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Original Research

The Effect of Different Components of the Brainling Model (i.e., Cultuling, Cogling, Sensoling, and Emoling) on their Recall and Retention of Complex Structures: EFL Learners' Perceptions in Focus

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Abstract

Contrary to the importance of recall and retention of complex structures in general and RSs in particular in language performance, they are difficult for EFL learners. To reduce EFL learning difficulties, different strategies have been put forth. This study explored EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their recall and retention of complex structures. To this end, a content analysis design was used. Ten lower-intermediate female EFL learners from a private language institute in Kerman participated in this study through purposive sampling. This research used a semi-structured interview with five open-ended questions to collect the data. For data analysis, the transcribed interview data were exposed to manual thematic analysis via open, axial, and selective coding. Regarding EFL learners' perceptions of the effect of different components of the Brainling Model, the following perceptions were identified: Reducing Ambiguity of Complex Structures, Reducing Difficulty of Learning Complex Structures, Designing Appropriate Tasks for Complex Structures, Increasing Learner Control over Learning Complex Structures, Enhancement of Teaching Materials, Activation of Different Senses, and Activation of Emotion and Cognition. With regard to EFL learners' perceptions of the effect of different components of the Brainling Model, the following perceptions were recognized: Enhancement of Memorization, Reducing Rate of Forgetting, Enhancement of Long-Term Learning, and Increasing Learning Speed. The findings have some implications for EFL textbooks and curriculum developers, teachers, and researchers.

Keywords: Complex Structures, Recall, Retention, the Brainling Model

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1. Introduction

English language consists of different aspects all of which are important in English as a Foreign Language (EFL) learning. One of these aspects is English grammar. According to Rashidi and Babaie (2013), grammar learning is necessary for EFL learners. English grammar has different domains including grammatical complexity. Complex grammatical structures cover various linguistic structures such as relative clauses (RCs), passive structures, modal verbs, etc. Complex structures help learners express complex things efficiently (Ellis, 2008). Complex structures are too difficult for EFL learners because they are built out of the merge of clauses or simpler clauses (i.e., dependent or independent) through coordination and embedding (DeKeyser, 2005). Learning complex structures, and recalling and retaining themes is a sign of general language development (Lau & Shea, 2022).

Recall is equivalent to retrieval of materials stored in the memory. As a fundamental aspect of EFL learning, the recall involves bringing previously stored materials in the memory into awareness (Alrayah, 2018). Retention, according to Anderson et al. (1999), refers to the long keeping of learned materials in the memory that is helpful in subsequent recollecting and using information.

Contrary to the importance of recall and retention of complex structures in general and RSs in particular in language performance, they are difficult for EFL learners. To reduce EFL learning difficulties, different strategies have been put forth. Recently, some new approaches have been proposed to make EFL learning easier for learners. One of these approaches is Brainling Model which seems promising in solving some problems of EFL learners with language learning (Pishaghadm & Ebrahimi, 2020). Pishaghadm and Ebrahimi (2020) designed Brainling Model based on the function of brain in language, and the importance of thinking, senses, emotion and culture in social interactions and consequently language learning. In this model, with emphasis on some issues like, language and thinking, language and emotion, language and sense, and language and culture, some new components such as cogling, cultuling, emoling, and sensoling are introduced. Pishaghadm and Ebrahimi (2020) believe that through relying on the functions of brain, this model can help EFL learners better learn EFL materials. Therefore, it may also be effective on grammar learning and learning complex structures. However, because this model is recently proposed, the volume of studies on it is scarce. Accordingly, this

study seeks to investigate the effect of Brainling Model on Iranian EFL learners' recall and retention of complex structures.

The specific syntax of complex structures makes them difficult for EFL learners. Accordingly, EFL learners neglect them or do not use them in their production or comprehension of language structures. This is while complex structures are inevitable aspects of language development. In the Iranian context, wherein language exposure is low, recall and retention of complex structures are really challenging for learners (Farhangi & Pourmohammadi, 2018). There exist different types of complex structures in the English language which are difficult to be learned among which RCs can be referred to. Several researchers have noted the difficulty of learning RCs in EFL contexts (e.g., Abdolmanafi & Rahmani, 2012; Marefat & Abdollahnejad, 2014). RCs are structures wherein one sentence is embedded in another sentence when the two sentences share a co-referential noun or noun phrase. A RC should always be located right after the noun that it modifies. In sum, recall and retention of RCs are difficult for EFL learners and various strategies should be tried to reduce the difficulty of recalling and retaining them.

