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HOW ARE MATERNAL AND PATERNAL CAUSAL LANGUAGE INPUTS ASSOCIATED WITH CHILDREN'S CAUSAL LANGUAGE PRODUCTION AND COUNTERFACTUAL THINKING?

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APPROVAL

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In addition, I acknowledge that any claim of irregularity that may arise in relation to this work will result in a disciplinary action in accordance with the university legislation.

Songül KANDEMİR

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Date (13.06.2023)

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HOW ARE MATERNAL AND PATERNAL CAUSAL LANGUAGE INPUTS ASSOCIATED WITH CHILDREN'S CAUSAL LANGUAGE PRODUCTION AND COUNTERFACTUAL THINKING?

ABSTRACT

Causal language encompasses the verbal structures we use to produce causal events that we observe in our daily lives. We begin using these structures from early childhood, and both the mother and father play crucial roles. Understanding the cause and effect of an event can potentially involve considering other possible scenarios, may indirectly linking causal language to counterfactual thinking. Counterfactual thinking is the ability to contemplate alternative outcomes of an event that has occurred or not yet occurred. In the present study, we aimed to investigate (1) the differences in maternal and paternal causal language input, (2) the association between maternal and paternal causal language inputs and children's causal language production, (3) the association between children's causal language production and their counterfactual thinking, and (4) the association between maternal and paternal causal language inputs and the child's counterfactual thinking. The online study involved 60 parent-child pairs (M_{age}*:* 56 months) and both mothers and fathers attended to the study separately. Tangram play and story-telling tasks were used for father-child and mother-child dyadic sessions. For the child session, storytelling, counterfactual thinking, causal verb production, inhibitory control tasks, and the TIFALDI-expressive subtest were employed. Results indicated that fathers tend to use more causal language compared to mothers. There was a positive relationship between maternal causal language input and child causal language directed to the mother. There was a positive relationship between paternal causal language input and child causal language directed to the father. However, while the father's causal language input was not associated with child counterfactual thinking, maternal causal language input negatively associated with child counterfactual thinking. Only child causal language directed to the mother was negatively associated with counterfactual thinking. Maternal or paternal causal language input were not associated with the child's story-telling and causal verb production task scores. In conclusion, this study contributes to the literature by focusing on both mothers and fathers, as well as investigating the relationship between child's causal language and counterfactual thinking.

Keywords: Causal language, maternal language input, paternal language input, counterfactual thinking, child language production

ANNENİN VE BABANIN NEDENSEL DİL GİRDİSİ ÇOCUĞUN NEDENSEL DİL ÜRETİMİ VE KARŞI OLGUSAL DÜŞÜNMESİ İLE NASIL İLİŞKİLİDİR?

ÖZET

Neden-sonuç ilişkisi ürettiğimiz sözlü yapıları kapsayan nedensel dil, günlük yaşamımızda gözlemlediğimiz nedensel olayları ifade etmek için kullandığımız dil yapısıdır. Bu yapıları erken çocukluk döneminden itibaren kullanmaya başlarız ve bu noktada hem anne hem de baba önemli roller oynar. Bir olayın sebep ve sonucunu anlamak, potansiyel olarak diğer olası senaryoları düşünmeyi gerektirebilir ve dolaylı olarak nedensel dilin karşı olgusal düşünceyle ilişkili olmasını sağlayabilir. Karşı olgusal düşünce, gerçekleşmiş veya henüz gerçekleşmemiş bir olayın alternatif sonuçlarını düşünme yeteneğidir. Mevcut çalışmada, (1) annelerin ve babaların nedensel dil girdisindeki farklılıkların, (2) anne ve babanın nedensel dil girdileri ile çocuğun nedensel dil üretimi arasındaki ilişkinin, (3) çocuğun nedensel dil üretimi ile karşı olgusal düşünceleri arasındaki ilişkinin ve (4) annelerin ve babaların nedensel dil girdileri ile çocuğun karşı olgusal düşüncesi arasındaki ilişkinin araştırılması amaçlanmıştır. Çevrimiçi yürütülen çalışma, 60 ebeveyn-çocuk çiftinin ($M_{yaş}$: 56 ay) katılımı ile gerçekleşmiş ve anne-babalar çalışmaya birbirlerinden ayrı katılım göstermiştir. Baba-çocuk ve anne-çocuk ikili oturumları için tangram oyunu ve hikaye anlatma görevleri kullanılmıştır. Çocuk oturumu için hikaye anlatma, karşı olgusal düşünme, nedensel fiil üretimi, inhibisyon kontrolü görevleri ve TIFALDI ifade edici dil alt testi kullanılmıştır. Araştırma bulgularına bakıldığında, babaların annelere kıyasla daha fazla nedensel dil kullandığı görülmektedir. Annenin nedensel dil girdisi ile çocuğun annesine yönelik kullandığı nedensel dil arasında pozitif bir ilişki bulunmuştur. Benzer şekilde, babanın nedensel dil girdisi ile çocuğun babasına yönelik kullandığı nedensel dili arasında pozitif bir ilişki vardır. Babanın nedensel dil girdisi çocuğun karşı olgusal düşüncesiyle ilişkili bulunmazken annenin nedensel dil girdisi ile çocuğun karşı olgusal düşüncesi arasında negatif yönlü bir ilişki bulunmuştur. Yalnızca çocuğun annesine yönelik kullandığı nedensel dilin karşı olgusal düşüncesiyle negatif bir ilişki içinde olduğu görülmektedir. Anne veya babanın nedensel dil girdisi çocuğun hikaye anlatma ve nedensel fiil üretimi görevlerinin puanlarıyla ilişkili bulunmamıştır. Sonuç olarak, bu çalışma çocukların nedensel dil ve karşı olgusal düşünceleri arasındaki ilişkiyi incelerken hem anneleri hem de babaları odak noktasına alarak literatüre katkıda bulunmaktadır.

Anahtar Sözcükler: Nedensel dil, Annenin dil girdisi, Babanın dil girdisi, Karşı olgusal düşünme, Çocuğun dil üretimi

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1. INTRODUCTION

Imagine a leaf blown from a tree on a very windy day. What causes the leaf, which cannot move independently, to make a move? As adults, we can quickly answer this question, but can children give a response similarly? What language structures do adults and children use to grasp this phenomenon and correctly answer this question? According to the literature, we use causal language to explain events like these in our daily lives and include both cause and effect (Marini & Singer, 1988). The critical questions are when, how, and with whose help do children learn to establish a cause-effect relationship within events and start using causal language? The purpose of this study is twofold. We are exploring the role and contribution of parents' input (both maternal and paternal) on children's causal language production and counterfactual thinking. Also, answering how children's causal language is related to children's counterfactual thinking was aimed. For this purpose, four main questions were asked: (1) How does maternal and paternal causal language input differ? (2) Are maternal and paternal causal language inputs associated with children's causal language production? (3) Is children's causal language production performance associated with their counterfactual thinking? (4) Are maternal and paternal causal language inputs associated with counterfactual thinking?

Causal language includes components such as causal connectives, lexical causatives, and morphological causatives, even though understanding, interpreting, and lexicalizing events vary by language (Ger et al., 2021a). We also see different types of causal events when we observe daily events. For instance, the cause and effect between objects, object A makes object B move, is mechanical or physical causality (Cuti & Zenhausern, 1970). We can observe causal events in our social experience, interpersonal communication, and mechanical causality. Psychological or social causality precisely emerges at this point and refers to that one person causes an effect on another person (Carlson-Luden, 1980; Rudolph & Försterling, 1997). In other words, on the one hand, causality can arise from person-to-person or person-to-object events, and on the other hand, it can occur in object-to-object events (Bonawitz et al., 2006; Sanefuji & Haryu, 2018; Schulz et al., 2007). Causality is a wide range of phenomena, and both the production and

comprehension of causal events differ regarding cognitive differences and language skills (Kupersmitt & Armon-Lotem, 2019; Williams, 2020). Different languages bring language-specific causal language production. For example, Kanero and colleagues' study (2016) focused on English- and Japanese-speaking children's lexical causative sentences in different scenarios. Results suggest that language-specific patterns of selecting subjects in causative sentences emerge as children grow and are used to their native language's rules and structure; these patterns are unique to each language and reflect the conventions of that language. Overall, causal language enables us to comprehend and express several causal events according to language structures and contexts. Investigating how causal language emerges and what factors play a role in this process is crucial.

1.1. Children's Comprehension of Causality and Causal Language Production

To discuss the differences between adults and children's causal language, first, it is necessary to mention event perception. Studies investigating event perception skills of infants show that 3-month-old infants can process causal events; in other words, perception of causality develops early, starting from infancy (Oakes & Cohen, 1990; White, 1988). On the other hand, a few studies also support that infants can perceive motion events between objects, but it may be premature to generalize these findings to causal events (Cohen et al., 1998; Saxe & Carey, 2006). Nevertheless, many studies in the literature prove that the causal event comprehension skill emerges starting from the first year of life, and researchers agree on this issue (Leslie, 1982; Leslie & Keeble, 1987; Muentener & Carey, 2010). Starting from infancy, this ability develops over time and continues in childhood.

The context in which an event occurs is crucial because it helps children understand its possible causes. Two different factors affect children's comprehension of causality. Firstly, the spatial contiguity between cause and effect simplifies causal events for children to perceive (Lesser, 1977). In other words, children can comprehend the causality of objects physically close to each other more quickly than others. Nevertheless, it is not possible to generalize for every event because some causal events do not have spatial contiguity. To exemplify, a lamp in a room may illuminate the opposite wall spatially distant from it, and this distance does not inhibit causality.

Secondly, it is necessary to mention another concept, temporal order, which is a powerful cue for children. Temporal order represents the order between cause and effect, and children benefit from this cue beginning from 3 years of life (Shultz et al., 1986). In addition to these two factors, children also use the explanations given to them as clues, and these clues can also affect their ability to make causal inferences. A study investigated the role of verbal framing in children extracting causal evidence from complex scenes (Butler & Markman, 2012). Results indicate that verbal framing or verbal cues significantly improves preschooler children's causal comprehension of complex scenes. Cues of context and semantic content are essential for comprehending causality. However, grasping and taking advantage of linguistic features, causal verbs, and causal connectors is a turning point for children's causal language production.

Children make use of language to express daily causal events. The skill of making causal connections from physical and mechanical causal events and expressing emerges 3 through 5 years of life (Trabasso & Magliano, 1996; Trabasso & Nickels, 1992). Preschool children can comprehend the process and correctly answer questions about causal events (Bullock, 1985; Kun, 1978). However, children need to learn how to use conjunctions such as *because* and *so* to remark the cause-and-effect order (Brown et al., 2011). For instance, if a boy hits the vase and the vase gets broken, we can explain this causal event in two ways. On the one hand, we can form a sentence with *because* and indicate the effect first (e.g., Vase was broken *because* he hit the vase). On the other hand, we can reframe our sentence *so* that causes come first (e.g., He hit the vase, *so* the vase broke). However, when considering their linguistic abilities, making a complete causal sentence with two clauses is difficult for children (French, 1988). Besides, children have difficulties with comprehension "*because*" of a conjunction that reports a cause and effect until they are almost 7-8 years old, and they presume that this conjunction is like "*and*" or "*then*" (Kyrantzis et al., 1990; McCabe & Peterson, 1985).

Syntactic structures in causal language include causal verbs and conjunctions for producing and comprehending causal events. Morphological and lexical transitive verbs indicate action towards an object or a person, while intransitive verbs describe the action performed by a person or an object alone (Tomasello & Brooks, 1998). Studies show that children begin to produce and comprehend causal and transitive verbs from

their second year of life (Corrigan & Stevenson, 1994; Göksun et al., 2008; Naigles, 1990; Sexton, 1983). Even though infants comprehend causal verbs such as *push* or *open* during this period, producing these types of verbs is difficult for them when lexicalizing an event (Cohen et al., 1998). Children aged 3 or 4 can establish a cause-and-effect relationship and produce causal verbs (Bowerman, 1974; Corrigan & Stevenson, 1994). On the other hand, according to Kline and colleagues (2013), exposure to transitive verbs helps speakers to perceive and remember causal events. Children's comprehension of causality from this period allows them to construct a new thinking ability by enabling them to use causal reasoning (Harris et al., 1996).

Some studies focus on children's causal production and comprehension from various perspectives. For example, Bonawitz and colleagues (2008) investigated whether children adhere to the principle of Ockham's razor, which suggests that more straightforward explanations are better. Results showed that children provided simpler causal explanations for simpler machines and more complex explanations for more complex machines. Children adapted their causal structures based on the conditions they encountered. Similarly, another study found that 3.5 to 4-year-old children changed their lexicalization of causal structures based on the type of agent they encountered (Muentener & Lakusta, 2011). Children used more causal language for intentionally causal events than unintentional or object-caused events. In a similar study, researchers investigated the gap between prediction and action in toddlers' causal inferences (Bonawitz et al., 2010). According to the results, toddlers successfully initiated causal events only when they involved direct contact between objects or when a dispositional agent initiated the events. Also, they were able to succeed in initiating events when the events were described using causal language. Children can produce causal language differently under different conditions and make causal inferences, although sometimes they struggle to understand cause-and-effect relationships (Bonawitz & Schulz, 2008). Children make causal inferences based on their prior beliefs or biases and use available information rationally (Denison et al., 2013; Muentener & Schulz, 2014). In sum, causal reasoning and causal language develop collaboratively from infancy, and this bidirectional relationship gets entrenched with age. Therefore, causal reasoning is crucial in understanding causal language structures and cause-and-effect relationships. Likewise, causal language has an essential role in the causal reasoning process.

1.2. Children's Causal Reasoning and Counterfactual Thinking

The causal language used by children includes causatives that express causal events, as well as some conjunctions. Causal conjunctions are particularly important in revealing the cause-effect relationship and preparing the ground for causal reasoning. For children to make causal reasoning, they must first comprehend how events happen, for example, how an object can move another object by applying force (Gärdenfors, 2021). Children's causal reasoning abilities for physical events like this example improve as they get older, and older preschoolers can infer more complex events than younger ones (George et al., 2019; Göksun et al., 2013; Muentener & Bonawitz, 2017). When children learn that one action can cause another action, it can help them in their social life and enable them to make predictions. The study by Walker et al. (2019) found that the design of a causal system can either facilitate or hinder children's ability to learn causal relationships. Specifically, systems with high interconnectedness between causal variables were found to be more conducive to children's discovery of causal relationships, even when the systems were more complex. These results emphasize the importance of considering design factors when teaching and learning about causality. Besides, children's causal knowledge can impact their unintentional processes and bias in their social life (Carvalho et al., 2021). Children can perceive both physical and social causal reasoning and learn to establish cause-effect relationships with these experiences. However, this is a complex process, and establishing a cause-effect relationship naturally brings with it another skill: counterfactual thinking (Fitzgibbon & Murayama, 2022).

