The Influence of Event Type and Frequency on Episodic Details and Gesture Production

by

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The Influence of Event Type and Frequency on Episodic Details and Gesture Production

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I am dedicating this thesis to my family, my mother, father, and sister.

ABSTRACT

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In this study, we investigated episodic details and gesture use when people talk about past and future events that were experienced a single time or repeatedly. Furthermore, we investigated whether individual differences in visual imagery affected episodic details, gesture use, and phenomenological ratings of events. Earlier research showed that past events were narrated with more episodic details and received higher phenomenological ratings compared to future events. Moreover, episodic details and gesture use were associated in past event conditions. On the other hand, people produced more details about events in single-time events and rated those events as more vivid than repeated events. Lastly, visual imagery ability is associated with details and phenomenological ratings. Therefore, we asked how episodic details and gesture use change in different event types and frequencies. Participants produced more internal episodic details and non-representational gestures in past events compared to future events. They produced more external episodic details in single-time conditions compared to repeated event conditions. Our participants used significantly more gestures in past and single-time conditions. Those results were in line with earlier findings, showing the role of episodic details and gesture use in different event types and event frequencies, and contributed to a growing body of knowledge in this young area of research.

Keywords: Autobiographical memory, future thinking, single-time events, repeated events, episodic details, gesture production, visual imagery.

ÖZETÇE

Olay Türleri ve Sıklıklarının Epizodik Detaylara ve Jest Üretimine Etkisi

Nevin Gamze Şilit

Psikoloji, Yüksek Lisans

12 Eylül 2024

Bu çalışmada insanların geçmişte yaşadıkları ve gelecekte yaşayabilecekleri tek seferli veya tekrarlı olaylar hakkında konuşurken kullandıkları epizodik detay ve jestleri inceledik. Dahası, görsel imgelem becerisindeki bireysel farklılıkların epizodik detaylara, jest kullanımına ve fenomenolojik değerlendirmelere etkisi olup olmadığını araştırdık. Önceki çalışmalar geçmiş olayların gelecek olaylara göre daha fazla epizodik detayla anlatıldığını ve fenomenolojik açıdan daha yüksek puanlandığını gösterdi. Ayrıca, geçmiş anlatılarda epizodik detaylar ve jest kullanımının bağlantılı olduğu bulundu. Öte yandan kişiler tek seferli yaşanmış olaylarda tekrarlı olaylara göre daha fazla detay veriyor ve bu olayları daha canlı olarak değerlendiriyorlar. Son olarak, görsel imgelem yeteneği olay detayları ve fenomenolojik değerlendirme kriterleriyle ilişkili olarak karşımıza çıkıyor. Bu nedenlerden dolayı, epizodik detayların ve jest kullanımının olay türlerine ve sıklıklarına göre nasıl değiştiği sorusunu sorduk. Sonuçlarımız katılımcıların geçmiş olay anlatılarında gelecek olay anlatılarına göre daha fazla iç epizodik detay ve temsili olmayan jestleri kullandıklarını ve tek seferli olay anlatılarında tekrarlı olay anlatılarına göre daha fazla dış epizodik detay kullandıklarını gösterdi. Katılımcılarımız geçmiş olay anlatılarında gelecek olay koşullarına göre anlamlı olarak daha fazla iç olay detayı ve temsili olmayan jest ürettiler. Tek seferli olay anlatılarında ise tekrarlı olaylara göre daha fazla dış olay detayı ürettiler. Katılımcılarımız geçmiş ve tek seferli olaylarda anlamlı olarak daha fazla jest kullandılar. Bulgularımız literatürle uyumluydu ve farklı olay türleri ve sıklıklarında epizodik detayların ve jest kullanımının etkisini ortaya koyarken bu genç araştıma alanındaki artmaya devam eden bilgi birikimine katkı sunuyor.

Anahtar kelimeler: Otobiyografik bellek, geleceği düşünme, tek seferli olaylar, tekrarlı olaylar, epizodik detay, jest kullanımı, görsel imgelem.

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ABBREVIATIONS

ABM	Autobiographical memory
VVIQ	Vividness of Visual Imagery Questionnaire
MIT	Mental Imagery Test
MCQ	Memory Characteristics Questionnaire
AMQ	Autobiographical Memory Questionnaire
GSA	Gesture-as-simulated action

Chapter 1:
INTRODUCTION

Autobiographical memory is one of the most essential elements in our lives. Through autobiographical memories, we can define our sense of self, form social relationships, and use them as an information source to predict future events or solve current problems (Alea & Bluck, 2003; Bluck & Alea, 2008; Pillemer, 2003). Moreover, the recollection of those memories involves many cognitive processes, such as visual imagery. Visual imagery considerably influences autobiographical memory by promoting the sense of reliving, vividness, and the amount of sensory contextual details (Brewer, 1996; Rubin et al., 2003; Rubin, 2006). However, the literature on autobiographical memory for repeated events suggests that people retrieve far fewer details about a specific instance of a series of repeated events (for a review, Dilevski et al., 2021).

Episodic future thought and episodic memory had similar neural bases and cognitive mechanisms. According to current views, some elements from past experiences are combined or extracted to form a representation of future events (Schacter & Addis, 2007). Although we know much about the relationship between future thinking and autobiographical memory for single-time events, the relationship between autobiographical memory for repeated events and future thinking about those events still needs further research.

Lastly, the role of gestures in communication and thinking processes is significant, and gesture production affects many cognitive processes by manipulating, activating, packaging, and exploring spatial and temporal information about events (Aydın et al., 2023; Kita et al., 2017). Moreover, gestures enable the autobiographical

recollection process and may result in remembering an enhanced level of episodic details about past events (Aydın et al., 2023; Güneş-Acar et al., 2024). However, as far as we know, no studies have investigated episodic details and gesture use in such research designs.

Considering earlier research on autobiographical memory, future thinking, visual imagery, and gesture production, in this study, we were interested in first the influence of event type and event frequency on episodic details and gesture use, second the role of visual imagery in terms of episodic details and gestures in memory and future thinking processes. We tried to answer the following questions: Do event type (past and future) and event frequency (single and repeated) influence episodic details and gesture production? Does visual imagery affect the episodic details and gesture use in event narratives? Keeping those questions in mind, we also examined the relationship between visual imagery and phenomenological ratings.

1.1 Autobiographical Memory for Single and Repeated Events

Autobiographical memories can be defined as the personal recollection of one's past events that occurred at a specific time and spatial layout (Wang, 2013). These memories can be used for self-identity (Bluck & Alea, 2008), social (Alea and Bluck, 2003), and directory purposes (Pillemer, 2003). Moreover, those memories can be categorized according to their frequencies; an autobiographical memory can either be a single event or a repeated event (Williams et al., 2008). As indicated in their names, single-time events refer to personal and unique events and memories that do not occur on a regular basis; for instance, graduating from the university or adopting a stray animal could be examples of those single-time memories. On the other hand, in repeated events, people usually experience similar or the same events several times throughout

their lives. Through several repetitions, those events tend to represent a generic flow and, as a result, are organized in clusters with similar themes (Brewer, 1999; Conway and Pleydell-Pearce, 2000; Burt et al., 2003).

Research investigating memory for repeated events seems to accumulate into three main accounts: the Fuzzy Trace Theory (Brainerd and Reyna, 2019; Reyna et al., 2016), the Source Monitoring Framework (Johnson et al., 1993), and the Script Theory (Hudson et al., 1983). According to the Fuzzy Trace Theory, the memory of the events is stored in two distinct categories of features: verbatim and gist (Reyna et al., 2016). Verbatim features in this theory refer to the superficial characteristics of the events or objects, while gist traces capture the underlying meaning of that event. Moreover, through dissociated retrieval processes, people either recall the events relying on the verbatim or gist traces. However, after being repeatedly exposed to similar events or after a certain amount of time passes, those superficial features are prone to fade, and the meaning of the events tends to be retrieved more successfully (Kintsch & Mangalath, 2011). Therefore, according to the theory, people mostly rely on the general meaning (gist) of the events when they are asked to recall a repeated event rather than its particular superficial characteristics (verbatim) (Brainerd & Reyna, 2019). As a result of reconstructing the memory from gist features, false memories may occur during the recollection process.

The Source Monitoring Framework (Johnson et al., 1993) is another account to explain the vulnerability of repeated event memories, which argues that events are encoded in the memory with their content rather than the source of the information. Considering remembering a specific instance of a repeated event, an individual should accurately decide on the source of the details. For instance, you go to a shopping mall once a week, and one time you go shopping, you lose your phone. Remembering which

shopping mall visits this event requires accurate source monitoring. Moreover, some perceptual, contextual, or semantic characteristics of the memory may affect the source attribution and cause source monitoring errors in memory recall (Dilevski et al., 2021; Johnson et al., 1993).

The Script Theory attempted to explain the process of recalling repeated events. According to this theory, through repeated exposure to different instances of similar events, people eventually organize those events under the same category of representations, and in time, those representations become scripts (Schank & Abelson, 1977). From this point of view, those event scripts provide a general outline of what usually happens at those events as well as provide a temporal order of the events (Hudson & Mayhew, 2008). Moreover, in those scripts, while some details can change regarding one specific instance (variable details), some details remain the same across different occurrences (fixed variables) (Fivush, 1984). For instance, a script for going to a café is more or less similar in every instance. First, you enter the place and take a seat; you check the menu and order your meal and drink. After finishing, you pay the check and leave the café. In such a scenario, ordering a meal or drink can be accounted for fixed details while what kind of meal or drink was preferred is a variable detail. At this point, it is argued by many researchers that since fixed details of an event are integrated with the event script and become a part of the event, recalling the accurate variable details depends on an accurate source monitoring process (Connolly & Lavoie, 2015; Connolly et al., 2016; Johnson et al., 1993).

