EXPLORING THE IMPACT OF DOMAIN, CONVENTIONALITY, AND CREATIVITY ON PREDICATE METAPHOR PROCESSING IN TURKISH SPEAKING PRESCHOOL CHILDREN: EVIDENCE FROM VERBAL AND NON-VERBAL TESTS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

BERFİN KARABULUT

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF ARTS
IN
THE DEPARTMENT OF ENGLISH LANGUAGE TEACHING

NOVEMBER 2023
Approval of the thesis:

EXPLORING THE IMPACT OF DOMAIN, CONVENTIONALITY, AND CREATIVITY ON PREDICATE METAPHOR PROCESSING IN TURKISH SPEAKING PRESCHOOL CHILDREN: EVIDENCE FROM VERBAL AND NON-VERBAL TESTS

submitted by BERFIN KARABULUT in partial fulfillment of the requirements for the degree of Master of Arts in English Language Teaching, the Graduate School of Social Sciences of Middle East Technical University by,

Prof. Dr. Sadettin KİRAZCI
Dean
Graduate School of Social Sciences

Prof. Dr. Nurten BİRLİK
Head of Department
Department of Foreign Language Education

Assoc. Prof. Dr. Duygu SARISOY
Supervisor
Department of Foreign Language Education

Examining Committee Members:

Assoc. Prof. Dr. Hale İŞIK GÜLER (Head of the Examining Committee)
Middle East Technical University
Department of Foreign Language Education

Assoc. Prof. Dr. Duygu SARISOY (Supervisor)
Middle East Technical University
Department of Foreign Language Education

Assoc. Prof. Dr. Nart Bedin ATALAY
TOBB University of Economics and Technology Department of Psychology
I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name: Berfin Karabulut

Signature:
Although metaphor processing is important for language and cognitive development, there is currently no agreement on how predicate metaphor processing works in children. Additionally, there is a lack of research on how linguistic and cognitive factors contribute to the development of metaphor processing. This study investigated the metaphor comprehension abilities of 35 Turkish-speaking preschool children with a mean age of 4.7 (Mage = 56.9 months, range = 44–67 months). The impact of domain, conventionality, and creativity on children’s metaphor processing abilities was explored. An analysis using mixed-effects multinomial logistic regression in R was conducted to examine how children comprehend metaphors conveyed through gesture-based non-verbal and verbal assessments. The study looked at how the comprehension of metaphors varied based on their domain (emotion and body) and conventionality (familiar, unfamiliar, and novel), as well as the age of the children and their creativity scores, which were measured by The Torrance Test of Creative Thinking Figural Form's fluency and originality levels. The analysis aimed to predict the likelihood of children providing metaphorical, literal, or no-response answers in the metaphorical assessment tasks. The study findings indicate that as children age, their metaphor comprehension abilities improve, with
abstract domains being more directly processed compared to concrete body-related expressions, which are often interpreted indirectly. Additionally, novel metaphors, in the emotional domain, were more likely to be understood metaphorically. Although creativity did not show significant effects, trends suggest that fluency may promote a deeper understanding of metaphorical expressions, while originality may influence the tendency to interpret metaphors literally. Further investigation is required to understand creativity’s role in metaphor processing.

**Key Words:** Metaphor Processing, Cognitive Linguistics, Creative Thinking, Direct Processing, Indirect Processing.
ÖZ

TÜRKÇE KONUŞAN OKUL ÖNCESİ ÇOCUKLarda DEVİNİM METAFORLARININ İŞLENIŞİNE METAFOR TÜRÜ, AŞİNALIK DÜZEYİ VE YARATICILİĞIN ETKİSİ: SÖZEL VE JEST TEMELLİ TEST BULGULARı

KARABULUT, Berfin
Yüksek Lisans, İngiliz Dili Öğretimi Bölümü
Tez Yöneticisi: Doç. Dr. Duygu SARISOY

Kasım 2023, 89 sayfa

düşük metaforlara göre, metaforik olarak anlaşılma olasılığının daha yüksek olduğu bulunmuştur. Yaratıcılık istatistiksel olarak anlamlı etkiler göstermesine de, eğilimler akıcılığın metaforik ifadelerin derinlemesine anlaşılmasını teşvik edebileceğini, orjinallığın ise metaforların literal yorumlanması ile ilgisi olabileceğine işaret etmektedir. Metafor işlemede yaratıcılığın rolünü anlamak için daha fazla araştırmaya ihtiyaç vardır.

**Anahtar Kelimeler:** Metafor İşleme, Bilişsel Dilbilim, Yaratıcı Düşünme, Doğrudan Erişim Modeli, Dolaylı Erişim Modeli
To my mother
ACKNOWLEDGEMENTS

I would like to express my gratitude to my supervisor Assoc. Prof Dr. Duygu SARISOY for her guidance, advice, criticism, encouragement, and insight throughout the research. Her expertise and input have been invaluable throughout the research process.

I also would like to express my gratitude to my thesis committee members, Assoc. Prof. Dr. Hale İŞIK GÜLER and Assoc. Prof. Dr. Nart Bedin Atalay for their detailed comments, suggestions, and feedback throughout the jury process and thereafter, which greatly contributed to the refinement of my thesis.

I extend my deepest gratitude to Assoc. Prof. Dr. Berrin Uğkun and Assoc. Prof. Dr. Nart Bedin Atalay for their invaluable guidance and support during my bachelor's degree, which has profoundly shaped my academic journey.

Although at times exhausting, my data collection process with the children was always delightful. The connections I formed with the children I met at the kindergarten will stay with me for life. I am immensely grateful to the children who participated in my study, those who patiently continued, and even those who, due to age constraints, could not participate but only secretly peek through the door to watch. You still appear in my dreams. I am truly fortunate to have met you and to have had the opportunity to play together, even if it was for a short time.

I would like to thank my colleagues Rümeysa Erdoğan, Ezgi Bayramoğlu, Fatma Nur Öztük and İşin Tekin who have consistently provided their support from the beginning of my involvement in the project. METU Language and Cognitive Development Laboratory members and volunteers Semih Can Aktepe, Galiya Saraç, Hilal Yıldırım Gündoğdu, Özlem Yeter, Süleyman Yaman, Hilal Çimen, Ceren Yucel, Bora Taşkın, Sueda Sevval Özmemiş , Enes Us, Özlem Eslemez, Onur Evcen, Adem Can Güna and anyone whose names have slipped my memory helped me for collecting, coding, and analysing data. I am grateful to for their efforts.
It would have been impossible to reach children without the help of METU Kindergarten and thanks are due to Esin Öz and Sinem Önal, the coordinators, and all personnel for their collaboration.

I owe a heartfelt thank you to Mert Yusuf Çam, who has been by my side through every joy and challenge of this journey. Your unwavering support has been my pillar of strength. A special thanks to my dear friends Zeynep Meral and Sena Çiçekli – though distance lay between us, your presence and support felt close and constant. I feel incredibly blessed to have grown up alongside such extraordinary people like you. To Karaca Erdemir and Zeynep Oğuzman, friends I found in school and wish to keep for a lifetime, thank you for your steadfast belief in me and your endless encouragement. Your friendship means the world to me.

With a heart full of gratitude, I want to thank my family, whose endless support and love have been the foundation of all my achievements. To my sister and roommate, Helin Karabulut, whose humour and patience have been a constant source of joy and comfort in our shared lives. Your ability to bring a smile to my face, even in the most challenging times, has been invaluable. To Havin Karabulut, for her inspirational wisdom and courage. Your insights and thoughtful advice have helped shape my decisions and have been a guiding light. To my mother, Sebahat Karabulut, who is the epitome of strength and creativity: In my professional assessment! having delved deeply into the realms of creativity for my thesis, I joyfully affirm that your imaginative spirit and ingenious solutions have been a beacon of inspiration to me. And to my father, Yusuf Kenan Karabulut, whose belief in me never wavered. Your confidence in my abilities has been a driving force in my pursuit of knowledge. Knowing that you always have faith in me gives me the courage to reach for the stars, striving to mirror the honesty and honour you embody in every aspect of life. Each one of you has played a pivotal role in my life, offering support, love, and guidance. I am eternally grateful for the sacrifices you have made and the unconditional love you have provided.

This project was supported by the the Scientific and Technological Research Council of Turkey (TUBITAK) 100,1 awarded to Assoc. Prof. Dr. Duygu Sarısoy (220K034).
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAGIARISM</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>ÖZ</td>
<td>vi</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>viii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ix</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xiv</td>
</tr>
<tr>
<td>CHAPTERS</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2. LITERATURE REVIEW</td>
<td>6</td>
</tr>
<tr>
<td>2.1. Theoretical Frameworks Explaining Metaphor Processing</td>
<td>6</td>
</tr>
<tr>
<td>2.1.1. The Indirect Access Model of Metaphor Processing</td>
<td>6</td>
</tr>
<tr>
<td>2.1.2. The Direct Access Model of Metaphor Processing</td>
<td>7</td>
</tr>
<tr>
<td>2.1.3. Conceptual Metaphor Theory</td>
<td>8</td>
</tr>
<tr>
<td>2.2. Development of Metaphor Processing</td>
<td>9</td>
</tr>
<tr>
<td>2.3. Factors Influencing Metaphor Processing</td>
<td>13</td>
</tr>
<tr>
<td>2.3.1. The Grammatical Structure of the Metaphors</td>
<td>13</td>
</tr>
<tr>
<td>2.3.2. Conventionality</td>
<td>14</td>
</tr>
<tr>
<td>2.4. Assessment of Metaphor Processing in Children</td>
<td>16</td>
</tr>
<tr>
<td>2.5. Creativity</td>
<td>17</td>
</tr>
<tr>
<td>2.6. Present Study</td>
<td>20</td>
</tr>
<tr>
<td>3. METHOD</td>
<td>22</td>
</tr>
<tr>
<td>3.1. Participants</td>
<td>22</td>
</tr>
<tr>
<td>3.2. Measurements</td>
<td>22</td>
</tr>
<tr>
<td>3.2.1. Metaphor Comprehension Tasks</td>
<td>22</td>
</tr>
<tr>
<td>3.2.1.1. Materials for Metaphor Comprehension Tasks</td>
<td>23</td>
</tr>
<tr>
<td>3.2.1.2. Non-verbal Metaphor Comprehension Task</td>
<td>25</td>
</tr>
<tr>
<td>3.2.1.2.1. Procedure</td>
<td>25</td>
</tr>
</tbody>
</table>
3.2.1.2.2. Data Coding Procedure ................................................................. 25
3.2.1.3. Verbal Metaphor Comprehension Task ........................................... 26
  3.2.1.3.1. Procedure ....................................................................................... 26
  3.2.1.3.2. Data Coding Procedure ................................................................. 26
3.2.2. Torrance Test of Creative Thinking Figural Form A ............................. 27
  3.2.2.1. Material and Procedure ................................................................. 28
  3.2.2.2. Data Coding ....................................................................................... 29
4. RESULTS ........................................................................................................ 32
  4.1 Results of the Non-verbal Metaphor Comprehension Assessment ............. 32
  4.2. Results of the Verbal Metaphor Comprehension Assessment .................. 39
5. DISCUSSION .................................................................................................. 44
  5.1. Overview .................................................................................................... 44
  5.2. The Role of Age in Metaphor Processing.................................................. 45
  5.3. The Role of Domain Differences in Metaphor Processing ......................... 47
  5.4. The Role of Conventionality in Metaphor Processing .............................. 48
  5.5. The Role of Creativity in Metaphor Comprehension ................................ 49
  5.6. Conclusion .................................................................................................. 51
  5.7. Significance of the Present Study ............................................................. 52
  5.8. Limitations and Suggestions for Further Studies ..................................... 52
REFERENCES .................................................................................................... 54
APPENDICES
A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE............ 66
B. PARENTAL INFORMED CONSENT FORM .................................................. 67
C. R SCRIPTS FOR THE ANALYSIS ................................................................. 70
D. TÜRKÇE ÖZET ............................................................................................... 77
E. SAMPLE TEZ İZİN FORMU / THESIS PERMISSION FORM ........................ 89
LIST OF TABLES

Table 1. The classification of metaphor types used in the metaphor comprehension tasks ......................................................... 24

Table 2. Results of mixed effects multinomial logistic regression analysis for the nonverbal assessment of metaphor comprehension ............................................. 34

Table 3. Results of mixed effects multinomial logistic regression analysis for the verbal assessment of metaphor comprehension ............................................. 40
LIST OF FIGURES

Figure 1. Example for activity 1, titled The dinosaur carries its egg on its back. ........29
Figure 2. Example for activity 2, titled Glasses. .................................................. 30
Figure 3. Example for activity 2, untitled. .......................................................... 30
Figure 4. Example for activity 3, titled Laundry on the Clothesline ..................... 31
Figure 5. Example for activity 3, titled Stick. ....................................................... 31
Figure 6. Example for activity 3, titled Cow. ....................................................... 31
Figure 7. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by age ................................................................. 36
Figure 8. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by item domain ......................................................... 37
Figure 9. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by conventionality ................................................. 37
Figure 10. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by fluency ............................................................. 38
Figure 11. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by originality ......................................................... 39
Figure 12. Estimated Marginal Means of the verbal assessment of metaphor comprehension by age ................................................................. 42
Figure 13. Estimated Marginal Means of the verbal assessment of metaphor comprehension by metaphorical domain ........................................ 42
Figure 14. Estimated Marginal Means of the verbal assessment of metaphor comprehension by conventionality ............................................. 43
CHAPTER 1

INTRODUCTION

Metaphor processing, a fundamental aspect of language and cognition, enables individuals to connect abstract concepts and concrete experiences by mapping knowledge from one domain to another. It is a complex cognitive process that involves the comprehension and interpretation of figurative language, which is also crucial for communication, imagination, and abstract thinking, making it a crucial area of investigation in children's cognitive development.

The literature proposes two main theories to explain the underlying mechanisms of metaphor processing: the indirect and direct access accounts. The indirect access account claims that metaphor comprehension requires an additional step of accessing and representing the literal meaning before arriving at the metaphorical meaning (Grice, 1975; Searle, 1979). This model states that processing metaphors is cognitively more taxing due to this extra step. Studies supporting this account have shown longer reaction times for metaphorical expressions than for literal ones. Context is considered significant in this account, as metaphorical meaning is facilitated in metaphorically supportive contexts but inhibited in contexts favouring literal interpretation.