The Brainling Model, as claimed by its designers, has the potential to make language learning easier for EFL learners. However because this model has been newly proposed in the field of Teaching English as a Foreign Language (TEFL), it has not been investigated in terms of its effectiveness on English grammar learning. More specifically, no previous study, to the best knowledge of the researcher, has addressed EFL learners' perceptions of the effect of the Brainling Model on their recall and retention of complex structures. To fill this gap, this study aims to explore EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their recall and retention of complex structures. It is worth noting that this paper was extracted from a mixed-methods dissertation whose quantitative phase has been covered in an independent paper. This is a qualitative paper whose main mission is covering EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their recall and retention of complex structures. In response to the reviewer's saying that how can we rely on the participants' perceptions without any measures of the real effect of this model on their recall and retention, it can be said that qualitative studies, as names clearly speak, do not need

quantitative measures because measures are left to quantitative studies. To this end, the following research questions were formulated:

1. What are EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their recall of complex structures?

2. What are EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their retention of complex structures?

Literature Review

Theoretical framework of this study is the Brainling Model. The Brainling Model was designed by Pishghadam and Ebrahimi (2020) based on inspiration from MacLean's (1978) seminal theory of the triune brain. MacLean's (1978) Triune Brain theory suggests that the human brain consists of three distinct evolutionary components, each representing different stages of brain development, namely (1) Reptilian Complex (R-Complex) which is the oldest part of the brain, responsible for instinctual behaviors and basic survival functions such as aggression, dominance, territoriality, and reproductive behavior. It is analogous to the brain structures found in reptiles, (2) Limbic System, sometimes referred to as the Paleomammalian Brain, which is associated with emotions, memory, and motivation. It plays a crucial role in social and nurturing behaviors, as well as in forming emotional bonds with others, and (3) Neocortex, also known as the Neomammalian Brain, which is the most recent evolutionary addition to the human brain. It is responsible for higher-order cognitive functions such as language, reasoning, problem-solving, and conscious thought. The neocortex allows humans to adapt to complex environments and engage in abstract thinking. Different components of Brainling model include Cogling, Emoling, Cultuling, and Sensoling.

Understanding Cogling is critical for effective communication, akin to the psychological Theory of Mind, which explains social perception and emotion's role in individual development. It entails comprehending mental states, emotions, beliefs, intentions, and their outward expressions. This understanding extends to discerning the intentions and emotions of oneself and others, an ability linked to specific brain regions. Philosophically, thought resonates with Descartes' adage "I think, therefore I am," equating

thought with humanity. Vygotsky (1986) suggests that language shapes thought, functioning as a channel for complex cognitive processes.

The concept of Emoling, coined by Poishghadam and Ebrahimi (2020), suggests that language carries emotional weight, influencing interpersonal dynamics and mood. Emoling distinguishes between internal and external excitement, highlighting their origins and impact. Internal emotions, inherent and automatic, such as pain, evoke immediate responses, while external emotions, acquired through experience and environment, require cognitive processing. These emotions manifest differently across cultures, shaping perceptions and interactions. Interpersonal emotions vary among individuals, influenced by personal preferences and experiences. Words evoke disparate emotional responses based on individual associations and cultural contexts. For instance, while "dog" may evoke warmth and companionship in one culture, it may elicit fear or disdain in another. Words function as bridges between the external world and internal mental representations, highlighting the importance of selecting words carefully to shape perceptions and thoughts (Poishghadam & Ebrahimi, 2020). According to researchers such as Dolcos et al. (2018) and Sirgy (2020), the use of positive language triggers the release of neurotransmitters such as dopamine, serotonin, and oxytocin, promoting feelings of positivity and well-being, whereas negative language can elevate stress hormones like cortisol, hindering concentration and inducing anxiety.