Research on the memory of schematic events produced a growing body of literature that attempted to understand the relationship between schemas and memory accuracy. Lampinen et al. (2001) investigated the effect of schemas on memory recollection. According to their results, participants showed a more accurate memory

for schema-inconsistent items when they were presented with the recognition test right after they experienced the learning session. However, participants who took a delayed recognition test produced a significant amount of schema-consistent false memories; in other words, after a certain time passes, participants remember schema-consistent information that was not presented to them, which is in line with the assumptions of script theory (Lampinen et al., 2001). Moreover, recent studies conducted with adult participants to understand the memory accuracy in single-time events and repeated events consistently revealed that memory accuracy for details is significantly higher in single-time events compared to repeated events (Deck & Paterson, 2021a; Deck & Paterson, 2021b; Theunissen et al., 2017). Those results lead us to the conclusion that details in repeated events tend to fade away in time and become a part of a script-like flow.

Those changes in memory accuracy and details of repeated events direct us to the question that when recalling a specific instance of a repeated event is needed, what kind of processes or skills make it easier to remember unique details about those events?

1.2 Future Thinking

Autobiographical memories hold a directive function (Pillemer, 2003). Autobiographical memories possess a considerable amount of both self and event-related information, and they provide guidance in our actions when needed (Pillemer, 2003). In addition, people take lessons from their past experiences and use the previous information to solve their current problems, and when encountering a novel situation, information from past experiences can be used easily. Moreover, those memories have predictive power about future events. Through similar past experiences, people may plan future events, especially when it comes to repeated events, through already existing

schemas and scripts; this planning will be much easier (Ece & Gülgöz, 2021; Nelson, 2003).

Episodic future thinking can be described as "a projection of the self into the future to pre-experience an event" (Atance & O'Neill, 2001, p. 533). Recent research suggests that future thinking can be investigated in four main modes: simulation, prediction, planning, and intention (Szpunar et al., 2014). According to their taxonomy, future thinking processes function in forming mental representations about an autobiographical future event, making estimates about the probability of events that may happen in one's future, adjusting goals for our personal future, and planning our future events to achieve a desired outcomes (Szpunar et al., 2014). Those functions could be related to episodic events, as well as semantic events (see also Schacter et al., 2017)

Research investigating the relationship between autobiographical memories and future thinking reached a significant conclusion: episodic memory, in general, is not only crucial for reliving a specific past experience but is also involved in a critical part of thinking about future events. According to the constructive simulation hypothesis, the underlying neural mechanisms that are responsible for episodic memories and future thinking are similar. Moreover, since episodic memories are reconstructive in their nature, they enable people to combine or integrate some characteristics of their past experiences and create a representation of their future scenarios (Schacter & Addis, 2007; also see Schacter et al., 2017 for a review).

The data obtained from neuroimaging studies also showed that the same brain areas were active during episodic recall and future thinking. PET (Okuda et al., 2003) and fMRI studies (Martin et al., 2011; Szpunar et al., 2007) revealed that frontal and medial temporal regions (hippocampus and parahippocampal gyrus) were active both during episodic remembering and imagining the future.

A growing body of literature shows connection between episodic memory and future thinking. Even though those two processes use similar neural networks to function, according to previous studies, future thinking, compared to episodic recall, includes fewer details and is rated lower in phenomenological ratings (Gamboz et al., 2010). Moreover, D'Argembeau and Van der Linden (2004) revealed that for both future and past, temporally close events included significantly higher amounts of sensory and contextual details compared to temporally far events. In addition, temporally closer events lead to the generation of a stronger sense of reliving for past events and pre-living for future events.

A study conducted by Ece and Gülgöz (2021) was designed to understand autobiographical memories for repeated events further. In the experiment, they asked participants about their vacation memories. They asked about five vacation instances: first, last, random, typical, and distinct. After providing the memory, participants completed the Autobiographical Memory Questionnaire to get information about event characteristics such as vividness and the number of details in recollection. Ece and Gülgöz (2021) found similar results confirming previous literature; first vacation memories were rated as less vivid than typical and random ones, and last vacation memories were significantly rated as more vivid than distinct vacation memories. Moreover, participants reported more details while narrating their last vacation memories compared to the other categories and participants produced fewer details in their first vacation memories than all the other categories of vacations except distinct vacation memories (Ece & Gülgöz, 2021).

The literature on future thinking and belief revealed critical findings about this study's purposes. In their study, D'Argembeau and Garcia Jimenez (2020) found that the level of mental imagery use, ease of imagining the event, the number of repetitions

and similarities with past events were significantly associated with the belief in future instances. Likewise, Ernst et al. (2019) suggest that episodic future thinking depends on both successful simulation of the future and successful integration with autobiographical experiences. In addition, Garcia Jimenez and D'Argembeau (2023) found that repetitive simulations of future events increase details about those events and lead to a decrease in construction times of those events.

Considering those results coming from recent studies, the level of episodic detail (internal and external) in an episodic future event depends on several factors, such as belief of its occurrence and repetition of the event. Moreover, in the next part of the paper, an essential factor that affects episodic future thinking and autobiographical memory will be discussed: visual imagery. Additionally, I tried to connect the studies on autobiographical memory, future thinking, visual imagery, and gesture use.

1.3 Visual Imagery, Autobiographical Memory and Future Thinking

Visual imagery is an essential element of autobiographical memory since it significantly promotes the sense of reliving (Rubin et al., 2003). Studies produced considerable evidence that visual imagery ability is strongly associated with the amount of details coming from various sensory channels in past and future events (D'Argembeau & Garcia Jimenez, 2020; D'Argembeau & Van der Linden, 2006). Moreover, higher levels of visual imagery in autobiographical recall later result in higher phenomenological ratings such as belief and sense of reliving (Rubin et al., 2003). In other words, imagery vividness predicted the recollection predicted the sense of reliving (Rubin, 2006). However, in a study conducted by Greenberg and Knowlton (2014), there were no significant correlations between visual imagery skills and phenomenological ratings of events such as reliving and belief. In addition, they

suggested that their participants may feel a sense of reliving and hold beliefs about those events regardless of the individual differences in visual imagery skills.

While this is the case for autobiographical memories, previous research suggests that future events hold far less sensory vividness and details and scored lower in phenomenological ratings (Addis et al., 2008; Rubin, 2015). More specifically, Addis et al. (2008) investigated age-related differences in future thinking and found that older adults produced fewer episodic details about past events compared to young adults. In addition, older adult groups showed similar tendencies about details in future thinking tasks. Lastly, older adults' relational memory abilities were found to be correlated with the number of episodic details they provide; thus, Addis et al. were able to find further evidence for the constructive simulation hypothesis (Addis et al., 2008; Schacter & Addis, 2007). The hypothesis suggests that in order to think and simulate future events, people integrate or recombine the elements from their episodic memories.

D'Argembeau and Van der Linden (2006) also investigated visual imagery ability's contribution to future thinking and past recollections by using the Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973), Memory Characteristics Questionnaire (MCQ; (Johnson et al., 1988) and Autobiographical Memory Questionnaire (AMQ; Rubin et al., 2003). They found that higher capacity in visual imagery results in more details related to visual and other sensory modalities in past recollections. Individuals who showed higher abilities in visual imagery reported higher amounts of visual and other sensory details for future events. In addition, they found that even though individuals with increased visual imagery reported more details compared to those with less visual imagery ability, the amount of sensory contextual details was lower for future events compared to past events. Moreover, Aydın (2018) found similar associations between visual imagery skills and phenomenological ratings.

According to her findings, object imagery was related to some of the phenomenological ratings of events, such as visual details, coherence, and intensity for past events and intensity for future events, while spatial imagery was related to the internal episodic details. Therefore, we used VVIQ that is intended to measure both object and spatial imagery constructs and the Mental Imagery Test which investigates maintenance, inspection, manipulation and generation of mental images to have a better understanding of the role of individual differences in imagery on episodic details and gesture use.

Considering the previous literature on visual imagery and autobiographical memory interaction, we see that although much evidence about single-time events and future thinking was found, the relationship between visual imagery ability and recollection of autobiographical memories and future thinking about those repeated events still needs further investigation.

1.4 Gesture Use in Autobiographical Memory Research

Gestures play an important role in both speaking and thinking processes. Besides holding an essential role in communication, gesture production has been found to be influential on many cognitive processes (Kita et al., 2017). Research investigating which cognitive processes gestures are beneficial revealed similar results in which gestures are helpful in decreasing cognitive load (see Cook et al., 2012; Ping & Goldin-Meadow, 2010). Moreover, gesture production is related to working memory capacities and visual and spatial abilities (see Özer & Göksun, 2020 for a review).

In gesture research, researchers investigate gestures in two main categories: representational and non-representational. While representational gestures convey meaning when combined with speech, non-representational gestures do not specifically

contribute to the speaker's message (McNeill, 1992). Moreover, representational co-speech gestures can be categorized into three main types: *iconic, metaphoric, and deictic*. Iconic gestures refer to hand gestures intended to represent concrete objects or real individuals. For instance, while a speaker is talking about a basketball game, she may bend her fingers, make a ball (iconic gesture), and move her hand while holding that gesture to represent the ball's movement (iconic gesture). Unlike iconic gestures, metaphoric gestures are used to represent abstract aspects of entities. Lastly, deictic gestures are used as pointing gestures. Those three types of gestures, because they convey the other parties a meaningful message, are considered representational gestures. However, some accounts consider deictic gestures as non-representational gestures because they may draw attention without the presence of a representation (Cappuccio et al., 2013). On the other hand, non-representational gestures, also called beat gestures, are simple, rapid, and rhythmic movements of hands that do not hold a special meaning (McNeill, 1992).

