language Proficiency: A Critical Review. *Journal of Regional Studies Review*, 5(4), 57-68.
<https://doi.org/10.62843/jrsr/v.iv.226>

RESEARCH ARTICLE

JOURNAL OF REGIONAL STUDIES REVIEW (JRSR)

Cognitive Processing of Task Complexity by ESL Learners with Varying Capacity of Working Memory and Second Language Proficiency: A Critical Review

Tayyaba Zainab ^a Aneela Gill ^b

Corresponding Author: Tayyaba Zainab; tayyabazainab@numl.edu.pk



Abstract: Despite the extensive task-based language teaching (TBLT) research available on Robinson's (2015) Cognitive Hypothesis, the findings of these studies are largely inconsistent, and at times contradictory. This paper aims to critically analyze the methodological practices of existing TBLT research with reference to task complexity. It also intends to investigate how working memory is operationalized by these studies. Adopting a Critical Interpretative Synthesis Methodological approach, the findings of this critical evaluation reveal some methodological and theoretical limitations of the existing literature. One of the limitations is either excessive or insufficient increase in the complexity of second language learning tasks while another significant one is the underassessed role of working memory in ESL learners with low proficiency level of the target language. Based on the findings, this review offers several implications for future research related to Cognitive Hypothesis.

Keywords: Task-Based Language Teaching, Cognitive Hypothesis, Task Complexity, Working Memory, L2 Proficiency, Second Language Acquisition

Introduction

During the last few decades, Robinson's Cognitive Hypothesis (2015) has emerged as one of the most influential frameworks in task-based second language teaching (TBLT) studies. This framework offers a theoretical account of the association between task complexity and second language learning. However, despite the widespread application of Cognitive Hypothesis (CH, henceforth), the findings of the empirical studies grounded in it have remained far from conclusion. A few studies have demonstrated complete agreement with the claims of CH (Awwad & Tavakoli, 2022; Cho, 2018; Sasayama, 2016); whereas, others have shown partial agreement (Sánchez & Sunesson, 2023; Manchón et al., 2023; Zhan et al., 2021; Xu & Zhang, 2023). These divergent findings have largely been attributed to methodological differences such as excessive or insufficient increase in task complexity and marginalizing the significant role of working memory. However, a little attention has been paid to investigating whether these methodological differences may be linked to the theoretical under-specification of CH.

Keeping the above-mentioned issue in view, this paper highlights the methodological and theoretical limitations of TBLT studies grounded in CH and emphasizes the need for its refinement. Furthermore, this paper provides a deeper insight into the underlying cognitive mechanism of second language learning for the upcoming researchers in the field and for pedagogical innovation.

To shed light on the reasons of inconsistent findings of the previous studies on task complexity, this paper aims to critically evaluate how task complexity is handled in the existing literature across two dimensions:

^a PhD Scholar, Department of English, National University of Modern Languages, Islamabad, Pakistan.

^b Assistant Professor, Department of English, National University of Modern Languages, Islamabad, Pakistan.

(i) resource directing dimension, which includes the linguistic features of a language learning task that direct attentional or cognitive resources towards inherent difficulty, (ii) resource dispersing dimension, which includes the procedural features of a task that divert attentional or cognitive resources from linguistic form to the procedures involved in a language learning task, such as planning time, steps involved, prior knowledge, etc. This study also endeavors to assess the operationalization of working memory and L2 proficiency in the existing TBLT studies embedded in Cognitive Hypothesis. Moreover, the study seeks to evaluate as well as synthesize the findings of the previous task-based studies on L2 written and spoken production to provide a deeper insight into the relationship between task planning, working memory and Second Language Acquisition (SLA). This paper is mainly guided by the following research questions:

1. What does the existing task-based literature offer on Robinson's (2015) Cognitive Hypothesis with reference to resource directing dimension?
2. What does the existing task-based literature offer on Robinson's (2015) Cognitive Hypothesis with reference to resource dispersing dimension?
3. How working memory and L2 proficiency levels are operationalized by TBLT studies grounded in Robinson's (2015) Cognitive Hypothesis?

Method

This study adopts Critical Interpretive Synthesis approach (Dixon-Woods et al., 2006) to summarize, and critically evaluate existing TBLT literature on Cognitive Hypothesis. Critical Interpretive Synthesis (CIS) approach by Dixon et al. (2006) is used to review conceptual, theoretical and methodological inconsistencies in the existing literature. It is one of the qualitative approaches applied in social sciences and ESL studies for compiling systematic and narrative reviews. This approach aims to synthesize existing findings, investigate underlying theoretical assumptions, resolve disagreements and establish new insights. Therefore, the researchers deemed CIS the most suitable approach for critically reviewing TBLT studies. The data sources include last 10 year's (2016-2026) most relevant TBLT studies grounded in Cognitive Hypothesis focusing on L2 reading, writing, listening and speaking.