Cultuling, also known as the culture of language, involves the structures and expressions within a language that reflect the cultural essence of a nation. According to Pishghadam and Ebrahimi (2020), socializing with individuals from diverse cultural backgrounds provides invaluable opportunities for cultural exchange and mutual enrichment. Through engaging with different cultural perspectives, individuals can broaden their understanding of human behavior and societal dynamics which paves the way for harmonious interactions and intercultural cooperation. In sum, Cultuling illuminates the symbiotic relationship between language and culture, emphasizing the critical role of language in reflecting, transmitting, and shaping cultural identities and societal norms. Awareness of cultural dissimilarities and linguistic subtleties is essential for raising cross-cultural understanding and effective communication in diverse social contexts (Covarrubias & Kirschbaum, 2017).

As mentioned by Pishghadam and Ebrahimi (2020), Sensoling, or sense within language, highlights the impact of sensory perception in human communication. This concept explains how sensory channels serve as channels, connecting individuals to their physical and social environments and shaping their verbal and non-verbal behaviors (Pishghadam & Ebrahimi, 2020). Heightened sensory acuity enables individuals to glean more accurate information from their surroundings, facilitating clearer comprehension of their circumstances (Pishghadam & Ebrahimi, 2020).

Considering the empirical studies, Modiri (2023) investigated the representation of the Brainling Model in the Farsi Textbook taught in the Ministry of Education in Iran. She concluded that the Farsi Textbook is not fully designed based on the components of the Brainling Model. Pishghadam and Ebrahimi (2020) designed the Brainling Model in four components including cultuling, sensoling, emoling and cogling. They also validated the designed model and confirmed its reliability. They concluded that the Brainling Model is of high effectiveness in EFL achievement of learners. Shinjae and Soyeon (2021) explored variations in syntactic complexity across different modes of production. The study utilized a learner corpus derived from undergraduate students, including casual conversations, monologues, and written texts. Syntactic complexity across each mode was assessed using an automated tool known as the syntactic complexity analyzer (TAASSC). The findings revealed that: a) both monologues and written texts exhibited higher syntactic complexity compared to conversations. However, there was no significant difference in syntactic complexity between monologues and written texts, except for Complex Nominals per Clause; b) among the three modes, syntactic complexity in conversations (specifically Mean Length of Sentences and Complex Nominals per T-unit) emerged as the most reliable indicator of L2 proficiency. It was concluded that different cognitive or executive processes associated with each mode may have influenced the utilization of syntactic complexity. Azadnia et al. (2019) sought to assess the grammatical complexity of texts composed by Iranian TEFL university students in comparison to those authored by English native students. The researchers utilized an application called Coh-Metrix to analyze a corpus comprising 10 doctoral dissertations written by Iranian students and 10 dissertations penned by English native students. The findings indicated that dissertations written by English students demonstrated a higher level of syntactic complexity indices compared to those written by Iranian writers. Jiang et al. (2019) conducted a study focusing on the

syntactic complexity of 410 narrative writings across four proficiency levels authored by beginner and intermediate L2 English learners. The investigation utilized both broad and detailed measures to assess syntactic complexity. The researchers employed the L2 Syntactic Complexity Analyzer and a dependency syntactically-annotated corpus to gather data for the large and fine-grained measures, respectively. Regarding the broader measures, the study revealed that students with higher writing proficiency levels tended to produce longer linguistic units, more subordinate and coordinated clauses, and increased noun phrases in their writings. Notably, metrics such as the mean length of T-unit, mean length of sentence, and dependent clauses per clause displayed better predictive abilities for writing proficiency compared to traditional measures. Concerning the more detailed measures, it was observed that more proficient learners used adverbial, complement, and relative clauses, as well as prepositional phrases and adjectival relative clauses, more frequently in their writing. Conversely, the frequency of compound nouns exhibited a negative correlation with writing proficiency.