Counterfactual thinking is a cognitive process of imagining alternative scenarios or events that differ from the actual past or present reality and evaluating the implications of different outcomes (Roese, 1997). It is a closely related and essential phenomenon that goes hand in hand with causal reasoning. Counterfactual thinking is related to considering other possible outcomes after an event (Harris et al., 1996; Mandel, 2003). After an event has occurred, asking a "what if" question about the cause of this event and thinking about possible effects shows that we can make counterfactual thinking as adults (Roese & Olson, 1995). In other words, for counterfactual thinking, individuals should first have grasped what has caused the result, and then they might be able to

think about possible outcomes. Beck and colleagues (2011) claimed that the counterfactual thinking improvement process has four stages: (1) creating alternative worlds, (2) truth and falsity, (3) counterfactual possibilities, and (4) comparisons between worlds. The first stage is creating alternative worlds, which refers to pretend play. The process of creating alternative worlds, which begins with pretend play, continues as children grasp whether these worlds are real or not. The second stage, which is truth and falsity, emerges here and refers to the reality or unreality of the world. Then, the ability to think about counterfactual alternatives develops, and finally, real and alternative worlds can be compared to each other. The skill of creating alternative worlds, which starts to develop at the age of 3, continues to progress until the age of 7, reaching a point where children can compare the present world with counterfactual worlds.

Thinking counterfactually and imagining other possibilities affects us in different contexts. For instance, Kray and colleagues (2010) showed that counterfactual thinking can be useful for creating meaning in life, particularly when people focus on positive alternatives or use it to better understand the causes and consequences of events. On the other hand, counterfactual thinking also influences us to establish a causal relationship by making sense of the events we experience. For example, in a study, participants were asked to imagine the counterfactual alternative of an event that happened earlier in time (Henne et al., 2021). The imagination of an early event had a weak interaction with the causal structure. However, when they imagined the counterfactual alternative of a recent event, the interaction between recency and causal structure was strengthened. These findings demonstrate that counterfactual thinking strategically affects us from different perspectives depending on the context and subject matter.

Counterfactual thinking is useful for supporting children's causal learning and reasoning and helping them make accurate inferences about cause-effect relationships (Engle & Walker, 2021). Nyhout and Ganea (2021) claimed that children perform scientific reasoning, which is associated with principles in the world, and counterfactual reasoning, which is associated with possible outcomes, separately. However, their ability to engage in counterfactual reasoning supports their understanding of scientific principles, critical thinking skills, and their general ability to engage in causal

reasoning. Although counterfactual thinking and causal reasoning are two thinking processes that affect and feed each other, they are not precisely the same. For example, consider a child who became sick because he drank cold water. To reflect the causality in this event, we can make a sentence such as "The child got sick *because* she/he drank cold water". What if the child did not drink cold water? Would she/he still be sick then, or could the outcome of this event change? At this point, we assume that an event has yet to occur by doing counterfactual thinking, and we consider possible new results.

Harris et al. (1996) emphasized the two possibilities for the appearance order of causal reasoning and counterfactual thinking processes. According to the first claim, we consider causal reasoning about cause and effect; after that, we make inferences about the eventual effects of causal events. To take the example above, first, we make causal reasoning about drinking cold water and becoming sick. After that, the counterfactual thinking process emerges, and we can think about "what might have been". On the other hand, there is a second claim that justifies the opposite order. For instance, we think about drinking cold water and try to understand what would happen if we did not drink cold water. Then we conclude that we would not be sick if we did not drink cold water. First, we make counterfactual thinking and then make causal reasoning by establishing the relationship between this cause and effect. In sum, causal reasoning and counterfactual thinking emerge in a sequential manner, but there are different claims about which one comes first. In both possibilities, it is obvious that there is a very tight connection between causal reasoning and counterfactual thinking.

It is possible to examine the relationship between causal reasoning and counterfactual thinking processes in different age groups. For instance, the literature has different explanations about how children learn the counterfactual thinking process. Some studies claim that pretend play reinforces the opposite of reality and prepares the ground for counterfactual thinking from the second year of life (Buchsbaum et al., 2012; Gopnik & Walker, 2013; Walker & Gopnik, 2013). Other studies focus on the ability of children to do counterfactual thinking by using their reasoning abilities (Mandel, 2003; Sherman & McConnell, 1996). In general, according to literature, it is known that children can use their counterfactual thinking from the age of 3, and the frequency of making mistakes decreases as they get older (Beck et al., 2006; German & Nichols, 2003; Gopnik &

Walker, 2013; Guajardo & Turley-Ames, 2004; Harris et al., 1996). Overall, there are some different perspectives, and explaining how children demonstrate this thinking ability regarding their language skills is essential.

Children should go backward by arranging the causes and effects of the event in an imaginary order for this thinking skill, but a short event and a short sequence may only sometimes emerge. For instance, let us examine a story in two different ways, which Riggs et al. (1998) used. "Peter, who works in a post office, woke up, got out of bed, and went to work. Where would Peter be now if he were not at work?" To answer this question, the imaginary chain children must think about goes like this: Peter did not go to work – Peter would be in bed. In this part, we go back to two steps and use a short chain for counterfactual thinking. In another version, let us make the story more complex. "Peter, who works at a post office, was sleeping in his bed and had to go to work because his friend Susan made a mistake at work. Where would Peter be now if Susan had not made a mistake?". A longer chain needs to be set up to answer this question: Susan made no mistake – Peter did not go to work – Peter would be in bed. This time, we go back to three steps and create a longer chain for counterfactual thinking. In a study conducted by German and Nichols (2003), the ability of younger and older children to make counterfactual inferences differs according to short and long chains. While younger children could make counterfactual inferences for short-chain events, they mostly failed for long-chain events. Older children mostly did well for short and long chains than younger children.

Considering these findings, if we assume that counterfactual thinking is a problem, we can say that the chain length of this problem makes it easier to solve. In other words, as the imaginary chain established becomes shorter, the children’s performance in counterfactual thinking improves. So, is it only about the child's individual characteristics or age to keep up with this way of thinking, establish these chains, and make causal reasoning? Studies often do not take the role of language input into account when explaining how these abilities emerge. According to Daubert and colleagues (2020), asking pedagogical questions, which refer to open-ended questions, encourages children to generate explanations and think critically about causal relationships. More pedagogical questions bring higher scores for children in causal learning. Besides,

Byrne (2005) claimed that language proficiency supports comprehending the cause-effect relationship and helps counterfactual thinking. Because expressing conditional statements and also some verbs which refer to possibilities helps us comprehend *what might have been*. Likewise, Murcia (2016) found that children's counterfactual language is positively associated with counterfactual thinking. Based on these findings, the ability to consider alternative possibilities is associated with using language structures when discussing alternative possibilities. This leads us to question the extent to which the language input children receive influences counterfactual thinking. In this context, it is crucial to examine how the specifically causal language input, especially from parents, affects the child's causal language outcome and contributes to their ability to engage in counterfactual thinking.

1.3. Maternal and Paternal Language Input and Childhood Outcomes

The home environment and the child's exposure to language at home are essential in language development. On the one hand, while the contribution of maternal speech in terms of the language development of the child is frequently mentioned in the literature, paternal speech is neglected (Dieterich et al., 2006; Tamis-LeMonda et al., 2001). On the other hand, some studies compare maternal and paternal speech and behavior directed at children (Cabrera et al., 2017; Fagan et al., 2014; Golinkoff & Ames, 1979; Pancsofar & Vernon-Feagans, 2006; Teti et al., 1988). Although research focusing on fathers is less compared to mothers, previous studies show that fathers' contribution to children's language development is as beneficial and necessary as mothers' (Rowe et al., 2004; Tamis-LeMonda et al., 2004). According to Gleason's (1975) 'bridge hypothesis', fathers have more references and teaching to the outside world because paternal communication with children is cognitively demanding compared to mothers. Even though significant changes in family dynamics and parental practices have emerged to date, studies focusing on paternal influences are still rare. For this reason, the overall language input the child receives from the fathers and mothers should be investigated simultaneously.

The language input parents provide to their children is essential in terms of quantity and quality. Anderson and colleagues (2021) conducted a meta-analysis of parental linguistic input regarding quality and quantity. Results indicated that parents' quality of

linguistic input is more strongly associated with child language skills compared to quantity. However, they mentioned that there were many studies about maternal language input but limited studies which focused on paternal language input. Besides, limited studies show us that maternal and paternal speech have similar and different aspects. Golinkoff and Ames (1979) conducted a study comparing maternal and paternal language input. They set a free play session for each parent and measured utterances, conversational turns, directives, questions, and repetitions of parents to their children. Results show that the language mothers and fathers use for their 19-month-old children does not differ quantitatively or qualitatively. However, fathers seem to talk less than mothers during triadic sessions. In another research conducted by Rowe et al. (2004), there was no difference in vocabulary variety, linguistic complexity, or length of utterance in parents' speech to their toddlers. A further study found that the mothers and fathers did not differ in terms of the words and questions they used, but only the different words used by the fathers predicted the child's later language skills (Pancsofar & Vernon-Feagans, 2006). Overall, in the literature, some studies show that maternal and paternal speech are similar (Malone & Guy, 1982; Rowe et al., 2004; Tamis-LeMonda et al., 2004), and some studies suggest that the language input of mothers and fathers is quite different and that mothers are more influential (Davidson & Snow, 1996; Leaper et al., 1998; McLaughlin et al., 1983). These contradictory findings might be since maternal and paternal input are not systematically included in the designs. Therefore, a more comprehensive approach is needed where maternal and paternal language input is considered.

Although maternal input has been examined regarding quality and quantity, a few studies focus on the causal language input used for the child and later child outcomes. For instance, some studies have focused on parental causal connectives and examined their impact on children's causal connective production. Two different growth curve analyses found that as the causal connectives used by the parents increased, the child's causal connective production also increased (Van Veen et al., 2009, 2013). In addition, parents used more causal connectives as their children got older (Van Veen, 2011). On the other hand, Aktan-Erciyes and Göksun (2023) conducted a study to investigate how early parental causal input predicts children's later causal verb comprehension. According to the results, only parental morphological causative input in free-play

sessions predicts children's later causal verb comprehension performance. In another study conducted by Dunn et al. (1991), it was found that mothers' causal and mental state conversations predicted later reasoning and emotional understanding skills in children. In addition to these findings, LaBounty et al. (2008) compared the mothers' and fathers' causal language inputs. They measured maternal and paternal causal term usage such as *because, how,* and *why* for coding causal references. They found that the causal references of both the mother and the father when talking about emotions predicted the later emotion understanding and theory of mind skills. In addition, this study shows that mothers make more causal inferences than fathers and emphasizes the need for detailed research into the causal input of the parents. Recent studies have found a relationship between mothers' causal speech and children's ability to comprehend causal stances (Alvarez & Booth, 2016; Booth et al., 2020). These results prove that the causal input of the parents positively affects and improves the children's reasoning ability.

1.4. The Present Study

Based on the research findings in the literature, the expectation was that the causal language input of mothers and fathers could be associated with children's causal reasoning and counterfactual thinking. The present study aims to fill the two gaps in the literature. First, paternal input, which might have a crucial explanatory power for child outcomes, should be addressed in input studies. Even the few father studies in the literature show that input from fathers is as worthy of investigation as input from mothers. The second critical gap in the literature is the thorough investigation of paternal causal language input with child causal language production. Studies examine language input from parents structurally and semantically, but causality is rarely studied (e.g., Aktan-Erciyes & Göksun, 2023; Booth et al., 2020; LaBounty et al., 2008). At the same time, studies measuring the association between parents' input and children's reasoning and counterfactual thinking are still very limited. It is known that causal reasoning and counterfactual thinking are not independent and predict the theory of mind skill in later years of life (Drayton et al., 2011; Guajardo & Turley-Ames, 2004; Guajardo & Cartwright, 2016; Lombard & Gärdenfors, 2021). In this respect, this study

will open a door for future studies investigating the association between exposure and use of causal language and theory of mind skill.

The main purposes of the present study are to examine the differences between paternal and maternal causal language input, the association between paternal/maternal causal language inputs and children's causal language production, and associations with children's counterfactual thinking. For these purposes, free/guided play sessions and the story-telling task were used to measure maternal and paternal causal language input. On the other hand, the story-telling and causal verb production tasks were used to measure children's causal language production performance. Also, two picture-based stories were used to investigate children's counterfactual thinking. To investigate the association between maternal/paternal causal language input and children's causal language production or counterfactual thinking, we planned to use children's age and expressive language, families' socioeconomic status, and parents' linguistic complexity as control variables. The current research hypotheses are listed below, and the procedure is explained in detail in the method section.

H_1: Maternal and paternal causal language inputs will differ.

H_2: Maternal causal language input will be positively associated with the child's causal language directed to the mother.

H_3: Paternal causal language input will be positively associated with the child's causal language directed to the father.

H_4: Child's causal language directed to the mother or father will be associated with the child's counterfactual thinking.

H_5: Maternal and paternal causal language input will be positively associated with the child's causal language in story-telling.

H_6: Maternal and paternal causal language input will be positively associated with the child's causal verb production causality and accuracy.

H_7: Children's causality and accuracy scores will be positively associated with children's counterfactual thinking.

H_8: Maternal and paternal causal language input will be positively associated with the child's counterfactual thinking.