One of the strengths of this study is that it aims to trace out the reasons of inconsistent findings in second language TBLT literature with the purpose of enhancing the understanding of the underlying cognitive mechanisms involved in second language learning.

Selection Criteria: For this critical review, 50 TBLT research studies grounded in Robinson's (2015) Cognitive Hypothesis were identified from a number of linguistics and cognition-focused peer reviewed second language learning journals. Out of those, the researchers selected only 14 most relevant studies published during the past ten years. The selected research papers were indexed in the following sources: Scopus, Web of Science, Google Scholar, Pro Quest and ERIC, whereas the search keywords were: task complexity, second language reading, writing, listening and speaking. In addition to this, a meta-analysis was conducted to identify additional studies (Johnson & Tabari, 2025).

Reconceptualization of the Existing TBLT Studies

Task-based language learning and teaching have received remarkable attention from L2 researchers and instructors. TBLT research is often based in one of the two theoretical models: Sweller's (2011) Cognitive Load Theory and Robinson's (2015) Cognitive Hypothesis. Although, both the models highlight the significance of cognitive resources in second language learning, they fundamentally diverge in their assumptions.

Cognitive Load Theory: To begin with, Sweller's (2011) Cognitive Load Theory (CLT) offers a limited resource view of cognitive and attentional mechanisms. It posits that a complex task splits attentional resources because it asserts high cognitive load and thus causes poor L2 performance. However, to enhance

second language learning, it is essential to minimize the difficulty level of the task assigned to the learner. With the view to reducing task complexity for second language learners, Sweller (2011) has proposed three types of cognitive load. The first type is called intrinsic cognitive load, the second type is termed as extraneous cognitive, while the third category is called germane cognitive load. Intrinsic cognitive load is the natural difficulty of a language learning task that may include the number of elements and variables such as vocabulary and structural complexity, the extraneous cognitive load deals with the sequence of elements, concepts and instructions in the given task, while germane cognitive load is an individual's mental ability to focus, integrate, synthesize and process information.

Sweller (2011) holds that the first two types of cognitive load, namely intrinsic and extraneous, cause attention split and lead to the development of ineffective schemas and poor language learning. However, germane cognitive load when enhanced by reducing both intrinsic and extraneous cognitive loads leads to better L2 performance. In other words, to maximize germane cognitive load and to increase L2 performance, the other two types of cognitive loads need to be reduced.

It is crucial to mention that germane cognitive load denotes various functions of working memory which is an internal storage system and has limited capacity to temporarily hold, process, critically evaluate, decode and interpret linguistic and visual information. Moreover, it retrieves and integrates linguistic schemas from long term memory during language learning and processing without which language learning and processing are not possible (Baddeley, 2012). As described by Baddeley's Multi-componential model (2000), WM comprises four components that include: visuospatial sketchpad, phonological loop, executive control and episodic buffer. The prior mentioned functions of working memory have significant role in second language learning (Baddeley, 2012; Hayes, 2012, Hayes and Fowler 1980; Kellogg, 1996). Learners' cognitive differences are reflected in their attentional and proficiency differences in second language learning (Baddeley, 2012; Mavrou, 2020). Showing general agreement, the existing literature has demonstrated that ESL learners with greater working memory show better L2 performance in comparison to those with low WM (Jung, 2018; Zohu, Rossi & Chen, 2017).

Cognitive Hypothesis: An alternate approach to task complexity and second language learning is Robinson's Cognitive Hypothesis (2015). It provides a multiple resource view of cognitive and attentional resources and thus advocates the flexibility of attentional resources. Moreover, it holds that increasing the complexity level of a language learning task involves underlying cognitive system (such as WM). Based on this approach, Robinson (2015) has proposed a systematic method for structuring a second language learning task, i.e., Triadic Componential Framework (henceforth TCF). TCF (2007) classifies a second language learning task into three distinct categories such as task complexity, task conditioning and task difficulty. The first category 'task complexity' is a cognitive factor that is further divided into two categories: resource directing dimension and resource dispersing dimension. Resource directing dimension is the inherent difficulty of a language learning task that includes +/- few numbers of elements and -/+ intentional reasoning; whereas, the resource dispersing dimension is a procedural factor that incorporates +/- planning time, +/- prior knowledge, +/- few steps and instructions. The second factor 'task difficulty' is a learner-related factor that is divided into ability and affective factor. Ability factor includes working memory, intelligence and aptitude; whereas, affective factor comprises motivation, anxiety and confidence. The last category 'task conditioning' is an interactive factor whereas task complexity is a learner's cognitive factor (Robinson, 2015).

According to Robinson (2015), increasing the complexity of second language learning task on resource directing dimension enhances L2 performance in terms of complexity and accuracy; yet, it has no influence on L2 fluency. On the other hand, enhancing task complexity on the resource dispersing dimension reduces all three measures including complexity, accuracy and fluency (i.e., CFA).