The direct access account, on the other hand, argues that metaphorical expressions are directly understood without the interference of the literal interpretation, mainly when supported by relevant context (Gibbs, 1994; Glucksberg, 2008). This model suggests a unified mechanism responsive to linguistic and non-linguistic information during the early stages of comprehension. Research supporting the direct access account has demonstrated reduced processing time discrepancies between metaphorical and literal expressions when presented in a rich context. Individual differences in cognitive abilities also influence metaphor processing efficiency.
According to the Conceptual Metaphor Theory developed by Lakoff and Johnson, metaphors are integral to language and thought (1980). They serve as crucial cognitive tools for organising and understanding abstract concepts. This theory categorises metaphors into orientational, structural, and ontological, where source domains (usually more concrete) are mapped into target domains (usually more abstract), and embodied experiences play a crucial role in shaping orientational metaphors, linking abstract concepts to sensorimotor inputs.

Over the years, researchers have explored the developmental trajectory of metaphor processing in children, understanding the milestones and stages of its emergence. Research conducted in the 1970s and 1980s claimed that children do not grasp metaphors until a relatively advanced stage of their cognitive development. It was stated that children initially pass through a "literal stage" where they consistently interpret metaphors literally (Gibbs, 1994; Winner et al., 1988). However, more recent research has shown that preschool children possess basic metaphorical abilities (Pouscoulous, 2011), and children as young as three or four years old are shown to be able to grasp metaphorical meaning when child-friendly assessment methods that do not focus on their metalinguistic abilities were used. However, difficulties persist in preschool, where children tend to interpret metaphorical expressions literally. Additionally, it was found that children face more difficulties with metaphors than with other figurative languages, possibly due to linguistic factors influencing metaphor processing.

Two critical linguistic factors influencing metaphor processing are the grammatical structure and conventionality of the metaphors. Most studies in this area have focused on nominal metaphors, while relatively few have investigated predicate metaphors (Goatly, 2011). In predicate metaphors, verbs are used figuratively, abstracting them from concrete, action-based meanings. The categorisation theory suggests that predicate metaphors are processed through direct categorisation. This means that metaphorical meanings are understood by abstracting them from a subordinate category (Glucksberg, 2008; Torreano et al., 2005). However, Utsumi and Sakamoto (2011) suggested an indirect categorisation that entails differences in nominal and predicate metaphor processing because of the semantic distinctions
between verbs and nouns. According to recent research, different types of metaphors engage different neural substrates, with verbs entailing rich elaborations and thematic roles, suggesting a two-stage process with indirect categorisation for predicate metaphors (Feng & Zhou, 2021).

The conventionality or familiarity of a metaphor is another critical factor influencing metaphor processing. Conventional metaphors are based on culturally pre-established connections, while novel metaphors are constructed at the moment using literal lexical meanings, world knowledge, and contextual cues (Pouscoulous, 2011). Familiar metaphors are found to be processed more quickly than novel ones (Blank, 1988; Blasko & Conine, 1993), and the career of metaphor hypothesis suggests that novel metaphors that initially function as new analogical comparison statements become conventionalised with repeated exposure (Bowdle & Gentner, 2005; Goldstein et al., 2012). Novel metaphor processing requires more cognitive effort than conventional metaphors' more automatic suppression process (Gentner & Bowdle, 2001; Sana et al., 2021).

Understanding metaphors involves establishing connections between seemingly unrelated domains, requiring cognitive flexibility and the ability to tolerate semantic violations (Anaki et al., 1998; Burgess & Chiarello, 2006; Faust & Mashal, 2007; Schmidt et al., 2007). This process is closely linked to creativity, which is considered a fundamental aspect of human thinking, involving the generation of novel and high-quality ideas (Guilford, 1950). Creativity is assessed through divergent thinking abilities commonly measured through fluency and originality, where individuals form a variety of unique connections between concepts. Studies have demonstrated a positive correlation between creativity and metaphor comprehension in adults (Kennet et al., 2018). Despite the compelling findings, the majority of research in this area has focused on adults and nominal metaphors, leaving a significant gap in understanding the role of creativity in metaphor processing during early developmental stages. Additionally, to our knowledge, no studies directly measured creative thinking. Examining the role of creativity, particularly fluency and originality, in predicate metaphor processing can offer valuable insights into children's linguistic and cognitive development. To bridge this gap, the present study
aims to investigate the role of creative thinking abilities, specifically measured by fluency and originality, in predicate metaphor processing focusing on familiar, unfamiliar and novel metaphors in the domains of emotion and body among Turkish-speaking preschool children.

Metaphors play a vital role in our social communication and everyday interactions, serving as valuable tools for explaining and comprehending complex topics (Katz, 2017). Remarkably, metaphors constitute a substantial portion of natural discourse, accounting for approximately 10% to 20% (Steen et al., 2010). Therefore, thinking and understanding metaphors are crucial for effective communication. Studying metaphor comprehension in children is significant for several reasons. First, it is clinically crucial to understand metaphor comprehension by studying how children develop metaphor comprehension because researchers can gain insights into how language develops. Metaphor comprehension is often impaired in individuals with neurodevelopmental disorders such as autism spectrum disorder (Kalandadze et al., 2016), wiliams syndrome (Von Herwegen et al., 2013) and developmental language disorder (Bühler et al., 2018). Consequently, metaphor comprehension significantly impacts social relationships, social participation, and educational attainment, as evident in the works of Kerbel and Grunwell (1997) and Swineford et al. (2014). Research can provide insights into this impairment's underlying cognitive and neural mechanisms, which may lead to the development of more effective interventions for neurodivergent populations. Second, teachers who recognise their essentiality frequently utilise metaphors, particularly in explaining scientific discoveries (Kerbel & Grunwell, 1997). By studying how children develop metaphor comprehension, researchers can gain insights into how to design educational materials that are effective for children of different ages and cognitive abilities. And finally, metaphor comprehension is a complex cognitive process reliant on multiple linguistic and cognitive factors with diverse developmental paths (Di Paola, Domaneschi & Pouscoulous, 2020). It serves as a focal point for researchers to gain insights into the development and interaction of these linguistic and cognitive factors. Therefore, understanding the development of metaphor comprehension in children and its relationship with other cognitive abilities contributes to our comprehension of cognitive and language development. Overall, investigating
metaphor comprehension in children is important for understanding cognitive and language development and developing effective interventions and educational materials.

The present chapter introduced the aim and significance of the current study. In the following chapter, we will discuss the study’s theoretical framework, which is based on both direct and indirect accounts of metaphor comprehension and conceptual metaphor theory. We will also delve into the development of metaphor processing and examine the factors that influence it.

Furthermore, we will briefly evaluate assessment methods in metaphor processing. Additionally, we will review the literature regarding the connection between creativity and metaphor processing. Finally, we will outline the aim of the present study.
CHAPTER 2

LITERATURE REVIEW

This chapter lays out the study’s theoretical framework, which is based on direct and indirect accounts of metaphor comprehension and conceptual metaphor theory. Following this, the chapter will explore the development of metaphor processing and the factors influencing metaphor processing. Additionally, a brief evaluation of assessment methods in metaphor processing is provided. The chapter then proceeds to review the literature regarding the connection between creativity and metaphor processing. The chapter will end with the aim of the present study.

2.1. Theoretical Frameworks Explaining Metaphor Processing

2.1.1. The Indirect Access Model of Metaphor Processing

Metaphor processing is a multifaceted process that entails figurative language comprehension and interpretation. Several theories are proposed to explain the metaphor processing mechanisms in the literature. The role of literal meaning during metaphor comprehension is one of the critical distinctions between the competing theories (Weiland et al., 2014). The classical scholars in pragmatics, Grice and Searle, laid the groundwork for the foundations of the indirect access account. According to this model (Grice, 1975; Searle, 1979), metaphor comprehension involves an additional step when compared to the comprehension of literal language. The indirect access model of metaphor comprehension proposes that accessing and representing the literal meaning is required before deriving the intended metaphorical meaning (Weiland et al., 2014). Further processing occurs if the literal interpretation is unsuitable in context (Heredia & Cieślicka, 2016). This model claims that because of the additional step, figurative language processing is cognitively more costly (Weiland et al., 2014). Several studies support the indirect access account. For
example, studies have shown that metaphorical expressions elicit longer reaction times than literal ones (Janus & Bever, 1985; Weiland et al., 2014). Several neuroimaging studies have also supported the indirect access account by showing discernible patterns of neural activation for metaphor comprehension compared to literal expressions (Bambini et al., 2016). Additionally, this account emphasises the role of context in metaphor processing. It postulates that in metaphorically supportive contexts, the metaphorical meaning is facilitated, whereas metaphorical meaning is inhibited in contexts that favour literal interpretation (Wang et al., 2018). It is claimed that contextually relevant interpretation surpasses the literal meaning of the words (Carston, 2010). In short, the indirect access account of metaphor processing claims that the additional literal interpretation of the expression is necessary for metaphor comprehension. It underlines that the essential activation of literal meaning is followed by the search for metaphorical interpretation.

2.1.2. The Direct Access Model of Metaphor Processing

In contrast, the direct access account of metaphor comprehension claims that metaphorical expressions can be interpreted directly without the interference of the literal meaning (Gibbs, 1994; Glucksberg, 2008). According to the direct access account, metaphorical expressions can be understood directly and easily when supported by relevant context (Weiland et al., 2014). This model challenges the idea that a literal step is necessary for understanding metaphors. (Sana et al., 2021). It suggests a unified mechanism responsive to linguistic and non-linguistic information and the interaction of simultaneously occurring lexical and contextual levels of comprehension at the early stages (Bambini et al., 2014). Several studies support the direct access account of metaphor processing. For example, Bambini et al. (2014) showed that when presented in a rich context, the discrepancy between the processing times between the metaphorical and literal expressions is decreased. This finding implies the critical role of context in promoting direct access to metaphorical meaning. Furthermore, several neuroimaging studies support the direct access account by showing the involvement of different neural activation patterns in processing metaphorical expressions compared to literal expressions (Reilly et al., 2019).
The direct access account also agrees that individual differences and cognitive factors affect metaphor processing. For example, readers’ cognitive style and working memory capacity were found to impact how they allocate additional processing effort on metaphor resolution (Olkoniemi et al., 2016). This indicates that the ease and efficiency of metaphor processing can be moderated by individual differences in cognitive abilities. To conclude, the direct access account of metaphor processing opposes the former account by claiming that metaphor processing does not require an extra step compared to literal language when supported with appropriate context. Multiple studies using reaction times (Glucksberg et al., 1982), eye tracking (Janus & Bever, 1985) and ERPs (Bambini et al., 2016) support this account. Furthermore, Landau et al. (2010) demonstrate that metaphors shape social thought and attitudes. This finding aligns with the direct access account by emphasising the crucial role of metaphors in social information processing and showing that metaphors are an important part of social thought rather than just the operations of schemas.

2.1.3. Conceptual Metaphor Theory

While the indirect and direct access accounts mostly focus on the role of literal language in metaphor comprehension, the Conceptual Metaphor Theory proposed by Lakoff and Johnson (1980) points out that metaphors are more prevalent in language and thought than previously realised. This theory claims that metaphor is more than a linguistic device, rather an essential cognitive mechanism that we structure and comprehend abstract concepts (Özçalışkan, 2005). This idea was first introduced by Argentinian author Jorge Louis Borges in his literary lectures in 1967 (Borges, 2000). According to conceptual metaphor theory, conceptual mappings represent fundamental metaphorical patterns in our thoughts (Kövecses, 2010, as cited in Holyoak & Stamenković, 2018). Conceptual mappings indicate both source and target. They are often represented by slogans such as TIME IS A MOVING ENTITY, HAPPY IS UP, or SAD IS DOWN. Every conceptual mapping consists of a source conceptual domain that is mapped into a target conceptual domain—usually, source domains are more concrete, and target domains are more abstract (Holyoak & Stamenković, 2018). For instance, the metaphor HAPPY IS UP links a positive sense with the top of a vertical spatial continuum (Casasanto & Gijssels, 2015). The
metaphorical link between upward direction and happiness is embedded in our embodied experiences. Furthermore, this viewpoint centres on the conceptual mappings that already exist in conventional metaphors, as highlighted by Barnden (2008). Therefore, rather than complex reasoning, metaphor processing is assumed to occur via retrieval of relevant mappings like constrained analogical reasoning (Holyoak & Stamenković, 2018). They propose that metaphors are based on mappings between different conceptual domains, where one domain is understood in terms of another. The understanding of a metaphor relies on the activation of these mappings and the context in which the metaphor is used.

Conceptual metaphor theory mainly categorises metaphors commonly used into three: orientational, structural and ontological (Lakoff & Johnson, 1980). Orientational (i.e. spatial) metaphors’ source is rooted in the spatial organisation of the world. Abstract concepts are structured through sensorimotor inputs as source domains (Özçalışkan, 2005). Up to now, a number of studies have reported results in favour of embodied nature of metaphors (Ackerman et al., 2010; Boroditsky, 2000; Gibbs et al., 2006; Gibbs & Matlock, 2008; Wilson & Gibbs, 2007). Several neuroimaging studies also provided evidence for the view of figurative language comprehension as an embodied process (Desai et al., 2011; Samur et al., 2015; Saygin et al., 2010). These findings indicate that children may find understanding the source domain meanings of metaphors easier due to their strong connection with their bodily experiences in the world (Özçalışkan, 2005). Therefore, it may emerge earlier than the target, in other words, metaphorical meaning. This might provide an explanation for the findings of earlier works (Asch & Nerlove, 1960; as cited in Özçalışkan, 2005) which found that children first focus on the literal meaning (source) of metaphors.

2.2. Development of Metaphor Processing

The research on the development of metaphor processing in children follows two main lines of enquiry: understanding the developmental milestones and stages and exploring the factors that affect it. Metaphor comprehension develops through the lifespan (Billow, 1975), but the onset of it is a debated topic in the literature.
Traditionally, metaphor comprehension was considered a late-emerging ability (Asch & Nerlove, 1960; Billow, 1981; Nippold, 1988/1998; Winner, 1988/1997). According to this classical perspective, any implicit comparison between two domains or entities based on their perceptual characteristics is a metaphor (e.g., a two-year-old child pointing to a cup and pretending it is tea). These studies accepted children’s ability to create connections between these domains based on similarity as a sign of metaphorical understanding (Gardner & Winner, 1978). These studies commonly concluded that preschool children are at the beginning stages of developing metaphorical ability (Vosniadou & Ortony, 1983). Although children were thought to be capable of making similarity-based matches at an early age, it was claimed that children developed the ability to accurately interpret metaphorical statements that contain implicit comparisons and rephrase them correctly at the ages 7;0 to 9;0 (Billow, 1975; Waggoner & Palermo, 1989).