Method

To conduct this study, a content analysis design was used. That is, the content of the semi-structured interviews was exposed to thematic analysis to explore the participants' perceptions of the effect of different components of the Brainling Model on their recall and retention of complex structures. Ten lower-intermediate female EFL learners from a private language institute in Kerman participated in this study through purposive sampling. That is, the participants were already exposed to the Brainling Model in learning complex structures. Explaining the details of where, when, and how were the participants exposed to this model is beyond the patience of this study since these issues are not relevant to this qualitative study. More specifically, they have been elaborated in a quantitative quasi-experimental study which will be submitted soon. Therefore, in this stage, it just suffices for readers to know that the participants were already exposed to the Brainling Model in learning complex structures. In response to the reviewer's saying that the model is vague, it is worth noting that this paper is not an exploratory one to unpack the features of this model. This paper, as repeatedly mentioned above, just aimed at unpacking the participants' perceptions. The participants were in the age range of 11-14. Data saturation was attained using this sample size. This research used a semi-structured interview with

five open-ended questions to collect the data. The interview started from the general questions to specific ones all of which addressed the effect of different components of the Brainling Model on recall and retention of complex structures. The interview was conducted in Persian, without a specified time frame, allowing the interviewees to respond to the questions freely. Additionally, the interviewees individually provided their answers in face-to-face sessions. The researcher tried not to intervene in the sayings of the interviewees so that her personal ideas did not penetrate into the data. Rigor and trustworthiness in qualitative research entail credibility, transferability, and dependability of the research findings (Ary et al., 2010). To confirm the credibility of the findings, low-inference descriptors were employed. The use of low-inference descriptors entails directly quoting the interviewees' responses (Ary et al., 2010). In this study, along with each theme, a quotation was provided to observe credibility issue. Transferability refers to showing that the findings have applicability in other contexts. According to Ary et al. (2010), the criterion for establishing transferability is thick description. Therefore, a rich and detailed description of the research participants, data collection, data analysis, and findings was provided, so that the readers can judge the similarity and relevance of the study to their situations or interests. With regard to dependability, member checks were used to check this characteristic of the findings. Member checking involves verifying the accuracy of interpretations with the interviewees to ensure that their statements have been correctly understood (Ary et al., 2010). In this study, when the themes were extracted, some themes were randomly checked with the participants to be sure about the interpretation of their sayings. For the purpose of data analysis, the transcribed interview data were exposed to manual thematic analysis via open, axial, and selective coding. Open coding refers to infringing the data into key terms, phrases, and sentences which are called units of analysis to categorize similar concepts into categories based on their thematic content. Axial coding refers to identifying the relationships between the categories and their sub-categories. Selective coding refers to identifying a core category from the identified categories (Ary et al., 2010).

Results

To answer the first research question *What are EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and*

emoling) on their recall of complex structures?, several themes were extracted from the interview data. In what follows, each theme is presented along with an excerpt from the interviewees' sayings.

1. Reducing Ambiguity of Complex Structures

This theme revolves around the effect of the Brainling Model on ambiguity of complex structures. According to this, with the use of this model, complex structures became less ambiguous for the learners. This is evident in the following quotation:

In the words of participant 3 (P3):

Complex structures were too ambiguous for me. I could not well distinguish between different relative pronouns. This caused difficulties for me in learning complex structures. Brainling Model reduced this ambiguity for me.

2. Reducing the Difficulty of Learning Complex Structures

According to this theme, as a result of using the Brainling Model, learning complex structures became less difficult for the learners. The following quotation shows this:

As put by P9:

Language complex structures was very difficult before I know about the Brainling Model. This led to lower pace of learning in me. Now it is easier. I learn complex structures more easily.

3. Designing Appropriate Tasks for Complex Structures

The meaning behind this theme is that through using the Brainling Model, appropriate tasks are designed to teach complex structures. This is documented by the following quotation:

According to P1:

One thing which is very satisfying in using the Brainling Model is designing appropriate tasks to teach complex structures. Our teacher planned interesting tasks based on this model.