Besides their meaning and categorization, gestures function in many aspects of our speech and cognition. To understand their function, in the later sections of the paper, two hypotheses will be mentioned: the gesture for conceptualization hypothesis (Kita et al., 2017) and the gesture-as-simulated-action (GSA) framework (Hostetter and Alibali, 2008).

According to the gesture for conceptualization hypothesis suggested by Kita et al. (2017), gestures function in activating, manipulating, packaging, and exploring spatio-motoric information. From their point of view, by manipulating and activating spatiotemporal information related to the past event, gestures may facilitate the autobiographical recall process and lead to recalling more details about autobiographical events (Aydın et al., 2023; Kita et al., 2017). As a result of the constructive natures of

episodic memories, in every recollection, the number of details and phenomenological characteristics of the events are prone to change flexibly. Therefore, the role of gesture production during autobiographical recall is critical and needs further research.

Two recent studies investigated the relationship between autobiographical memories and gesture use. Aydın et al. (2023) investigated the influence of gesture production on autobiographical recall and future thinking. Participants first provided past autobiographical, future autobiographical, and non-autobiographical memories and rated the characteristics of those memories, such as vividness, reliving, and mental time travel. Autobiographical events were probed with cue words, while participants narrated a procedural event in non-autobiographical narratives. They also measured spatial imagery ability and visuospatial working memory. Aydın et al. (2023) reached some critical results indicating a significant association between representational gesture use and episodic details of memories. Moreover, they found a significant correlation between gesture use and phenomenological reports of memory characteristics. Lastly, non-representational gesture production and non-episodic details (external) were associated.

Güneş-Acar et al. (2024) also investigated the relationship between autobiographical memory and gesturing in adults and children. They found similar findings as Aydın et al. (2023); representational gesture use and episodic details were positively correlated in adult samples. However, contrary to Aydın et al. (2023), Güneş-Acar et al. (2024) found no significant correlations among phenomenological ratings and gesture use. Therefore, at this point, the literature shows mixed results in terms of the relationship between phenomenological ratings, episodic details, and gesture use.

Those findings were mostly in line with previous literature on gesture, autobiographical memory, and visual imagery, and those two are the first studies to

combine those concepts. However, as mentioned in the article written by Aydın et al. (2023), one of the reasons why they could not find any differences in gesture rate across different event conditions could be the length of their narratives. They explained the absence of the relationship between future events and gesture use by emphasizing the gesture-as-simulated-action (GSA) framework proposed by Hostetter and Alibali (2008). The degree of physical affordances related to the event affects gesture use. Therefore, since people do not have any solid affordances about future autobiographical events, their gesture use was not significantly associated with episodic details (Aydın et al., 2023).

According to the gesture-as-simulated-action hypothesis, gestures help simulate a mentally represented event or object. They argue that co-speech gestures occur spontaneously while speakers think and discuss their mental simulations of motor actions or sensory-perceptual states (Hostetter & Alibali, 2019). More importantly, some of the predictions that the GSA framework presents are essential for the purposes of this study. Firstly, the GSA framework suggests that gesture production will be higher when the speech is related to imagery constructs rather than verbal elements. Thus, in the presence of a visual-spatial context, it is expected to activate an imagistic simulation, resulting in increased gesture use (for a review, Hostetter & Alibali, 2019). Secondly, salient visual images may evoke action or spatially relevant aspects of events, and this activation may lead to higher rates of gesture production.

In both cases, gesture production seems to be strongly associated with mental imagery, primarily spatial and visual imagery. Even though we do not have a piece of direct evidence from autobiographical memory and gesture literature, individual differences in visual imagery ability may result in differences in episodic details, gesture use, and phenomenological ratings. In other words, people with higher levels of

visual imagery may produce more episodic details and gestures and rate events higher in phenomenological ratings.

1.5 The Present Study

The present study investigated the influence of event types (past and future) and frequencies (single time and repeated) on episodic details and gesture use. Moreover, whether individual differences in visual imagery skills result in differentiated amounts of episodic details, gesture use, and phenomenological ratings in different event conditions was investigated. Previous literature provided much evidence on the relationship between visual imagery and autobiographical past and future events (see Aydın et al., 2023; Gamboz et al., 2010; Rubin et al., 2003); however, the relationship among event types and frequencies and episodic details and gesture use is a novel issue that will be addressed in this study. I investigates associations between our variables using a similar methodology to Aydın et al. (2023) and Güneş-Acar et al. (2024).

It was hypothesized that (a) participants would produce more gestures (total) and internal episodic in autobiographical memory recall compared to future thinking conditions. Furthermore, (b) it was expected to find that compared to repeated event conditions, participants would produce more representational gestures and internal episodic details in single-time event conditions.

Moreover, it was expected to find that (c) individuals with higher levels of visual imagery would use more representational gestures and produce more internal episodic details about events compared to individuals with lower visual imagery skills in all conditions. In line with the previous literature, (d) individuals with stronger visual imagery skills were expected to rate the events higher in terms of phenomenological characteristics (e.g., vividness, reliving).

To investigate those hypotheses, participants were presented with a series of event questions that aimed to get information about the level of episodic details in their narratives and, at the same time, their co-speech gestures were investigated. Phenomenological ratings like vividness or reliving about those events were obtained by presenting the participants with an Autobiographical Memory Questionnaire. After answering the event questions, participants' visual and mental imagery skills were measured using VVIQ and MIT. Those were found to be correlated with ABM (VVIQ) and gesture use (MIT) (Arslan & Göksun, 2021; Hyusein & Göksun, 2023). Therefore, we chose them to have better understanding about the relationship among those variables.

Chapter 2:
METHOD

2.1 Participants

According to the analysis conducted using G-Power software, the participants for this study were 36 Koç University students. We collected data from 34 participants, and 1 participant was excluded from the analysis because the scores they obtained from the imagery measures, episodic details, and gesture use were outliers. We ended up with 33 participants (21 Female, 12 Male). We recruited our participants from SONA systems, and they received one course credit for their participation. The convenience sampling method was used to recruit participants. Once they logged into the SONA system, they made reservations for available slots and came to the Language and Cognition Lab to complete the sessions. All of our participants have lived most of their lives in Turkey, were native Turkish speakers, were right-handed, were Koç University students, and were between the ages of 18 and 26 (M = 21.50, SD = 1.68). None of them reported having psychological disorders/ or using antipsychotic drugs. Participants did not have any disabilities or physical restrictions that limit their hand mobility. Ethical permission was obtained from the Koç University Committee on Human Research to conduct the study (2023.264.IRB3.118).

2.2 Materials

2.2.1 Demographic information form

This form was created by the researcher to get information about participants' age, gender, and education. This form was presented to participants on a Qualtrics page.

History of psychological disorders, use of medication, and dominant hand were asked verbally.

2.2.2 Event questions

Those questions were designed using the Autobiographical Interview method (Levine et al., 2002) to collect information about four event conditions (past-single time, past-repeated, future-single time, future-repeated). In those questions, participants were asked to remember (or imagine) an important event that happened (may happen) in the last (next) five years for the single-time condition. Moreover, for the repeated event conditions, we asked them to remember (or imagine) a birthday event that happened (may happen) in the last (next) five years.

2.2.3 Vividness of Visual Imagery Questionnaire

The Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973) is intended to measure visual imagery differences among individuals. In this task, participants will be given 16 different situations and asked to visualize those scenes and rate the vividness of the image in their mind on a 5-point Likert scale ranging from 1-not vivid at all to 5 extremely vivid. Higher ratings on the scale refer to an increased amount of vividness and indicate an enhanced visual imagery ability. The VVIQ is a reliable measure with an alpha level of .73. All the questions in VVIQ can be found in Appendix (B) section.

2.2.4 The Mental Imagery Test

The MIT (Di Nuovo et al., 2014) was designed to assess individuals' mental imagery skills. The MIT comprises eight questions that assess different elements of mental imagery skills and combine them into a single test. The example questions are

visualizing letters, *cube test,* and *imagined paths*. The MIT is a reliable measure with a Cronbach alpha of .83. The MIT has already been translated and used in Turkish samples (Arslan & Göksun, 2021; Hyusein & Göksun, 2023). The total score of the test can be calculated by summing up a single set of scores.

2.2.5 The Autobiographical Memory Questionnaire (AMQ)

The Autobiographical Memory Questionnaire was created by Rubin et al. (2003), containing 15 items intended to understand the characteristics of the memories. 13 items will be rated on a 7-Point Likert scale with slightly different labels, and the remaining two questions were rated differently. The AMQ is comprised of three subscales that measure (1) recollection and belief, (2) component processes, and (3) properties of events. Some example questions are: “As I remember the event, I feel as though I am reliving the original event.” “As I remember the event, I can see it in my mind.” This questionnaire was used for both autobiographical memories and future events. Thus, for future events, the wording of the items was changed (ex: As I imagine the event…). Moreover, 12 items were used for future events with slightly different wordings *(Future Thinking Questions).* Both scales intended to reveal phenomenological characteristics of autobiographical memories and future thoughts can be found in Appendix (C) and Appendix (D).