A frequent criticism of many of these studies concerns a general lack of systematically chosen metaphorical stimuli (i.e., analogical mappings between psychological characteristics and bodily sensations) (Özçalı̇skan, 2005). However, the studies that utilised systematically chosen stimuli also concluded that children were not able to understand the metaphorical meaning until the ages of 7;0 to 10;0 (Winner et al., 1976). Asch & Nerlove (1960) conducted one of the first studies that chose their metaphorical stimuli systematically to investigate the cognitive prerequisites of metaphor comprehension in children. The study utilised two tasks to interpret the metaphorical understanding of the children between the ages of 6;0 to 14;0. Sixteen metaphoric sentences that were equated in length and word frequency were selected. They consisted of eight psychological-physical and eight cross-sensory metaphors. For the first task, children were asked to explain metaphoric sentences. For the second task, they were asked to choose one of four possible paraphrased sentences explaining the metaphorical sentence. The second task presented four possible interpretations for each sentence: magical, metonymic, primitive metaphoric, and genuine metaphoric. The results indicated that at the ages of 3;0 to 6;0 children only focused on the literal meaning, which gave way to the beginning of metaphorical understanding between 7;0 to 10;0, which was followed by a unified comprehension of literal and metaphorical meanings at 11;0 to 14;0 (Asch & Nerlove, 1960).
Generally, these studies suggested that children’s ability to comprehend develops gradually, and preschool children have a tendency to interpret metaphorical expressions literally before age 8, or they might understand the metaphorical expressions as magical or fictional (Johnson, 1982, as cited in Pouscoulous & Tomasello, 2020).

However, recent studies demonstrate an earlier emergence of metaphorical understanding (Pouscoulous, 2011). These studies found that young children as young as three years old can comprehend metaphors when comprehension is measured through actions rather than metalinguistic responses (Pouscoulous & Tomasello, 2020) and metaphorical competence improves at the age of 4 (Deamer, 2013; Özçaliskan, 2005). These findings are in line with another line of developmental research that shows that 3 to 4-year-olds have advanced pragmatic abilities (Tomasello, 2008). However, difficulties remain in preschool years, in which children have a tendency to interpret metaphorical expressions literally. These difficulties are attributed to a number of factors, such as age, experience, language background, and individual differences in cognitive abilities (Öztürk et al., 2020). The latter line of research is found to be using more child-friendly, age-appropriate experimental paradigms (further explanation of different assessment methods will be provided in section 2.4).

Pouscoulus and Tomosello (2019) investigated novel metaphor processing in three-year-old children by using a behaviour choice task. In the task, the object was referred to metaphorically (i.e. they were asked to identify the dog with the brown shoes, while the target toy is a dog with brown feet, and the distracter toy is a dog with a brown bow). It is concluded that children are able to derive pragmatic inferences from figurative language as early as three years old. One of the most cited studies is that of Şeyda Özçalışkan who investigated the developmental trajectory of metaphorical motion verbs within the framework of the conceptual metaphor theory (Özçalışkan, 2005). Turkish-speaking children between the ages of 3 to 5 were presented with 16 stories that contained three different metaphorical domains: time, illness and ideas. The metaphors in each target domain had two levels, highly conventional and non-conventional, to control for the effect of previous exposure to
the conventional metaphors and test the children’s pragmatic inference skills in metaphor comprehension. After the story, children attended a child-friendly comprehension task that required them to pick the correct puppet that answered the metaphorical comprehension questions about the metaphorical expressions in the story. An interview regarding the reason for their puppet choice and metaphorical expressions were conducted. It was found that four-year-olds were able to understand metaphorical expressions when presented in an appropriate context, but they failed to provide verbal reasoning regarding the metaphorical expressions in the interview phase. Five-year-olds, on the other hand, were capable of giving verbal reasoning about metaphorical expressions. Additionally, no significant differences were found between metaphorical domains, and it was taken as an indication of the domain-generality of metaphor comprehension. This finding is in line with previous research that indicated the development of children’s metaphorical thinking is related to the broadening of their conceptual domains, which contribute to their metaphor processing skills. Overall, children’s metaphor processing skills appear to be developing earlier than traditional studies suggested.

Rundblad and Annaz (2010) were one of the first to examine the developmental trajectory of metaphor and metonymy comprehension in children and adults. In their cross-sectional study with forty-five typically developing children and adults, they used a child-friendly story picture task. A strong relationship between metaphor and metonymy comprehension and chronological and mental age, as well as receptive vocabulary scores, were reported. It was found that comprehension improves with age. However, a slower rate of development was reported for metaphors. It was argued that metonymy requires a more cognitively basic processing mechanism than metaphor.

Deamer (2013) investigated three, four and five-year-old children in their metaphor comprehension abilities with age-appropriate, novel metaphors using a picture-story task.

Additionally, they investigated the relationship between children’s metaphor comprehension abilities and inhibitory control capacity. They found that children as
young as three years of age can understand novel metaphors. Furthermore, they found that inhibitory control scores were highly correlated with metaphor comprehension scores. They concluded that children’s executive functions are employed during metaphor comprehension by suppressing unnecessary information. They stated that metaphor processing requires active suppression. Rubio- Fernandez and Grassman (2016) also investigated the role of cognitive abilities and metaphor comprehension. They focused on alternative naming and analogy perception and considered that these cognitive abilities might play a role in metaphor processing. They utilised nominal, novel metaphors in three and four-year-old children. The study utilised two tasks consisting of a baseline task and a target task. The former task involved analogy perception and the latter involved both cognitive abilities. It was found that children performed better at the baseline task compared to the target. It was concluded that in preschool years, assigning second labels to familiar objects may affect their metaphor comprehension skills.

It seems that preschoolers can carry out complex linguistic pragmatic inferences when the experimental task is simple enough, age-appropriate, engaging, and presented in context.

However, children experience more difficulties with metaphors when compared to comprehension of other figurative language, such as metonymy (Rundblad & Annaz, 2010) and hyperbole (Deamer, 2013). These differences could be due to the linguistic factors affecting metaphor processing. The next section will describe the linguistic factors that influence metaphor comprehension.

2.3. Factors Influencing Metaphor Processing

2.3.1. The Grammatical Structure of the Metaphors

When investigating metaphor comprehension, it is important to consider the grammatical structure of the metaphors because not all metaphors are alike. The majority of the studies focus on nominal metaphors (e.g., our lives are the rivers), and relatively few studies investigated predicate metaphors (e.g., time passes)
Predicate metaphors abstract the verbs from concrete action-based meanings by using them in a figurative way.

In line with the nominal metaphor processing studies, the categorisation theory (Glucksberg, 2008; Torreano et al., 2005) claimed that predicate metaphors are processed by direct categorisation. For example, in my job is a jail, both job and jail fall under the same subordinate category of unpleasant and oppressive situations (Feng & Zhou, 2021). Direct categorisation proposes that metaphorical meanings are understood by abstracting them from a subordinate category.

In opposition to this theory, Utsumi and Sakamoto (2011) claimed that since the semantic structures of verbs are different from nouns, the processing of nominal and predicate metaphors should also be different. Research has also indicated that different types of metaphors are processed through different neural substrates (Schmidt-Snoek et al., 2015). Verbs entail events, actions and semantic relations of rich elaborations and thematic roles; for instance, to V1 is to V2 in some way (e.g., to move is to change something’s position or place). Nouns, on the other hand, entail objects and semantic relations of class inclusion; for example, an N1 is an N2 (e.g., A car is a vehicle) is a hierarchical classification. The meanings of predicate metaphors are less likely to be formed by superordinate categorisation since they are less likely to rely on hierarchical relations (Chen et al., 2008). A transitional entity is presumed to be activated by verbs before a figurative category of action is concluded (Utsumi & Sakamoto, 2011). For example, in the men bent the truth before the abstract meaning of changing a story or facts is understood, the transitional entity that things that are bent (e.g., metal, plastic) or imagination of bending may be evoked in mind.

2.3.2. Conventionality

In addition to the grammatical structure of the metaphors, an important factor potentially contributing to metaphor processing is the conventionality, also known as familiarity, of the metaphor. The processing of conventional metaphors differs from novel metaphors (Pouscoulous, 2011). While conventional metaphors rely on culturally established connections, novel metaphors are constructed with literal
lexical meaning, world knowledge and contextual cues on the spot. Because of this difference, novel metaphors are found to be suitable for investigating metaphor processing in children (Pouscoulous & Tomasello, 2020).

Blank (1988) contrasted conventional metaphors with novel metaphors to investigate the role of familiarity in metaphor processing. It was found that participants were faster at naming the last word of the conventional metaphor compared to novel metaphors. Blasko and Conine (1993) pointed out that Blank (1988) did not collect familiarity ratings for the familiar and novel metaphors, but they decided on the familiarity of the metaphors post hoc, based on naming times. Building on Blank (1988)’s study, Blasko and Conine (1993) conducted a word association task in their study to investigate the influence of familiarity on metaphor comprehension. They collected familiarity ratings for their items. In line with Blasko (1988), faster processing was reported for familiar metaphors (Blasko & Conine, 1993; see also; Tabossi et al., 2009).

Metaphor processing requires the activation of a broad range of semantic associations to combine weakly connected concepts with novel and appropriate metaphorical expressions. The career of metaphor hypothesis (Bowdle & Gentner, 2005) suggests that novel metaphors are initially processed as new analogical comparison statements, like similes. However, with repeated exposure, they become conventionalised, and new categorical meanings for the metaphor vehicle are formed and integrated into the semantic memory structure, which implies a strategical transition from analogical comparison to categorisation (Bowdle & Gentner, 2005; Goldstein et al., 2012). Although both familiar and novel metaphors require contextual information, the comparison process of novel metaphors was found to require more cognitive effort than the categorisation process of conventional metaphors (Gentner & Bowdle, 2001; Sana et al., 2021). This is because the processing of conventional metaphors requires the selection of the already existing appropriate meaning, whereas novel metaphor processing requires alternative non-literal interpretations that are cognitively more taxing.
In conclusion, the grammatical structure and conventionality of metaphors are essential for understanding metaphor processing. Further research using these factors holds the potential to contribute to understanding the underlying mechanisms of figurative language.

2.4. Assessment of Metaphor Processing in Children

The methods used for investigating metaphor processing in children vary to a great extent (Cacciari & Padovani, 2012). However, six types of tasks were mostly used in previous literature. Winner et al. (1980) asked the children to pick a target object (e.g., a cone-shaped toy) to match with either a categorically relevant object (a block), an unrelated object (a fire engine), or a perceptually similar object considered as the metaphorical match (a toy rocked ship). In multiple choice tasks (Qualls & Harris, 1999), the children are presented with a short story that contains a metaphorical expression. Children are required to choose the correct meaning of a metaphorical expression from multiple choices. The verbal explanation task (Gibbs, 1987) requires the children to explain the meaning of a metaphorical expression presented in a short story. The comparison task (Vosniadou & Ortony, 1983) differs from the previous tasks by not providing a context for the metaphorical expression. In this task, children are asked to compare two words, one of which is metaphorical and the other literal and determine which one is more similar in meaning (e.g., A nose is like a (....) metaphorical/literal word pair: mountain/mouth). In the multiple sentences task (Pollio & Pollio, 1974), children are expected to provide as many sentences as possible using a given word in different meanings and ways. And finally, the metaphorical enactment task (Vosniadou et al., 1984) requires children to explain the meaning of a metaphorical sentence by acting out and using the objects in a specially constructed toy world. Implementing child-friendly and age-appropriate assessment methods is crucial for understanding figurative language processing. For example, Bernicot et al. (2007) discovered that children might perform worse in a metapragmatic task, although showing that they understand it years earlier in a picture selection task.

Overall, the more a task depends only on linguistic measures, the more the experiments are expected to underestimate children’s metaphor comprehension skills.
The multiple-choice task in which the metaphorical expressions were given in context and the non-verbal matching task that did not rely on children’s linguistic abilities reported earlier metaphorical understanding in children (Vosniadou et al., 1984). From this line, Hülagü and Özge (2017) used a gesture-based act-out task to measure metaphor comprehension in four-year-old children and adults. The task required the participants to act out the literal and metaphorical motion verbs. It was found that both groups used more gestures by decomposing the lexical item into its components in literal motion verbs compared to metaphorical ones.

2.5. Creativity

Lakoff and Turner (1989) have noted that poets often create metaphors that are novel adaptations of the conventional conceptual metaphors from our everyday metaphorical language. As an example, Omar Khayyam’s poem, *Ah, make the most of what we yet may spend, Before we too into the Dust Descend; Dust into Dust, and under Dust, to lie, Sans Wine, sans Song, sans Singer and—sans End!* (Khayyam, n.d. XXIII, as cited in Lakoff & Turner, 1989) is a creative realisation of the conventional conceptual metaphor DEATH IS DEPARTURE with a downward direction. That conceptual metaphor gives way to everyday ways to talk about death, such as *passing away or leaving early.* This shows that human thinking is creative even in its simplest forms, such as talking about death. Creative thinking is visible in both poetic metaphors and everyday figurative language, even if we can investigate it only in its simple and defined forms. In this section, we will first define creativity and explore the potential mechanisms involved in creative thinking during metaphor comprehension. We will then provide an overview of studies that have investigated the relationship between metaphor comprehension and creativity.

Creativity has been a topic of interest in psychology since Joy Paul Guilford made a claim for its importance as the president of the American Psychological Association in 1950. Over time, numerous studies have emerged examining different aspects of creativity and cognition. These studies consistently emphasise the significance of creativity while also improving the definition of it. Creativity is described as the cognitive ability to generate uncommon and high-quality ideas (Hong & Milgram,
2008) as well as imaginative and surprising (Guilford, 1981). Guilford (1950) determined divergent thinking as the core of creative thinking. Divergent thinking is the capacity of a person to generate numerous and useful solutions for a complex and open-ended problem (Guilford, 1967). Divergent thinking is considered important because it brings creativity, a heavily debated, subjective and complex topic, into the realm of empirical science (Dietrich & Kanso, 2010). This focus on divergent thinking opened the way to the development of several standardised tests of creativity. Divergent thinking is generally attributed to and measured by two abilities, fluency and originality (Cho et al., 2010). Fluency is defined as the capacity to generate a large number of ideas, whereas originality is defined as the ability to generate ideas that are distinct and uncommon (Guilford, 1967; Torrance, 1974; Wallach & Kogan, 1965). Both abilities are common to most creative thinking tests.