4. Increasing Learner Control over Learning Complex Structures

Based on this theme, controlling learning is more convenient when using the Brainling Model in teaching complex structures. The following quotation acts as evidence of this:

P5 stated that:

Students' learning and performance can be easily self-controlled by Model of Brainling. It seems that I have more control over learning when this method was taught to me.

5. Enhancement of Teaching Materials

According to this theme, via the Brainling Model, teaching materials used to teach complex structures were improved. This is evident in the following quotation:

As put by P8:

Teachers have more options for the selection of teaching materials when teaching complex structures based on the Brainling Model. With the Brainling Model, teaching materials are enhanced.

6. Activation of Different Senses

This theme indicates that an outcome of using the Brainling Model to teach complex structures is that different senses are activated in the learners. The following quotation confirms this:

According to P6:

A big success in using the model is that when it is used, all of my senses are activated. It gives me a feeling of involvement.

7. Activation of Emotion and Cognition

According to this theme, the Brainling Model provides such conditions that both the emotion and cognition of the learners are activated. In other words, using the Brainling Model calls for the learners' emotion and cognition simultaneously. The following quotation supports this:

According to P2:

We see that emotion and thinking should be active when teaching is done based on Brainling Model. This is an advantage in learning complex structures that is a complex thing.

To answer the second research question *What are EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their retention of complex structures?*, several themes were extracted. In the following, each theme is provided with a quotation from the interviewees.

1. Enhancement of Memorization

This theme shows that the learners' memorization was enhanced after using the Brainling Model. This is evident in the following quotation:

In the words of P10:

The role of the Brainling Model is improving memorization ability. I could memorize complex structures due to the Brainling Model.

2. Reducing the Rate of Forgetting

According to this theme, the Brainling Model reduced the rate of forgetting. The following quotation shows this:

As put by P4 :

Complex structures remain in my mind better than before. I can guess that this is for the Brainling Model. I forget them less frequently. This makes me more self-confident.

3. Enhancement of Long-Term Learning

The rationale behind this theme is that the Brainling Model enhances long-term learning of complex structures. This is documented by the following quotation:

According to P1:

Sometimes you just learn for a short time. You cannot retrieve learned information after a long period. But the Brainling Model helped me learn for a longer time. It enhanced long-term learning.

4. Increasing Learning Speed

Based on this theme, the pace of learning is increased as a result of using the Brainling Model. That is, complex structures are learned more quickly. The following quotation is evidence of this:

As mentioned by P7:

A result of the Brainling Model is learning speed. Previously, I learned complex structures with a lower speed. I was very slow. With the help of the new model, learning speed was improved in me.

Discussion

This study answered two research questions. On the first research question *What are EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their recall of complex structures?*, the following perceptions were identified: Reducing Ambiguity of Complex Structures, Reducing Difficulty of Learning Complex Structures, Designing Appropriate Tasks for Complex Structures, Increasing Learner Control over Learning Complex Structures, Enhancement of Teaching Materials, Activation of Different Senses, and Activation of Emotion and Cognition.

With regard to the second research question *What are EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their retention of complex structures?*, the following perceptions were recognized: Enhancement of Memorization, Reducing Rate of Forgetting, Enhancement of Long-Term Learning, and Increasing Learning Speed.

In comparing the findings with the previous studies, it is worth noting that since this study was the first endeavor on EFL learners' perceptions of the effect of different components of the Brainling Model (i.e., cultuling, cogling, sensoling, and emoling) on their recall and retention of complex structures, exclusive comparison of the findings is not possible. However, there are similar studies whose results are implicitly corroborated by the present study. For example, the findings support the results of the studies by Demirel (2010), Esmaili (2011), Johansson (2009), Nazeri (2010), Paivandi (2008), and Stockdale (2006) which showed positive attitudes toward the learners towards the representation of different senses in EFL textbooks. The findings also confirm (although implicitly) the results of Aratemur Çimen and Bayhan (2019), Bouzid (2019), and Zhang (2014) which showed that EFL textbooks in different countries bear an emotional and cognitive load.