Reconceptualization of Empirical Findings on Cognitive Hypothesis: A great number of TBLT studies based on Robinson's (2015) Cognitive Hypothesis have mainly examined task complexity and task difficulty. However, the findings are still inconclusive due to some methodological and theoretical shortcomings upon which a detailed description is provided below.

a. Task Complexity across Resource Directing Dimension: The resource directing dimension of task complexity refers to the association between linguistic features of a second language learning task and cognitive resources such as working memory. It includes task-related features such as +/- few elements, +/- here and now, +/- past, +/- intentional reasoning. Intentional reasoning is the feature of a second language learning task that may be controlled through linguistic, syntactic or discourse complexity; whereas, a visual task may be regulated through controlling the number of elements, events and characters (Robinson, 2007). According to Robinson (2015), increasing task complexity on resource directing dimension is essential for engaging the underlying cognitive mechanism. It enhances L2 complexity and accuracy; yet, it may temporarily decrease L2 fluency. Across the resource directing dimension, a single TBLT research study (Awwad & Tavakoli, 2022) has shown complete alignment with Robinson's (2015) Cognitive Hypothesis; however, a substantial number of studies (Sánchez & Sunesson, 2023; Xu & Zhang, 2023; Zhan et al., 2021; Manchón et al., 2023; Cho, 2018; Sasayama, 2016) have demonstrated partial agreement. The following paragraphs in this section attempt to reconceptualize the empirical findings on the resource directing dimension of Robinson's (2015) Cognitive Hypothesis.

Showing complete agreement with Cognitive Hypothesis, Awwad and Tawakoli (2022) reported a noticeable upsurge in complexity and accuracy without any effect on fluency. Notably, the researchers enhanced task complexity on resource directing dimension (i.e., +/- intentional reasoning) by increasing the number of characters and their activities in an oral task.

On the other hand, working on the same dimension, Sánchez and Sunesson (2023) observed partial agreement with Robinson's (2015) Cognitive Hypothesis. In this regard, the researchers verified that enhancing intentional reasoning by increasing the total count of stories in a writing task, which was presented in a visual form, enhanced L2 learners' complexity and fluency; yet, it resulted in the form of a trade-off between complexity and accuracy. It is important to mention here that initially the selection of participants and their division in two different groups were made on a random basis. However, the proficiency level of the participants was assessed at a later stage. Therefore, it may be concluded that ignoring the L2 proficiency level or the random sampling technique might have affected the findings of the study and contributed to the tradeoff between complexity and accuracy. In this regard, Sasayama (2016) attributes a significant role to L2 proficiency in a task-based study. It is further argued that achieving a high proficiency level reduces the role of WM in second language learning. Findings from both the studies strongly advocate that the division of participants in different groups based on their L2 proficiency level is inevitable.

In another study, highlighting the significance of L2 proficiency in task-based second language learning, Sasayama (2016) argues that L2 proficiency level is a moderating variable that mediates between task complexity, cognitive load and L2 performance. Although the study highlights the significance of L2 proficiency in task-based second language learning, it shows some methodological deficiencies that may include an excessive increase in the complexity of a task. In simple words, task complexity was increased on both dimensions. On the resource directing dimension, it was enhanced by increasing the number of characters in four different oral story telling tasks; however, on the resource dispersing dimension limited time duration was provided for the completion of each task that eventually resulted in high cognitive load for the participants with low proficiency level. Moreover, the self-report of cognitive load and the statistical findings revealed that the participants with high proficiency level experienced less cognitive load; they remained focused, and used better vocabulary and syntactic structures in comparison with the learners with low proficiency level in both structurally and procedurally complex tasks. The study thus highlights the

significance of L2 proficiency in task-based second language learning; yet, it shows partial agreement with CH due to its methodological limitation of excessive increase in task complexity.

It is important to reiterate here that the methodological issue of excessive increase in task complexity offers one of the plausible reasons for inconsistent findings in the existing literature and is the subject of inquiry for this critical review. The same was observed in a study by Manchón, McBride, Martínez and Vasylets (2023) where the complexity of a visual story telling task was increased on both dimensions, i.e., resource directing and resource dispersing, with 79 undergraduate Spanish students majoring in English language as participants. On the resource directing dimension, intentional reasoning demand was increased by incorporating complex visual images, lack of logical connection between various events, and by increasing the number of characters and events in two story writing tasks; however, on the resource dispersing dimension, task complexity was enhanced by increasing the number of instructions. The findings of this study showed a trade-off between complexity and accuracy which presents partial agreement with CH. Moreover, the study concludes that increased proficiency is a predictor of writing performance at all three levels of task complexity. It is important to acknowledge here that the findings of this study may have been influenced by the excessive increase in task complexity across both dimensions. In this regard, Sweller (2011) argues that a highly complex task may also divert attentional resources resulting in poor L2 performance.