Metaphor comprehension involves building associations or semantic relations between frequently unrelated domains. Semantic flexibility and tolerance of semantic violations related to the right hemisphere are found to be crucial for metaphor comprehension (Anaki et al., 1998; Burgess & Chiarello, 2006; Faust & Mashal, 2007; Schmidt et al., 2007). In this context, fluency which indicates finding multiple potential links between the source and the target contributes to semantic flexibility (Littlemore, 2001). On the other hand, originality, which elicits original combinations and unusual associations, is found to be necessary for tolerance of semantic violations (Rossman & Fink, 2010).

A number of studies claim that even though both conventional and novel metaphors require some kind of semantic violation, they should be regarded as different linguistic expressions that initiate different semantic processing mechanisms (Bowdle & Gentner, 2005; Mirous & Beeman, 2012). Several neuroimaging studies showed the distinction between the processing of conventional and novel metaphors (Arzouan et al., 2007; Lai et al., 2009; Mashal et al., 2015). In line with these findings and the career of metaphor hypothesis (explained in the previous section: Bowdle & Gentner, 2005), conventional metaphors are understood through pre-established salient semantic relations between the words. Understanding novel metaphors, on the other hand, involves creating novel connections between concepts
in memory. This process is connected to creative thinking (Mednick et al., 1964). Studies have also found that the right hemisphere is responsible for semantic coding (Beeman et al., 2004) as well as creative thinking (Faust & Kahana, 2002; Helie & Sun, 2010). Additionally, tasks requiring verbal creativity have been observed to activate the RH more (Mihov et al., 2010).

The link between metaphor processing and creativity has been investigated from different angles. Glicksohn and colleagues (1993) conducted a study with thirty-five adult participants in which they investigated the relationship between creativity and metaphorical thinking. This study used a battery that measures the fluency domain of creative thinking and a metaphorical thinking test that used nominal metaphors. A positive correlation was found between metaphorical thinking and creativity. Friedman and Förster (2000) studied the cognitive process of creativity from the perspective of embodied cognition, implementing a series of experiments to test the relationship between body, environment, and creativity. Their findings indicated that body actions, for instance, arm flexing, can increase creative insight. This study is important since it is one of the first studies to demonstrate a relationship between creativity and embodied cognition. More recently, Leung and colleagues (2012) also investigated the link between embodiment and creativity and found that there is a significant cognitive relationship between the embodiment of idioms and creative output.

In 2011, Gold and colleagues conducted research on how creative thinking is related to fluency and understanding of various types of word pairs and metaphors. They tested adult participants on the nominal novel and conventional metaphors, as well as literal and unrelated word pairs. According to the study, individuals who are more creative tend to process both conventional and novel metaphors faster than those who are less creative. The researchers concluded that people with higher levels of creativity find it easier to comprehend metaphors. Building on this study, Kennet and colleagues (2018) investigated the link between individual differences in creativity and semantic relatedness. In the study, lower and higher creative adult participants completed a semantic relatedness judgment task on word pairs that contained four different types of semantic relations: nominal novel and conventional metaphors,
literal word pairs, and meaningless word pairs. They found that higher creative participants were faster in comprehension in all of the word types when compared to lower creative participants. Higher creative participants were faster in both novel and conventional metaphors, but they were found to be more accurate only for the novel metaphors. They explained that since higher creative people have a more flexible semantic memory structure (Faust, 2012) and novel and conventional metaphor processing taps into different mechanisms, higher creative people were more accurate in novel metaphor comprehension (Kennet et al., 2018).

In summary, creativity plays a crucial role in metaphor processing, especially in the context of fluency and originality. The ability to semantically relate two concepts, despite the fact that they are not usually linked together and are not coded in the mental lexicon, may require a creative linguistic process in order to establish novel, original semantic relations. However, as stated in other sections of this literature review, metaphor understanding is a multifaceted process that depends on the grammaticality and conventionality of the metaphors, the assessment methods, the items selected for the assessment and different cognitive abilities. All the studies that investigated the role of creativity so far, however, suffer from the fact that they mostly focused on nominal metaphors and almost exclusively consisted of adult participants with no domain specificity in their item selection. Therefore, the present study aims to address this gap by exploring the role of creativity, as measured by fluency and originality, in predicate metaphor processing, specifically in preschool children.

2.6. Present Study

While previous research has hinted at children's metaphorical understanding from as young as three years old and predicate metaphor comprehension at the age of four, the specific influence of domain and conventionality on this process remains unexplored. Furthermore, the connection between metaphor comprehension and creative thinking in preschool children has not been thoroughly investigated. To fill this gap in the literature and gain a comprehensive understanding of language and cognitive development during early childhood, our study aims to investigate the
developmental trajectory of predicate metaphor processing. The main objective of the current study is to explore the processing of predicate metaphors in Turkish preschool children, focusing on familiar, unfamiliar and novel metaphors in the domains of emotion and body and the effect of creativity on this process.

Another important aspect of this research is the careful consideration of assessment methods. Since the varied approaches used in previous studies have led to divergent findings due to their reliance on different linguistic measures or non-linguistic abilities, to avoid this issue and obtain a comprehensive understanding of metaphor comprehension, we adopt both a nonverbal gesture-based act-out task and a verbal semi-structured interview. This approach allows us to capture a broader range of responses and minimise potential biases that can arise from children's limited linguistic abilities.

Significantly, our study sets itself apart by being the first to investigate the role of creativity in metaphor processing in preschool children. By examining the relationship between creative thinking, as measured by fluency and originality, and metaphor comprehension, we aim to investigate potential connections that could shape language development during early childhood.

Overall, this study seeks to contribute valuable insights into the process of metaphor comprehension in Turkish preschool children, offering a comprehensive exploration of the factors at play, the developmental trajectory involved, and the interplay between creative thinking and language development.
This chapter describes the research methodology of the study, including participants, measures of metaphor comprehension and creativity, procedure, and data coding of the measures. The study is part of a TUBİTAK project, and it was approved by the Middle East Technical University Human Research Ethics Committee numbered 28620816. The parents of the children signed the consent form before participating in the study.

3.1. Participants

Participants were 35 Turkish-speaking, typically developing monolingual kindergarten children (9 female, 26 male) with a mean age of 4.7 (Mage = 56.9 months, range = 44 – 67 months). All participants were recruited from METU Kindergarten in Ankara, and they have been attending preschool for at least a year. One child with ASD and one child with ADHD were excluded from the study. Three children also dropped out due to changing schools and not wanting to complete the tasks.

3.2. Measurements

3.2.1. Metaphor Comprehension Tasks

It is important to note that the current study implemented both verbal and non-verbal tests to gain a more comprehensive understanding of children’s metaphor processing. A gesture-based act-out test as one of the two ways of assessment methods of metaphor comprehension developed by Hülägü and Özge (2017) was utilised. To better grasp the children’s implicit understanding of metaphoric language, the non-
verbal test was utilised, whereas the verbal test provided information about children’s explicit understanding. By using a multi-method approach, a more nuanced and complete assessment of children’s metaphor comprehension is aimed to be gained. Additionally, by using a combination of verbal and non-verbal tests, more accurate and inclusive results, as well as the benefit of avoiding single test modality, were aimed (Paola et al., 2020). The possibility of varying strengths and preferences of children towards verbal or non-verbal tests is also taken into consideration. Additionally, considering that in real life, metaphor comprehension involves both verbal and non-verbal communication, applying two tests provides a more ecologically valid assessment.

3.2.1.1. Materials for Metaphor Comprehension Tasks

The items used in both non-verbal and verbal metaphor comprehension tasks consisted of twelve metaphors constructed with motion verbs and seven literal expressions, which included the motion verbs used in the metaphorical expressions. Metaphorical items were grouped by their metaphorical domain and conventionality. The domains were formed by their motion in space. The body domain indicated BODY IS A CONTAINER conceptual domain while the emotion domain indicated EMOTION IS A LOCATION that indicates the direction of a motion in space. Half of the metaphorical expressions are categorised under the body domain, and the remaining half under the emotion domain.

To determine the conventionality of the items, prior to this study, as part of a larger project this thesis was part of, a survey was conducted since the literature lacked a systematic database pertaining to motion metaphors in Turkish. The survey was conducted through an online survey software Qualtrics XM and was given to 79 parents. Participants were asked to provide their ratings for each item on a scale of 1 to 7 based on their familiarity. First, the average familiarity score for each item was calculated. If an item's score was lower than 4.0, it was categorised as unfamiliar. On the other hand, items with a score of 5.0 or higher were categorised as familiar. The novel items were produced by five researchers that are familiar with the project and judged by ten native adult Turkish speakers (domain and conventionality). The parameters of the items are provided in Table 1).
<table>
<thead>
<tr>
<th>Metaphorical items</th>
<th>Emotion Metaphors</th>
<th>Body Metaphors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Seviçten uçmak (F=5.63)</td>
<td>(Flying on air from joy)</td>
<td>1. Çenesi düşmek (F=5.30)</td>
</tr>
<tr>
<td>2. Keyfi kaçmak (F=5.38)</td>
<td>(Running away of someone’s mood)</td>
<td>2. Gözden kaçmak (F=5.18)</td>
</tr>
<tr>
<td>3. Telaşa düşmek (UF=4.00)</td>
<td>(Falling into panic)</td>
<td>3. Dili dolaşmak (UF=3.15)</td>
</tr>
<tr>
<td>4. Ümitsizliğe düşmek (UF=3.94)</td>
<td>(Falling into despair)</td>
<td>4. Diline düşmek (UF=2.78)</td>
</tr>
<tr>
<td>5. Mutluluğa varmak (N)</td>
<td>(Arriving at happiness)</td>
<td>5. Midesi taşmak (N)</td>
</tr>
<tr>
<td>6. Üzüntüye dalmak (N)</td>
<td>(Diving into sadness)</td>
<td>6. Kalbinden düşmek (N)</td>
</tr>
<tr>
<td>Literal items</td>
<td>1. Kuşun uçması (Bird is flying)</td>
<td>1. Çukura düşmek (Falling into a hole)</td>
</tr>
<tr>
<td>2. Okula varmak (Arriving at school)</td>
<td>2. Köpekten kaçmak (Escaping from a dog)</td>
<td></td>
</tr>
<tr>
<td>3. Denize dalmak (Diving into the sea)</td>
<td>3. Müze dolaşmak (Walking around the museum)</td>
<td></td>
</tr>
<tr>
<td>4. Suyun taşması (Water overflow)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** This table shows the metaphorical domains and conventionality of the metaphorical items and literal items. English translations are provided under each item. The conventionality levels of the items with their mean scores obtained from the survey are given in parentheses. According to the survey results, 7 is the most familiar, while 0 is not familiar. F stands for familiar, UF for unfamiliar, and N for novel.
3.2.1.2. Non-verbal Metaphor Comprehension Task

3.2.1.2.1. Procedure

The assessment was conducted in a small and quiet room in METU Kindergarten. The same female researcher conducted the task. Participants were first introduced to a hand puppet controlled by the researcher and informed that the puppet could not hear them but could see them. They have been informed that they will be playing a game with the puppet in which they will act out the expressions to the puppet without speaking. Before the task, a warm-up task was conducted. The children were asked to act out three neutral expressions which are to sleep, to eat, and to play a game with the puppet. After they acted the neutral expressions out, they were congratulated, and the experimental condition was started.

The researcher read the items from a randomised list, and the children were expected to act out them with gestures silently. The list was created by making sure that the same motion verb does not follow each other. The children were praised and encouraged after completing each expression regardless of their accuracy. The responses were recorded on camera and coded later, but the children were unaware that they were being recorded.

3.2.1.2.2. Data Coding Procedure

In order to accurately analyse the nonverbal metaphor comprehension of children, their gestures were coded in three levels. First, a detailed description of metaphorical gesture response was recorded, followed by a coarse gesture coding that categorised responses as metaphorical, literal, or no response. Literal gesture coding was used as a reference when deciding on the counter-metaphorical gesture. If a child gestured to both literal and metaphorical expressions in the same manner, it was coded as literal. For example, if a child acted out sevinçten uçmak (to fly on air from joy) and kuşun uçması (a bird is flying) with the same gesture of flapping their arms like wings, it was coded as literal. Conversely, if a child's response emphasised the metaphorical meaning of a statement, it was coded as metaphorical. For example, if a child flapped their arms for kuşun uçması and smiled and jumped around for sevinçten uçmak, it was coded as metaphorical. Finally, no response was recorded as an umbrella.
category for all unrelated, unknown, or silent responses. For example, if a child started to run around when asked to gesture çenesi düşmek (Dropping one’s jaw) or stated that they did not know the meaning of the expression, it was coded as no response.

3.2.1.3. Verbal Metaphor Comprehension Task

3.2.1.3.1. Procedure

After the non-verbal metaphor comprehension task, children were asked to explain the meaning of the same items by speaking. In this task, the items are presented in sentences; for instance, Edi mutluğa vardı (Edi arrived at happiness) and then asked a set of questions. They were first asked to explain the meaning of each expression and then how each expression might occur. For instance, what does arriving at happiness mean? How does arriving at happiness occur? Elaboration of their answers was encouraged. Similar to the non-verbal assessment, their answers were recorded.

3.2.1.3.2. Data coding Procedure

The same three levelled coding procedure was applied for the verbal task. Below are some examples of children’s answers that were categorised as metaphorical.

(1) Nezihe, 53 months.
R: Mesela diyorum ki Edi mutluğa vardı.   R: Let's say Edi arrived at happiness.
Birinin mutluğu varması nasıl olur, anlatabilir misin bana?   Can you explain to me how someone arrives at happiness?
P: Gülümşiyorsun. Gerçekte bir yere gitmiyorsun.   P: You smile. You are not actually going somewhere

(2) Burak, 60 months.
R: Mesela desem ki, Edi Telaşa düştü.   R: Let's say Edi fell into panic. Can you explain to me how someone falls into panic?
Birinin telaşa düşmesi nasıl olur?   P: If you are late for something, you run fast like this.
P: Bir şeye geç kalırsan böyle hızlı hızlı koşarsın.
Below are examples of children’s answers that were categorised as literal.

(3) Ali, 48 months.
P: Mesela Edinin çenesi düştü dersem, birinin çenesinin düşmesi nasıl olur anlatabilir misin? R: His jaw might be injured, might be cut. But his jaw is not really dropping.

(4) Sena, 59 months.
P: Let's say Edi fell into panic. Can you explain to me how someone falls into a panic?

Below are examples of children’s answers categorised as no response.

(5) Berk, 51 months.
P: It actually means everyone has no tongue.

(6) Yusuf, 55 months.
P: It means to explode.