2.3 Procedure

Recruited participants first signed an informed consent form that gave general information about the study and stated that they were voluntarily participating and could leave the study if they did not want to proceed. Also, since the sessions were recorded, the participants were informed about it in the informed consent. A verbal version of

informed consent was also provided to them. After they consented to participate, they completed the demographic information sheet, and other questions were verbally asked to ensure they fit the criteria.

At the beginning of the experiment, we asked three short warm-up questions. Later, participants were asked to provide narratives about their memories and future thoughts. All participants received event questions in a Latin Square order. For single-time autobiographical memories and autobiographical future thinking, after participants are presented with the relevant event questions, they will either remember an important autobiographical memory that happened in the last five years or imagine an important future autobiographical event that may happen in the next five years. Likewise, in repeated event questions, participants were asked to remember or imagine a birthday event in the last five years or their future projections about their birthdays in the next five years.

After participants provided a narrative to the related event question, they were asked to rate event characteristics in *The Autobiographical Memory Questionnaire* (Rubin et al., 2003). As indicated in the materials section, the items' wording was changed to reflect whether they provided a past or future event. Thus, in total, participants provided four narratives and completed *The Autobiographical Memory Questionnaire* four times. After completing the event questions, participants were presented with the *Vividness of Visual Imagery Questionnaire* (VVIQ; Marks, 1973) and *the Mental Imagery Test* (MIT; Di Nuovo et al., 2014) to measure their visual and mental imagery vividness levels. The presentation order of those two imagery tasks was counterbalanced. The data collection sessions took about 30-50 minutes. All interview sessions were video-recorded for coding purposes.

2.4 Coding

2.4.1 Narrative Coding Scheme

Event narratives were transcribed into text by assigned assistants. The beginning of their narratives was corrected to the beginning of the event. In other words, the sentences or frames not related to the event narratives, for instance, clarifying questions, were not included in transcripts and coding. After each narrative was obtained, the main event was determined for each event. Later, narratives were coded in terms of the coding schemes of Levine et al. (2002) and Renoult et al. (2020). Narrative details were coded into eleven categories: event details, time, place, sensory/perceptual, thoughts/feelings, repetitions, general semantics, autobiographical facts, personal information, repeated events, and others. The prior five categories could be either internal or external details, while the other categories are external. Internal details refer to the details directly related to the main event, while external details are the other details that are not directly related to the main event.

After detecting and sorting the details, the number of internal and external details was calculated by summing them up. A second independent coder coded 21% of the narratives, and intraclass correlation coefficients were calculated. Inter-rater reliability results showed that ICC values for internal and external details were .76 - .80, respectively, indicating a good agreement between coders (ICC two-way random effects).

2.4.2 Gesture Coding Scheme

Participants were recorded during the entire data collection process. Later, their speech was transcribed into text in ELAN software. After that, for the purposes of this

study, their co-speech gestures were coded for four events. Their gestures were coded according to the classification of McNeill (1992). However, we used two main categories: iconic and beat (representational and non-representational). Iconic (movements of hand that represent concrete characteristics of objects, events, individuals etc.), metaphoric (gestures that represent abstract aspects of entities), and deictic (static position of fingers or hand that points to an object or individual) gestures were coded into representational gestures (iconic) category while beat gestures (simple, rapid and rhythmic movements of hands that do not have any representational meaning) were coded into non-representational gestures category. After a main coder coded the data, a second coder coded 21% of the data (seven participants), the inter-rater reliability was computed with an intraclass correlation coefficient and indicated excellent agreement between coders. ICC values for the total gesture, iconic gestures, and beat gestures were in a range of .95 - .99 (ICC two-way random effects). After the initial coding part, we exported the raw data (total number of gesture use) and divided it into word counts for each narrative. For instance, a participant used 30 iconic and 6 beat gestures, and the word count for that narrative was 150. We calculated “gesture per word” by dividing 30 and 6 by 150 and used “gesture per word” for our analyses.

Chapter 3:
RESULTS

3.1 Descriptive Statistics

Descriptive statistics of internal and external details and representational and non-representational gestures were calculated (Table 3.1, Figure 3.1.1 & 3.1.2). Gesture use in each narrative was divided into the total number of words produced, and "gesture per word" was calculated for each category (Table 3.1, Figure 3.1.3). Descriptive statistics about VVIQ (M = 62.82, SD = 8.69) and MIT (M = 69.06, SD = 6.55) were calculated. After careful consideration, one participant was excluded for the reasons that their imagery scores, length of their narratives, episodic details and gesture production were outliers. The outlier was detected by using boxplots and interquartile ranges. The final sample consisted of 33 participants.

Figure 3.1: Number of episodic details, gestures and gesture per word in experimental conditions

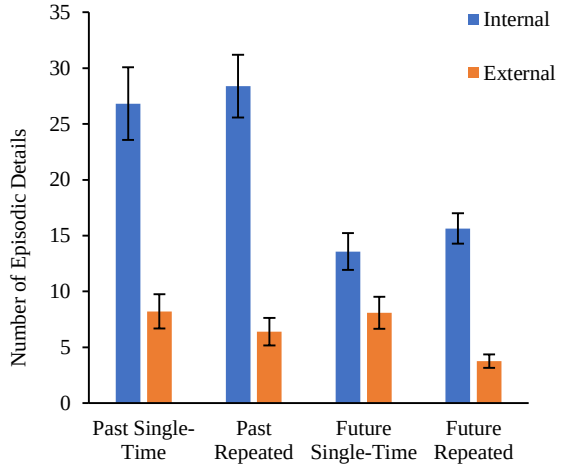

Figure 3.1.1

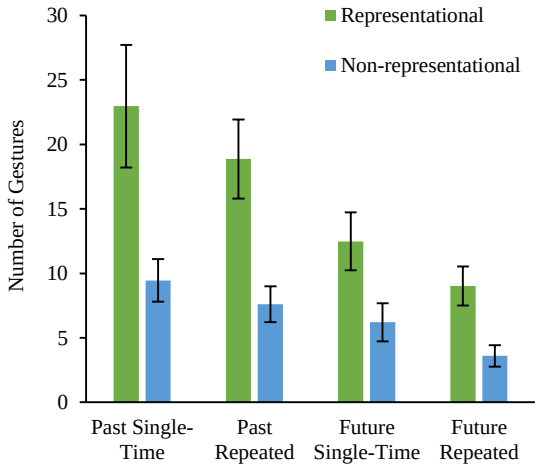

Figure 3.1.2

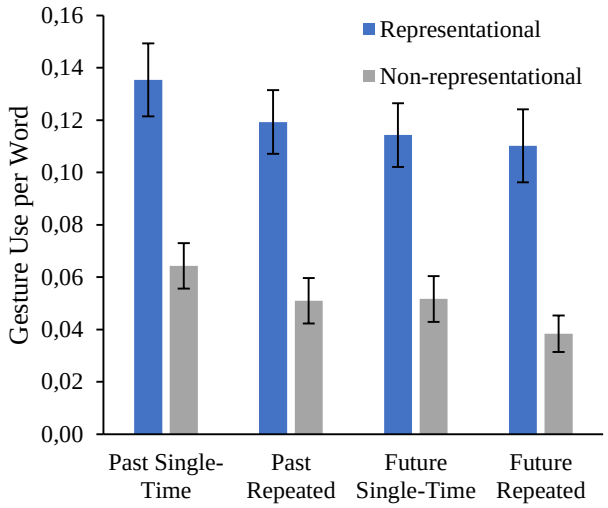

Figure 3.1.3.

Table 3.1 Means and standard deviations of episodic details and gesture use

	Internal Details		External Details		Gesture Use		Representational Gesture Use		Non-representational Gesture Use		Gesture per word		Representational gesture per word		Non-representational gesture per word	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Past Single-Time	26.82	18.65	8.21	8.83	32.42	36.21	22.97	27.32	9.45	9.51	0.20	0.10	0.14	0.08	0.06	0.05
Past Repeated	28.39	16.10	6.40	7.02	26.48	23.64	18.88	17.60	7.61	8.03	0.17	0.10	0.12	0.07	0.05	0.05
Future Single-Time	13.58	9.54	8.09	8.19	18.70	19.80	12.49	12.95	6.21	8.46	0.17	0.11	0.11	0.07	0.05	0.05
Future Repeated	15.64	7.80	3.76	3.48	12.64	11.67	9.03	8.72	3.61	4.79	0.15	0.102	0.11	0.08	0.04	0.04

3.2 Event Types and Frequencies

To investigate whether internal and external details, total gesture frequency, representational and non-representational gesture use differed across four experimental conditions, five 2x2 (event type x event frequency) repeated measures ANOVAs were computed. The first 2x2 repeated measure ANOVA revealed that there was a main effect of event type (past or future) on internal details $F(1,32) = 30.23$, $p < .001$, $\eta^2 = .19$ such that past events had more internal details than future events. There were no significant main effects of event frequency ($F(1,32) = .93$, $p = .34$) and interaction between event type and frequency ($F(1,32) = .02$, $p = .90$). The second 2x2 Repeated Measures ANOVA was conducted to see whether participants used a differentiated

number of external details across conditions. The analysis yielded a main effect of event frequency (single time or repeated) $F(1,32) = 8.99$, $p = .005$, $\eta^2 = 0.04$, showing that the participants reported more external details in single events. The main effect of event type ($F(1,32) = 1.42$, $p = .24$) and interaction between event type and frequency ($F(1,32) = 1.48$, $p = .23$) were not significant.