In a similar study with 59 postgraduate EFL Chinese learners, Zhan, Sun and Zhang (2021) enhanced the complexity level of a task on both dimensions. On the resource directing dimension, task complexity was increased by intensifying intentional reasoning demand in an argumentative essay writing task. However, on the resource dispersing dimension, L2 complexity was enhanced by increasing the number of instructions. The findings revealed partial alignment with CH by demonstrating a trade-off between complexity and accuracy; whereas, no significant impact of enhancing complexity of a task was found on learners' fluency. The limitations of this study suggest to take a careful account of the level of task complexity while investigating L2 performance.

On the other hand, an insufficient increase in the complexity of a task may also cause inconsistent findings. In this regard, Cho's (2018) study provides one such example. The researcher increased the complexity of an argumentative writing task by elevating intentional reasoning; however, no predetermined time duration was allocated for the completion of the task. The findings of this study show a trade-off between syntactic complexity and accuracy with no improvement in fluency. This tradeoff could be an attribute of insufficient increase in the complexity of the task on resource dispersing dimension. To elaborate this point further, providing no predetermined time slot for the completion of the task might have caused an inadequate challenge for the learners to complete the task. As argued by Sasayama (2016), unless a task is not complex enough, the underlying cognitive mechanism cannot be engaged effectively.

To sum up the above discussion, it can be concluded that the level of learners' proficiency and task complexity (excessive or insufficient) seem to provide an explanation for inconsistent findings of existing TBLT studies and suggest further inquiry in this regard. Moreover, thorough investigations are required to address the level of structural complexity of second language learning tasks.

b. Task Complexity across Resource Dispersing Dimension: As mentioned earlier, the resource dispersing dimension of task complexity incorporates +/- few instructions, +/- planning time, +/- prior knowledge, and +/- single task. According to Robinson (2015), increasing task complexity across resource dispersing dimension diverts attention from linguistic form to cognitive mechanism. Moreover, it asserts high cognitive load that negatively affects complexity, accuracy and fluency (Robinson, 2022). On the resource dispersing dimension, a single TBLT study (Gui & Ismail, 2024) has shown complete agreement with CH; whereas, a great number of TBLT studies (Tajeddin & Bahador, 2012; Ansari & Shafiee, 2018; Frear & Bitchner, 2015;

Santos, 2018) have shown partial agreement; however, some studies (Donate & Leow, 2024; Attarzade & Farahani, 2014) have reported complete disagreement.

On the resource dispersing dimension, the study by Gui and Ismail (2024) that has shown complete agreement with CH reports that reducing planning time of a second language learning task produces negative impact on L2 vocabulary development. Furthermore, participants with increased working memory outperform their counterparts with limited WM, when no planning time is allocated. Although the findings of this study show complete agreement with Cognitive Hypothesis, it ignores other 3 triads of task complexity which include complexity, accuracy and fluency.

Contrarily, Tajeddin and Bahador (2012) reported fractional agreement with CH while assessing oral production of L2 learners. Notably, the researchers manipulated task complexity on both dimensions. At the initial stage, 22 female EFL learners were divided into two groups on the basis of their proficiency level. Group 1 comprised of 11 participants with high proficiency; whereas, group 2 consisted of 11 participants with low proficiency level. On the resource dispersing dimension, task complexity was increased by reducing planning time. The two groups (A and B) in two different tests were assigned less and more planning time respectively. Group A showed similar findings in both situations. However, Group B with more planning time showed increased syntactic complexity; whereas, with less planning time the same group showed poor performance. Based on the findings, it was concluded that more planning time makes a complex task comparatively easier and more manageable for the learners with low proficiency. In other words, a positive relationship exists between task planning time and syntactic complexity. In other words, more planning time results in better performance.

In a similar study, Ansari and Shafiee (2018), administered two story telling tasks (simple and complex) among 30 male and female participants with intermediate proficiency level in English. These participants were divided into two groups; whereas each group was tested twice under two different conditions. The first group received a pre-test and later a post-test by manipulating task conditions on resource directing dimension (via +/- reasoning); during the pretest, the first group encountered a simple image-based story telling task with 6 pictures that were presented in the correct sequence; whereas, for the post-test the same group received a complex story telling task with the same 6 pictures that were scrambled. However, the second group was given pre- and post-test by operating task conditions on resource dispersing dimension (via +/- planning time). During the pre-test, the second group received a simple task with prior knowledge; whereas, the same group encountered a complex task without prior knowledge. Notably, the same test was used after an intervention of one week. Based on the findings, it was concluded that increasing task complexity on both dimensions, resource directing and resource dispersing, enhanced complexity and accuracy without affecting fluency. The findings of this study clearly illustrated partial agreement with Cognitive Hypothesis, while the findings on the resource dispersing dimension are aligned with those of Foster and Skehan's findings (1997, cited in Ansari and Shafiee, 2018). It is important to mention here that using the same story telling task as pre- and post-test and changing the sequence of simple and complex tasks is likely to have influenced the task complexity which might have affected the findings of the study.