3.2.2. Torrance Test of Creative Thinking Figural Form A

In the present study, Torrance Tests of Creative Thinking-Figural A (TTCT from now on) was used to measure the fluency and originality domains of creativity of children. Torrance Tests of Creative Thinking is a scale that can be used from
kindergarten to adulthood (Aslan, 2001). It was first developed by Torrance (1966), improved in 1974 (Torrance), and revised in the later years 1984 (Torrance & Ball), 1998 (Torrance). The TTCT is the most often used and most well-constructed test to assess divergent thinking and creativity (Davis, 2003; Zhu et al., 2013). Longitudinal studies showed that it had predictive validity for real-life creative achievement (Howieson, 1981).

The TTCT consists of two versions: the TTCT-Verbal and the TTCT-Figural. Both versions involve two forms, A and B, to be utilised as pre and post-tests. Kim (2017) conducted a study on the relationship and reliability of the two versions of TTCT. Nine hundred ninety-four participants, from preschool children to adults, participated in the study. The results showed that both versions were significantly related. TTCT-Figural, however, was found to be a more comprehensible, reliable and valid measure of creative thinking compared to the Verbal form. A meta-analysis study on creativity tests by Kim (2008) also revealed that TTCT-Figural is the most accurate predictor of creative achievement among the creative thinking tests, including divergent thinking tests, examined in the present study. The Turkish validity and reliability study of the Torrance Test of Creativity was conducted by Aslan in 2001. Additionally, compared to the TTCT-Verbal, which takes seventy minutes to complete, TTCT-Figural takes thirty minutes and is easier for children to complete since TTCT-Verbal requires the answers of the children to be written down by adults, therefore the finishing time increases. TTCT-Figural, on the other hand, can be completed by the children since it is based on drawing.

3.2.2.1. Material and Procedure

TTCT-Figural A consists of three activities: picture construction, picture completion, and repeated figures of lines. Each activity takes ten minutes to complete. The participants are provided with pencils. Torrance (1998) stated that the test can be administered in groups. In the present study, it was administered in groups of five in a big classroom. The participants were seated in a way that prevented them from seeing each other. They were informed about the test. In the first activity, the participants were presented with a black egg-like shape and asked to create a picture using the shape. The only rule was that the stimulus shape must be an integral part of
their drawing. In the end, they were required to name their drawings, and the researcher wrote down their titles. In the second activity, the participants were asked to complete ten incomplete figures to form an object or a picture. The researcher also assisted the children with writing down the titles of their drawings. The third activity included three pages of parallel lines that the participants were asked to incorporate into their pictures.

### 3.2.2.2. Data Coding

Scoring of fluency and originality scores were administrated by following the official scoring guidelines (Torrance & Ball, 1984). The second and third activities are scored for fluency. The fluency score is the number of relevant and interpretable answers. The drawings are considered relevant and interpretable when they include incomplete figures (activity 2) and parallel lines (activity 3). Children received 1 for every fluent answer they gave. They received extra points if they merged incomplete figures or parallel lines. The fluency scores were obtained from the sum of the number of meaningful answers each child provided for each task. Originality lists were prepared and provided for each activity based on normative data by Torrance and Ball (1984). All three activities were scored for originality. To score the originality, statistically most frequently generated responses, as determined by Torrance and Ball (1984), were given 0, and all other responses were given 1. The sum of the scores gave the originality score. Each participant’s fluency and originality scores were computed into standard scores. Below are some examples of children in the three activities. Below is an example of an answer for activity 1, titled *The dinosaur carries its egg on its back* which received 1 for originality.

![Figure 1](image).

**Figure 1.** Example for activity 1, titled *The dinosaur carries its egg on its back.*
Below are two examples for activity 2. The first drawing is titled *Glasses*, and it received 1 for fluency but 0 for originality since glasses are a frequent answer for this figure. The second drawing is untitled. It was uninterpretable and, therefore, not scored for fluency and originality.

![Figure 2. Example for activity 2, titled Glasses.](image)

Below are examples for activity 3. The first drawing is titled *Laundry on the Clothesline*, and it received 1 for fluency and 1 for originality. The second drawing, titled *Stick*, received 1 for fluency but 0 for originality. The third drawing is titled *Cow*, and it received 0 for fluency and, therefore, was not scored for originality because the drawing and the title are unrelated. Considering the development of psychomotor abilities of children, the participant was questioned about their drawing, but they were unable to explain it.

![Figure 3. Example for activity 2, untitled.](image)
Figure 4. Example for activity 3, titled Laundry on the Clothesline

Figure 5. Example for activity 3, titled Stick.

Figure 6. Example for activity 3, titled Cow.
CHAPTER 4

RESULTS

Children’s metaphor comprehension abilities were evaluated using two separate analyses: nonverbal assessment through a gesture-based act-out task and verbal assessment through a semistructured interview. We used a combination of R (R Core Team, 2022) and Jamovi (The Jamovi Project, 2022) to take advantage of R’s ability to handle complex models, specialised packages and analytical flexibility while also benefitting from Jamovi’s efficiency in graphing and ability to provide understandable, clear graphs.

4.1 Results of the Non-verbal Metaphor Comprehension Assessment

The focus was to investigate if children's understanding of metaphors conveyed through gesture-based act-out tasks varied depending on the metaphorical domain and conventionality, which were categorical variables. Furthermore, we aimed to determine if age and scores in fluency and originality, which were continuous variables, could predict how children responded to the metaphors. Our dependent variable, the non-verbal assessment task, included three categories: Metaphorical, Literal and No Response; therefore, we used mixed-effects multinomial logistic regression in R. To do this, we fitted multinomial baseline logit models using the mblogit function from the mclogit package in R (Elff, 2022; R Core Team, 2022). Our baseline comparison for the analysis was the literal response to metaphorical statements.

Our strategy involved fitting a full model with fixed effects and interactions that were theoretically related and then gradually removing components until we arrived at the final fit for the model (as described in Bates et al., 2015). The full model included fixed main effects for age, the metaphorical domain (Emotion, Body),
conventionality (Familiar, Unfamiliar, Novel), and fluency and originality scores. Additionally, a three-way interaction between metaphorical domain, conventionality, and age was included. Subject and Item were added as random effects. We used Bayesian Information Criteria (BIC) and Aikake Information Criteria (AIC) to assess the goodness of fit and arrive at the full model.

First, we removed the conventionality interaction because the full model did not converge. Instead, we focused on the Age x Domain interaction. However, we also removed their interaction because the BIC differences were too high (ΔAIC = 2.4889, ΔBIC = 10.5694). The model included the main effects of age, metaphorical domain, conventionality, and fluency and originality scores with random effects of subject and item. To decide whether to exclude random effects from a multinomial logistic regression analysis, likelihood ratio tests are considered more accurate and robust than AIC or BIC (Agresti, 2013; Burnham & Anderson, 2004; Hosmer et al., 2013). Therefore to see whether the model that included the random effects of subject and item provided a significantly better fit to the data than the model without these random effects, a likelihood ratio test was conducted alongside AIC and BIC. The likelihood test was conducted through an ANOVA in R to compare the two models. Model 1 included fixed effects for age, the metaphorical domain, conventionality, fluency, and originality. Model 2 included the same fixed effects as Model 1 and random effects for the Subject and Item. The results showed that Model 2 had a significantly better fit to the data than Model 1 ($\chi^2(6) = 87.032, p < 0.001$). Additionally, AIC and BIC differences increased when the random effects were removed (ΔAIC = 742.5951, ΔBIC = 50.7903). This suggests that keeping the random effects for subject and item improved the model’s ability to predict nonverbal responses.

Considering the AIC and BIC, and likelihood ratio tests’ results, we present the mixed effects logistic regression results as our final analysis. The final model (See Table 2) included the main effects of the following independent variables: age, metaphorical domain (Emotion and Body), conventionality (Familiar, Unfamiliar and Novel), and fluency and originality scores. Subject and Item were put as random effects to control within-participant and item variability. Our independent variable
was non-verbal metaphor comprehension assessment scores (Metaphorical, Literal and No Response). The R code for fitting the model, computing model fit statistics, and obtaining odds ratios and confidence intervals are provided in Appendix C.

Table 2. Results of mixed effects multinomial logistic regression analysis for the nonverbal assessment of metaphor comprehension

<table>
<thead>
<tr>
<th></th>
<th>Metaphorical vs. Literal</th>
<th>Literal vs. No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β (SE)</td>
<td>Exp β (95% CI)</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>-9.33 (2.10)</td>
<td>0.00 (0.00-0.00)</td>
</tr>
<tr>
<td>Age</td>
<td>0.11 (0.03)</td>
<td>1.11 (1.03-1.19)</td>
</tr>
<tr>
<td>Metaphorical Domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion-Body</td>
<td>3.81 (0.53)</td>
<td>45.02 (6.98-119.82)</td>
</tr>
<tr>
<td>Con conventionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Familiar- Novel</td>
<td>2.72 (0.60)</td>
<td>15.13 (4.62-49.57)</td>
</tr>
<tr>
<td>Familiar-Unfamiliar</td>
<td>-0.15 (0.59)</td>
<td>0.86 (0.27-2.75)</td>
</tr>
<tr>
<td>Fluency</td>
<td>0.21 (0.29)</td>
<td>1.24 (0.66-2.17)</td>
</tr>
<tr>
<td>Originality</td>
<td>-0.26 (0.28)</td>
<td>0.77 (0.45-1.34)</td>
</tr>
</tbody>
</table>

Note. This table shows literal comprehension versus metaphorical comprehension (left) and literal comprehension versus no response / unrelated / do not know responses (right) of metaphorical statements. Body metaphors are the reference group for the metaphorical domain, and familiar metaphors are the reference group for conventionality. McFadden’s R2 = 627.56, Cox and Snell’s R2 = 0.32, and Nagelkerke’s R2 = 0.50

The mixed effects multinomial logistic regression analysis comparing metaphorical comprehension with literal comprehension revealed significant associations for three predictors. Additionally, the intercept, which indicates the log odds of the
metaphorical responses over the literal responses when all other predictors are held constant, was highly significant (p < 0.001), indicating that participants were more likely to give literal responses than metaphorical responses on average. Age emerged as a significant predictor, indicating that older participants were more likely to comprehend metaphorical statements than literal ones. There was a significant difference in nonverbal responses for the different domain types of metaphors. Children gave more metaphorical over-literal responses in the emotion domain compared to the body domain (p < 0.001). Additionally, conventionality with novel metaphors compared to familiar metaphors also showed a significant effect on metaphorical comprehension (p < 0.001). Children were more likely to give metaphorical responses to novel metaphors than familiar metaphors. Furthermore, fluency and originality scores did not predict the response direction of children (p = 0.4 and p = 0.3, respectively).

In the analysis comparing no response with literal comprehension, the intercept was found to be highly significant (p = 0.002). Age also emerged as a significant predictor, indicating older participants were more likely to give no response to metaphorical expressions. The metaphorical domain of emotion, in comparison to the body domain, displayed a significant effect on children's responses (p < 0.001). Children were more likely to give no response to metaphorical expression in the emotion domain compared to the body domain. Moreover, participants' fluency scores demonstrated to suggestive trend towards significance for predicting the response direction of the children (p = 0.07); as the fluency scores increased, children tended to give more no responses compared to literal responses. Participants’ originality scores also showed a trend towards significance (p = 0.08). Although it was not found to be significant, children with higher originality scores were more likely to give literal responses to metaphoric expressions compared to no responses. Despite not reaching conventional levels of significance, considering the study's small sample of participants and low statistical power, these findings may warrant further investigation.

Estimated marginal means for age, item domain, conventionality, fluency and originality were compared in Jamovi (The Jamovi Project, 2022). As seen in Figure
7, the probability of giving a literal response generally decreased as age increased. In contrast, the probability of giving metaphorical and no-response answers tended to increase. Specifically, for younger participants, the estimated marginal mean probability of giving a literal response was higher (EMM = 0.47, SE = 0.03, 95% CI [0.53, 0.41]) compared to older participants (EMM = 0.28, SE = 0.027, 95% CI [0.34, 0.22]). It was found that the older participants’ estimated probability of giving a metaphorical response was higher (EMM = 0.35, SE = 0.03, 95% CI [0.41, 0.29]) compared to younger participants (EMM = 0.27, SE = 0.026, 95% CI [0.32, 0.22]). Similar to metaphorical responses, the probability of giving no response to metaphorical expressions was higher for the older participants (EMM = 0.37, SE = 0.03, 95% CI [0.44, 0.30]) compared to the younger group (EMM = 0.26, SE = 0.03, 95% CI [0.33, 0.20]).

![Figure 7. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by age](image)

The metaphorical domain of the metaphorical statements was also found to be a significant predictor, as seen in Figure 2. The children’s probability of giving metaphorical responses to emotion metaphors (EMM = 0.50, SE = 0.03, 95 CI [0.57, 0.43]) was higher compared to body metaphors (EMM = 0.12, SE = 0.02, 95 CI [0.17, 0.08]).
Figure 8. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by item domain

Figure 9 shows familiar metaphors were more likely to be interpreted as literal responses (EMM = 0.49, SE = 0.36, %95 CI [0.57, 0.41]). In contrast, novel metaphors were more likely to be understood as metaphorical (EMM = 0.53, SE = 0.04, %95 CI [0.61, 0.46]). Moreover, novel metaphors were least likely to be interpreted literally. (EMM = 0.21, SE = 0.03, %95 CI [0.28, 0.14]), and unfamiliar metaphors showed the highest likelihood of receiving no-response answers (EMM = 0.49, SE = 0.04, %95 CI [0.49, 0.31]).

Figure 9. Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by conventionality.
The results, as seen in Figure 10, show a trend that did not reach significance but is worthy of mentioning was found. As fluency increased, the probability of giving a literal response decreased, while the probability of giving no-response answers tended to increase. For the participants with lower fluency scores, the probability of giving a literal response was higher (EMM = 0.44, SE = 0.03, 95% CI [0.51, 0.36]) compared to those with higher fluency scores (EMM= 0.31 (SE = 0.03, 95% CI [0.38, 0.23]).