The third 2x2 Repeated Measures ANOVA revealed whether total gesture use differed across four experimental conditions. According to the analysis, there were main effects of both event type (past and future) $F(1,32) = 8.02$, $p = .008$, $\eta^2 = 0.02$ and event frequency (single time and repeated) $F(1,32) = 4.60$, $p = .04$, $\eta^2 = 0.01$, but the interaction was not significant ($F(1,32) = .24$, $p = .63$). Past events and single events were told with higher gesture frequencies.

A fourth 2x2 Repeated Measures ANOVA showed whether representational gesture use differed across different conditions. According to the analysis, there were no main effects of event type ($F(1,32) = 3.65$, $p = .07$) and event frequency ($F(1,32) = 1.95$, $p = .17$) and interaction across conditions ($F(1,32) = .29$, $p = .59$) in representational gesture use. The last 2x2 Repeated Measures ANOVA was intended to see if there was any difference across experimental conditions in terms of non-representational gestures. The analysis revealed a main effect of the event type, $F(1,32) = 6.15$, $p = .02$, $\eta^2 = 0.018$. Past event recollections were reported with a higher rate of non-representational gestures. There were not any significant main effects of event frequency ($F(1,32) = 3.89$, $p = .06$) and interaction between event type and frequency ($F(1,32) = 1.96e\text{-}9$, $p = 1.00$).

3.3 Individual Differences in Visual Imagery

A correlation analysis was conducted among internal and external details, representational and non-representational gestures per word, VVIQ, and MIT. Since we conducted a series of correlational analyses, we adjusted the p-value to .01 and considered the values as significant if they were significant at the .01 level. The VVIQ and MIT were not significantly correlated with each other ($r(31) = -.11$, $p = .55$). It was found that the MIT and external details of future repeated events were correlated ($r(31) = .45$, $p = .009$). Moreover, no other variables of episodic details or gesture use were found to be correlated with VVIQ and MIT. To see all the correlations, please see Table 3.3.

3.4 Phenomenological Ratings

For phenomenological ratings, we hypothesized that people with higher levels of visual imagery would give higher phenomenological ratings to events. To investigate this hypothesis, we conducted a series of correlations. Our analyses showed that VVIQ was positively correlated with the item "When I think about the event, I can simulate the setting" (setting) ($r(31) = .45$, $p = .009$) in future single-time event condition and "The event comes to me in words" (in words) item in future repeated event condition ($r(31) = .49$, $p = .005$). No other significant correlations existed among phenomenological ratings, VVIQ, and MIT in all event conditions. All the correlation tables can be found in Appendices E, F, G, and H.

Table 3.3. Correlations among VVIQ, MIT, episodic details and gesture use.

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. VVIQ	r	—																	
2. MIT	r	-0,11	—																
3. Past Single Internal	r	-0,28	0,03	—															
4. Past Single External	r	-0,16	0,31	0,77***	—														
5. Past Single Representational	r	-0,16	0,09	0,28	0,42*	—													
6. Past Single Non-Representational	r	-0,18	0,02	-0,01	0,05	0,32	—												
7. Past Repeated Internal	r	-0,07	0,4*	0,38*	0,63***	0,60***	0,24	—											
8. Past Repeated External	r	-0,12	0,09	0,5**	0,41*	0,19	0,03	0,32	—										
9. Past Repeated Representational	r	-0,01	0,03	0,24	0,14	0,33	0,10	0,43*	0,24	—									
10. Past Repeated Non-Representational	r	-0,12	-0,23	0,30	0,23	0,44**	0,46**	0,28	0,05	0,34	—								
11. Future Single Internal	r	-0,20	0,09	0,26	0,23	-0,01	0,10	0,25	0,15	0,02	0,05	—							
12. Future Single External	r	-0,17	0,32	0,28	0,30	0,20	0,11	0,33	0,37*	0,24	-0,02	0,13	—						
13. Future Single Representational	r	-0,13	0,15	0,12	0,08	0,57**	0,28	0,36*	0,09	0,60***	0,22	0,08	0,19	—					
14. Future Single Non-Representational	r	-0,09	0,08	0,15	0,18	0,19	0,60***	0,39*	0,07	0,24	0,52**	0,29	0,12	0,41*	—				
15. Future Repeated Internal	r	0,03	0,24	0,27	0,21	-0,06	0,11	0,30	0,34	0,14	0,15	0,52**	0,51**	-0,07	0,23	—			
16. Future Repeated External	r	-0,07	0,45**	0,01	0,11	0,03	0,03	0,39*	0,09	-0,01	-0,01	0,31	0,28	0,02	0,17	0,13	—		
17. Future Repeated Representational	r	-0,08	0,10	0,17	0,25	0,75***	0,38*	0,43*	-0,09	0,41*	0,55**	-0,09	0,19	0,68***	0,33	0,02	-0,06	—	
18. Future Repeated Non-Representational	r	-0,08	-0,24	0,06	-0,03	0,19	0,41*	0,25	0,06	0,21	0,59***	0,19	0,11	0,20	0,44*	0,28	0,20	0,23	—

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

***. Correlation is significant at the 0.001 level (2-tailed).

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Chapter 4:
DISCUSSION

In this study, we first investigated whether episodic details and gesture use differed across those four conditions: past-single time, past-repeated, future-single time, and future-repeated. Second, we examined whether there were associations among visual imagery skills, episodic details, gesture use, and phenomenological ratings in four experimental conditions. Our participants provided four narratives according to the instructions, rated those events in terms of their phenomenological characteristics, and completed VVIQ and MIT.

Results showed that in terms of internal details and non-representational gestures, event type (past or future) had a main effect, while in terms of external details, event frequency (single-time or repeated) had a main effect. On the other hand, for total gesture use, we found the main effects of both event type and frequency. However, we could not find a difference across situations regarding representational gestures. Moreover, results showed that MIT was only significantly correlated with external details of future repeated events. VVIQ was not significantly correlated with any of our measures. In addition, results showed that VVIQ and MIT were not significantly correlated. Lastly, we found two meaningful correlations among visual imagery measures and two phenomenological ratings for future event conditions. There was no significant correlation between visual imagery and phenomenological ratings. The results and their implications are further discussed in the following sections.

4.1 Event Type and Frequency Effect on Episodic Details and Gesture Use

We initially hypothesized that participants would produce more internal details and gestures (total) in past event conditions compared to future conditions. Moreover,

we expected that participants would produce more representational gestures and internal episodic details in single-time conditions compared to repeated conditions. Therefore, we expected to find the main effects of event type in total gesture use, internal episodic details, and the main effects of event frequency on representational gestures and internal episodic details.

Overall, our results partially confirmed our hypotheses. Firstly, we found the main effects of event type on internal episodic details and gesture use. Participants used significantly higher numbers of internal episodic details and gestured more in past event conditions compared to future event conditions. The earlier findings regarding past and future event details suggest a similar finding; these results were aligned with Aydın et al.'s (2023) findings, indicating total gesture use differed at least for two of their experimental conditions, which were past, future, and non-autobiographical events in terms of total gesture use. Even though there is a certain level of overlap in the underlying mechanisms of episodic memory and future thinking, constructing a future event, compared to recalling an autobiographical memory, requires more effort because, in future thinking processes, phases such as extraction from past experiences, recombination and integration of the old and new situations are needed (Attance & O'Neill, 2001; Schacter & Addis, 2007). On the other hand, the results are not surprising for total gesture use because, in past events, we can mention a certain amount of reliving and mental time travel. Moreover, after mentally simulating those events, scenes, and people, our participants might have gestured more to communicate those details. According to the gesture-as-simulated-action framework, when those mental simulations are activated, they may also activate the motor and the perceptual systems, resulting in increased gesture production (Hostetter & Alibali, 2019). At this point, mental time travel could be an important factor in both memory recollection and gesture

use. Engaging in mental time travel may result in an increase in internal details, and as a result of the mental time travel, our mental simulations may be activated, resulting in increased gesture use.

Secondly, we expected participants to use more internal episodic details and representational gestures in single-time event conditions compared to repeated event conditions. We did not find any effect of event frequency on internal episodic details or representational gestures. In other words, the number of internal episodic details and the amount of representational gesture use did not differ between single-time and repeated event conditions. There is strong evidence in the literature that details in single-time events are remembered better with more details (Deck & Paterson, 2021a; Deck & Paterson, 2021b; Theunissen et al., 2017). We expected that internal episodic details would be higher. The level of external episodic detail was significantly higher in single-time events compared to repeated events. Since unique events that only happen once in our lives possess specific properties such as vividness and importance, producing more internal details about those events while recalling them would not be surprising. Also, theories and research on single and repeated events suggest that details in repeated events tend to fade away after repeated occurrences, and those events tend to be remembered as scripts (Brainerd & Reyna, 2019; Reyna et al., 2016; Schank & Abelson, 1977). We found that our participants used significantly higher numbers of external episodic details and gestured more in single-time event conditions compared to repeated event conditions.

Those results regarding external episodic details can be explained by using the Fuzzy Trace Theory (Reyna et al., 2016). This theory assumes that after repeated exposure, gist features are better remembered, and verbatim features tend to be forgotten. Therefore, our participants remembered internal episodic details in single-

time and repeated events equally because they represented the gist of the events; however, they did not recall external episodic details in repeated events because, after repeated exposure, only the gist of the events tended to be remembered. This is not the case for single-time events; their unique nature enables participants to also recall details that are not directly related to the main event.