In another study, Frear and Bitchner (2015) selected 34 non-native English language learners with intermediate proficiency level and designed 3 letter writing tasks with varying degree of complexity. For each task, complexity level was enhanced on both dimensions. On resource directing dimension, reasoning demand and number of elements were increased in the instructions of the task. However, on resource dispersing dimension, task complexity was increased by allocating only 2 minutes for reading the instructions and questions; whereas, 30 minutes were allowed for the completion of the writing task. The results revealed that increasing task complexity on resource dispersing dimension (i.e., - few elements) significantly enhanced lexical complexity; yet, it had no visible impact on sentence subordination. Moreover, the participants experienced high level of stress while performing the task that is an indicator of high cognitive load.

Similarly, Santos (2018), in his study, enhanced task complexity on both dimensions. On the resource directing dimension, for increasing the complexity level of an oral task, the number of elements was increased; yet, on the resource dispersing dimension no planning time was allocated. It is important to mention here that the researcher selected 39 participants with intermediate proficiency level and divided them into two groups. Group 1 comprised of 19 participants who were exposed to a simple task with planning time; whereas, Group 2 consisted of 20 participants, who were provided a complex task without planning time. The study reported improved accuracy and complexity; yet, it negatively affected the learners' level of fluency upon increasing task complexity on resource directing dimension. However, on the resource dispersing dimension, the same study showed partial agreement with CH, as increasing task complexity improved the accuracy; yet, it had no significant effect on syntactic complexity and fluency. Highlighting the details of inconsistent findings and methodological flaws, the researcher has mentioned that the different amount of time allocated for task planning might have influenced L2 performance. In the light of the findings, this study suggests future researchers to adopt a cautious approach for manipulating planning and completion time of a task.

A further instance of an excessive increase in task difficulty is manipulating task complexity by a factor of two on a single dimension. Working on the resource dispersing dimension, Donate and Leow (2024) manipulated L2 oral task complexity by twofold via instructions (+/- few instructions) and planning time (+/- planning time) that resulted in no improvement in oral L2 vocabulary development and syntactic complexity. It is important to mention here that the researcher neglected to investigate all three measures, i.e., CFA. Similarly, Attarzade and Farahani (2014) reported negative results and poor listening comprehension while increasing task complexity on resource dispersing dimension twice. To elaborate further, the researchers enhanced the complexity level of L2 listening comprehension task without providing planning time and prior knowledge that might have asserted high cognitive load resulting in negative impact on vocabulary development. In this regard, Sweller (2011) argues that a highly difficult task may negatively influence the underlying cognitive mechanism of second language learners.

In the light of the above discussion, it may be concluded that increasing task complexity simultaneously on both dimensions or on the same dimension by twofold may be considered as important variables that may affect the findings on resource dispersing dimension. In short, a more cautious methodological approach for handling task complexity on resource dispersing dimension is required for utilizing Cognitive Hypothesis as effective theoretical basis for studies in SLA.

c. Operationalization of Working Memory and L2 Proficiency: There is a general consensus in second language learning studies on the substantial role of working memory. Offering profound understanding in this area, Nouwens, Groen, Kleemans and Verhoeven (2021) reported that planning and exhibition are two major functions of working memory that are necessary for interpreting vocabulary and grammatical structures in reading comprehension when learning a second language. Jiang and Farquharson (2018) also acknowledged that second language learners, who had low WM, lack one of the executive functions of working memory (i.e., behavioral attention) while decoding the text during reading and speaking processes. The researchers also recommended to avoid the use of oral instructions and to provide some extra assistance to second language learners with limited WM. Acknowledging the function of WM in second language sentence processing, Zhou et al. (2017) confirmed that learners with greater working memory translated 'Wh' sentences with more accuracy in a short time period. Fay (2014) also admitted that higher working memory resulted in improved L2 reading skills. Likewise, Mavrua (2020) claimed that cognitive differences caused variation in retrieval function during L2 writing. Additionally, low working memory resulted in a trade-off between fluency and lexical complexity.

In contrast to the previously mentioned second language studies, only a few TBLT studies (Gui & Ismail, 2024; Jung, 2018; Sasayama, 2016) have considered working memory as a central moderating variable. On

the other hand, a noticeable number of TBLT studies grounded in Cognitive Hypothesis have neglected to investigate the capacity of working memory (Sánchez & Sunesson, 2023; Zhan et al., 2021; Donate & Leow, 2024).

In an investigation, Gui and Ismail (2024) observed that WM is a central controlling variable in second language learning. Moreover, it plays a remarkable role in vocabulary development as L2 learners with high working memory outperformed their counterparts with low WM in a complex writing task. However, the researchers completely ignored to investigate the function of cognitive differences in the processing of diverse grammatical structures. In another study, Jung (2018) observed that learners with high WM performed better as compared to those who had lower WM in a complex L2 reading task.