2. METHOD

2.1. Participants

In the present study, four- and five-year-old children (M_{age} = 56 months, *SD* = 6.5) and their parents participated. We used G*Power 3.1.9.2 program to determine the required sample size (α = .05, power = .90). The effect size was *.33* and drawn from the recent meta-analysis of parental linguistic input and children's language outcomes (Anderson et al., 2021). According to the regression analysis and research design, the target sample size was 60, and 60 families were recruited, including the mother, the father, and the child. A demographic form was used to determine the child's age and gender as well as the parents' region, education, and socioeconomic status. The parents' subjective ratings of socioeconomic status (SES) years of education were asked. Fathers' average education year (M_{year} = 15, *SD* = 3.5) and mothers' education year (M_{year} = 15, *SD* = 3) were calculated. Families' socioeconomic status varied between low and high on a 5-level scale (*M* = 2.96, *SD* = .8). A composite SES score with Z scores of education levels and socioeconomic status was created, and the SES level was controlled for all analyses. Details of participants' demographic information are given in Table 1 below.

Table 1
Demographic Information of Families

Variable	N	% of Total
Region		
The Marmara Region	22	36.7
The Central Anatolia Region	13	21.7
The Aegean Region	13	21.7
The Black Sea Region	2	3.3
The Mediterranean Region	5	8.3
The Eastern Anatolia Region	4	6.7
The South-eastern Anatolia Region	1	1.7
Maternal Education		
Primary School	1	1.7
Middle School	2	3.3
High School	7	11.7
University	42	70
Master Degree	5	8.3
Ph.D. Degree	3	5
Paternal Education		
Primary School	1	1.7
Middle School	1	1.7
High School	10	16.7
University	37	61.7
Master Degree	5	8.3
Ph.D. Degree	6	10
Socioeconomic Status		
Low	4	6.7
Low-Middle	12	20
Middle	26	43.3
High-Middle	18	30
High	0	0

2.2. Instruments of Assessment

Both child-parent dyadic tasks and child assessment tasks were used. Before the data collection process, they fill out a demographic information form. This form includes questions about the child's age, the family's socioeconomic status, and the parents' education level. After the demographic information form, there were three tasks for each parent and five for the child.

2.2.1. Parent-child tasks: Free-guided play sessions

The *Tangram* toy was used for holding mother-child and father-child play sessions. This toy has seven geometric shapes, and these shapes can come together to form different figures. First, both mothers and fathers requested participation in a free play session with the child in a dyadic design. Every father and mother had 5 minutes to play with the tangram toy. They were instructed that they have a particular time and can play as

they wish during this time. After the free play session, constructing one figure for each parent (*rabbit* for fathers, *cat* for mothers*)* using geometric shapes was asked from parents. These two figures were chosen because they were similar and had close render times. Thus, parents are involved in both free play and guided play. Video recordings were made during the play sessions in the online Zoom meetings.

2.2.2. Parent-child tasks: Parent's story-telling task

In this section, the "A Boy, A Dog, and A Frog" story was shown (Mayer, 1967), and both mothers and fathers were asked to tell the story to their children during their sessions. Although this book contains 25 different scene images, we used only 9 images in this study, including causal events (Appendix A).

2.2.3. Child tasks: Children's story-telling task

The *Flower Story* pictures were shown to the children, and they were asked to explain what was happening in the pictures to the experimenter. This story consisted of 4 different scenes and included causal events. In this way, we examined the causal production of children in terms of narrative (Appendix B).

2.2.4. Child tasks: Causal verb production task

Children watched 16 videos online and randomly on their computer screens in their sessions. These videos included eight morphological (e.g., *uyutmak* 'make someone sleep') and eight lexical causal verbs (e.g., *açmak* 'open') (see Table 2). 4 of the morphological verbs as transitive and 4 as intransitive were selected. Children instructed as follows:

"You will see a woman in the videos performing actions with toys. I want you to tell me what the woman is doing." If the child responds with a sentence explaining what the toy is doing, such as "*doll is eating*," s/he will be prompted again as: "I want you to tell what the woman is doing" Proportion of morphological and lexical causal verbs the child uses will be taken as a score.

Table 2
Causal Verb Production

Causative Type	Causal Verbs			
	Verb (TR)		Verb (ENG)	Transitive/ Intransitive
Morphological Causatives	Uyu-t-mak		*to make someone sleep*	Intransitive
	Otur-t-mak		*to make someone sit*	Intransitive
	Hopla-t-mak		*to make someone jump*	Intransitive
	Kay-dır-mak		*to make someone slide*	Intransitive
	Ye-dir-mek		*to feed someone*	Transitive
	İç-ir-mek		*to make someone drink*	Transitive
	Yaz-dır-mak		*to make someone write*	Transitive
	Giy-dir-mek		*to make someone get dressed*	Transitive
	Verb	*Direct object*	Verb (ENG)	
Lexical Causatives	Açmak	kapı '*door*'	*to open*	Transitive
	Koymak	sandalye '*chair*'	*to put*	Transitive
	Silmek	pencere '*window*'	*to wipe*	Transitive
	Kaşımak	çocuk *'child'*	*to scratch*	Transitive
	Çekmek	saç *'hair'*	*to pull*	Transitive
	Atmak	top *'ball'*	*to throw*	Transitive
	Yuvarlamak	silindir *'cylinder'*	*to roll*	Transitive
	Taramak	saç *'hair'*	*to brush*	Transitive

2.2.5. Child tasks: Counterfactual thinking task

Two different stories were used for measuring children's counterfactual thinking: The Spade Story and the Vase Story (Appendix C). First, stories were told to them in order, and then their counterfactual thinking was tested by asking questions about emotional and locational situations. These stories and the questions were selected from research by Beck et al. (2010), and a back-translation from English to Turkish was made for our Turkish sample. There are 4 control questions (2 emotions, 2 locations) and a total of 6 test questions (3 emotions, 3 locations). Children get 1 point for each correct answer from the short, medium, and long counterfactual emotional and locational questions we asked. For these test questions, children can receive 6 points for each story. Thus

children can receive 12 points in total. Details of the stories are presented below (see Table 3 and Table 4).

Spade Story. Tom had built a sandcastle. He called his father to see it (picture 1). When his father opened the door, the dog escaped from the house (picture 2), ran into the garden, stole Tom's spade (picture 3), and dropped it in the pond. This made Tom sad (picture 4).

Table 3
Questions of Spade Story from Counterfactual Thinking Task

Question Type		Spade Story	Correct Answer
Emotion Control Questions	Current	"Just now, is Tom happy or sad?"	Sad
	Previous	"Right at the beginning, was Tom happy or sad?"	Happy
Location Control Questions	Current	"Just now, is the spade in the sandpit or the pond?"	Pond
	Previous	"Right at the beginning, was the spade in the sandpit or the pond?"	Sandpit
Emotion Test Questions	Short (Picture 3)	"What if the dog had not stolen the spade? Would Tom be happy or sad?"	Happy
	Medium (Picture 2)	"What if the dog had not escaped from the house? Would Tom be happy or sad?"	Happy
	Long (Picture 1)	"What if Tom had not called his Dad? Would Tom be happy or sad?"	Happy
Location Test Questions	Short (Picture 3)	"What if the dog had not stolen the spade? Would the spade be in the sandpit or in the pond?"	Sandpit
	Medium (Picture 2)	"What if the dog had not escaped from the house? Would the spade be in the sandpit or in the pond?"	Sandpit
	Long (Picture 1)	"What if Tom had not called his Dad? Would the spade be in the sandpit or in the pond?"	Sandpit

Vase Story. Nicholas' mother puts some flowers in a vase on the windowsill. Nicholas' friend comes to play football (picture 1). Nicholas kicks the ball too hard (picture 2), and it knocks over the vase. The vase breaks (picture 3), and Nicholas' mother is sad (picture 4).

Table 4
Questions of Vase Story from Counterfactual Thinking Task

Question Type		Vase Story	Correct Answer
Emotion Control Questions	Current	"Just now, is Nicholas' mother happy or sad?"	Sad
	Previous	"Right at the beginning, was Nicholas' mother happy or sad?"	Happy
Location Control Questions	Current	"Just now, are the flowers in the window or on the floor?"	Floor
	Previous	"Right at the beginning, are the flowers in the window or on the floor?"	Window
Emotion Test Questions	Short (Picture 3)	"What if the ball had not broken the vase? Would Nicholas' mother be happy or sad?"	Happy
	Medium (Picture 2)	"What if Nicholas had not kicked the ball too hard? Would Nicholas' mother be happy or sad?"	Happy
	Long (Picture 1)	"What if Nicholas' friend had not brought the ball? Would Nicholas' mother be happy or sad?"	Happy
Location Test Questions	Short (Picture 3)	"What if the ball had not broken the vase? Would the flowers be in the window or on the floor?"	Window
	Medium (Picture 2)	"What if Nicholas had not kicked the ball too hard? Would the flowers be in the window or on the floor?"	Window
	Long (Picture 1)	"What if Nicholas' friend had not brought the ball? Would the flowers be in the window or on the floor?"	Window

2.2.6. Child tasks: Turkish expressive and receptive language test (TIFALDI) - expressive subtest

Children's expressive language performance was measured with TIFALDI – expressive language (Berument & Güven, 2013). There are 80 pictures in this test. The name of these pictures was asked of them. They get 1 point for each correct answer.

2.2.7. Child tasks: Bear/dragon task

This task was used to measure the inhibitory control ability of children (Beck et al., 2009). Bears and dragons were in the original task, but in the recent study, cow and wolf puppets were used instead (Kochanska et al., 1996). A cow and a wolf were shown to the children with the following instruction: "This nice cow is our friend. You will do what the nice cow instructs you (e.g., *touch your nose*). However, this naughty wolf is not our friend. You will not do what the naughty wolf instructs you." After completing two practice trials, we gave the necessary feedback to the children until they were ready for the game. Regarding the testing phase, the order of presenting the puppets was as follows: BDDBDDDBDBDB (Bear: B, Dragon: D). Children must do what the bear says and should not do what the dragon says. If they did not do what the dragon said, they got 1 point for each command. Each child can get a maximum of 7 points from dragon comments (see Table 5).

Table 5
Bear/Dragon Task Comments

	Turkish	English
Bear	*Dilini çıkar.*	Stick out your tongue.
Dragon	*Dişine dokun.*	Touch your tooth.
Dragon	*Kulağına dokun.*	Touch your ear.
Bear	*El çırp.*	Clap your hands.
Dragon	*El çırp.*	Clap your hands.
Dragon	*Gözüne dokun.*	Touch your eye.
Dragon	*Omzuna dokun.*	Touch your shoulder.
Bear	*Burnuna dokun.*	Touch your nose.
Dragon	*Burnuna dokun.*	Touch your nose.
Bear	*Karnına dokun.*	Touch your belly.
Dragon	*El salla.*	Shake your hand.
Bear	*Başına dokun.*	Touch your head.

2.3. Procedure

The present study was conducted online, and the data was collected via the Zoom program. To inform families about the study, announcements were made through various channels. Families first filled out demographic information forms, and this way, their address information was obtained. In the first stage, tangram toys were sent to families to be able to conduct the research. After the toy reached the families, planning was made to meet with them, and until the meeting, children did not see or play with the toy. All families played with the toy for the first time during the interview. Four- and five-year-old children and their parents attended the study, and there was one session with three parts. In the first part, father-child dyads played with the tangram toy in the free and guided play game. After that, fathers narrated the picture-based story to their children. In the second part, mother-child dyads played the game and told the story similarly. The first and second parts of the session took approximately 30 minutes for mother-child and father-child dyads. After that, in the third part of the session, the children attended the session independently. The mothers were involved if there was any technical issue and the child needed help. In the child part, a story with pictures was first shown, and asked the children to tell a story. Then, two different stories were told, and asked counterfactual thinking questions. After that, their executive function was tested with the Bear/Dragon Stroop task. When they finished these tasks, we showed the causal verb production task and asked the explanations of all events from the children. In case of technical issues, mothers were also involved in the process. Apart from that, neither mothers nor fathers intervened with the children. After the interview was

completed, the results of TIFALDI – expressive language applied to children were reported back to the families. All children's tasks took approximately 30 minutes. All three parts of the session were held on the same day for all participants, and video recordings were made. Research assistants made transcriptions for whole sessions. After the transcriptions, data coding, and testing models were made. Finally, children participated in a party alone.

2.4. Data Coding

2.4.1. Causal language coding

After the data collection and transcription processes, the causal language coding was completed for the maternal and paternal play and story-telling tasks. Along with the parents, the causal production of children based on their story-telling task was made. Also, children's causal language production directed to the mother and father regarding the parent-child dyadic part of the session was coded. In this coding, causal connectives (e.g., *because, so*), lexical causal verbs (e.g., *open, put*), and morphological causal verbs (e.g., *ye-Dir*, 'make someone eat') used by parents and children were coded (Table 6).

Table 6
Causal Language Coding

Causal Language Components	Definition	Examples
Causal Connectors	These are conjunctions or phrases used to explain causal events.	He/she woke up late in the morning *because* he/she slept late at night. *If* you hit the glass, it will break.
Lexical Causatives	These are verbs that contain cause and effect in themselves.	*Throw*, *break*, *bend*, *open*, *put*, *pull*, etc.
Morphological Causatives	These are causal verbs created using suffixes.	Giy-*Dir* "to dress someone", İç-*ir* "make someone drink" Zıp-*lat* "make someone jump"

Two research assistants completed causal language coding. The main coder coded all the data, and the reliability coder coded 20% of the data. The Intraclass Correlations Coefficients (ICC) analyses were conducted to investigate the reliability between

coders. The two coders indicated high reliability for causal language coding (CI(%95)= .96 to .99, p<.01).

2.4.2. Linguistic complexity coding

On the other hand, the linguistic complexity coding of the parents was made for use as a control variable. Both free/guided play and story-telling sessions were coded for each parent. The components of linguistic complexity coding, their definitions, and examples are shown in Table 7. The main coder coded all the data regarding linguistic complexity, and the reliability coder coded 20% of the data. The Intraclass Correlations Coefficients (ICC) analyses were conducted to investigate the reliability between coders. The two coders indicated high reliability for linguistic complexity coding (CI(%95)= .95 to .99, p<.01).