The findings also resonate with those of Pishghadam (2015), Pishghadam et al. (2013), Pishghadam et al. (2016), and Pishghadam and Mirzaee (2008) according to which

emotions, cognition, senses and sensory emotions should be taken into account in preparing EFL educational materials. Similarly, Khany and Ghasemi (2018) and Nazari and Karimpour (2022) recommended paying heed to the incorporation of emotions, thinking, and senses in EFL teaching. Last but not least, the findings are congruent with the study by Birjandi and Alizadeh (2013) and Riazi and Aryasholouh (2007) wherein positive perceptions were reported by learners on the representation of different brain functions in EFL textbooks.

That memorization was enhanced with the Brainling Model is interpreted as referring to Pishghadam et al. (2013) who held the view that brainling is one of the main factors in helping students in different learning processes and stages. In regard to the reduction in the forgetting rate, Pishghadam and Tabataba'ian (2011) claimed that if English language classrooms are turned into a place for improving human abilities, learning English becomes a persistent act for learners. Concerning the enhancement of long-term learning, Pishghadam et al. (2013) came up with a novel approach to second language acquisition named Emotion-Based Language Instruction, which is based on the fact that having stronger emotions toward second/foreign language leads to a better understanding of them and facilitates retention. Increasing learning speed can reflect the model developers' tendency to enhance the thinking skills of students. Moreover, it shows that they are more concerned with engaging students in the learning process so that they find educational materials more tangible and learn the English language better.

Reducing the Ambiguity of Complex Structures shows the Brainling Model makes learners more aware of language structures. It improves their consciousness level by activating cognitive mechanisms. Reducing the Difficulty of Learning Complex Structures demonstrates that the Brainling Model is here to affect learning based on attention, reasoning and problem-solving. Increasing Learner Control over Learning Complex Structures can be attributed to the effect of the Brainling Model on the autonomy of learners. It is potentially achieved through the simultaneous activation of emotions and cognition. Enhancement of Teaching Materials may be attributed to diverse options generated as a consequence of incorporating cultural issues, thinking, emotions and senses in material development. Representing all these elements in instructional and educational materials provides material developers and teachers with an open hand in developing appropriate materials.

Activation of Different Senses shows that the model developers pay attention to senses because may evoke different levels of emotions, which can alter students' perceptions of the world (Pishghadam et al., 2016). The main purpose of sensory language is to use the senses to help create a vivid image of a setting, scene, or emotion in the text. Based on the findings, it can be inferred that the model employs sensory language to provoke emotional responses and facilitate a stronger sense of connection to content for EFL learners. Activation of Emotion and Cognition is obviously in line with the main motto behind the Brainling Model according to which empowerment of students is the result of reasoning, thinking and emotion. According to Pishghadam et al. (2016), cognition and emotion jointly aid in better understanding and learning.

Conclusions and Implications

The findings lead to the conclusion that EFL teachers can make complex structures less ambiguous and difficult for learners via the Brainling Model. Besides, it can be argued that to develop appropriate tasks to teach complex structures, the Brainling Model is a good option. Additionally, the Brainling Model is a tool for learner agency and autonomy. Thus, in order to male learners more agent and independent in learning, this model can be resorted to. What is more, more appropriate teaching materials can be developed using the Brainling Model as the framework. Also, it is worth proposing that using the Brainling Model activates different senses, and emotions and cognition in learners. Accordingly, it can be utilized as an appropriate tool to encourage learners sensually, emotionally and cognitively.

According to the findings, it is concluded that if the Brainling Model is used in English classes, they can memorize materials better. Moreover, it is concluded that the Brainling Model can be used as a strategic attempt to decrease forgetting in learners. Further, the Brainling Model is helpful in long-term learning. Therefore, it can be used in situations where long-term learning is preferred to short-term learning. The other conclusion is that in cases where a huge amount of materials is going to be learned in a short time span, the Brainling Model can be effective.

The findings have several implications for different stakeholders of the field including EFL textbook and curriculum developers, teachers, and researchers. EFL textbooks and curriculum developers should use the Brainling Model in developing new

English materials. EFL teachers should focus on the Brainling Model when teaching English. EFL researchers can explore potential application of the Brainling Model in different EFL textbooks. This extends the breadth and depth of the findings of the present study.

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