As mentioned earlier, working memory plays a significant role in second language learning; however, this role becomes more crucial in the case of reduced L2 proficiency (Sasayama, 2018; Serafini & Sanz, 2016 as mentioned in Manchón et al., 2023). Based on the foregoing discussion, it may be concluded that for ESL learners with low proficiency level, it is essential to take an account of learner's capacity of working memory while manipulating task complexity. In a parallel study, Sánchez and Sunesson (2023) reported partial agreement with CH. More precisely, the researchers found that low proficiency level participants showed improved syntactic complexity, accuracy and fluency in a simple task; however, those with high proficiency level demonstrated high complexity, accuracy and fluency in a complex story writing task. Based on the findings, Sánchez and Sunesson (2023) suggested to account for L2 proficiency level while designing task complexity. Moreover, further examining the capacity of working memory of the learners with low proficiency level is essential for advancing the clarity on this matter.

In a similar study, Zhan et al. (2021) reported partial agreement with Robinson's (2015) Cognitive Hypothesis due to selecting postgraduate EFL Chinese learners with lower intermediate level of proficiency in English language. For this study, it is inevitable to investigate the capacity of WM in low proficiency level learners. Likewise, Donate and Leow (2024) manipulated L2 oral task, on resource dispersing dimension, among 51 low proficiency learners of Spanish that resulted in no improvement in oral L2 vocabulary development and syntactic complexity. Since the job of working memory in learners with low proficiency level increases, it is essential to determine their level of working memory before increasing the task complexity. In the case of low WM, no positive effects of task complexity can be yielded on L2 performance (Sasayama, 2018).

As discussed earlier, a noticeable number of TBLT studies have disregarded the investigation of learners' capacity of working memory (limited or high) while designing task complexity, and this discrepancy serves as a cognitive bottleneck. In short, the existing literature consistently reports varying findings on task complexity and working memory.

d. Theoretical Limitations of Cognitive Hypothesis: A core limitation of Robinson's (2015) Cognitive Hypothesis could possibly be its insufficient discussion on the level (minimum or maximum) of task complexity which could have led to the varying levels of agreement (complete, partial, or none) in the existing literature. Another foundational flaw of Cognitive Hypothesis is not giving central importance to WM and L2 proficiency but classifying them as ability variables under task difficulty; whereas, both must be treated as core or central components instead of treating them as peripheral variables.

In short, the absence of discussion on an appropriate level of task complexity, and inappropriate classification of working memory and L2 proficiency level are the two factors causing floor and ceiling effect in the studies grounded in Cognitive Hypothesis. However, addressing these two loopholes may help it evolve from purely a task-based hypothesis to a dependable theory in the field of second language acquisition.

At this point, it is also essential to distinguish the claims of CH from other TBLT approaches such as Sweller's (2011) Cognitive Load Theory and Skehen's (1998, 2009) Trade-off Hypothesis. Contrary to CH, the other two theoretical postulations posit that WM has a critical function in L2 performance. It has a limited

capacity to hold, integrate and store information; therefore, to avoid cognitive load and improve L2 performance, it is essential to design the level of task complexity by considering learner's cognitive differences.

Limitations, Future Directions, and Conclusion

With reference to the first research question, this critical review reveals that a single TBLT research study (Awwad & Tavakoli, 2022) on resource directing dimension has shown complete agreement with Cognitive Hypothesis (2015); however, a large number of studies (Sánchez & Sunesson, 2023; Xu & Zhang, 2023; Manchón et al., 2023; Zhan et al., 2021; Cho, 2018; Sasayama, 2016;) have demonstrated partial agreement due to some theoretical and methodological limitations. The previously mentioned studies with partial agreement reported a trade-off between complexity and accuracy that supports one of the basic postulates of Baddeley's (2012) Multimodal of working memory which claims that working memory has limited capacity to hold and process information. With reference to this claim, one of the common methodological limitations of all the previously mentioned studies is the lack of investigation on learner's level of L2 proficiency and an inappropriate increase in task complexity (i.e., excessive or insufficient) or cognitive load. These methodological deficiencies could be the reason for the inconsistent findings of previous studies and suggest further inquiry in this regard. Moreover, these methodological limitations indicate the need to re-examine the concept of task complexity (minimum or maximum) by Robinson's (2015) Cognitive Hypothesis.