Table 7
Linguistic Complexity Coding

Linguistic Complexity Coding Components	Definition	Examples
Simple Clause	a clause with one predicate	'Go forward (*ileri git*).'
Infinitival Clause	a clause with *-ma/-mak* construction (in Turkish)	'He woke up to go to school (*okula git-mek için uyanmış*).
Coordination Clause	two clauses with a conjunction such as 'and, 'so,' 'because.'	She was upset because her homework was broken (*üzüldü 'çünkü' ödevi kırıldı*).
Converb Clause	two clauses with *-ken, -ip, -ince, -a –a* conjunctions (in Turkish)	She fell down while she was going to school (*okula gider-ken yere düştü*).
Subordination Clause	two clauses with *-an, -mış, -sa, -dığı, -dıktan sonra* conjunctions (in Turkish)	The teacher was angry with Ali who came to school late (*öğretmeni okula geç gel-en Ali'ye kızgınmış*).
Main Clause	the predicate of a sentence with at least one conjunction	He woke up and went to school (*uyandı ve okula 'gitti').*

2.4.3. Causal verb production coding

In addition, children's causal verb production task scores were calculated. A coding scheme with four important variables was used. Lexical and morphological verbs were essential for the coding according to the children's answers for each causal event video. Their answer for these two categories was coded, and if the answer included a noncausal verb, it went to the noncausal verb category. Finally, the accuracy of the answers was coded. If the child explained the videos correctly, they get 1 point for each. For example, some answers needed to explain the target causal event correctly, even

though they included a causal verb. So, this type of answer did not get the point for accuracy to the child. Details of coding showed in Table 8.

Table 8
Causal Verb Production Coding

Causal Verb Production Coding Components	Definition	Examples
Lexical Verb	These causal verbs contain cause and effect in themselves.	Kapıyı açtı. '*She opened the door.*'
Morphological Verb	These causal verbs are created using suffixes.	Çocuğu Girardi. '*She made him dressed.*'
Noncausal Verb	These verbs do not contain cause and effect.	Çocuk geldi. '*The child came.*'
Verb Accuracy	These verbs are the same or at least similar (zıplatmak/hoplatmak '*make someone jump/bounce*') to the target verbs.	Target verb: Çekmek (*pull*) Accurate answer: Çocuğun saçını çekti (*She pull his hair*).

Two different scores were calculated from the children's answers to the causal verb production task. First, the causality score was obtained from the ratio of causal verbs to all verbs. Second, the accuracy score was calculated from the ratio of the accurate answers the children gave to all answers. Two research assistants completed causal language coding in line with the other coding procedures. The main coder coded all the data, and the reliability coder coded 20% of the data. The Intraclass Correlations Coefficients (ICC) analyses were conducted. According to the results, two coders indicated high reliability for causal verb production coding (CI(%95)= .98 to .99, $p<.01$).

Besides, the counterfactual thinking score was calculated from children's answers to the questions. They got 1 point for each correct answer and a maximum of 12 points. Also, children's executive function performance based on the executive function task was calculated.

2.5. Data Preparation

Paternal and maternal causal language inputs were determined from free play, guided play, and story-telling tasks and included causal conjunctions, lexical causatives, and morphological causatives. Likewise, paternal and maternal linguistic complexity, number of clauses, number of words, and duration scores were obtained from free play, guided play, and story-telling tasks. On the other hand, children's causal language directed to fathers is determined by the father-child dyadic part, and children's causal language directed to mothers is determined by the mother-child dyadic part. The other

causal production scores of children came from the child part without parents. Child causal language production in story-telling came from the story-telling task of children. Causality and accuracy scores came from the child causal verb production task.

2.6. Analysis Plan

Firstly, preliminary analyses were conducted to make sure whether there were children's gender or the parents' participation order differences. Intraclass Correlation Analysis was performed to calculate inter-rater reliability for the scores obtained through coding. Independent *t*-tests were conducted to examine whether children's gender affected the study's variables, including dependent and independent variables. Then, it was investigated whether the inclusion of fathers first in the study had any effect. For this purpose, linguistic complexity, number of clauses, number of words, and duration scores of mothers and fathers were compared using paired samples *t*-test. The correlation between the independent, dependent, and control variables planned to be included in the analyses was measured using Pearson correlation analysis. IBM SPSS Statistics 26 program was used for all preliminary analyses. To test the hypotheses, we performed hierarchical regression analyses using the SPSS version 26 (IBM, 2019). Also, three Path Analysis models were tested using MPlus version 7 software and showed in Appendix D (Muthén and Muthén, 2007).

3. RESULTS

3.1. Preliminary Analyses

Firstly, gender differences among the children were compared. Then, differences in general language input of mothers and fathers except from causal language were examined. The linguistic complexity, number of words, clauses, and duration of mothers and fathers were compared for these analyses. Lastly, the relationship between the independent, dependent, and control variables that were planned to be used during the hypothesis tests was examined through a correlation analysis.

3.1.1. Gender differences across variables

Independent t-tests were conducted for investigated gender differences. Gender effects on maternal/paternal causal language, child causal language directed to fathers/mothers, child causal language in the story-telling task, child counterfactual thinking, child causal verb production causality score, and accuracy scores were not significant (all *p*'s >.05). All analyses details are showed in Table 9.

Table 9
Gender Differences Across Variables

Variables	Female		Male		*t*	*p*
	N	*M (SD)*	N	*M (SD)*		
Paternal Causal Language	27	.342 (.066)	33	.332 (.054)	.634	.528
Maternal Causal Language	27	.314 (.047)	33	.313(.052)	.028	.978
Causal Verb Production Causality Score	27	.701 (.152)	33	.737 (.190)	-.796	.429
Causal Verb Production Accuracy	27	.476 (.172)	33	.464 (.228)	.230	.819
Child Causal Language in Story-Telling	27	.202 (.186)	32	.243 (.169)	-.895	.375
Child Causal Language Directed to Parents	27	.330 (.107)	33	.341 (.091)	-.415	.680
Child Causal Language Directed to Fathers	27	.343 (137)	33	.347 (.136)	-.113	.911
Child Causal Language Directed to Mothers	27	.323 (.134)	33	.337 (.098)	-.458	.649
Counterfactual Thinking	27	6.703 (3.123)	33	7.272 (2.577)	-.759	.452

3.1.2. Comparison of maternal and paternal language input

In order to investigate whether there were any differences in the language input of mothers and fathers, paired samples *t*-tests were conducted. For this purpose, the linguistic complexity scores from mothers and fathers were compared, and paired samples t-test was used for this comparison. The analysis revealed no significant difference between mothers and fathers regarding linguistic complexity, $t(59) = -.306$, $p = .761$. Since no significant difference was found, in the study we did not use linguistic

complexity as a control variable in the models which include both maternal and paternal causal language inputs. We only used linguistic complexity as a control variable in the models that focused on maternal and paternal causal language input separately.

Besides, mothers and fathers were also compared in terms of their different scores. In the procedure of the study, mothers and fathers were included in a certain order, and fathers always played with their children first. To control for the effect of this order, mothers and fathers were compared in terms of their different scores. To do this, the total number of clauses, total number of words, and duration (in seconds) from mothers and fathers were compared. The paired sample *t*-test revealed that there was no significant difference between mothers and fathers in terms of the total number of clauses, the total number of words, and duration, $t(59) = .230$, $p = .819$; $t(59) = .308$, $p = .759$; $t(59) = .878$, $p = .383$, respectively. The details of whole linguistic differences of parents showed in Table 10.

Table 10
Language Input Differences of Parents

Variables	Paternal Input (N=60)		Maternal Input (N=60)		*t*(59)	*p*	*Cohen's d*
	M	*SD*	*M*	*SD*			
Linguistic Complexity (%)	.297	.091	.300	.087	-.306	.761	-.039
Total Number of Clauses	197.816	76.628	195.150	82.213	.230	.819	-.029
Total Number of Words	715.450	285.792	702.283	295.574	.308	.759	.039
Duration (in sec)	742.916	184.642	713.650	250.010	.878	.383	.113

3.1.3. Relations between variables

We conducted zero-order Pearson correlation analyses for all variables. Results are presented in Table 11. There was a significant positive relationship between parental causal language and maternal causal language, $r(58) = .305$, $p = .018$. Similarly, there was a strong and significant positive relationship between total child causal language directed to parents and maternal causal language, and also paternal causal language, $r(58) = .400$, $p = .002$; $r(58) = .333$, $p = .009$, respectively. When we checked child-causal language directed to fathers and mothers separately, there was a positive and significant relationship between child-causal language directed to fathers and paternal causal language, $r(58) = .358$, $p = .005$. Also, child-causal language directed to mothers and maternal-causal language had a significant and positive relationship, $r(58) = .372$, *p*

= .003. Likewise, there was also a positive association between child-causal language directed to fathers and maternal-causal language, $r(58) = .264$, $p = .042$. However, we expected a relationship between child causal language production directed to the mother/father, and causal language production in the story-telling task for creating a composite score. But there was no significant relation between causal language directed to mother/father and causal language production in story-telling, all *p*'s > .05. So, we did not create a composite score, and we used causal language production in story-telling as a separate variable. There was also a strong and significant positive relationship between the causality and accuracy scores that children obtained from the causal verb production task, $r(58) = .745$, $p = .000$). When the variables related to children's counterfactual thinking scores were examined, it was found that only a significant relationship was found with the causal verb production task. A significant positive relationship existed between children's counterfactual thinking score and the causal verb production causality and accuracy scores, $r(58) = .323$, $p = .012$; $r(58) = .273$, $p = .035$, respectively.

On the other hand, the inhibitory control variable, which was planned to be added as a control variable in hypothesis testing, was found not to be related to the dependent or independent variables of the study (all *p*'s>.05). Children's inhibitory control scores were only significantly and positively associated with TIFALDI – expressive language and children's age, $r(58) = .311$, $p = .015$; $r(58) = .260$, $p = .045$, respectively. Inhibitory control, which does not affect the dependent or independent variables of the study, was not included as a control variable. However, due to the effect on other variables, TIFALDI – expressive language scores that measure children's expressive language proficiency, SES composite scores created with children's age in months, and family's socioeconomic and educational level were used as control variables for all hypotheses tests. TIFALDI – expressive language had a significant positive relationship with both the causal verb production causality and accuracy scores, $r(58) = .339$, $p = .008$; $r(58) = .374$, $p = .003$, respectively. Additionally, there was a strong and significant positive relationship between TIFALDI – expressive language and counterfactual thinking, $r(58) = .470$, $p = .000$. Children's TIFALDI – expressive language scores and age were also significantly positively related, $r(58) = .449$, $p = .000$.

Table 11

The Association Between All Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Paternal Causal Language	1														
2. Maternal Causal Language	.305*	1													
3. Causal Verb Production Causality Score	.043	-.059	1												
4. Causal Verb Production Accuracy	-.068	-.138	.745**	1											
5. Child Causal Language in Story-Telling	-.072	.097	.123	.468	1										
6. Child Causal Language Directed to Fathers	.358**	.264*	-.251	-.185	-.095	1									
7. Child Causal Language Directed to Mothers	.179	.372**	-.107	.036	-.134	.369**	1								
8. Child Causal Language Directed to Parents	.333**	.400**	-.200	-.078	-.140	.794**	.831**	1							
9. Counterfactual Thinking	-.123	-.207	.323*	.273*	.213	-.103	-.224	-.201	1						
10. Paternal Linguistic Complexity	.012	-.022	.309*	.182	.250	-.015	.081	.061	.170	1					
11. Maternal Linguistic Complexity	-.092	.128	.189	.095	.119	.017	.230	.123	.253	.491***	1				
12. Inhibitory Control	-.199	.090	.088	.154	.122	.023	.097	.070	.149	.048	.294*	1			
13. TIFALDI – Expressive Language	-.120	-.075	.339**	.374**	.230	-.105	.101	.006	.470**	.286*	.364**	.311*	1		
14. Child -Age in Months	.116	.002	.290*	.207	.044	-.060	.022	-.021	.269*	.196	-.003	.260*	.449**	1	
15. SES Composite	-.311*	-.200	.002	.165	.147	-.152	-.119	-.135	.048	.155	.120	.084	.109	-.155	1

*p<.05 **p<.01

3.2. Descriptive Statistics for All Variables

The descriptive statistics scores of the independent, dependent, and control variables are presented in Table 12. The skewness and kurtosis values of the variables are within the normal range. However, while all variables represent the entire sample, only the child causal language story-telling variable is presented with one missing participant due to needing to perform this task.

Table 12
Descriptive Statistics Across Variables

Variable	N	Mean	Std.	Max	Min	Skewness	Kurtosis
Paternal Causal Language	60	.336	.059	.467	.209	.417	-.051
Maternal Causal Language	60	.314	.049	.443	.212	.110	-.352
Causal Verb Production Causality Score	60	.720	.174	1	.250	-.729	.206
Causal Verb Production Accuracy	60	.469	.203	.880	.000	.084	-.497
Child Causal Language in Story-Telling	59	.224	.177	1	.000	1.478	4.893
Child Causal Language Directed to Parents	60	.336	.098	.589	.134	.364	-.033
Child Causal Language Directed to Fathers	60	.345	.135	.750	.100	.649	.115
Child Causal Language Directed to Mothers	60	.330	.115	.654	.060	.468	1.080
Counterfactual Thinking	60	7.016	2.825	12	.000	-.442	-.469
Paternal Linguistic Complexity	60	.297	.091	.567	.120	.758	.559
Maternal Linguistic Complexity	60	.301	.087	.577	.103	.452	1.220
TIFALDI – Expressive Language	60	53.216	9.822	70	27	-.507	-.022
Age of Child	60	56.883	6.517	71	48	.265	-.907
SES Composite	60	.000	.836	1.337	-2.745	-.802	1.242

3.2.1. Comparison of maternal and paternal causal language inputs

The study's first hypothesis was aimed to investigate differences between maternal and paternal causal language. We conducted paired samples *t*-tests[1] and compared paternal and maternal causal language inputs in total and also in different tasks (H_1). The paired samples *t*-test showed a significant difference between mothers and fathers regarding the total causal language scores, $t(59) = 2.710$, $p = .009$. When the means were examined, it was observed that fathers ($M = .336$, $SD = .059$) used more causal language than mothers ($M = .314$, $SD = .049$) to their children. We conducted another paired samples *t*-tests to investigate the source of this difference. Results indicated that maternal and paternal causal language input in story-telling and guided play tasks were

[1] For post hoc comparisons, a Bonferroni correction was used (Holm, 1979) with a corrected alpha: (1−(1−.05) 1/4=.0125)

not different, $t(59) = .285$, $p = .777$; $t(59) = -.030$, $p = .976$, respectively. There is a significant difference between fathers and mothers in causal language input only for free play task, $t(59) = 3.139$, $p = .003$. Fathers ($M = .404$, $SD = .092$) used more causal language in free play than mothers ($M = .353$, $SD = .086$). Details of the analyses are shown in Table 13.