The reason we could not observe such a difference between single-time and repeated events could be the events that we used. We asked them to remember/simulate "important event" for single-time conditions and "birthday events" for repeated event conditions. It would be more suitable for the purpose of this study to ask events that are not special occasions for repeated event conditions. Some of our participants told us birthday memories for "important event" questions, and this situation led us to think that maybe we were not able to dissociate "important events" from "birthday events" since both could be important and unique.

For non-representational gesture use, we found the main effect of event type; in other words, our participants used non-representational gestures more in the past than in future conditions. According to the cognitive load hypothesis, gesture production increases when the cognitive load increases (Goldin-Meadow et al., 2001). From this point of view, we may argue that since past and single-time events are unique events that possess a well-established background, details, and emotional intensity, communicating them to other people may increase the cognitive load, and people use their gestures to balance that load. Therefore, to investigate this argument, future research may add a scale that measures emotional intensity so that we can see whether it has an effect on gesture use and episodic details.

Lastly, we could not find meaningful associations between episodic details and representational gestures, either in the past or future condition although previous

literature found such an effect for past conditions (Aydın et al., 2023; Güneş-Acar et al. 2024),

4.2 Visual Imagery, Episodic Details, and Phenomenological Ratings

Initially, we expected that individuals with stronger visual imagery skills would produce more episodic details and gesture more. To investigate this hypothesis, we conducted a correlation analysis. According to the results, VVIQ was not significantly correlated with any of our variables in all conditions, while the MIT was only significantly correlated with the external details of future repeated events. Moreover, results showed that our two measures of imagery were not correlated with each other.

In our third set of hypotheses, we expected that there would be positive correlations between visual imagery skills and phenomenological ratings. In other words, we hypothesized that people with higher visual imagery skills would give higher phenomenological ratings to the events (e.g., vividness and reliving). We could not find such an effect for either of the past event conditions (past single-time and past repeated). Those results were partially in line with the findings of Aydın et al. (2023) who found that the sense of reliving was significantly correlated with episodic details (internal and external) for past event conditions. For future event conditions, there were no significant correlations. However, our analyses showed positive correlations between VVIQ and “setting” for future single-time events and VVIQ and “in words” for future repeated event conditions.

Our results showed both conflicting and confirming patterns with our hypotheses. Previous literature shows strong evidence of the relationship between visual imagery and episodic details in autobiographical memory and future thinking (Aydın, 2018; D’Argembeau & Van der Linden, 2004; 2006; Rubin, 2006). More specifically, in

a study investigating gesture use, autobiographical memory, and future thinking measures of visuospatial working memory, Corsi Block-Tapping Task and spatial mental imagery (Mental Rotation Task) were neither associated with episodic details nor gesture use (Aydın et al., 2023).

As we mentioned in the literature review, there were some mixed findings that showed individual variations in visual imagery skills were not correlated with phenomenological ratings of ABMs (Greenberg & Knowlton, 2014). A study that did not find any meaningful associations between individual differences in visual imagery skills and phenomenological findings explained the lack of associations by emphasizing the recollection method. The studies that found an association (Aydın et al., 2023; D'Argembeau & Van der Linden, 2006) used probe cues to recall memories and events; however, we used specific instructions to recall those events. Greenberg and Knowlton (2014) argued that giving participants broad cue words may lead to greater activation in their visual imagery, revealing the role of individual variabilities in visual imagery skills. Moreover, in line with this argument, the events they told us were somehow salient and probably rehearsed events that our participants did not need to visualize in order to tell with details.

Another possibility of lack of associations could be the imagery measures themselves. Aydın (2018) and Sheldon et al. (2016) discussed this problem, emphasizing that researchers should not treat visual imagery as a homogeneous concept but as a combination of two different constructs: object imagery and spatial imagery. Results also suggest that spatial visual imagery skill predicts internal episodic details in autobiographical memories and future thoughts, while object imagery skill predicts some phenomenological ratings, such as visual details and narrative coherence for autobiographical memories. Moreover, for both autobiographical memory and future

thinking conditions, emotional intensity can be predicted from object imagery skills (Aydın, 2018).

Therefore, even though we could not find any significant associations among VVIQ, the MIT, episodic details, gesture use, and phenomenological ratings, we cannot say that visual imagery is unrelated to our variables. The lack of significant associations could be caused by the measurements that we used in our study. Blajenkova (2006) and Aydın (2018) suggested that VVIQ is a measure that includes both object imagery and spatial imagery constructs, and that is why we chose this measure to use in our study. However, regarding the results coming from spatial visual imagery research, it would have been more suitable for the purposes of our study to investigate those two visual imagery constructs separately. By measuring object and spatial imagery separately, we might find relations between object imagery and phenomenological characteristics of events and spatial imagery and episodic details, as Aydın (2018) suggested.

4.3 Visual Imagery and Gesture Use

Previous literature on gesture production argues that gesture production could be related to activating mental images in our minds (Kita et al., 2017). The gesture-for-conceptualization hypothesis and gesture-as-simulation hypothesis both suggest that gestures could be evoked by mental images. Moreover, other studies found a correlation between MIT and gesture production. For instance, Arslan and Göksun (2021) investigated gesture use, working memory, and mental imagery skills of older and younger adults, and they indicated that they found significant associations between representational gesture use and mental imagery skills in an address description task. However, in an autobiographical memory study, no significant associations were revealed between spatial mental imagery and gesture use (Aydın et al., 2023).

Moreover, another study investigating the relations among creativity, gesture production, and mental imagery found that people with higher mental imagery do not always have to use gestures while solving convergent thinking problems (Hyusein & Göksun, 2023).

Overall, previous literature presents mixed findings regarding the relationship between mental imagery and gesture use. We also have evidence that gesture use is facilitated when a vivid mental simulation appears in people's minds. Moreover, gesture use is significantly more pronounced in tasks related to visuospatial skills (Hostetter & Alibali, 2019). Therefore, we could not find any meaningful results because of the lack of the activation of visual-spatial skills. Because of its nature, in autobiographical memory and future thinking studies, even though visual elements can be easily evoked, spatial properties of events sometimes become obscured, and the possible effect of visual and mental imagery on gestures might become vaguer.

Our results showed us a meaningful picture to understand how episodic details and gesture use differ across different event types and frequencies and also how individual variations in visual imagery skills influence episodic details, gesture use, and phenomenological ratings. Moreover, they contributed to a growing body of knowledge in autobiographical memory, future thinking, visual imagery, and gesture production and tapped into the junctions of those research areas. This is among the first studies investigating visual imagery, episodic details, and gesture use in different event types and frequencies. Research investigating single-time and repeated events focuses especially on eyewitness testimonies and forensic areas (such as Deck & Paterson, 2021a; Deck & Paterson, 2021b). This study may add to our understanding of how repeated events work and what properties of repeated events change across different event types and frequencies. The intersection between autobiographical memory, future

thinking, and gesture production is a relatively young area of research, and we do not have much research investigating those topics. Therefore, even though some of our hypotheses conflicted with the results and previous literature, we have a chance to build on them and use that knowledge to understand the puzzle of human memory and language.

It is one of the first studies to combine those areas and it brings up questions to think about. For instance, we found some significant differences across event conditions. We also discussed the possible reasons for those differences; however, we still do not know the cognitive processes that may cause such differences. On the other hand, even though literature says there are connectedness among visual imagery, autobiographical memory, future thinking, (D'Argembeau & Garcia Jimenez, 2020; D'Argembeau & Van der Linden, 2006) and gesture use, we found no evidence for it. Therefore, future research may be conducted by changing the imagery measures and techniques to collect narratives. Other cognitive skills, such as visual-spatial working memory, can be made a part of the picture to understand the relations profoundly.

We had some limitations in this study. As mentioned above, asking for "birthday memories" for repeated event conditions may not be the best event to collect. Since it is a special occasion, it can also be considered an "important event" for some participants. We may not tap into the exact underlying principles of repeated events because of our questions about repeated events. Second, we did not investigate visual imagery as two different constructs suggested in the literature: object and spatial imagery. It was found that spatial imagery could be more related to episodic details, while object imagery is found to be related to phenomenological ratings (Aydın, 2018). Although we used VVIQ, a measure that includes both object and spatial imagery, and the MIT, a measure

investigating mental imagery in terms of manipulating and generating images, it would be better to investigate visual imagery constructs dependently.

4.4 Conclusion

This study investigated the relationship among episodic detail, gesture use, visual imagery, and phenomenological ratings by combining two different event types and frequencies (past, future and single-time, repeated). We found significant differences across event types and frequencies in terms of episodic details and gesture use. Our participants used a significantly higher amount of internal event details, total gestures, and non-representational gestures in past event conditions compared to future event conditions and used significantly higher numbers of external event details in single time events compared to repeated events. Those results contribute to this young area of memory and gesture research by providing an additional dimension: event frequencies. Future research should focus on investigating the role of distinct constructs on episodic details and gesture use. Moreover, this research line can be investigated developmentally since there is a growing research line investigating single-time and repeated event memories of children. Those research outputs may add to the eyewitness memory area, in which single-time and repeated events were heavily investigated and have practical implications.

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Appendix A: Event Questions (Original Turkish versions)

Past and Future Single-Time Events

Çalışmamızın bu kısmında sizden geçtiğimiz beş sene içerisinde yaşadığınız/gelecek beş sene içerisinde yaşayabileceğiniz sizin için önemli olan bir anıyı hatırlamanızı/düşünmenizi istiyorum. Bu olay geçmişte belli bir zamanda ve mekanda ve tek sefer yaşanmış olmalı/yaşanacak olmalı. Bu olayla ilgili detayları, kişileri, olayın yaşandığı yer ve zamanla ilgili bilgileri gözünüzde canlandığı kadar ayrıntılı şekilde anlatabilirseniz çok seviniriz.