In response to the second research question, the review of existing literature shows that, as is the case with the studies on resource directing dimension, only one TBLT study (Gui & Ismail, 2024) on the resource dispersing dimension has showed complete agreement with CH; whereas, a great number of TBLT studies (Ansari & Shafiee, 2018; Santos, 2018; Frear & Bitchner, 2015; Tajeddin & Bahador, 2012) have shown fractional agreement. However, some studies (Donate & Leow, 2024; Attarzade & Farahani, 2014) have reported complete disagreement due to an excessive increase in the complexity of L2 task that includes increasing the task complexity on the same dimension by twofold. This methodological limitation poses a serious question on the reliability of the findings and the underlying methodological and theoretical assumptions of the previously mentioned studies. In short, increasing task complexity simultaneously on both dimensions or on the same dimension by twofold, manipulating the sequence of elements/tasks and planning time need to be considered as some important variables that may affect the findings on resource dispersing dimension as they are likely to add to the complexity of a second language learning task. To sum up, the limitations of these studies are a reflection of theoretical inadequacies of Cognitive Hypothesis. Furthermore, these limitations suggest to adopt a more refined and careful approach for the operationalization of structural boundaries of task complexity.

Addressing the third research question, the findings of this critical review confirm that a number of TBLT studies grounded in Robinson's (2015) Cognitive Hypothesis have paid limited attention to individual differences in WM and L2 proficiency and this oversight is considered a significant factor for inconsistent findings in the previous studies. A second language learner with high proficiency level performs better on a complex task as compared to those with limited proficiency level. In the case of low L2 proficiency, it is necessary to manipulate the second language learning task according to the learners' cognitive capacity.

However, a few TBLT studies have highlighted the function of WM and L2 proficiency in a complex language learning task (Gui & Ismail, 2024; Jung, 2018; Sasayama, 2016; Tajeddin and Bahador, 2012); whereas, others have completely ignored to investigate the capacity of working memory in L2 learners with low proficiency level (Sánchez & Sunesson, 2023; Zhan et al., 2021; Donate & Leow (2024). As discussed earlier, WM and L2 proficiency are two of the important factors that are likely to affect the findings of the studies on task complexity.

Summing up, the previously mentioned inconsistent findings of TBLT literature may be linked to the methodological and theoretical inadequacies of Cognitive Hypothesis. These limitations include classifying WM and L2 proficiency in the Triadic Componential Framework (2007) as a subcategory (i.e., ability variable) of task difficulty rather than dealing with them as central or moderating variables in second language learning. This study highlights that the inconsistent and contradictory findings of the previous studies call for an updated task-based framework that considers L2 learners' capacity of working memory and their proficiency level as central variables.

References

- Ansari, E., & Shafiee, S. (2018). Impacts of resource dispersing and resource directing task dimensions on EFL learners' oral production. *International Journal of English Linguistics*, 8(6).
- Attarzade, S., & Farahani, E. (2014). The effect of task complexity on Iranian EFL learners' listening comprehension across aptitude. *Procedia - Social and Behavioral Sciences*, 98, 314–323. <https://doi.org/10.1016/j.sbspro.2014.03.422>
- Awwad, A., & Tavakoli, P. (2022). Task complexity, language proficiency and working memory: Interaction effects on second language speech performance. *International Review of Applied Linguistics in Language Teaching*, 60(2), 169–196. <https://doi.org/10.1515/iral-2018-0378>
- Baddeley, A. D. (2012). Working memory: Theories, models and controversies. *Annual Review of Psychology*, 63, 1–29. <https://doi.org/10.1146/annurev-psych-120710-100422>
- Cho, M. (2018). Task complexity, modality, and working memory in L2 task performance. *System*, 72, 85–98. <https://doi.org/10.1016/j.system.2017.10.010>
- Donate, A., & Leow, R. (2024). Task complexity, task features, and task anxiety at low L2 proficiency levels. In S. Li (Ed.), *Individual differences and task-based language teaching* (pp. 111–137). John Benjamins. <https://doi.org/10.1075/tblt.16.04don>
- Dixon-Woods, M., Cavers, D., Agarwal, S., Annandale, E., Arthur, A., Harvey, J., Hsu, R., Katbamna, S., Olsen, R., Smith, L., Riley, R., & Sutton, A. J. (2006). Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Medical Research Methodology*, 6, Article 35. <https://doi.org/10.1186/1471-2288-6-35>
- Frear, M. W., & Bitchener, J. (2015). The effects of cognitive task complexity on writing complexity. *Journal of Second Language Writing*, 30, 45–57. <https://doi.org/10.1016/j.jslw.2015.08.009>
- Fay, A., & Buchweitz, A. (2014). Listening comprehension and individual differences in working memory capacity in beginning L2 learners. *Letrônica*, 7(1), 113–129.
- Gui, J., & Ismail, S. M. (2024). The effect of planning time on vocabulary acquisition in a task-based environment: The mediating roles of working memory and field (in)dependence. *BMC Psychology*, 12, Article 145. <https://doi.org/10.1186/s40359-024-01638-4>
- Hayes, J. R. (2012). Modeling and remodeling writing. *Written Communication*, 29(3), 369–388. <https://doi.org/10.1177/0741088312451260>
- Jackson, D. O., & Suethanapornkul, S. (2013). The cognition hypothesis: A synthesis and meta-analysis of research on second language task complexity. *Language Learning*, 63(2), 330–367. <https://doi.org/10.1111/lang.12008>
- Jiang, H., & Farquharson, K. (2018). Are working memory and behavioral attention equally important for both reading and listening comprehension? A developmental comparison. *Reading and Writing*, 31, 1449–1477. <https://doi.org/10.1007/s11145-018-9840-y>
- Jung, J. (2018). Effects of task complexity and working memory capacity on L2 reading comprehension. *System*, 74, 21–37. <https://doi.org/10.1016/j.system.2018.02.005>
- Kellogg, R. (1996). A model of working memory in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 57–71). Lawrence Erlbaum Associates.
- Li, S., & Fu, M. (2018). Strategic and unpressured within-task planning and their associations with working memory. *Language Teaching Research*, 22(2), 230–253. <https://doi.org/10.1177/1362168816684367>
- Luo, X. (2022). The effect of manipulating task complexity along resource-dispersing dimension on L2 written performance from the perspective of complexity theory. *English Language Teaching*, 15(9), 151–159.
- Manchón, R. M., McBride, S., Martínez, M. D. M., & Vasylets, O. (2023). Working memory, L2 proficiency, and task complexity: Independent and interactive effects on L2 written performance. *Studies in Second Language Acquisition*, 45(3), 737–764.