Table 13
Maternal and Paternal Causal Language Input Differences

Variables	Paternal Input (N=60)		Maternal Input (N=60)		*t*(59)	*p*	*Cohen's d*
	M	*SD*	*M*	*SD*			
Total Causal Language	.336	.059	.314	.049	2.710	.009**	.350
Causal Language in Free Play	.404	.092	.353	.086	3.139	.003**	.405
Causal Language in Guided Play	.341	.104	.341	.104	-.030	.976	-.003
Causal Language in Story-Telling	.251	.076	.248	.068	.285	.777	.036

*$p<.05$ **$p<.01$

3.2.2. Relations between maternal causal language input and child causal language directed to mother

The association between maternal causal language input and child causal language outcome directed to the mother was investigated (H_2). A hierarchical regression analysis was conducted for this aim, and child causal language directed to the mother was the outcome variable. The child's age and the SES composite score were control variables included in the first model. In the second model, TIFALDI was added as another control variable. Maternal linguistic complexity was added in the third model as a control variable. Finally, in the fourth model, maternal causal language was included as a predictor. According to the results, the first model only explained 01% of the total variance and was not significant, $F(2, 57) = .411$, $p = .665$. In the second step, TIFALDI was introduced to the model. The second model explained 03% of the variance and was not significant, $F(3, 56) = .593$, $p = .622$. TIFALDI did not improve the model significantly, $\Delta R^2 = .01$, $F(1, 56) = .958$, $p = .332$. The third model explained 07% of the total variance and was not significant, $F(4, 55) = 1.128$, $p = .353$. Maternal linguistic complexity did not improve the model significantly, $\Delta R^2 = .04$, $F(1, 55) = 2.681$, $p = .107$. In the fourth model, maternal causal language input was introduced to the model, and the model was significant, $F(5, 54) = 2.418$, $p = .047$. Maternal causal language input improved the model significantly, $\Delta R^2 = .10$, $F(1, 54) = 7.078$, $p = .010$. The fourth model explained 18% of the total variance and maternal causal language input

positively associated with child causal language directed to the mother, β = .340, p = .010 (see Table 14).

Table 14
Relations Between Maternal Causal Language Input and Child Causal Language Directed to Mother

Outcome: Child Causal Language Directed to Mother					
Step	R^2	F-Change	SE	β	p
1	.014	.411			
Age			.002	.003	.981
SES Composite			.018	-.118	.376
2	.030	.958			
Age			.002	-.067	.660
SES Composite			.018	-.145	.289
TIFALDI – Expressive Language			.001	.147	.332
3	.075	2.681			
Age			.002	-.020	.891
SES Composite			.018	-.0154	.253
TIFALDI – Expressive Language			.001	.042	.792
Maternal Linguistic Complexity			.187	.232	.107
4	.182	7.078*			
Age			.002	-.033	.819
SES Composite			.017	-.085	.513
TIFALDI – Expressive Language			.001	.091	.555
Maternal Linguistic Complexity			.181	.163	.240
Maternal Causal Language			.292	.340	.010*

*p<.05 **p<.01

3.2.3. Relations between paternal causal language input and child causal language directed to father

We conducted a hierarchical regression analysis to examine the relationship between paternal causal language input and child causal language outcome directed to the father (H_3). The outcome variable was the child's causal language directed to the father. In the first step, age and SES composite were included in the model as control variables. TIFALDI was introduced to the model as a control variable in the second step. Paternal linguistic complexity was added to the model as a control variable in the third step. Finally, paternal causal language is included in the model as a predictor in the fourth step. According to the results, the first model explained 03% of the variance and was not significant, $F(2, 57)$ = .895, p = .414. The second model explained 03% of the variance and was not significant either, $F(3, 56)$ = .646, p = .589. TIFALDI did not

improve the model significantly, ΔR^2 = .003, F(1, 56) = .174, p = .678. The third model explained 03% of the model with paternal linguistic complexity and was not significant, F(4, 55) = .499, p = .736. Finally, the fourth model explained 14% of the total variance and was still insignificant, F(5, 54) = 1.794, p = .130. However, paternal causal language input significantly improved the fourth model, ΔR^2 = .107, F(1, 54) = 6.763, p = .012. Paternal causal language input is positively associated with children's causal language outcome directed to the father, β = .351, p = .011 (see Table 15).

Table 15
Relations Between Paternal Causal Language Input and Child Causal Language Directed to Father

Outcome: Child Causal Language Directed to Father					
Step	R^2	F-Change	SE	β	p
1	.030	.895			
Age			.002	-.086	.518
SES Composite			.021	-.165	.215
2	.033	.173			
Age			.003	-.056	.712
SES Composite			.021	-.154	.261
TIFALDI – Expressive Language			.002	-.062	.678
3	.035	.091			
Age			.003	-.061	.691
SES Composite			.022	-.160	.251
TIFALDI – Expressive Language			.002	-.071	.644
Paternal Linguistic Complexity			.206	.042	.764
4	.142	6.763*			
Age			.003	-.108	.464
SES Composite			.022	-.061	.657
TIFALDI – Expressive Language			.002	-.011	.938
Paternal Linguistic Complexity			.197	.014	.912
Paternal Causal Language			.305	.350	.012*

*p<.05 **p<.01

3.2.4. Relations between child-causal language directed to father/mother and counterfactual thinking

A hierarchical regression analysis investigated how children's causal language directed to mothers and fathers predicts their counterfactual thinking (H_4). The child's counterfactual thinking was the outcome variable, while the child's causal language directed to fathers and mothers was the predictor. In the first step, the child's age and the SES composite score were included in the model as control variables. In the second

step, we introduced TIFALDI as a control variable to the model. In the third step, child causal language directed to fathers and mothers was added as predictors to the model, respectively. The analysis showed that the model was not significant in the first step and only explained 08% of the total variance, $F(2, 57) = 2.490$, $p = .092$. The child's age and the child's counterfactual thinking were positively associated in the first step, $\beta = .283$, $p = .032$. In the second model, TIFALDI significantly improved the model, $\Delta R^2 = .14$, $F(1,56) = 10.430$, $p = .002$. The second model explained 22% of the variance, $F(3,56) = 5.410$, $p = .002$. There was a positive association between TIFADI and counterfactual thinking, $\beta = .434$, $p = .002$. However, the second model's relationship between the child's age and counterfactual thinking disappeared. Finally, we involved predictors to the model in the third step. Child causal language directed to the father and mother improved the model significantly, $\Delta R^2 = .07$, $F(2,54) = 2.980$, $p = .059$. In the third model, predictors explained 30% of the total variance, $F(5,54) = 4.670$, $p = .001$. There was still an association between TIFALDI and counterfactual thinking, $\beta = .481$, $p < .001$. Also, only child causal language directed to mothers has negatively associated with child counterfactual thinking, $\beta = -.298$, $p = .020$. Analysis details are presented in Table 16.

Table 16
Relations Between Child-Causal Language Directed to Father/Mother and Counterfactual Thinking

Outcome: Child Counterfactual Thinking					
Step		R^2	F-Change	SE	β	p
1		.080	2.490			
	Age			.055	.122	.032*
	SES Composite			.434	.308	.480
2		.224	10.430**			
	Age			.058	.032	.577
	SES Composite			.410	.040	.922
	TIFALDI – Expressive Language			.038	.124	.002**
3		.302	2.980**			
	Age			.056	.025	.654
	SES Composite			.402	-.076	.850
	TIFALDI – Expressive Language			.037	.138	<.001**
	Child Causal Language Directed to Fathers			2.598	1.204	.645
	Child Causal Language Directed to Mothers			3.048	-7.315	.020*

*p<.05 **p<.01

3.2.5. Relations between paternal/maternal causal language input and child causal language production in story-telling

To investigate whether maternal and paternal causal language inputs are associated with a child's causal language outcome (H_5), the causal language score obtained from the child's story-telling directed toward the researcher was used as the outcome variable in this analysis. The age of the child and SES composite, which were control variables in the study, were added to the first model, and TIFALDI was added to the second model as a control variable. Finally, paternal and maternal causal language inputs were included as predictors in the third model. According to hierarchical regression analysis, the first model explained only 02% of the variance and was not significant, $F(2, 56) = .754$, $p = .475$. Likewise, the second model was not significant and explained 07% of the total variance, $F(3, 55) = 1.395$, $p = .254$. TIFALDI did not improve the model in the second step, $\Delta R^2 = .044$, $F(1, 55) = 2.635$, $p = .110$. The third model explained only 09% of the model and was not significant, $F(5, 53) = 1.073$, $p = .386$. Paternal and maternal causal language inputs did not improve the model as predictors, $\Delta R^2 = .021$, $F(2, 53) = .618$, $p = .543$. Details showed in Table 17.

Table 17
Relations Between Paternal/Maternal Causal Language Input and Child Causal Language Production in Story-Telling

Outcome: Child Causal Language in Story-Telling					
Step	R^2	F-Change	SE	β	p
1	.02	.754			
Age			.001	.068	.612
SES Composite			.033	.157	.243
2	.07	2.635			
Age			.004	-.051	.732
SES Composite			.028	.116	.387
TIFALDI – Expressive Language			.002	.243	.110
3	.09	.618			
Age			.004	-.043	.777
SES Composite			.029	.132	.351
TIFALDI – Expressive Language			.002	.242	.116
Paternal Causal Language			.428	-.051	.722
Maternal Causal Language			.489	.153	.272

*p<.05 **p<.01

3.2.6. Relations between paternal/maternal causal language input and child causality score

The causal verb production task examined the association between maternal and paternal causal language input and children's causal language production (H_6). For this purpose, a hierarchical regression analysis was conducted, and the causality score obtained from the task was added to the model as an outcome variable. In the first model, the age of the child and SES composite were included, while TIFALDI was added in the second model. Paternal and maternal causal language input, which were the predictors of the model, were added in the third model. The analysis showed that the first model explained 08% of the variance and was not significant, $F(2, 57) = 2.690$, $p = .076$). However, the child's age was positively associated with the causality score of a child, $\beta = .297$, $p = .024$. The second model explained 13% of the variance and was significant, $F(3, 56) = 3.000$, $p = .038$). However, TIFALDI did not improve the second model significantly, $\Delta R^2 = .052$, $F(1, 56) = 3.395$, $p = .071$. The significant association between child causality score and age disappeared in the second model, $\beta = .173$, $p = .231$. The third model explained 14% of the model; it was not significant, $F(5, 54) = 1.840$, $p = .121$. Paternal and maternal causal language inputs did not improve the model significantly, $\Delta R^2 = .006$, $F(2, 54) = .212$, $p = .809$. Details are shown in Table 18.

Table 18
Relations Between Paternal/Maternal Causal Language Input and Child Causality Score

Outcome: Child Causal Verb Production Causality Score						
Step		R^2	F-Change	SE	β	p
1		.08	2.690			
	Age			.003	.297	.024*
	SES Composite			.026	.048	.707
2		.13	3.395			
	Age			.003	.173	.231
	SES Composite			.026	5.34	.997
	TIFALDI – Expressive Language			.002	.261	.071
3		.14	.212			
	Age			.003	.161	.275
	SES Composite			.028	.009	.942
	TIFALDI – Expressive Language			.002	.270	.068
	Paternal Causal Language			.405	.078	.574
	Maternal Causal Language			.465	-.061	.648

*p<.05 **p<.01

3.2.7. Relations between paternal/maternal causal language input and child causal verb production accuracy score

Like the above analysis, the accuracy score obtained from the causal verb production task was added to the model as an outcome variable (H_6). The child's age and the SES composite were included in the first model as control variables. Likewise, TIFALDI was added in the second model. Finally, paternal and maternal causal language inputs were added in the third model as predictors. The results of the hierarchical regression analysis showed that the first model only explained 08% of the variance and was not significant, $F(2, 57) = 2.570$, $p = .085$. The second model was significant and explained 16% of the variance, $F(3, 56) = 3.570$, $p = .019$. TIFALDI is associated with child accuracy score, $\beta = .319$, $p = .026$, and improved the model significantly, $\Delta R^2 = .078$, $F(1, 56) = 5.204$, $p = .026$. However, the third model was not significant and still explained 16% of the variance, $F(5, 54) = 2.200$, $p = .068$. Paternal and maternal causal language inputs did not improve the model, $\Delta R^2 = .008$, $F(2, 54) = .274$, $p = .761$. In the third model, TIFALDI is still significantly associated with child accuracy score, $\beta = .319$, $p = .030$. Details are presented in Table 19.

Table 19
Relations Between Paternal/Maternal Causal Language Input and Child Accuracy Score

Outcome: Child Causal Verb Production Accuracy Score						
Step		R^2	F-Change	SE	β	p
1		.08	2.570			
	Age			.004	.239	.068
	SES Composite			.031	.202	.122
2		.16	5.204*			
	Age			.004	.086	.542
	SES Composite			.030	.143	.262
	TIFALDI – Expressive Language			.002	.319	.026*
3		.16	.274			
	Age			.004	.081	.575
	SES Composite			.032	.133	.326
	TIFALDI – Expressive Language			.002	.319	.030*
	Paternal Causal Language			.468	.031	.818
	Maternal Causal Language			.537	-.097	.463

*p<.05 **p<.01

3.2.8. Relations between child causality/accuracy scores and counterfactual thinking

To investigate the relationship between child causality and accuracy scores with counterfactual thinking, we conducted a hierarchical regression (H_7). The outcome variable was counterfactual thinking. In the first step, we added age and SES composite to the model as control variables. In the second step, we introduced TIFALDI as another control variable. In the final step, we added child causality and accuracy scores to the model as predictors. According to the results, the first model was not significant, $F(2, 57) = 2.490$, $p = .092$. However, age and counterfactual thinking had a positive association, $\beta = .283$, $p = .032$. The second model explained 22% of the variance and was significant, $F(3, 56) = 5.410$, $p = .002$. TIFALDI improved the model significantly, $\Delta R^2 = .14$, $F(1, 56) = 10.430$, $p = .002$. There was a positive association between TIFALDI and counterfactual thinking, $\beta = .434$, $p = .002$. However, the relation between age and counterfactual thinking disappeared in the second model, $\beta = .075$, $p = .577$. In the final step, we introduced child causality and accuracy scores to the model, and predictors did not improve the model, $\Delta R^2 = .02$, $F(2, 54) = 1.020$, $p = .367$. However, the third model explained 25% of the total variance, and it was significant, $F(5, 54) = 3.660$, $p = .006$. There was still a positive association between TIFALDI and counterfactual thinking, $\beta = .393$, $p = .007$ (see Table 20).