![Graph showing non-verbal test results](image)

**Figure 10.** Estimated Marginal Means of the nonverbal assessment of metaphor comprehension by fluency.

Figure 11 shows a trend that did not reach significance but is worth mentioning. As originality increased, the likelihood of giving a literal response to metaphorical expressions tended to increase. Additionally, the likelihood of giving no-response answers tended to decrease. The children with lower originality scores had a lower probability of giving literal responses (EMM = 0.30, SE = 0.03, 95% CI [0.38, 0.23]) compared to those with higher originality scores (EMM = 0.44 (SE = 0.03, 95% CI [0.51, 0.36]). Contrarily the children with lower originality scores had a higher probability of giving no-responses (EMM = 0.39, SE = 0.04, 95% CI [0.48, 0.31]) compared to those with higher originality scores (EMM= 0.25 (SE = 0.03, 95% CI [0.32, 0.317]).
4.2. Results of the Verbal Metaphor Comprehension Assessment

Children’s metaphor comprehension skills were also investigated using a verbal assessment task. We assessed whether children's understanding of metaphors conveyed through verbal responses to interview tasks varied depending on the metaphorical domain and conventionality. We also considered age, fluency, and originality scores as potential predictors for their responses. We utilised mixed-effects multinomial logistic regression in R to analyse which factors predicted children's ability to comprehend metaphors through verbal assessment. We followed the same approach as the previous analysis for gestures, utilising AIC and BIC scores and then a likelihood ratio test to decide on adding random effects.

The full model consisted of the full interaction of age, metaphorical domain, and conventionality. First, we removed the conventional interaction due to the high difference between AIC and BIC scores ($\Delta$AIC = 9.1218, $\Delta$BIC = 57.6049). After that, we focused on the Age x Domain interaction instead. However, we also removed their interaction ($\Delta$AIC = 1.6067, $\Delta$BIC = 9.6872) due to the difference in BIC. Finally, similar to the nonverbal assessment, to decide whether to keep the random effects of subject and item, a likelihood ratio test was conducted alongside AIC and BIC. The results showed that the model that involved the random effects was a significantly better fit to the data than the model without the random effects.
Additionally, AIC and BIC differences increased when the random effects were removed ($\Delta$AIC = 62.4388, $\Delta$BIC = 38.1973). This was in line with the likelihood ratio test that indicated the random effects for the subject, and the item improved the model’s ability to predict verbal responses. The final model included the main effects of age, metaphorical domain, conventionality, and fluency and originality scores (for the full iteration, see Appendix C).

Table 3. Results of mixed effects multinomial logistic regression analysis for the verbal assessment of metaphor comprehension

<table>
<thead>
<tr>
<th>Metaphorical vs. Literal</th>
<th>Literal vs. No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>β (SE)</strong></td>
<td><strong>Exp β (95% CI)</strong></td>
</tr>
<tr>
<td>(Intercept)</td>
<td>-8.06 (2.09)</td>
</tr>
<tr>
<td>Age</td>
<td>0.12 (0.04)</td>
</tr>
<tr>
<td>Metaphorical Domain</td>
<td></td>
</tr>
<tr>
<td>Emotion-Body</td>
<td>2.68</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
</tr>
<tr>
<td>Conventionality</td>
<td></td>
</tr>
<tr>
<td>Familiar- Novel</td>
<td>1.32 (0.36)</td>
</tr>
<tr>
<td>Familiar- Unfamiliar</td>
<td>-0.65 (0.36)</td>
</tr>
<tr>
<td>Fluency</td>
<td>0.37 (0.29)</td>
</tr>
<tr>
<td>Originality</td>
<td>-0.47 (0.29)</td>
</tr>
</tbody>
</table>

Note. This table shows literal comprehension versus metaphorical comprehension (left) and literal comprehension versus no response / unrelated / do not know responses (right) of metaphorical statements. Body metaphors are the reference group for the metaphorical domain, and familiar metaphors are the reference group for conventionality. McFadden’s $R^2 = 0.70723$, Cox and Snell’s $R^2 = 0.23$, and Nagelkerke’s $R^2 = 0.40$. 

(χ²(6) = 74.439, p < 0.001).
Table 3 shows that the mixed-effects multinomial logistic regression analysis results revealed significant associations for specific predictors for the metaphorical versus literal comparison. The intercept of metaphorical and literal responses differed significantly ($p < 0.001$). Age emerged as a significant predictor, with older children more likely to provide metaphorical responses than literal ones ($p = 0.001$). Moreover, the item type Emotion significantly predicted participants' responses to metaphorical versus literal statements, with participants being more likely to comprehend metaphorical statements when the item type was Emotion than Body ($p < 0.001$). Similar to the nonverbal assessment, conventionality with novel metaphors compared to familiar ones demonstrated a significant effect, with participants being more likely to comprehend metaphorical statements when the metaphors were novel instead of familiar ($p < 0.001$). Although the comprehension of the unfamiliar metaphors did not significantly differ from familiar metaphors, a marginal trend was observed ($p = 0.071$). Fluency and originality did not significantly predict metaphorical comprehension ($p = 0.207$ and $p = 0.100$, respectively).

We used mixed effects multinomial logistic regression analysis to compare the participants' responses between no response and literal. The intercept did not exhibit a statistically significant difference ($p = 0.145$). Age also did not significantly predict participants' responses in this comparison ($p = 0.345$). However, the item type Emotion significantly predicted participants' responses to no response versus literal statements, with participants more likely to provide no responses for Emotion metaphors compared to Body metaphors ($p < 0.001$). Additionally, novel metaphors compared to familiar ones demonstrated a significant effect, with participants being more likely to provide no responses for novel metaphors than familiar metaphors ($p = 0.003$). Unfamiliar metaphors also showed a statistically significant difference compared to familiar metaphors ($p = 0.013$). Fluency and originality did not predict participants' responses ($p = 0.185$ and $p = 0.376$, respectively).

Marginal means were compared in Jamovi (Jamovi, 2022) for age, metaphorical domain and conventionality, which were found to be significant predictors in the verbal assessment test. As can be seen in Figure 12, as age increased, the probability of giving a metaphorical response also increased, while the probability of giving
literal answers tended to decrease. Specifically, for the older children, the estimated marginal mean probability of giving a metaphorical response was higher (EMM = 0.46, SE = 0.03, 95% CI [0.53, 0.40]) compared to younger children (EMM = 0.28, SE = 0.03, 95% CI [0.35, 0.22]).

Figure 12. Estimated Marginal Means of the verbal assessment of metaphor comprehension by age

The metaphorical domain of the metaphorical statements was also found to be a significant predictor, as seen in Figure 12. The probability of giving metaphorical responses to emotion metaphors (EMM = 0.54, SE = 0.03, %95 CI [0.62, 0.47]) was higher compared to body metaphors (EMM = 0.20, SE = 0.03, %95 CI [0.25, 0.14]).

Figure 13. Estimated Marginal Means of the verbal assessment of metaphor comprehension by metaphorical domain

42
As seen in Figure 14, familiar metaphors were equally likely to receive literal (EMM = 0.38, SE = 0.04, %95 CI [0.46, 0.30]) and metaphorical responses (EMM = 0.38, SE = 0.04, %95 CI [0.46, 0.30]). In contrast, unfamiliar metaphors were more prone to receiving no-response answers (EMM = 0.44, SE = 0.04, %95 CI [0.53, 0.35]). Moreover, novel metaphors showed the highest likelihood of being predicted metaphorically (EMM = 0.51, SE = 0.04, %95 CI [0.42, 0.60]).

**Figure 14.** Estimated Marginal Means of the verbal assessment of metaphor comprehension by conventionality.
CHAPTER 5

DISCUSSION

5.1. Overview

The study aimed to examine whether Turkish-speaking preschool children as young as four years old, can process predicate metaphors directly or indirectly and whether certain factors like conventionality, domain, and creativity impacted their ability to comprehend metaphors. The study measured the children's metaphor comprehension through non-verbal and verbal tasks and a creativity test that measured their fluency and originality scores.

The study found that age is a significant predictor in metaphor comprehension, with older children better at metaphor processing than younger children. The study's findings revealed significant influences of conventionality on metaphor comprehension in both non-verbal and verbal tasks. In the non-verbal task, familiar metaphors were more likely to be taken literally, while novel metaphors were predominantly understood as metaphorical expressions. However, familiar metaphors were equally likely to provide literal and metaphorical responses in the verbal task. Similarly to the non-verbal task, novel metaphors were predominantly interpreted as metaphorical. On the other hand, unfamiliar metaphors mostly received no response in both tasks. Domain-specific differences in the processing of metaphors by the children also revealed interesting results, suggesting certain metaphors may be easier for children to comprehend if they are presented in specific domains. Results showed that children tend to interpret emotion metaphors more metaphorically than body metaphors. The study could not find creativity, as measured by fluency and originality, to significantly predict children's ability to comprehend metaphors. However, a trend that did not reach significance but is worthy of mentioning was found. It is observed that in the non-verbal task, the probability of giving a literal
response decreased as fluency increased. In contrast, the probability of giving no-response answers tended to increase. In contrast, although not reaching significance, it was found that as originality increased, the likelihood of giving a literal response to metaphorical expressions tended to increase, and the likelihood of giving no-response answers tended to decrease. Fluency and originality did not significantly influence participants' responses in the verbal assessment.

The study's results provide valuable insights into children’s cognitive development and ability to process metaphors. It also highlights the importance of domain and conventionality in children's language comprehension skills. The study's findings have implications for educators and parents who can use this information to develop appropriate teaching methods and strategies to help children improve their language comprehension skills.

5.2. The Role of Age in Metaphor Processing

The results of the non-verbal task showed that as children's age increased, there was a decrease in the probability of providing literal responses and an increase in the probability of providing metaphorical and no-response answers. Similarly, in the verbal task, the results show that as children's age increased, the probability of giving metaphorical responses increased while the probability of providing literal answers tended to increase. Younger participants tended to rely more on the literal meaning of expressions, while older participants showed a higher tendency to interpret metaphorical expressions appropriately. This finding aligns with previous research that suggested that metaphor comprehension develops gradually throughout childhood (Weiland et al., 2014; Pouscoulous & Tomasello, 2020).

The trend of increasing metaphorical responses and no-response answers in older participants in the non-verbal task might indicate their growing ability to recognise and engage with the intended figurative meaning of expressions. This shift may reflect their enhanced cognitive flexibility and capacity to establish novel connections between concepts, which is crucial in metaphor processing (Bambini et al., 2014). The study's results underscore the importance of age-related cognitive
development in metaphor comprehension, suggesting that older children possess better metaphorical thinking skills than younger children.

Interestingly, the increase in older children's no-response answers similar to metaphorical responses may be attributed to their improved cognitive and language skills, which allows them to recognise metaphorical expressions more effectively. As children grow older, their language comprehension and pragmatic abilities develop, enabling them to grasp the context and intended meaning of metaphorical expressions (Pouscoulous & Tomasello, 2020). Older children understand metaphorical expressions and their possible meanings better than younger children. As a result, they might be more cautious about an incorrect or literal response when uncertain about the intended figurative meaning. Instead, they may opt for a no-response rather than a wrong answer, as they recognise the complexity of the expression. This behaviour might reflect their growing awareness of the ambiguity and richness of language and their ability to consider alternative possibilities. Children's cognitive flexibility and ability to map concepts develop so they better understand the meanings metaphors can convey (Holyoak & Stamenković, 2018). Their increased awareness of the multiple possible interpretations may make them hesitate before choosing a specific response, resulting in a higher likelihood of noresponse answers.

In summary, the increase in no-response answers in older children, similar to metaphorical responses, can reflect their maturing language comprehension and cognitive abilities. As their understanding of metaphorical language becomes more nuanced, they may choose to give no response when faced with expressions that they find challenging to interpret. This cautious approach might indicate their developing metalinguistic awareness and the recognition of the complexity of metaphorical language.

The results from the non-verbal and verbal tasks align with the Conceptual Metaphor Theory, highlighting that children's metaphor comprehension improves as they develop and broaden their conceptual domains (Kövecses, 2010; Holyoak & Stamenković, 2018). Therefore, the increasing probability of giving metaphorical
responses with age can be attributed to older children's enhanced conceptual mapping abilities.

5.3. The Role of Domain Differences in Metaphor Processing

Indirect access involves initially accessing and processing the literal meaning of an expression before deriving its intended metaphorical meaning (Grice, 1975; Searle, 1979). The present study found that children were more likely to adopt an indirect processing strategy for body metaphors. When presented with body-related expressions, such as diline düşmek (falling on someone’s tongue), the children tended to gesture and give verbal explanations as if they were falling to the ground on their tongue. This indicates a focus on the literal physical event rather than the metaphorical meaning. This suggests that children presented with body metaphors first accessed the literal meaning of the expression (i.e., the physical action of the falling) before attempting to understand its metaphorical significance.

Direct access, on the other hand, refers to the ability to directly understand the metaphorical meaning of an expression (Gibbs, 1994; Glucksberg, 2008). This study showed this was evident in how children processed emotion metaphors. When presented with emotion metaphors, the children showed a higher likelihood of providing metaphorical responses in both the non-verbal gesture-based and verbal explanation tasks. For example, when presented with the metaphor mutluluğa varmak (to arrive at happiness), the children made a happy face, directly communicating the metaphorical meaning of the expression. This suggests that they could access and understand the metaphorical meaning of the expression without the need for initial literal processing.

The domain of the metaphor (emotion vs body) played an important role in determining the processing strategy. Emotion metaphors, associated with more abstract concepts, were more likely to be directly understood, while body metaphors, which involve more concrete objects, were more likely to be processed indirectly. Previous findings in the literature also claim that people use the level of abstraction as a cue to metaphoricity (Torreano et al., 2005). These results also aligned with the
conceptual metaphor theory, which suggests that abstract concepts, like emotions, are often understood through concrete experiences, making them more amenable to direct processing (Lakoff & Johnson, 1980). In contrast, concrete objects, like body parts, may be initially processed literally before connecting them to their metaphorical meaning.

It is important to note that finding different processing strategies for different domains is a novel finding in the literature and sheds light on the domain-based differences in metaphor comprehension. This aligns with the previous studies that compare the processing of abstract and concrete domains of metaphorical expression (Erdoğdu, 2023). It highlights that the nature of the metaphorical domain plays a crucial role in determining the accessing strategies of children in metaphor processing.