Past and Future Repeated Events

Çalışmamızın bu kısmında sizden geçtiğimiz beş sene içerisinde yaşadığınız/geleccek beş sene içerisinde yaşayabileceğiniz bir doğum gününüzü hatırlamanızı/düşünmenizi istiyorum. Anlatacağınız anının spesifik bir gün ve zamanda gerçekleşmiş/gerçekleşecek olması gerekiyor. Bu olayla ilgili detayları, kişileri, olayın yaşandığı yeri ve zamanı hatırlayabildiğiniz kadar ayrıntılı anlatabilirseniz çok seviniriz.

Appendix B: *Vividness Of Visual Imagery Questionnaire (VVIQ; Marks, 1973*) *(Turkish version)*

Lütfen belirtilen her imgeyi zihninizde görebildiğiniz canlılığını aşağıdaki ölçeği kullanarak değerlendiriniz:

1	2	3	4	5
Hiç bir resim aklıma gelmiyor (sadece o nesneyi düşündüğümü biliyorum)	Belli belirsiz ve sönük	Orta derecede net ve canlı	Net ve oldukça canlı	Tamamen net ve gözümle gördüğüm şeyler kadar canlı

Sık sık gördüğünüz ama şu an sizinle olmayan bir akraba veya arkadaşınızı düşünün. Aklınızın gözünde canlanan resim üzerinde dikkatlice düşünün. Sonra aşağıdaki soruları yukarıdaki ölçeğe göre puanlandırın:

1. Suratın, kafanın, omuzların ve vücudun kesin hatları,
2. Başın karakteristik duruşları, vücudun genel tavırları vs.
3. Yürümekteki kesin duruş, adım boyu vs.
4. Aşina olduğunuz elbiselerde giyilen farklı renkler

Doğan bir güneşi hayal edin. Aklınızın gözünde canlanan resim üzerinde dikkatlice düşünün. Sonra aşağıdaki soruları yukarıdaki ölçeğe göre puanlandırın:

5. Güneş, ufuktan sisli bir gökyüzüne doğuyor.
6. Gökyüzü açıyor ve güneşi mavilikle çevreliyor.
7. Bulutlar. Şimşekler içeren bir fırtına başlıyor.
8. Bir gökkuşağı beliriyor.

Sıkça gittiğiniz bir dükkânın dışını düşünün. Aklınızın gözünde canlanan resim üzerinde dikkatlice düşünün. Sonra aşağıdaki soruları yukarıdaki ölçeğe göre puanlandırın:

9. Yolun karşısından dükkânın genel görünüşü
10. Renkler, şekiller ve satılan ürünlerin ayrıntılarını içeren vitrin
11. Girişin yanındasınız. Kapının rengi, şekli ve ayrıntıları
12. Dükkâna giriyorsunuz ve tezgâha gidiyorsunuz. Tezgâhtar size yardımcı oluyor. Para ödüyorsunuz.

Son olarak, ağaçlar, dağ ve göl içeren bir kırsal sahne hayal edin. Aklınızın gözünde canlanan resim üzerinde dikkatlice düşünün. Sonra aşağıdaki soruları yukarıdaki ölçeğe göre puanlandırın:

13. Manzaranın dış hatları
14. Ağaçların renk ve şekilleri
15. Gölün renk ve şekli
16. Güçlü bir rüzgâr ağaçların ve gölün üzerine esiyor, dalgalar oluşturuyor

Appendix C: *Autobiographical Memory Questionnaire (Rubin et al., 2003)*

Lütfen, soruları yanıtlamaya başlamadan önce bu anı hakkında biraz düşünün.

1. Olayı hatırlarken, olayı **yeniden yaşıyormuş** gibi hissediyorum. (RELIVING)

1	3	5	7
Hiç değil	Belli belirsiz	Net bir biçimde	Şu anda oluyormuş gibi

2. Olayı hatırlarken, onu zihnimde **duyabiliyorum**. (HEARING)

3. Olayı hatırlarken, onu zihnimde **görebiliyorum**. (SEEING)

4. Olayı hatırlarken, kendim ya da başka insanlar **konuşuyor**. (TALKING)

5. Olayı hatırlarken, o zamanki **duyguları** şimdi de duyuyorum. (EMOTIONS)

6. Olayı hatırlarken, olayın geçtiği **yeri** anımsayabiliyorum. (SETTING)

7. İnsanlar bazı olayları, hatırlamasalar da başlarından geçtiğini bilirler. Ben anımı hatırlarken, bu olayın başımdan geçtiğini bilmekten öte onu gerçekten **hatırlayabiliyorum**. (REMEMBER/KNOW)

1	3	5	7
Hiç değil	Belli belirsiz	Net bir biçimde	Herhangi bir anım kadar

8. Olayı **kelimesi kelimesine** hatırlıyorum. (IN WORDS)

9. Olayı hatırlarken, olayın **olduğu zamana geri döndüğümü** ve olayı dışarıdan seyreden biri değil ona yeniden katılan biri olduğumu hissediyorum. (MENTAL TIME TRAVEL)

10. Olayı hatırlarken, aklıma yalnızca bir durum, gözlem ya da sahne olarak değil; sözcükler ya da resimlerden oluşan **bütün bir hikaye** ya da olay olarak geliyor. (COHERENCE)

11. Bu olay bana bir mesaj verdiği için ya da yaşamımda kritik bir zamanı veya dönüm noktasını simgelediği için benim için **önemli** bir anıdır. (SIGNIFICANCE)

12. Bu olayın **gerçekten hatırladığım şekilde gerçekleştiğine** ve olmamış herhangi bir şeyi hayal etmediğime ya da kurmadığıma inanıyorum. (REAL/IMAGINE)

1	7
% 100 hayal ürünü	% 100 gerçek

13. Olduğundan beri, bu olay hakkında **<u>düşündüm</u>** ya da **<u>konuştum</u>**. (THINK/TALK)

1	3	5	7
Hiçbir zaman	B azen	Bir çok kez	Hayatımdaki herhangi bir olay kadar sık

14. Bildiğiniz kadarıyla, bu anı, belli bir zaman ve yerde **<u>bir kere</u>** gerçekleşmiş bir olayın mı, birçok benzer ya da ilişkili olayın **<u>birleşiminin</u>** mi ya da bir günden fazla bir süreye **<u>yayılmış</u>** bir olayın mı hatırlanmasıdır? (MERGED/EXTENDED)

1	2	3
Bir kerede gerçekleşmiş bir olay	Birkaç olayın birleşimi	Bir günden fazla bir süreye yayılmış bir olay

15. Lütfen olayın **<u>tarihini</u>** (gün / ay / yıl) olabildiğince doğru bir şekilde hatırlamaya çalışın. *<u>Tahmin etmeniz gerekse bile lütfen bir gün, ay ve yıl yazın</u>*. Eğer bu anı uzun bir süreye yayılmışsa, bu sürenin yaklaşık olarak ortasına gelen tarihi yazın. Eğer ayı biliyor ama günü bilmiyorsanız, ayın başı, ortası veya sonu için sırasıyla 1, 15 ya da 30 yazın. Bazen olayın tarihini hatırlamak için tatiller, doğum günleri ya da okulda olduğunuz yıllar gibi bilinen tarihler kullanmak yardımcı olabilir. (DATE)

Appendix D: *Future Thinking Questionnaire (adapted from Rubin et al., 2003)*

Lütfen, soruları yanıtlamaya başlamadan önce bu olay hakkında biraz düşünün.

1. Olayı düşünürken, olayı **<u>yaşıyormuş</u>** gibi hissediyorum. (PRELIVING)

1	3	5	7
Hiç değil	Belli belirsiz	Net bir biçimde	Şu anda oluyormuş gibi

2. Olayı düşünürken, onu zihnimde **<u>duyabiliyorum</u>**. (HEARING)

3. Olayı düşünürken, onu zihnimde **<u>görebiliyorum</u>**. (SEEING)

4. Olayı düşünürken, kendim ya da başka insanlar **<u>konuşuyor</u>**. (TALKING)

5. Olayı düşünürken, yaşayabileceğim **<u>duyguları</u>** şimdi de duyuyorum. (EMOTIONS)

6. Olayı düşünürken, olayın geçtiği **<u>yeri</u>** zihnimde canlandırabiliyorum. (SETTING)

7. Olayı **<u>kelimesi kelimesine</u>** aklımda canlandırabiliyorum. (IN WORDS)

1	3	5	7
Hiç değil	Belli belirsiz	Net bir biçimde	Herhangi bir olay kadar

8. Olayı düşünürken, olayın **<u>olacağı zamana gittiğimi</u>** ve olayı dışarıdan seyreden biri değil ona katılan biri olduğumu hissediyorum. (MENTAL TIME TRAVEL)

9. Olayı düşünürken, aklıma yalnızca bir durum, gözlem ya da sahne olarak değil; sözcükler ya da resimlerden oluşan **<u>bütün bir hikaye</u>** ya da olay olarak geliyor. (COHERENCE)

10. Bu olay bana bir mesaj vereceği için ya da yaşamımda kritik bir zamanı veya dönüm noktasını simgeleyeceği için benim için **<u>önemli</u>** bir olaydır. (SIGNIFICANCE)

11. Bu olay, belli bir zaman ve yerde **<u>bir kere</u>** gerçekleşmiş bir olayın mı, birçok benzer ya da ilişkili olayın **<u>birleşiminin</u>** mi ya da bir günden fazla bir süreye **<u>yayılmış</u>** bir olaya dair düşüncelerinizdir? (MERGED/EXTENDED)

1	2	3

Bir kerede gerçekleşmiş bir olay	Birkaç olayın birleşimi	Bir günden fazla bir süreye yayılmış bir olay

12. Lütfen olayın yaşanabileceği **tarihi** (gün / ay / yıl) yazın. Eğer bu olay uzun bir süreye yayılmışsa, bu sürenin yaklaşık olarak ortasına geleceğini düşündüğünüz tarihi yazın. Eğer ayı tahmin ediyor fakat günü tahmin edemiyorsanız, ayın başı, ortası veya sonu için sırasıyla 1, 15 ya da 30 yazın. (DATE)

Appendix E & F: The correlation tables of visual and mental imagery, phenomenological ratings, episodic details and gesture use for past single-time and past repeated conditions.