Table 20
Relations Between Child Causality/Accuracy Scores and Counterfactual Thinking

Outcome: Child Counterfactual Thinking					
Step	R^2	F-Change	SE	β	p
1	.080	2.490			
Age			.055	.283	.032*
SES Composite			.434	.091	.480
2	.224	10.430**			
Age			.058	.075	.577
SES Composite			.410	.011	.922
TIFALDI – Expressive Language			.038	.434	.002**
3	.253	1.020			
Age			.059	.043	.753
SES Composite			.419	.017	.887
TIFALDI – Expressive Language			.040	.393	.007**
Child Causality Score			2.958	.208	.259
Child Accuracy Score			2.558	-.041	.825

*p<.05 **p<.01

3.2.9. Relations between paternal/maternal causal language input and counterfactual thinking

The present study investigated whether paternal and maternal causal language input is associated with child counterfactual thinking (H_8). For this purpose, child counterfactual thinking was used as the outcome variable in the hierarchical regression analysis. The child's age and SES composite were included in the first model, while TIFALDI was added in the second model as control variables. The predictors were added to the model in the third step. The analysis showed that the first model explained 08% of the variance and was not significant, $F(2, 57) = 2.490$, $p = .092$. However, child age was positively associated with counterfactual thinking, $\beta = .283$, $p = .032$. In the second model, 22% of the variance was explained, and the model was significant, $F(3, 56) = 5.41$, $p = .002$. TIFALDI positively associated with counterfactual thinking, $\beta = .434$, $p = .002$, and significantly improved the model, $\Delta R^2 = .144$, $F(1, 56) = 10.43$, $p = .002$. The relation between age and counterfactual thinking disappeared in the second model, $\beta = .075$, $p = .577$. The third model with predictors explained 25% of the total variance and was significant, $F(5, 54) = 3.740$, $p = .006$. TIFALDI is still associated with counterfactual thinking, $\beta = .419$, $p = .003$. However, predictors did not improve the model significantly, $\Delta R^2 = .032$, $F(2, 54) = 1.180$, $p = .315$. Details showed in Table 21.

Table 21
Relations Between Paternal/Maternal Causal Language Input and Counterfactual Thinking

Outcome: Child Counterfactual Thinking					
Step	R^2	F-Change	SE	β	p
1	.08	2.490			
Age			.055	.283	.032*
SES Composite			.434	.091	.434
2	.22	10.430**			
Age			.058	.075	.577
SES Composite			.410	.011	.922
TIFALDI – Expressive Language			.038	.434	.002**
3	.25	1.180			
Age			.059	.080	.556
SES Composite			.428	-.032	.800
TIFALDI – Expressive Language			.039	.419	.003**
Paternal Causal Language			6.134	-.039	.760
Maternal Causal Language			7.048	-.170	.175

*p<.05 **p<.01

4. DISCUSSION

The main purposes of this thesis were to examine the differences between paternal and maternal causal language, investigate the association between paternal/maternal causal language inputs and children's causal language production, as well as counterfactual thinking, and analyze the relationship between children's causal language production and their counterfactual thinking. Considering these purposes, we asked four questions: (1) How does maternal and paternal causal language input differ? (2) Are maternal and paternal causal language inputs associated with children's causal language production? (3) Is children's causal language production performance associated with their counterfactual thinking? (4) Are maternal and paternal causal language inputs associated with counterfactual thinking? We used a design including mothers, fathers, and their children to investigate the research questions mentioned above. In order to minimize the bidirectional influence of parents on one another, separate sessions of father-child and mother-child were completed. On the other hand, children attended the research with their parents in order and also alone. With the help of this design, we easily focused on paternal and maternal causal language differences, parents' causal language input to their child, and children's causal language production and counterfactual thinking.

Based on the participant' data, we tested eight hypotheses. According to the results, fathers used more causal language directed to their children in free play than mothers. Also, paternal causal language input was positively associated with child causal language production directed to the father. Likewise, maternal causal language input was positively associated with child causal language production directed to the mother. However, we found that only child causal language directed to the mother was negatively associated with counterfactual thinking. Maternal and paternal causal language inputs did not associate with the child's production scores from causal verb production tasks and story-telling tasks. Finally, contrary to what we expected, only maternal causal language input was negatively associated with child counterfactual thinking. We discussed in detail the study's findings and whether the hypotheses were confirmed. Also, we argued our results with similar studies in the literature regarding similarities and differences.

4.1 Maternal and Paternal Causal Language Input Differences

The first research question was how maternal and paternal causal language input differs. We tested our first hypothesis for investigating the differences between maternal and paternal causal language inputs. According to the analysis, fathers used more causal language structures than mothers only in free play. The results from the preliminary analysis, which include maternal and paternal causal language differences, support this finding. We compared mothers' and fathers' total number of words used, total clauses, duration, and linguistic complexity for all tasks. As a result of this comparison, we found that mothers and fathers completed the tasks in a similar amount of time, and there was no difference in terms of duration. Similarly, there was no difference in the total number of words and clauses used by mothers and fathers, and the language complexity used was also found to be similar. Considering these findings, it can be said that mothers and fathers completed the tasks using similar language complexity, similar total words/clauses, and in a similar amount of time.

Contrary to the preliminary findings of the current study, some studies indicate that mother and father language inputs differ significantly, and mothers use more words and more complex language towards their children (Davidson & Snow, 1996; Leaper et al., 1998; McLaughlin et al., 1983; Shapiro et al., 2021). On the other hand, the findings from the current study about mothers and fathers using a similar amount of words and complexity are in a different place than the literature in this regard. However, Rowe et al. (2004) found no difference between mothers and fathers similar to our current study. They found no differences between maternal and paternal language input regarding linguistic complexity and length of utterance. Likewise, the present study shows no difference between mothers and fathers in terms of linguistic complexity, total words/clauses, and duration.

On the other hand, findings reveal that paternal causal language input is more than maternal causal language input only in free play. However, maternal and paternal language input is similar in terms of words, clauses, and duration. When comparing our findings from maternal and paternal language input studies, there are some similarities and differences with the findings in the literature. Despite the scarcity of the number of studies, the majority of the findings demonstrate that maternal and paternal language

inputs are similar (Malone & Guy, 1982; Rowe et al., 2004; Tamis-LeMonda et al., 2004). Additionally, in the study, fathers spoke less than mothers in triadic sessions, but in the current study, there was no difference between mothers' and fathers' total amount of language input. A more recent study conducted by LaBounty et al. (2008) found a difference between mothers and fathers in terms of making causal inferences. They collected data from preschoolers and their parents in a separate mother-child and father-child design. This study aimed to investigate the relation between children's emotion understanding and theory of mind skills. Also, they focused on maternal and paternal causal language input differences in terms of causal explanatory language that refers to emotions and desires. According to the results, mothers made more emotional causal explanations than fathers. Due to mothers using more emotional inferences directed at their children in daily life, their causal explanations in the emotional narratives were more effective than fathers. Although the focus was not on specific emotional narration, the causal language inputs were also compared in the current study. However, the current study found paternal causal language input more than mothers.

4.2. Maternal and Paternal Causal Language Inputs and Children's Causal Language Production

The relationship between maternal causal language input and child causal language production directed to the mother was examined, and a positive association between them was assumed (H_2). According to the results, maternal causal language input was positively associated with child causal language production directed to the mother. Thus, this hypothesis was confirmed. Similar studies in the literature support this finding. Van Veen and colleagues (2009, 2013) implemented two growth curve analyses in order to investigate the association between parental *wh*-questions and children's causal connective production. Results indicated that the child's causal connective production increased as parents used more causal connectives. Also, some studies focusing on parents' *wh*-question input indicated that it is positively associated with child *wh*-question production (Hood et al., 1979; McCabe & Peterson, 1997). These similar studies' results support this finding. Although the current study focused on child causal language production, studies in the literature show that as maternal causal language input increases, so does a child's causal verb comprehension (Aktan-Erciyes & Göksun, 2023; Alvarez & Booth, 2016; Booth et al., 2020). In light of these findings, it

can be said that maternal causal language input is influential and associated with children's causal language production.

For our third hypothesis, we expected a positive association between paternal causal language input and child causal language production directed to the father (H_3). According to the results, paternal causal language input was positively associated with child causal language production directed to fathers. Thus this hypothesis was confirmed. Although studies conducted for similar purposes are limited in the literature, it is possible to refer to a few studies that support this finding. In the study by Rowe et al. (2017), only *wh*-questions used by fathers were related to children's vocabulary and reasoning outcomes. Similarly, in another study focusing on *wh*-questions used by fathers, it was found that these questions, including causal expressions in themselves, were related to children's vocabulary (Leech et al., 2013). Similarly, two growth curve analyses focusing on parental causal connective inputs showed that children's causal connective production increases with parents using more causal connectives (Van Veen et al., 2009, 2013). These findings indicated that both maternal and paternal causal connective input is associated with children's causal connective production.

The relationship between child causal language production with maternal and paternal causal language input was also examined. To investigate this, we initially planned to form a composite score taking child causal language in story-telling, child causal verb production causality, and accuracy scores. However, there was no significant correlation, thus, scores were considered separately. Results indicated that contrary to expectations (H_5), there was no relationship between the causal language score obtained from the story-telling task, in which children participated alone, and the maternal/paternal causal language inputs for play sessions. On the other hand, we focused on causality and accuracy scores obtained from the causal verb production task, in which children participated alone. The positive association between maternal and paternal causal language inputs and child causal verb production causality and accuracy scores was expected (H_6). Analyses results showed that there was no relationship between the paternal causal language input and child causal verb production causality/accuracy scores. Similarly, the association between maternal causal language and causal verb production causality/accuracy scores was not significant. When

examining the studies in the literature, it is observed that quite limited studies specifically investigate the connection between causal language input and production. Therefore, it would be beneficial to consider these findings in a broader context. For example, some studies did not find a link between maternal language input and child vocabulary level, and present findings are consistent with these studies (Rome-Flanders et al., 1995). However, some studies showed that parental causal connective input is positively associated with child causal connective production and acquisition (Van Veen et al., 2009, 2013; Van Veen, 2011). Also, parental *wh*-question input was positively associated with children's *wh*-question production (Hood et al., 1979; McCabe & Peterson, 1997). Parental *wh*-questions require sometimes explaining with causal connections such as *because* and should increase child causal language production. However, the present findings are outside these studies from the literature. One reason might be about the features of tasks. On the one hand, children did not produce a detailed story in the story-telling task, and we had to code causal language coding from a weak narrative. On the other hand, children may struggle with the complexity of causal verb production tasks. When we examine it in detail, we can see there is only 47% overall accuracy. More than half of the children failed the task regarding accuracy score. Also, children had only 5 or 6 seconds for each scene to watch, and they could fail in this short time period. Because of these possible explanations, they may be unable to demonstrate their performance.

4.3. Children's Causal Language Production and Counterfactual Thinking

We investigated the association between child causal language production directed to the mother/father and counterfactual thinking (H_4). Findings indicated that child causal language directed to the father was not associated with child counterfactual thinking. On the other hand, child causal language directed to the mother has negatively associated with child counterfactual thinking. One potential explanation for this finding is that mothers might have facilitated children's counterfactual thinking with more engagement in conversation. As maternal causal language input increases child's causal language directed to the mother also increases. However, the inclusive conversation of mothers may be a dominant factor for children since children have difficulty in thinking of other possible consequences and counterfactual thinking. Also, there was the effect of

expressive language performance on child counterfactual thinking even though it was controlled. Expressive language skills are highly associated with the child's counterfactual thinking and may become an efficient factor. When we check the literature, we see only a few studies focusing on language skills and counterfactual thinking. According to Byrne (2005) and Murcia (2016), language proficiency creates advantages for counterfactual thinking. Language allows expressing conditional statements and using some model verbs such as "might" and "could". Proficiency in these expressions helps children with counterfactual thinking. This study supports our finding that expressive language and counterfactual thinking are positively associated.

On the other hand, we expected a positive association between child causal verb production causality/accuracy scores and counterfactual thinking (H_7). According to the results, neither the causal verb production causality score nor the causal verb production accuracy score was associated with counterfactual thinking. A possible explanation for this finding is that the causal verb production causality and accuracy scores only measure children's ability to use causal verbs and correctly identify the target verb. However, using causal conjunctions is particularly associated with understanding causal connections (Hood et al., 1979; McCabe & Peterson, 1997). Therefore, the lack of the expected relationship with counterfactual thinking may be indirectly related to the content of the task.

4.4. Maternal and Paternal Causal Language Inputs and Child Counterfactual Thinking

Finally, we investigated and expected a positive association between maternal/paternal causal language inputs and child counterfactual thinking (H_8). Results indicated that paternal causal language input was not associated with child counterfactual thinking. Likewise, there was no significant association between maternal causal language input and child counterfactual thinking. There were a few studies focused on parental language input and children's thinking processes. For example, Daubert and colleagues (2020) found that asking children pedagogical questions can develop their critical thinking and causal learning skills. From this perspective, open-ended questions used by parents will enhance children's ability to think about alternative possibilities, i.e., counterfactual thinking. However, contrary to our expectations that the causal language

inputs of parents, including open-ended questions with the help of causal conjunctions, would have an impact, only mothers have a negative association with child counterfactual thinking. We also found a negative association between child causal language directed to the mother and counterfactual thinking. Like this finding and its possible explanations, the mother's intensive use of causal language might create a dominant environment for the child, which can increase the child's causal language production but also hinder the child's ability to think counterfactually and consider alternative possibilities. On the other hand, we did not find any positive or negative effect of fathers' intensive causal language input on child counterfactual thinking. It is possible that fathers do not act as a barrier to child counterfactual thinking, despite providing intensive causal language input.