5.4. The Role of Conventionality in Metaphor Processing

In both tasks, familiar metaphors were more likely to be interpreted as literal responses, while novel metaphors were more likely to be understood as metaphorical. This finding is different from the previous literature. It was found that children interpreted novel metaphors in the emotion domain more metaphorically, while they tended to interpret novel body metaphors more literally. This contradicts the initial expectation that novel metaphors would be more cognitively demanding since they require creating new mappings between topic and vehicle (Gentner & Bowdle, 2001; Sana et al., 2021). The conflicting result might be attributed to the emotional terms used in the novel emotion metaphors. Abstract topics like happiness and sadness were used for novel emotion metaphors, whereas other abstract topics like mood, despair, and joy which were less known by children were used for familiar and unfamiliar emotion metaphors. The unfamiliarity of these emotional terms might have made it challenging for children to arrive at the intended metaphorical meaning. Furthermore, Keil (1986) stated that children's metaphor comprehension abilities tend to emerge in a categorical manner within specific conceptual domains. In other words, if they comprehended one metaphor within a conceptual domain, they were likely to understand other metaphors within the same domain. For instance, if they
understood metaphors related to happiness and sadness, they might also generalise this understanding to novel emotion metaphors in our study. However, in contrast to novel emotion metaphors, novel body metaphors such as *midesi taşmak* (overflowing of someone’s stomach) were not a familiar domain in the study.

In line with the literature, unfamiliar metaphors showed a higher likelihood of receiving no-response answers in the verbal task (Erdoğdu, 2023). This indicates that when encountering metaphors that are not familiar to them, children may face difficulties in providing a meaningful response, possibly due to the lack of established associations for these expressions (Gentner & Bowdle, 2001).

5.5. The Role of Creativity in Metaphor Comprehension

The present study did not reveal significant findings regarding the influence of fluency and originality on metaphor comprehension; however, interesting trends were observed. In the nonverbal task, it was found that as fluency increased, the probability of giving a literal response decreased. In contrast, the probability of giving no-response answers tended to increase in the non-verbal task, which the interplay of cognitive processes might explain. Higher fluency enables individuals to explore multiple potential metaphorical meanings, which decreases the likelihood of providing literal responses in line with the literature (Kennet et al., 2018). The decrease in the probability of giving a literal response as fluency increases can be explained by the divergent thinking process, which refers to the ability to generate multiple solutions to a given problem (Guilford, 1950). When individuals have higher fluency, it means they can come up with a more significant number of ideas or interpretations for a metaphorical expression. This cognitive flexibility allows them to explore various potential meanings beyond the literal interpretation of the metaphor. Higher fluency might have enabled preschool children to go beyond the literal meaning of metaphors and explore multiple metaphorical interpretations. However, due to the cognitive limitations associated with their age, in line with the findings regarding the role of age in metaphor processing, they might find it challenging to comprehend the metaphorical meaning, leading to a higher tendency to give no-response answers.
Moreover, although not reaching statistical significance, there was a tendency for children with higher originality scores to give more literal responses to metaphorical expressions and be less likely to give no-response answers. However, these effects were not evident in the verbal assessment. This increase in literal interpretation might be attributed to two cognitive factors: perceived lower semantic distance between domains and children’s tendency toward magical thinking.

It was found that people with higher originality scores tend to perceive the semantic distance between different domains as smaller than it is (Rossman & Fink, 2010). In the context of metaphor comprehension, their perception of a smaller semantic distance might lead them to perceive more direct connections between the source and target domains of a metaphor. As a result, they might be more inclined to interpret metaphorical expressions literally since they see a closer relationship between the two domains. This was observed in some of the children’s answers. For example, a child explained *sevinçten uçmak* (to fly with joy) by flapping their arms like a bird and smiling and later explained it as they are so happy because they are flying to space. In this case, they directly associated the act of flying with the emotion of joy, which led to a literal interpretation of the expression.

Furthermore, as observed in the previous literature, children might understand the metaphorical expressions as magical or fictional (Johnson, 1982, as cited in Pouscoulous & Tomasello, 2020). Magical thinking requires believing in non-causal links or supernatural effects on events. This tendency towards magical thinking might influence their interpretations of metaphorical expressions in metaphor processing. For example, considering the metaphor *sevinçten uçmak* (to fly with joy) again, children with higher originality scores might have a tendency towards magical thinking that leads them to interpret the metaphors fantastically or imaginatively. This inclination for magical thinking also aligns with their tendency to see smaller semantic distances between different domains.

Though the outcomes did not reach statistical significance, the identified trends imply potential implications of creativity in children’s metaphor processing. In the next step, we are planning to increase the sample size to enhance the statistical power and test the validity of these findings.
5.6. Conclusion

The present study investigated the metaphor comprehension abilities of thirty-five Turkish-speaking preschool children and explored the impact of conventionality, domain, and creativity on their ability to process metaphors. The study revealed important insights into children's cognitive development and language comprehension skills. Age was a significant predictor of metaphor comprehension, with older children demonstrating better metaphor processing abilities than younger children. This aligns with previous research indicating that metaphor comprehension develops gradually throughout childhood. Older children showed an increased likelihood of providing metaphorical responses and a higher tendency for no-response answers, indicating enhanced cognitive flexibility and ability to establish novel connections between concepts. The role of domain differences in metaphor processing was also investigated. The study found that children tended to adopt an indirect processing strategy for body metaphors, accessing the literal meaning before deriving the metaphorical significance. In contrast, emotion metaphors were more likely to be directly understood, suggesting that abstract concepts may be more prone to direct processing. Conventionality also played a significant role in metaphor comprehension, with familiar metaphors more likely to be interpreted literally and novel metaphors more often understood as metaphorical. However, novel emotion metaphors were more likely to be interpreted metaphorically, while novel body metaphors were taken more literally. This suggests that the familiarity and complexity of the emotional terms used in the novel metaphors influenced the children's ability to arrive at the intended metaphorical meaning. Regarding creativity, although fluency and originality scores did not significantly impact metaphor comprehension, trends were observed. As fluency increased, the probability of giving a literal response decreased, while the likelihood of giving no-response answers tended to increase. In contrast, as originality increased, the probability of giving a literal response to metaphorical expressions tended to increase, and the likelihood of giving no-response answers tended to decrease. These trends suggest that certain cognitive processes, such as perceived lower semantic distance between domains and a tendency towards magical thinking, may influence children's interpretations of metaphorical expressions. The findings of this study
contribute to the understanding of metaphor processing in children and highlight the importance of age, domain, and conventionality in metaphor comprehension.

5.7. Significance of the Present Study

Overall, the study's findings add to the existing literature on metaphor processing in children in several ways. First, the results indicate that metaphor comprehension undergoes developmental changes throughout childhood, with older children showing a more sophisticated understanding of metaphors than younger children. Second, this study showed that the strategies for understanding predicate metaphor processing depend on abstractness and concreteness of the metaphorical domains in contrast to previous literature that suggested domain generality in metaphor comprehension (Özçalıșkan, 2005). By combining domain and conventionality, this study showed that these aspects might change the processing mechanisms. Third, the current study used non-verbal and verbal assessment methods to investigate metaphor comprehension in children and avoid limitations of their linguistic development. Although fluency and originality scores did not have a significant impact on metaphor comprehension, this study identified important cues and different aspects of creativity that can influence it. This study contributed to the research on metaphor processing in the Turkish language. The study explored the effects of different domain and conventionality levels and also investigated how creativity impacts metaphor processing in preschool children who speak Turkish.

5.8. Limitations and Suggestions for Further Studies

Our study explores the impact of metaphorical domain and conventionality in metaphor comprehension and the influence of creativity, specifically regarding fluency and originality. The limited sample of participants in this study, which consisted of thirty-five preschool children, may have contributed to the non-significant results.

Furthermore, this study employed a non-standardised gesture-based non-verbal task to assess metaphor comprehension in children (Hülagü & Özge, 2017). The lack of a
standardised test of non-verbal assessment for children might limit the generalisation of the findings of this study.

Finally, the results indicated that fluency and originality scores did not have a significant impact on participants' metaphor comprehension abilities. However, despite the lack of significant direct effects, the findings provide important cues and insights for future research on the relationship between metaphor comprehension and different aspects of creativity.

One possible reason for the lack of significant direct effects could be the complexity of metaphor comprehension and the involvement of multiple cognitive processes. Metaphor comprehension is a multifaceted process that various cognitive factors beyond fluency and originality may influence. Children's cognitive abilities and developmental stage might affect creative thinking skills in unique ways, leading to complex interactions that require further exploration. Further research can continue exploring the specific cognitive mechanisms that underlie the developmental changes in metaphor processing and their impact on language and cognitive development in children.
REFERENCES


Asch, S. E., & Nerlove, H. (1960). The development of double function terms in children. In B. Kaplan & S. Wapner (Eds.), *Perspectives in psychological theory* (pp. xx-xx). International Universities Press. (Note: Replace 'xx-xx' with the specific page numbers if available.)


Deamer, F. M. (2013). An investigation into the processes and mechanisms underlying the comprehension of metaphor and hyperbole (Doctoral dissertation, UCL (University College London)).


APPENDICES

A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

Bu araştırmanın sonucunda elde edilecek bilgiler çocukların dil ve bilişsel gelişimi hakkındaki bilgimizi artırmada etkili olacaktır. Erken yaşta çocukların bağlam içinde verilen sembolik kelimeleri anlamlandırmaya sürecini aydınlatacak ve hikaye kitaplarının bu süreçteki etkisini anlamamıza yardımcı olacaktır. Bu çalışmadan elde edilen bilgiler kullanılarak, erken çocukluk döneminde sembolik dil anlamaya güçlü çok çocuklara yönelik yardım amaçlı yeni stratejiler geliştirilebilecektir.


Katılm sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendini rahatsız hisseden durumda bulunduğu kullanarak serbestsiniz. Eğitimlere devam etmek istemiyorsanız, araştırmacıyla iletişime geçebilirsiniz.

Değerli vaktiniz bu çalışmaya ayırıldığınız için şimdiden teşekkür ederiz.

ODTÜ Dil ve Bilişsel Gelişim Laboratuvarı
İletişim Bilgileri Mail Adresi: lcd@metu.edu.tr
Telefon Numarası: +90 532 403 4650 / 90 312 210 3661 / 3664
Bu çalışmaya tamamen gönüllü olarak katıldığım ve istediğim zaman yarıda kesip bırakabileceğimi biliyorum. Vereceğim bilgilerin kimliğimle eşleştirilmeyeceğini biliyorum ve bilimsel amaçlı yayınlanlarında kullanılmasını kabul ediyorum.

İsim Soyisim-İmza
C. R SCRIPTS FOR THE ANALYSIS

str(mp)
mp$subject <- as.factor(mp$subject)
mp$itemtype <- as.factor(mp$item_type)
mp$familiarity <- as.factor(mp$fam)
mp$imagebility <- as.numeric(mp$imagebility)
mp$verbal <- as.factor(mp$inter1)
mp$nonverbal <- as.factor(mp$gest1)
mp$item <- as.factor(mp$item_no)
mp$sagegroup <- as.factor(mp$sage_group)
mp$age <- as.numeric(mp$sage)
mp$creativity <- as.numeric(mp$storral)
mp$fluency <- as.numeric(mp$flu)
mp$originality <- as.numeric(mp$orig)
mp$titles <- as.numeric(mp$titles)
mp$elab <- as.numeric(mp$elab)
mp$resist <- as.numeric(mp$resist)
ilk <- data.frame (agegroup = mp$sagegroup,
                   age = mp$sage,
                   subject = mp$subject,
                   item = mp$item,
                   itemtype = mp$itemtype,
                   familiarity = mp$familiarity,
                   imagebility = mp$imagebility,
                   verbal = mp$verbal,
                   nonverbal = mp$nonverbal,
                   creativity = mp$creativity,
fluency = mp$fluency,
originality = mp$originality,
titles = mp$titles,
elaboration = mp$elab,
resistance = mp$resist)

install.packages("mclogit")
library(mclogit)
install.packages("MASS")
library(mass)

#nonverbal
library(mclogit)
ilk$nonverbal <- relevel(ilk$nonverbal, ref = "Literal")
g0 <- mblogit(nonverbal ~ age * itemtype * familiarity + fluency + originality ,
data = ilk,
random = list(~1 | subject, ~1 | item),
maxit = 1000,
method = "PQL")

AIC(g0)
BIC(g0)
summary(g0) #did not converge

ilk$nonverbal <- relevel(ilk$nonverbal, ref = "Literal")
g1 <- mblogit(nonverbal ~ age * itemtype + familiarity + fluency + originality ,
data = ilk,
random = list(~1 | subject, ~1 | item),
maxit = 1000,
method = "PQL")
AIC(g1) # 670.0522
BIC(g1) #758.9378
summary(g1)

# a trend for fluency and originality was found for literal vs. no response

library(mclogit)
ilk$nonverbal <- relevel(ilk$nonverbal, ref = "Literal")
g2 <- mblogit(nonverbal ~ age + itemtype + familiarity + fluency + originality,
    data = ilk,
    random = list(~1 | subject, ~1 | item),
    maxit = 1000,
    method = "PQL")

AIC(g2) #667.5633
BIC(g2) #748.3684
summary(g2)
getSummary.mclogit(g2, alpha = .025)
exp(coef(g2)) # odds ratio
exp(confint(g2)) # CI for odds ratio
library(memisc)
mtable(g2)

library(emmeans)
age_gesture_emm <- emmeans(g2, ~ age | nonverbal, data = ilk)
itemtype_gesture_emm <- emmeans(g2, ~ itemtype | nonverbal, data = ilk)
familiarity_gesture_emm <- emmeans(g2, ~ familiarity | nonverbal, data = ilk)
fluency_gesture_emm <- emmeans(g2, ~ fluency | nonverbal, data = ilk)
originality_gesture_emm <- emmeans(g2, ~ originality | nonverbal, data = ilk)
print(age_gesture_emm)
print(itemtype_gesture_emm)
print(familiarity_gesture_emm)
print(fluency_gesture_emm)
print(originality_gesture_emm)

# Fit a model without the random effects
ilk$nonverbal <- relevel(ilk$nonverbal, ref = "Literal")
g2_reduced <- mblogit(nonverbal ~ age + itemtype + familiarity + fluency + originality,
    data = ilk,
    method = "PQL",
    maxit = 1000)
AIC(g2_reduced) # 742.5951
BIC(g2_reduced) # 799.1587
summary(g2_reduced)
getSummary.mclogit(g2_reduced, alpha = .025)
exp(coef(g2_reduced)) # odds ratio
exp(confint(g2_reduced)) # CI for odds ratio
library(memisc)
mtable(g2_reduced)