- Mavrou, I. (2020). Working memory, executive functions, and emotional intelligence in second language writing. *Journal of Second Language Writing*, 50, Article 100758.
- Nouwens, S., Groen, M. A., Kleemans, T., & Verhoeven, L. (2021). How executive functions contribute to reading comprehension. *British Journal of Educational Psychology*, 91(1), 169–192. <https://doi.org/10.1111/bjep.12355>
- Qian, L., Shamsudin, S., & Don, Z. M. (2024). Effects of task complexity on Chinese EFL learners' language production in synchronous computer-mediated communication. *SAGE Open*, 14(3). <https://doi.org/10.1177/21582440241273866>
- Robinson, P. (2015). The cognition hypothesis, second language task demands, and the SSARC model of pedagogic task sequencing. In M. Bygate (Ed.), *Domains and directions in the development of TBLT* (pp. 87–121). John Benjamins.
- Robinson, P. (2022). The cognition hypothesis and individual difference factors. In *The Routledge handbook of second language acquisition and individual differences* (pp. 3–33). Routledge.
- Robinson, P., & Gilabert, R. (2007). Task complexity, the cognition hypothesis and second language learning and performance. *IRAL: International Review of Applied Linguistics in Language Teaching*, 45(3), 161.
- Sánchez, L., & Sunesson, M. (2023). Grasping the effects of storyline complexity, task structure and proficiency in narrative writing performance. *Journal of Second Language Writing*, 60, Article 100986. <https://doi.org/10.1016/j.jslw.2023.100986>
- Santos, S. (2018). Effects of task complexity on the oral production of Chinese learners of Portuguese as a foreign language. *Journal of the European Second Language Association*, 2(1).
- Sasayama, S. (2016). Is a 'complex' task really complex? Validating the assumption of cognitive task complexity. *The Modern Language Journal*, 100(1), 231–254. <https://doi.org/10.1111/modl.12313>
- Skehan, P. (2009). Modelling second language performance: Integrating complexity, accuracy, fluency, and lexis. *Applied Linguistics*, 30(4), 510–532.
- Skehan, P. (2018). *Second language task-based performance: Theory, research, assessment*. Routledge.
- Skehan, P., & Foster, P. (2001). Cognition and tasks. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 183–205). Cambridge University Press.
- Sweller, J. (2011). *Cognitive load theory*. In *Psychology of learning and motivation* (Vol. 55, pp. 37–76). Academic Press.
- Johnson, M. D., & Tabari, M. A. (2025). Linguistic complexity in second language writing: Insight from studies on task planning. *Language Teaching*, 58(1), 1–13.
- Tajeddin, Z., & Bahador, H. (2012). Pair grouping and resource-dispersing variables of cognitive task complexity: Effects on L2 output. *Iranian Journal of Applied Linguistics*, 15(1), 123–149.
- Xu, T. S., & Zhang, L. J. (2023). Effects of cognitive task complexity and online planning on second language learners' argumentative writing. *Frontiers in Psychology*, 14, Article 1121994.
- Xu, T. S., Zhang, L. J., & Gaffney, J. S. (2022). Examining the relative effects of task complexity and cognitive demands on students' writing in a second language. *Studies in Second Language Acquisition*, 44(2), 483–506.
- Zhan, J., Sun, Q., & Zhang, L. J. (2021). Effects of manipulating writing task complexity on learners' performance in completing vocabulary and syntactic tasks. *Language Teaching Research*. <https://doi.org/10.1177/13621688211024360>
- Zhou, H., Rossi, S., & Chen, B. (2017). Effects of working memory capacity and tasks in processing L2 complex sentence: Evidence from Chinese-English bilinguals. *Frontiers in Psychology*, 8, Article 205425.