5. CONCLUSION

There were four main aims of the current study. The first one was to investigate the differences between maternal and paternal causal language. We found that paternal causal language input was more than maternal causal language input, although their linguistic complexity, number of words/clauses, and task duration were similar. Our second aim was to examine the association between maternal/paternal causal language inputs and children's causal language production. We found that maternal causal language input was positively related to children's causal language directed to the mother. And paternal causal language input was positively related to children's causal language directed to the father. However, we found no association between maternal/paternal causal language input and children's causal language production in story-telling or causal verb production causality/accuracy scores. Our third aim was to investigate the association between children's causal language production and counterfactual thinking. We found that there was no association between causal verb production causality/accuracy scores and counterfactual thinking. However, only child causal language directed to mothers has negatively associated with child counterfactual thinking. The final aim of current study was to examine the association between maternal/paternal causal language input and child counterfactual thinking. Only maternal causal language input was associated with child counterfactual thinking.

This research's findings fill some gaps in the literature. For instance, most studies investigating parent-child interaction in, specifically language contexts, only focus on mothers. With this study, the role of fathers in language development has been revealed. Additionally, a new study has been added to the literature focusing on the differences between maternal and paternal language. Moreover, the study has demonstrated the simultaneous association of mothers and fathers to child language production and counterfactual thinking, which has been limited in previous studies that only examine the interaction between causal reasoning and counterfactual thinking. This current study not only presents the interaction between maternal/paternal causal language input and counterfactual thinking but also shows the interaction between child causal language production and counterfactual thinking. Maternal and paternal causal language inputs were obtained in different tasks and contexts, such as free play, guided play, and story-

telling, which makes the content of the study rich. In addition, child causal language production was measured in various contexts and tasks.

There are also some limitations of the present study. For example, fathers always participated in the research in the first order, and mothers were included in the second. Even though we checked the linguistic differences between mothers and fathers, making a counterbalance between mothers and fathers was needed. It would be reasonable to eliminate this limitation in future studies. Another suggestion for future studies is to focus on *wh*-questions when investigating the relationship between causal language production and counterfactual thinking. Additionally, looking at causal language comprehension along with causal language production will strengthen the findings.

Overall, the current study makes significant contributions to the existing literature by addressing gaps in knowledge about paternal language input, the association between causal language and counterfactual thinking and providing insights into parent-child interaction, language development, and counterfactual thinking. It highlights the previously overlooked role of fathers in language development, emphasizing the need to include both parents in research. The study's rich content, including data from various tasks and contexts, enhances the breadth and depth of the findings.

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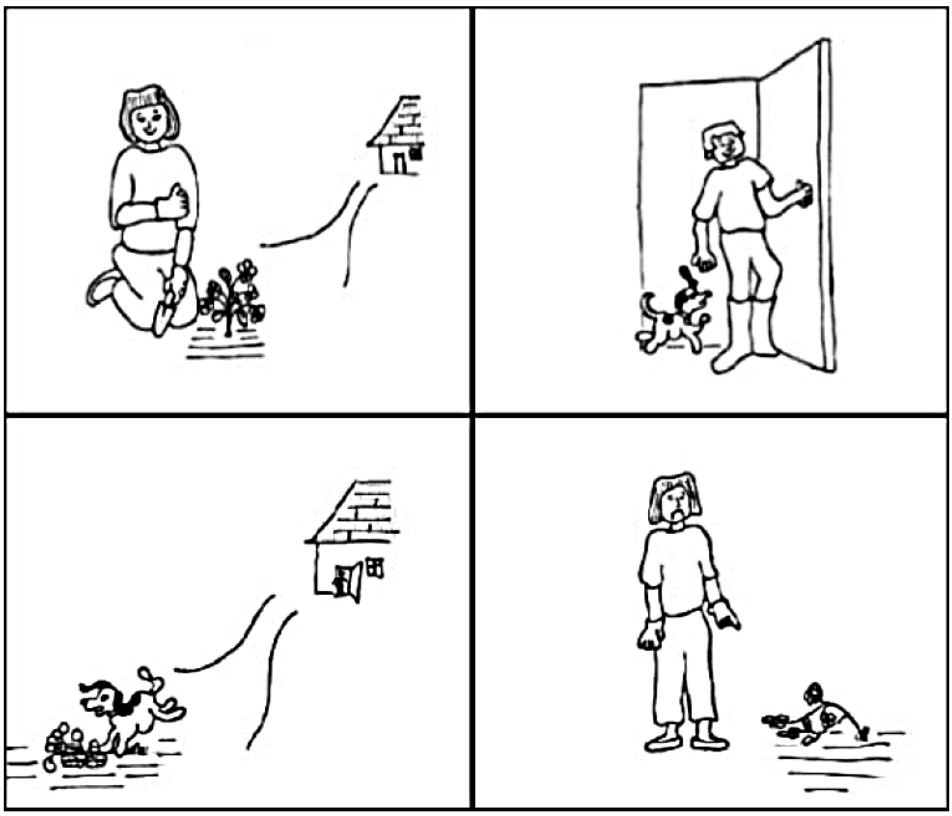
APPENDIX A

A Boy, A Dog, and A Frog

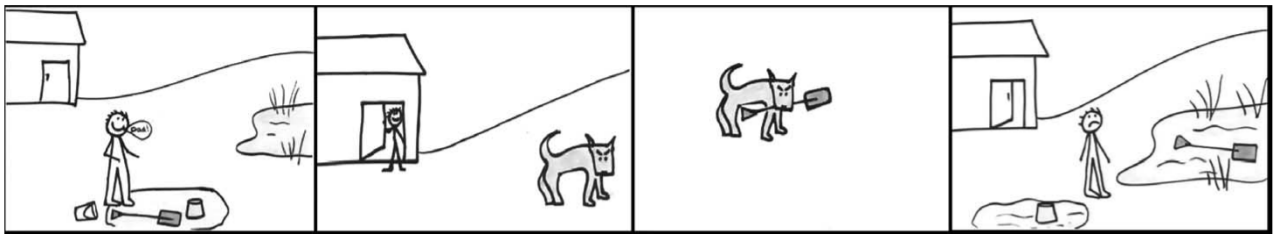
APPENDIX B

Flower Story

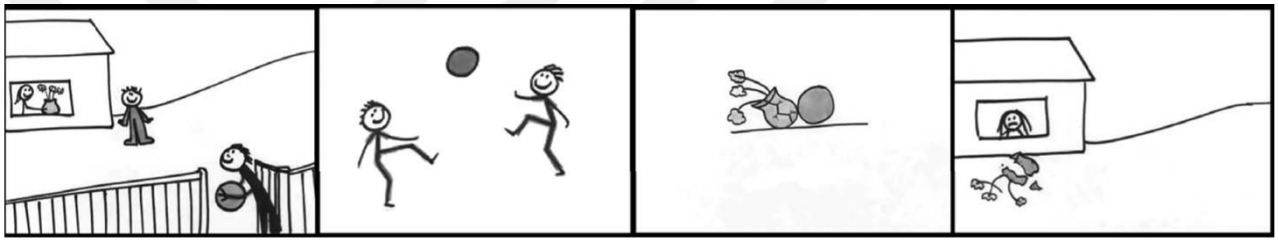


APPENDIX C

Spade Story



Vase Story



APPENDIX D

1. The Effect of Parental Causal Language Input on Child Causal Language Production and Counterfactual Thinking

To test hypotheses, we also performed path analysis with MPlus software. It was hypothesized that mothers' causal language input directed to the child would predict the child's causal language outcome directed to the mother (H_2). Similarly, a relationship was assumed between the fathers' causal language input and the child's causal language outcome directed to the father (H_3). Additionally, it was hypothesized that the child's causal language scores directed towards the mother and father separately would predict their counterfactual thinking (H_4). While testing the hypotheses, the TIFALDI, the SES composite, and the child's age were added to the model as control variables. Before running the model, the goodness-of-fit indices values were checked for path model testing. The results show an acceptable fit for the model, χ^2 = 19.867, CFI = .910, TLI = .905, RMSEA = .053. Details of goodness-of-fit indices are given below in Table 22.

Table 22
Goodness-of-Fit Indices from Parental Causal Language Input on Child Causal Language Production and Counterfactual Thinking

Goodness-of-fit indices	Cut-off measures of fit indices	Fit indices measures	Judgment
Chi-Square	$p > .05$	19.867 (p = .281)	Very Good Fit
CFI	>.90	.910	Very Good Fit
TLI	>.90	.905	Acceptable Fit
RMSEA	<.10	.053	Very Good Fit

We ran the Path Analysis and checked goodness-of-fit indices (see Figure 1). According to the analysis, maternal causal language input predicted the child's causal language directed to mothers, β = .372, p = .001. Moreover, the father's causal language input

predicted the child's causal language directed to the father, β = .358, p = .001. In other words, using more causal language by the mother supports the child's causal language directed to the mother. At the same time, the father's causal language input also supports the child's causal language directed to the father. In addition, maternal and paternal causal language inputs are closely related and affect the model, β = .305, p = .009. Regarding counterfactual thinking, it was observed that child causal language directed to the father did not predict child counterfactual thinking, β = .056, p = .622. However, child causal language directed to the mother negatively predicted child counterfactual thinking, β = -.291, p = .007. This finding indicates that children's use of more causal language to their mothers is associated with receiving lower counterfactual thinking scores. Finally, TIFALDI, one of the control variables included in the model, was found to predict child counterfactual thinking, β = .470, p = .000. In other words, it was found that as children's expressive language skills increase, they receive higher counterfactual thinking scores. The details of the Path Analysis and estimates for direct effects are presented in Table 23.

Table 23
Estimates of Direct Effects from Parental Causal Language Input on Child Causal Language Production and Counterfactual Thinking

Paths	(β)	SE	Confidence Intervals (%95)		p
			Lower	Upper	
MCL → CCM	.372	.111	.154	.590	.001**
PCL → CCF	.358	.113	.138	.579	.001**
CCM → CT	-.291	.108	-.503	-.079	.007**
CCF → CT	.056	.114	-.167	.280	.622
TIFALDI → CT	.470	.110	.255	.686	.000***
SES → CT	-.022	.111	-.239	.195	.842
AGE → CT	.058	.121	-.180	.296	.635

CCF: Child Causal Language Directed to Fathers, CCM: Child Causal Language Directed to Mothers, CT: Counterfactual Thinking, PCL: Paternal Causal Language, MCL: Maternal Causal Language.

*p<.05 **p<.01 ***p<.001

In addition to direct effects, the indirect effects of the model were also controlled. According to the analysis results, there is only one significant indirect effect in the model. Maternal causal language input predicts child counterfactual thinking via child causal language directed to mothers in a negative way, β = -.108, p = .042. This result means that counterfactual thinking decreases via child causal language directed to mothers when maternal causal language increases. The details of the indirect effects are shown in Table 24.

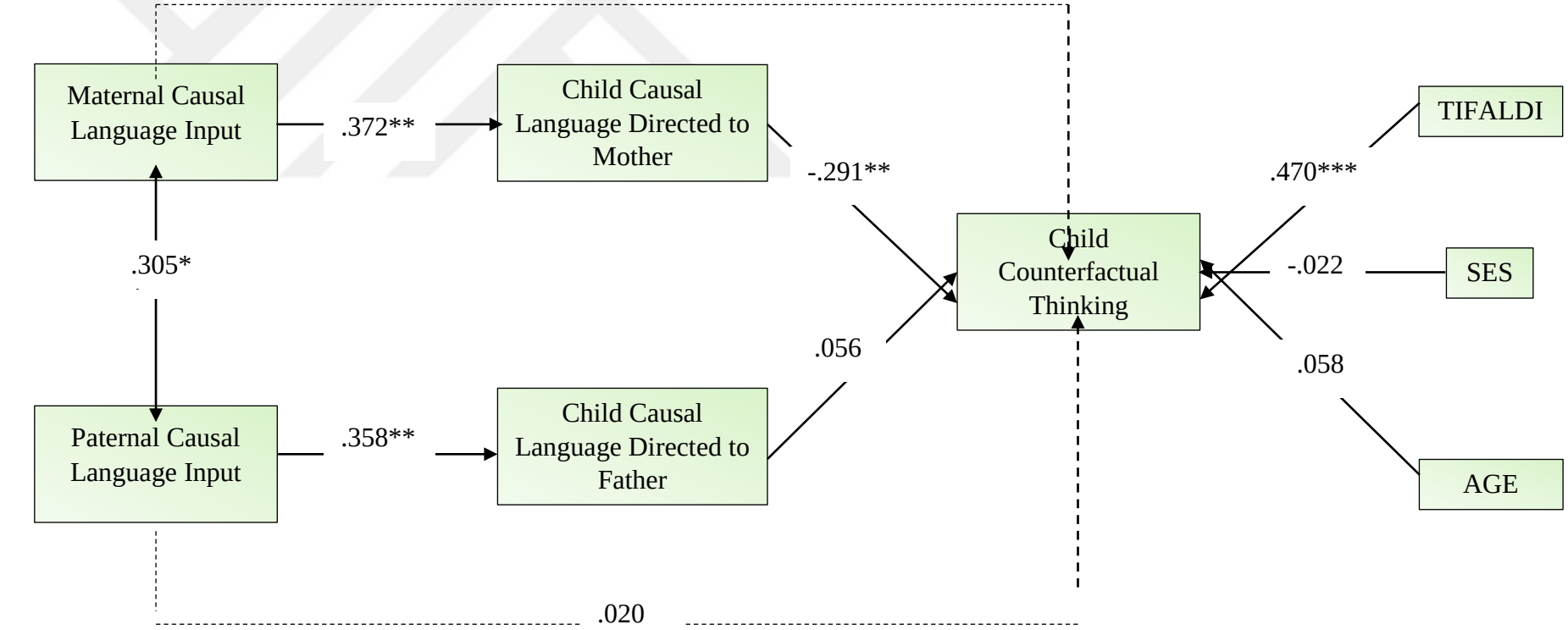
Table 24
Estimates of Indirect Effects from Parental Causal Language Input on Child Causal Language Production and Counterfactual Thinking

Paths	(β)	SE	Confidence Intervals (%95)		p
			Lower	Upper	
MCL → CCM → CT	-.108	.053	-.212	-.004	.042*
PCL → CCF → CT	.020	.041	-.061	.101	.626

CCF: Child Causal Language Directed to Fathers, CCM: Child Causal Language Directed to Mothers, CT: Counterfactual Thinking, PCL: Paternal Causal Language, MCL: Maternal Causal Language.