E. Past single-time events.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
VVIQ	r	—																		
MIT	r	-0.109	—																	
reliving	r	0.054	0.065	—																
hearing	r	0.004	0.049	0.894***	—															
seeing	r	0.263	-0.072	0.566***	0.560***	—														
talking	r	-0.018	0.178	0.713***	0.786***	0.587***	—													
emotions	r	0.091	0.024	0.699***	0.650	0.364*	0.462**	—												
setting	r	-0.050	-0.190	0.159	0.140	0.446**	0.049	0.139	—											
remember/know	r	-0.046	-0.043	0.520**	0.492**	0.685***	0.547***	0.281	0.385*	—										
in words	r	0.277	-0.237	0.558***	0.531**	0.653***	0.452**	0.342	0.315	0.731***	—									
mental time travel	r	0.128	0.083	0.583***	0.570***	0.491**	0.524	0.689***	0.212	0.490**	0.414*	—								
coherence	r	0.214	-0.176	0.415*	0.417*	0.365*	0.409*	0.396*	0.445**	0.333	0.439*	0.302	—							
significance	r	-0.070	0.351*	0.239	0.344	0.180	0.402*	0.277	0.164	0.222	0.026	0.387*	0.036	—						
real imagine	r	0.301	-0.099	0.352*	0.231	0.246	0.074	0.201	0.230	0.317	0.314	0.240	0.317	-0.105	—					
think/talk	r	-0.051	-0.328	0.367*	0.281	0.141	0.089	0.547***	0.110	0.115	0.299	0.285	0.159	-0.050	0.109	—				
Internal	r	-0.280	0.027	0.098	0.000	-0.024	0.089	-0.048	0.093	0.165	0.015	0.156	-0.233	-0.092	-0.044	-0.093	—			
External	r	-0.156	0.308	0.237	0.164	0.069	0.290	0.105	0.156	0.235	0.066	0.325	0.117	0.139	-0.036	0.014	0.760***	—		
Representational	r	-0.163	0.094	0.098	0.097	-0.106	-0.143	0.239	-0.059	-0.072	-0.128	0.081	0.007	-0.102	-0.083	0.116	0.281	0.419*	—	
Non-representational	r	-0.179	0.019	0.239	0.279	0.118	0.209	0.200	0.056	0.040	0.146	0.152	0.116	0.157	-0.087	0.173	-0.006	0.051	0.323	—

Note. * p < .05, ** p < .01, *** p < .001

F. Past repeated events

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
VVIQ	r	—																		
MIT	r	-0.109	—																	
reliving	r	0.041	-0.112	—																
hearing	r	0.024	0.395*	0.606***	—															
seeing	r	0.113	-0.195	0.706***	0.455**	—														
talking	r	0.031	-0.094	0.606***	0.631***	0.342	—													
emotions	r	0.197	-0.086	0.740***	0.474**	0.532**	0.576***	—												
setting	r	0.123	-0.025	0.365*	0.215	0.587***	-0.015	0.308	—											
in words	r	0.289	-0.085	0.314	0.503**	0.380*	0.567***	0.316	0.213	—										
remember/know	r	0.258	-0.136	0.532**	0.493**	0.801***	0.231	0.500**	0.566***	0.353*	—									
mental time travel	r	0.368*	-0.091	0.600***	0.363*	0.597***	0.434*	0.725***	0.336	0.334	0.671***	—								
coherence	r	0.234	-0.300	0.456**	0.563***	0.503**	0.305	0.312	0.300	0.539**	0.513**	0.295	—							
significance	r	0.110	0.047	0.441*	0.455**	0.389*	0.325	0.482**	0.050	0.146	0.368*	0.384*	0.198	—						
real imagine	r	0.335	-0.264	0.362*	0.445**	0.542**	0.339	0.468**	0.182	0.414*	0.702***	0.561***	0.441*	0.279	—					
think/talk	r	-0.203	-0.236	0.549***	0.619***	0.391*	0.328	0.443**	0.158	0.053	0.319	0.229	0.312	0.398*	0.139	—				
Internal	r	-0.065	0.397*	0.441	0.187	0.336	0.234	0.317	0.151	-0.000	0.324	0.305	0.354*	0.383*	0.195	0.264	—			
External	r	-0.122	0.087	-0.014	0.104	0.059	-0.104	-0.109	-0.057	-0.163	0.020	-0.059	0.163	0.431*	-0.064	0.284	0.318	—		
Representational	r	-0.007	0.027	0.132	0.062	0.237	-0.153	-0.211	0.121	-0.042	0.158	-0.159	0.244	-0.109	-0.078	0.200	0.427*	0.241	—	
Non-Representational	r	-0.125	-0.234	0.432*	0.319	0.355*	0.292	0.228	0.061	0.241	0.298	0.130	0.395*	-0.058	0.124	0.231	0.284	0.047	0.340	—

Note. * p < .05, ** p < .01, *** p < .001

Appendix G & H: The correlation tables of visual and mental imagery, phenomenological ratings, episodic details and gesture use for future single-time and future repeated conditions.

G. Future single-time events

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VVIQ	r	—															
MIT	r	-0.109	—														
pre-living	r	0.389*	-0.056	—													
hearing	r	0.359*	0.002	0.711***	—												
seeing	r	0.421*	-0.181	0.690***	0.628***	—											
talking	r	0.080	0.222	0.329	0.587***	0.244	—										
emotion	r	0.428*	0.059	0.626***	0.406*	0.426*	0.194	—									
setting	r	0.447**	-0.274	0.358*	0.295	0.619***	0.052	0.342	—								
in words	r	0.262	-0.194	0.589***	0.550***	0.430*	0.103	0.318	0.276	—							
mental time travel	r	0.121	-0.088	0.306	0.381*	0.245	0.249	0.436*	0.134	0.244	—						
coherence	r	-0.187	0.244	0.311	0.367*	0.211	0.106	0.089	0.134	0.299	0.206	—					
significance	r	0.325	0.098	0.341	0.402*	0.344	0.211	0.335	0.513**	0.298	-0.002	0.358*	—				
Internal	r	-0.201	0.085	0.034	0.022	0.218	-0.032	-0.132	-0.028	-0.129	0.002	0.156	0.000	—			
External	r	-0.171	0.323	-0.122	0.007	-0.220	-0.136	0.169	-0.275	0.003	0.130	0.190	-0.034	0.127	—		
Representational	r	-0.126	0.154	0.097	0.122	0.055	-0.241	-0.006	0.076	0.064	-0.113	0.321	0.050	0.080	0.191	—	
Non-representational	r	-0.089	0.081	-0.188	-0.124	-0.048	-0.362*	-0.275	-0.084	-0.085	-0.013	0.266	-0.159	0.286	0.122	0.412*	—

Note. * p < .05, ** p < .01, *** p < .001

H. Future repeated events

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VVIQ	r	—															
MIT	r	-0.109	—														
pre-living	r	0.108	-0.066	—													
hearing	r	0.304	0.043	0.523**	—												
seeing	r	0.109	-0.101	0.617***	0.313	—											
talking	r	0.374*	-0.058	0.518**	0.661***	0.336	—										
emotion	r	0.169	0.182	0.548***	0.456**	0.503**	0.355*	—									
setting	r	0.143	-0.168	0.354*	0.156	0.575***	0.277	0.296	—								
in words	r	0.519**	0.068	0.322	0.486**	0.330	0.297	0.275	0.206	—							
mental time travel	r	0.207	0.128	0.396*	0.474**	0.308	0.309	0.543**	0.410*	0.172	—						
coherence	r	0.053	-0.194	0.521**	0.297	0.413*	0.468**	0.028	0.246	0.332	0.038	—					
significance	r	0.220	0.016	0.341	0.589***	0.248	0.428*	0.165	0.097	0.347*	0.205	0.365*	—				
Internal	r	0.028	0.240	0.171	0.253	0.094	0.229	0.059	0.213	0.138	0.053	0.095	0.250	—			
External	r	-0.068	0.446**	-0.274	0.103	-0.155	0.150	0.000	-0.015	-0.015	0.020	-0.010	-0.058	0.135	—		
Representational	r	-0.078	0.099	-0.156	-0.193	-0.264	-0.424*	-0.051	0.043	0.088	-0.145	-0.099	-0.120	0.018	-0.056	—	
Non-representational	r	-0.079	-0.241	-0.115	-0.005	-0.021	-0.064	-0.021	0.129	-0.089	-0.250	0.160	0.294	0.278	0.196	0.235	—

Note. * p < .05, ** p < .01, *** p < .001