# Perform a likelihood ratio test to compare the two models
anova(g2_reduced, g2)
# χ²(6) = 87.032, p < 0.001

# VERBAL MODEL
library(mclongit)
ilk$verbal <- relevel(ilk$verbal, ref = "Literal")
v0 <- mblogit(verbal ~ age * itemtype * familiarity + fluency + originality,
data = ilk,
random = list(~1 | subject, ~1 | item),
maxit = 1000,
method = "PQL")
AIC(v0) #757.9555
BIC(v0) #895.3242
summary(v0)

ilk$verbal <- relevel(ilk$verbal, ref = "Literal")
v1 <- mblogit(verbal ~ age * itemtype + familiarity + fluency + originality,
data = ilk,
random = list(~1 | subject, ~1 | item),
maxit = 1000,
method = "PQL")
AIC(v1)#748.8337
BIC(v1) #837.7193
summary(v1)

library(mclogit)
ilk$verbal <- relevel(ilk$verbal, ref = "Literal")
v2 <- mblogit(verbal ~ age + itemtype + familiarity + fluency + originality,
data = ilk,
random = list(~1 | subject, ~1 | item),
maxit = 1000,
method = "PQL")
AIC(v2) #747.227
BIC(v2) #828.0321
summary(v2)
getSummary.mclogit(v2, alpha = .025)
exp(coef(v2)) #oddsratio
exp(confint(v2)) #CI for odds ratio
library(memisc)
mtable(v2)

# Fit a model without the random effects
ilk$nonverbal <- relevel(ilk$nonverbal, ref = "Literal")

v2_reduced <- mblogit(verbal ~ age + itemtype + familiarity + fluency + originality, 
            data = ilk,
            method = "PQL",
            maxit = 1000)
AIC(v2_reduced) #809.6658
BIC(v2_reduced) #866.2294

summary(v2_reduced)
getSummary.mclogit(v2_reduced, alpha = .025)
exp(coef(v2_reduced)) #oddsratio
exp(confint(v2_reduced)) #CI for odds ratio
library(memisc)
mtable(v2_reduced)

# Perform a likelihood ratio test to compare the two models
anova(v2_reduced, v2)

#(χ²(6) = 74.439, p < .001).

library(emmeans)

age_verbal_emm <- emmeans(v22, ~ age | verbal, data = ilk)
itemtype_verbal_emm <- emmeans(v2, ~ itemtype | verbal, data = ilk)
familiarity_verbal_emm <- emmeans(v2, ~ familiarity | verbal, data = ilk)

print(age_verbal_emm)
print(itemtype_verbal_emm)
print(familiarity_verbal_emm)
D. TÜRKÇE ÖZET

1. Giriş


Metafor işleme, dil ve bilişsel gelişim için önemli olmasına rağmen, alanyazında çocuklarda devinin metaforlarının anlaşılmamasına dair bir uzlaşma bulunmamaktadır. Ayrıca, dil ve bilişsel faktörlerin metafor işlemesi gelişimine nasıl katkıda
bulunduğuna dair de araştırma eksikliği vardır. Metafor işleme süreçleri, bireylerin soyut kavramlar ile somut deneyimler arasında köprü kurmasını sağlar; bu, bilginin bir alandan diğerine aktarılmasınayla gerçekleştirdir. Figüratif dilin anlaşılması ve yorumlanmasını içeren bu karmaşık bilişsel süreç, iletişimden hayal gücüne, soyut düşünümeden sanata kadar birçok alanda önemlidir. Dolayısıyla, metafor işleme, çocukların bilişsel gelişiminde araştırılması gereken önemli bir konudur.


yüksek metaforlara dönüştüğünü öne sürmektedir (Goldstein vd., 2012). Özgün metaforların işlenebilmesi, yüksek aşınalıklı metaforların gerektirdiği otomatik bastırma sürecinden daha fazla bilişsel çaba gerektirir (Gentner & Bowdle, 2001; Sana vd., 2021).


Önceki araştırmalar, çocukların üç yaşından itibaren metaforik dili anlamaya ve dört yaşında devinim metaforlarını kavramaya başladığına işaret etse de, bu süreçte metafor türlerinin ve aşınalık düzeyinin etkisi henüz araştırılmamıştır. Ayrıca, okul öncesi çocuklarda metafor anlama yetisi ile yaratıcı düşünme arasındaki bağlantı incelenmemiştir. Literatürdeki bu boşluğu doldurmak ve erken çocukluk döneminde dil ve bilişsel gelişimi kapsamlı bir şekilde anlamak adına, çalışmamızın devinim metaforların işlemini kapsayabileceğini amaçlamaktadır. Mevcut çalışmanın ana amacı, Türk okul öncesi çocuklarda devinim metaforlarının işlemini araştırmak, duygusal ve beden metaforlarındaki aşınalık düzeyi yüksek, düşük ve özgün metaforlara odaklanmak ve bu süreçte yaratıcılığın etkisini incelemektir.

Bu araştırmanın bir diğer önemli yönü, değerlendirme yöntemlerine verdiği önemdir. Daha önceki çalışmalarla kullanılan çeşitli yaklaşımlar, farklı dilbilimsel ölçütlerle

Bu çalışma, okul öncesi çocuklarda metafor işleme sürecinde yaratıcılığın rolünü araştıran ilk çalışma olma özelliğini taşımaktadır. Akıllı ve orijinallik ile ölçülen yaratıcı düşünceyenin, metafor anlama ile arasındaki ilişkiyi inceleyerek, erken çocuklık döneminde derle ve şekillendirebilecek potansiyel bağlantılar araştırılmıştır.

2. Yöntem

2.1. Örneklem

Katılımcılar, ortalama yaşları 4.7 olan (Aralık = 44 – 67 ay) tipik gelişim gösteren, sadece Türkçe konuşan 35 anaokulu çocukundan (9 kız, 26 erkek) oluşturmaktadır. Tüm katılımcılar Ankara'da bulunan ODTÜ Anaokuluna en az bir yıl devam eden öğrencilerdir.

2.3. Ölçekler ve İşlem

2.3.1. Metafor Anlama Testleri

Hem sözlü hem de sözsüz metafor anlama görevlerinde kullanılan metaforik ifadeler, hareket fiilleriyle oluşturulmuş on iki metafor ve metaforik ifadelerde kullanılan hareket fiillerini içeren yedi gerçek anlam ifadesinden oluşmaktadır. Metaforik öğeler, metaforik alanlarına ve yaygınlığına göre gruplandırılmıştır. Metaforik ifadelerin yarısı beden alanı, kalan yarısı da duygusal alanında sınıflandırılmıştır.


2.3.2. Yaratıcılık Testi

Torrance Yaratıcı Düşünme Testi-Şekilsel Form A (TTCT), çocukların yaratıcı düşünce yetilerinin akıcılık ve orijinalllik boyutlarını ölçmek için kullanılmaktır. TTCT- Şekilsel Form A resim yapma, resim tamamlama ve tekrarlanan çizgiler olmak üzere üç aktiviteden oluşmaktadır. Test, büyük bir sınıfta beşerli gruplar halinde uygulanmıştır. İlk aktivitede katılımcılara siyah, yumurta benzeri bir şekil sunulmuş ve bu şekli kullanarak bir resim oluşturmak için on tamamlanmamış figürü tamamlamaları istenmiştir. İkinci aktivitede katılımcılardan bir nesne veya resim oluşturmak için on tamamlanmamış figürü tamamlamaları istenmiştir. Üçüncü aktivitede, katılımcıların üç sayfa boyunca tekrarlayan paralel çizgileri kullanarak resim yapmaları istenmiştir.

3. Sonuçlar

Değerlendirmemizde metafor testleri üç kategoride kodlandığı için sessiz jest üretim testi ve sözlü metafor algılama testi, R’da (R Core Team, 2022) ayrı ayrı

Sessiz jest üretim testinin sonuçlarından metaforik anlama ile literal anlama arasında karşılaştırma yapıldığında üç değişken için anlamlı ilişkiler bulunmuştur. Yaş, anlamlı bir değişken olarak bulunmuştur ve daha büyük katılımcıların metaforik ifadeleri anlama olasılığının daha yüksek olduğu bulunmuştur. Çocuklar, beden metaforlarına kıyasla duygu metaforlarına daha çok metaforik yanıtlar vermişlerdir. Ayrıca, anlamlı düzeyi yüksek metaforlara kıyaslta özgün metaforlar daha iyi anlaşılmuştur. Çocukların, anlamlı düzeyi yüksek metaforlardan ziyade özgün metaforlara metaforik yanıtlar vermeyeye daha meyilli olduğu bulunmuştur.


Sözlü metafor algılama testinde metaforik ve literal olan cevaplar karşılaştırıldığında yaşa büyük çocukların literal yanıtlar yerine metaforik yanıtlar vermeyeye daha eğilimli olduğu görülmüştür. Ayrıca, katılımcıların duygu metaforlarını vücut

83
metaforlara göre daha iyi anladığı bulunmuştur. Katılımcıların özgün metaforları yüksek aşınalık düzeyine sahip metaforlara göre daha iyi anladıkları görülmüştür. Aşınalık düzeyi yüksek metaforların anlasılması düşük metaforlardan anlamlı bir şekilde farklı olmadığı görülmüş, ancak marjinal bir trend gözlemmiştir. Akıncılk ve orijinalliğin, metaforik anlama üzerinde anlamlı bir etkisi bulunamamıştır.


4. Tartışma

4.1. Bulguların Değerlendirilmesi


Sözsüz görevde daha büyük katılımcılarında metaforik yanıtlarının ve yanıtsız cevapların daha fazla olması, ifadelerin metaforik anlamanın tanınma yeteneklerinin gelişmekte olduğunu işaret ediyor olabilir. Bu değişim, metafor işleminde önemli kavramlardan olan yeni bağlantılar kurma kapasitesi ve bilişsel esnekliğin, yaşla birlikte artmasını bir sonucu olabilir (Bambini vd., 2014). Çalışmanın sonuçları, metafor kavrama süreçlerinde yaşa bağlı bilişsel gelişimin önemini vurgulamaktadır.
Çalışmanın ilginç bulgularından olan yaşı daha büyük çocukların yanıtsız cevaplarının artması, metaforik ifadeleri daha etkili bir şekilde tanımlamalarına ve gelişmiş bilişsel ve dil becerilerine atfedilebilir. Çocuklar büyürken, pragmatik yetenekleri gelişir, bu da metaforik ifadelerin bağlamını ve anlamını kavramaz ve alternatif olasılıkları değerlendirir. Bu davranış, dilin belirsizliği ve zenginliği konusundaki artan farkındalığına ve alternatif olası olmuşları değerlendirme yeteneklerini yansıtabilir.


Ayrıca, istatistiksel olarak anlam olmasa da, orijinalite puani daha yüksek çocukların metaforik ifadeleri literal olarak anlam eğiliminde olduğu, yanıt vermeme olasılığının daha düşük olduğu görülmüştür. Literal yorumlamaların artması alan arasında algılanan düşük semantik mesafe ve daha orijinal düşünebilen çocukların sırhili düşünmeye eğilimli olmalarına atfedilebilir. Daha yüksek orijinalite puani sahip bireylerin farklı alanlar arasındaki semantik mesafeyi gerçekle olduğuundan daha küçük algıladiği bulunmuştur (Rossman & Fink, 2010). Metafor algılama süreçlerinde, daha küçük bir semantik mesafe algılanmak, bir metafonun kaynak ve hedef alanları arasında daha doğrudan bağlantılar algılamaya neden olabilir. Sonuç olarak, iki alan arasında daha yakın bir ilişki gördükleri için,

4.2. Çalışmanın Katkıları ve Güçlü Yönleri


4.3. Sınırlılıklar ve Öneriler

Çalışmanın katılımcı sayısının sınırlılığı anlaşılan olmayan sonuçlara katkıda bulunmuş olabilir. Akılcılık ve orijinallik puanlarının katılımcıların metafor anlaması süreçlerini üzerinde anlaşılan bir etkisi bulunamamıştır. Ancak, anlaşılan doğrudan etkilerin eksikliğine rağmen, bulgular, metafor anlaması ile yaratıcılığın farklı yönleri arasındaki ilişki üzerine gelecekteki araştırmalar için önemli ipuçları ve içgörüler sunmuştur.
İstatiksel olarak anlamlı etkilerin eksikliğinin olası bir nedeni, metafor algılama süreçlerinin karmaşık ve çok yönlü bilişsel süreçler içermesi olabilir. Çocukların özgü bilişsel yetenekleri ve gelişimsel süreçleri, yaratıcı düşünme yeteneklerini etkileyip, daha karmaşık etkileşimlere yol açabilir. İlerideki çalışmalar metafor işlemedeki gelişimsel değişikliklerin altında yatan özel bilişsel mekanizmaları ve bu değişikliklerin çocuklardaki dil ve bilişsel gelişim üzerindeki etkilerini keşfetmeye devam edebilir.
E. SAMPLE TEZ İZİN FORMU / THESIS PERMISSION FORM

(Please fill out this form on computer. Double click on the boxes to fill them)

ENSTİTÜ / INSTITUTE

Fen Bilimleri Enstitüsü / Graduate School of Natural and Applied Sciences

Sosyal Bilimler Enstitüsü / Graduate School of Social Sciences

Uygulamalı Matematik Enstitüsü / Graduate School of Applied Mathematics

Enformatik Enstitüsü / Graduate School of Informatics

Deniz Bilimleri Enstitüsü / Graduate School of Marine Sciences

YAZARIN / AUTHOR

Soyadı / Surname : Karabulut
Adı / Name : Berfin
Bölümü / Department : İngiliz Dili Öğretimi / English Language Teaching

TEZİN ADI / TITLE OF THE THESIS (İngilizce / English): EXPLORING THE IMPACT OF DOMAIN, CONVENTIONALITY, AND CREATIVITY ON PREDICATE METAPHOR PROCESSING IN TURKISH SPEAKING PRESCHOOL CHILDREN: EVIDENCE FROM VERBAL AND NON-VERBAL TESTS

TEZİN TÜRÜ / DEGREE: Yüksek Lisans / Master ☒ Doktora / PhD ☐

1. Tezin tamamı dünya çapında erişime açılacaktır. / Release the entire work immediately for access worldwide.

2. Tez iki yıl süreyle erişime kapalı olacaktır. / Secure the entire work for patent and/or proprietary purposes for a period of two years. *

3. Tez altı ay süreyle erişime kapalı olacaktır. / Secure the entire work for period of six months. *

* Enstitü Yönetim Kurulu kararının basılı kopyası tezle birlikte kütüphaneye teslim edilecektir. / A copy of the decision of the Institute Administrative Committee will be delivered to the library together with the printed thesis.

Yazarın imzası / Signature __________________________ Tarih / Date __________________________

(Kütüphaneye teslim ettiriniz tarih. Elle doldurulacaktır.)

(Library submission date. Please fill out by hand.)

Tezin son sayfasıdır. / This is the last page of the thesis/dissertation.