*p<.05 **p<.01

Figure 1
Path Model: The Effect of Parental Causal Language Input on Child Causal Language Production and Counterfactual Thinking



2. Parental Causal Language Input on Child Causality Score and Counterfactual Thinking

Children's causal language production and accuracy scores in the causal verb production task were examined separately for testing. It was hypothesized that maternal and paternal causal language input would predict children's causal language production and accuracy scores (H_5). On the other hand, it was assumed that children's causal language production and accuracy scores would predict their counterfactual thinking scores (H_6). Path analysis was used to test these hypotheses. Before interpreting the analysis for child causal verb production causality score, goodness-of-fit indices were checked (see Table 25). According to the values, the model did not have an acceptable fit, χ^2 = 20.922, CFI = .465, TLI = .465, RMSEA = .123.

Table 25
Goodness-of-Fit Indices from Parental Causal Language Input on Child Causality Score and Counterfactual Thinking

Goodness-of-fit indices	Cut-off measures of fit indices	Fit indices measures	Judgment
Chi-Square	*p*>.05	20.922 (*p*=.034)	Did Not Fit
CFI	>.90	.465	Did Not Fit
TLI	>.90	.465	Did Not Fit
RMSEA	<.10	.123	Did Not Fit

The path analysis of the child causal verb production causality score had no significant direct effect (see Figure 2). Since there were no significant findings, the indirect effects were not checked. The details of path analysis results and estimates of direct effects are shown in Table 26.

Table 26
Estimates of Direct Effects from Parental Causal Language Input on Child Causality Score and Counterfactual Thinking

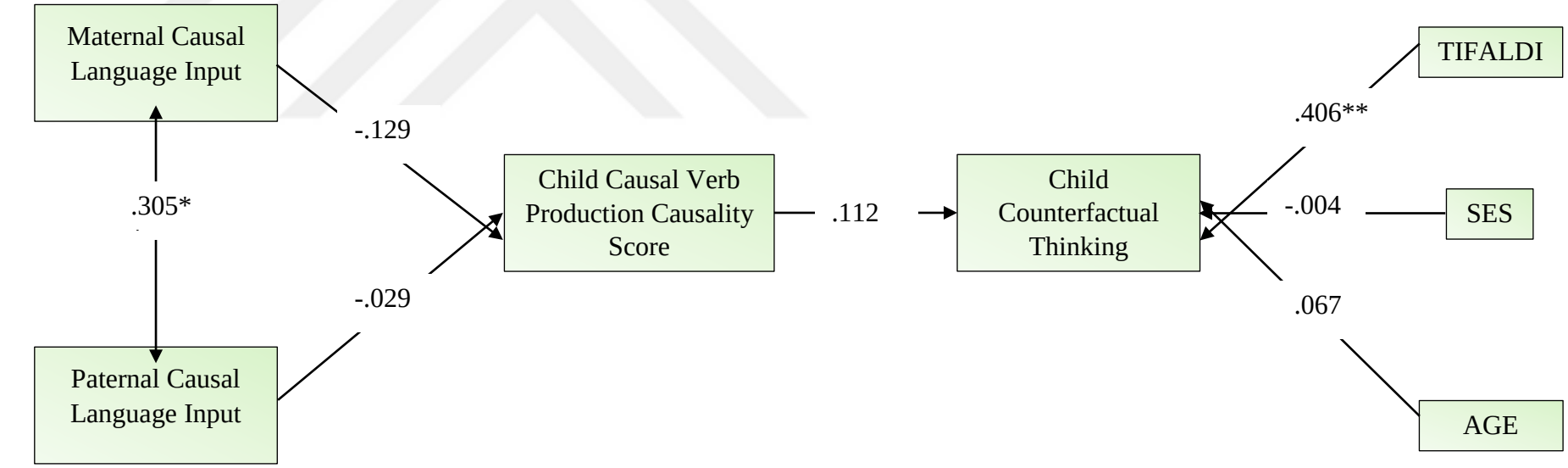
Paths	(β)	SE	Confidence Intervals (%95)		*p*
			Lower	Upper	
MCL → CVPC	-.129	.133	-.390	.132	.332
PCL → CVPC	-.029	.134	-.291	.234	.832
CVPC → CT	.112	.127	-.137	.362	.376
TIFALDI → CT	.406	.128	.155	.658	.002**
SES → CT	-.004	.120	-.240	.232	.974
AGE → CT	.067	.132	-.192	.327	.610

CVPC: Child Causal Verb Production Causality Score, CT: Counterfactual Thinking, PCL: Paternal Causal Language, MCL: Maternal Causal Language.

*p<.05 **p<.01

Figure 2

Path Model: The Effect of Parental Causal Language Input on Child Causality Score and Counterfactual Thinking



Direct Effect: ⟶

*p<.05 **p<.01

3. Parental Causal Language Input on Child Accuracy Score and Counterfactual Thinking

Child causal verb production accuracy scores were considered for testing H_4 and H_5. Goodness-of-fit indices were checked before running the path analysis (see Table 27). In this model, the indices values were not adequate, and the model did not have an acceptable fit, χ^2 = 20.131, CFI = .504, TLI = .504, RMSEA = .118.

Table 27
Goodness-of-Fit Indices from Parental Causal Language Input on Child Accuracy Score and Counterfactual Thinking

Goodness-of-fit indices	Cut-off measures of fit indices	Fit indices measures	Judgment
Chi-Square	*p*>.05	20.131 (*p*=.043)	Did Not Fit
CFI	>.90	.504	Did Not Fit
TLI	>.90	.504	Did Not Fit
RMSEA	<.10	.118	Did Not Fit

Since the model did not fit and direct effects did not turn out significant, indirect effects were not presented (see Figure 3). The estimates of direct effects and details of the analysis results are presented in Table 28.

Table 28
Estimates of Direct Effect from Parental Causal Language Input on Child Accuracy Score and Counterfactual Thinking

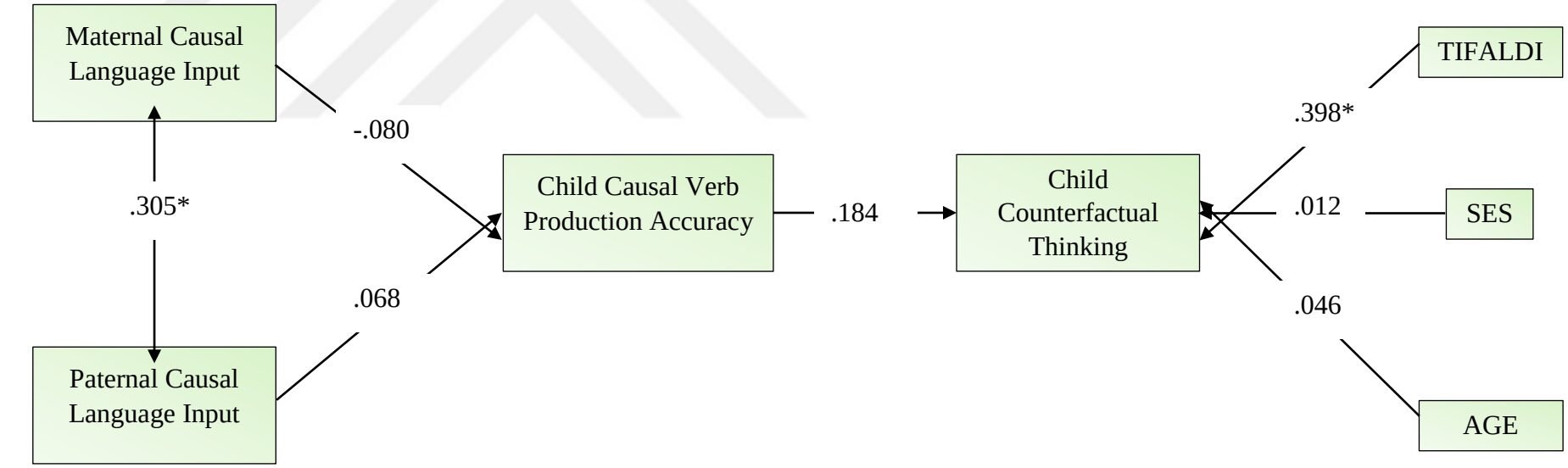
Paths	(β)	SE	Confidence Intervals (%95)		*p*
			Lower	Upper	
MCL → CVPA	-.080	.135	-.344	.184	.554
PCL → CVPA	.068	.135	-.197	.332	.616
CVPA → CT	.184	.125	-.061	.428	.141
TIFALDI → CT	.398	.127	.148	.648	.002**
SES → CT	.012	.118	-.220	.244	.918
AGE → CT	.046	.133	-.215	.308	.730

CVPA: Child Causal Verb Production Accuracy, CT: Counterfactual Thinking, PCL: Paternal Causal Language, MCL: Maternal Causal Language.

*p<.05 **p<.01

Figure 3

Path Model: The Effect of Parental Causal Language Input on Child Accuracy Score and Counterfactual Thinking



Direct Effect: ⟶

*p<.05

CURRICULUM VITAE
SONGÜL KANDEMİR

EDUCATION

M.A. in Developmental Psychology (2020-2023): Kadir Has University, Istanbul, Turkey
B.A. in Psychology (2015-2020): Mersin University, Mersin, Turkey

RESEARCH & WORKING EXPERIENCE

Psychologist (05/2023 – Present)

Hayata Destek (Support to Life), Batman, Turkey

Responsibilities: I give both individual and group therapies by providing psychological support to refugees and individuals affected by the earthquake.

Lab Manager (07/2022 – Present)

Studies in Language and Bilingualism Lab, Kadir Has University, Istanbul, Turkey

Supervisor: Assoc. Prof. Aslı Aktan-Erciyes

Responsibilities: I organize weekly lab meetings and presentations. I manage our lab's website and social media accounts.

Graduate Research Assistant (10/2020 – Present)

Studies in Language and Bilingualism Lab, Kadir Has University, Istanbul, Turkey

Supervisor: Assoc. Prof. Aslı Aktan-Erciyes

Responsibilities: I conducted my own research project and collected data from adults. I make transcriptions, speech, and co-speech gesture coding. Also, I am working on my thesis project and collecting data from families. I am organizing research assistant groups that work on my projects.

Undergraduate Research Assistant (07/2020 – 10/2020)

Language and Cognition Lab, Koç University, Istanbul, Turkey

Supervisor: Assoc. Prof. Tilbe Göksun

Responsibilities: I work on a project which is investigating cognitive differences between full-term and pre-term born infants. I made data transcription of mother-infant sessions and gesture coding of them.

HONORS & AWARDS

TÜBİTAK Scholarship
Research Assistant (Kadir Has University, Istanbul, Turkey) (10/2021 – 11/2022)

TÜBİTAK 3501 Project Name: "İkinci dil ediniminin okul öncesi ve okul çağı çocuklarında anlatı becerilerinin kurgusal, dilbilimsel ve algısal süreçlerine olan etkisi: Boylamsal bir çalışma." **Supervisor:** Assoc. Prof. Aslı Aktan-Erciyes

PUBLICATIONS & PRESENTATIONS

PUBLICATIONS

Kandemir, S., Özer, D., Aktan-Erciyes, A. (2023). Multimodal language in child-directed vs. adult-directed speech. *Quarterly Journal of Experimental Psychology.*

Ünlütabak, B., Aktan-Erciyes, A., Yılmaz, D., **Kandemir, S.,** & Göksun, T. (2022). Parental input during book reading and toddlers' elicited and spontaneous communicative interactions. *Journal of Applied Developmental Psychology, 81*, 101436.

Kandemir, S., (2020). Erken çocukluk döneminde iki dilli olmak: İçsel ve dışsal faktörler temelinde bir inceleme. *Onto Psikoloji Dergisi, 18*, 6-11.

POSTER PRESENTATIONS

Aktan-Erciyes, A., Göksun, T., Karataş, P., **Kandemir, S.** & Özcan, B. S. (2023). Frog, where are you? Investigation of narrative skills in bilingual and monolingual children through eye-tracking. Poster presented at the 13th BCCCD, Budapest, Hungary.

Kandemir, S., Aktan-Erciyes, A., Karataş, P. & Özcan, B. S. (2023). Bilingual education helps children to know "what might have been" better. Poster presented at the 13th BCCCD, Budapest, Hungary.

Kandemir, S., Civelek, H., Kaçar, S., Gümüşay, B. & Aktan-Erciyes, A. (2023). Let's talk about causality! Maternal and paternal causal language input are associated with children's causal language production. Poster presented at the 13th BCCCD, Budapest, Hungary.

Aktan-Erciyes, A., Ger, E., Göksun, T., Özcan, B. S., **Kandemir, S.** & Karataş, P. (2023). Does early L2 exposure have an effect on causal verb production? Comparison of 5-, 7- and 9-year-old bilingual and monolingual children. Poster presented at the 13th BCCCD, Budapest, Hungary.

Kandemir, S., Özer, D. & Aktan-Erciyes, A. (2022). Çocuğa ve yetişkine yönelik konuşmada multimodal iletişim süreçleri. Poster presented at the 3rd Development Psychology Symposium, Istanbul, Turkey.

Kandemir, S., Sezer, M., Civelek, H., Eraçıkbaş, A. F. & Aktan-Erciyes, A. (2022). Verbal and gestural differences in child-directed and adult-directed speech. Poster presented at the 12th BCCCD.

Kandemir, S., Akgöz-Aktaş, G. & Aydın, A. (2021). İnsanın karanlık yönü ve saldırganlık ilişkisi: Zihin kuramı temelinde bir inceleme. Oral presentation at the International Congress of Adolescence and Youth Studies, Online, Turkey.

Kandemir, S. & Akgöz-Aktaş, G. (2019). The evaluation of separation anxiety by working model of attachment, secure base script, psychological examination of parents. Poster presented at the 19th European Conference on Developmental Psychology, Athens, Greece.

TALKS

Aktan-Erciyes, A., Göksun, T., Karataş, P., **Kandemir, S.** & Özcan, B. S. (2022). "Kurbağa, neredesin?" İki dilli ve tek dilli çocuklarda anlatı becerilerinin göz izleme tekniğiyle incelenmesi. Oral Presented at the 3rd Development Psychology Symposium, Istanbul, Turkey.