

ENCODING INFERENTIAL EVIDENCE FOR EVENTS IN LANGUAGE:
EVIDENCE FROM TURKISH SPEAKING CHILDREN AND ADULTS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
OZYEGIN UNIVERSITY



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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF ARTS
IN
THE DEPARTMENT OF PSYCHOLOGY

MAY 2022

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To my family



ABSTRACT

Learning and communicating about events are fundamental aspects of an individual's life. Yet, how people learn about events often vary with some events perceived in their entirety and others are inferred based on available evidence. Here we investigate how children and adults linguistically encode the sources of their event knowledge. We focus on Turkish – a language that obligatorily encodes sources of information for past events using two evidentiality markers. Children (4- to 5-year-olds and 6- to 7-year-olds) and adults watched and described events that they directly saw or inferred based on visual cues. The indirectness of the visual evidence giving rise to an inference was also manipulated. The results revealed that participants modified the evidential marking in their descriptions depending on (a) whether they saw or inferred the event and (b) the indirectness of the visual cues giving rise to an inference. There were no differences across age groups. These findings suggest that Turkish-speaking children and adults' use of evidentiality markers in language are sensitive to the indirectness of the inferential evidence.

Keywords: Evidentiality, events, visual perception, visual inference, Turkish

ÖZET

Olaylar hakkında bilgi edinmek ve bunlarla ilgili iletişim kurmak, insan yaşamının önemli bir parçasıdır. Ancak, insanların olaylar hakkındaki bilgileri hangi yoldan edindikleri olayların tamamına şahit olup olmadıklarına ya da mevcut kanıtlardan çıkarım yapmalarına bağlı olarak değişiklik gösterir. Bu çalışmada çocukların ve yetişkinlerin olaylar hakkındaki bilgileri nasıl edindiklerini dilsel olarak nasıl ifade ettikleri araştırılmıştır. Bunun için, iki kanıtsallık eki kullanılarak geçmiş olaylar için edinilen bilginin kaynağını belirtmenin dilbilgisi açısından zorunlu olduğu Türkçeye odaklanılmıştır. Anadili Türkçe olan çocuklar (4-5 yaşındakiler ve 6-7 yaşındakiler) ve yetişkinlerden, doğrudan gördükleri veya görsel ipuçlarına dayanarak çıkarım yapmak durumunda oldukları olayları izleyip gördüklerini anlatmaları istenmiştir. Araştırma sonucunda hem çocukların hem de yetişkinlerin (a) olayı görüp görmediklerine veya çıkarımlarına ve (b) bir çıkarıma yol açan görsel ipuçlarının dolaylılığına bağlı olarak anlatımlarındaki kanıtsallık eklerini değiştirdikleri bulunmuştur. Bu bulgular, Türkçe konuşan çocukların ve yetişkinlerin dilde kanıtsallık eklerini kullanmalarının onların çıkarımsal kanıtların dolaylılığına duyarlı olduğunu göstermiştir.

Anahtar Kelimeler: Kanıtsallık, olaylar, görsel algı, görsel çıkarım, Türkçe

ACKNOWLEDGMENTS

First and foremost, I would like to express my gratitude to my advisor Ercenur Ünal, for her time, guidance, patience and support. Her guidance was very valuable for me in terms of cultivating my passion to learn and create. I also want to thanks to my committee members; Berna Uzundağ and Alper Açık for their feedback and support.

Thanks to Asude Eraçıkbaş, Ceren Barış and Zeynep Bolluk for their assistance with data collection and transcription process. Without their support data collection process would be harder.

Thanks to former and current members of Language, Cognition and Development Lab for their support and ideas. I especially want to thank to grad members of our lab, Bahar Tarakçı and Kevser Kırbaşoğlu, their support was very meaningful for me.

Thanks to my old friend Günay Eser who helped me to create materials during the challenging Covid lockdown days. I also want to thank to my amazing friends Aygün, Öykü, Merve, Gözde, Özge and Selin for their endless support.

Thanks to my family who supported my desire to learn from a very young ages and helped me pursue my dreams.

Finally, thanks to families and children who participated in this study.

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LIST OF ABBREVIATIONS

3		Third person
ACC		Accusative
ABL		Ablative
DAT		Dativ
PASS		Passive
PRS		Present
PST		Past
SG		Singular

CHAPTER 1

INTRODUCTION

Gaining knowledge about people, objects, situations, and events is a fundamental aspect of an individuals' life. Knowledge about events is particularly important as they provide a rich source of information that allow individuals to predict upcoming happenings and remember past experiences (Zacks & Tversky, 2001). However, how individuals gain knowledge about events often varies depending on the perspective of the observer (Gleitman, 1990). That is, an individual could identify an event by witnessing it completely or partially. People rely on different types of evidence or sources of information to gain information about events. For instance, one might directly observe someone slicing a cucumber or only see a sliced cucumber on a plate and make the inference that someone sliced a cucumber.

In addition to gaining information about events, people also frequently communicate about those events that they have learned about. Importantly, languages have means to convey how a speaker has learned about an event (Aikhenvald, 2004; Aikhenvald, 2018). The linguistic encoding of information sources is known as evidentiality (Aikhenvald, 2004, 2014, 2018; De Haan, 2001; Faller, 2001, 2002; Izvorski, 1998; Johanson & Utas, 2000; Matthewson, 2012; Mayer, 1990; McCready, 2008, 2014; Speas, 2004; Willett, 1988). Yet, how speakers express the information that they have experienced about an event differs across languages. Some of languages specify information sources obligatory as part of grammar, on the other hand, some of the languages do not require to specify

information sources. How do learners of a language with an obligatory evidential system use evidentiality markers for different types of indirect inferential evidence is a fundamental question to ask to in terms of developmental perspective. As reviewed in Chapter 2 in more detail, early studies demonstrated that acquisition of indirect evidential is a late achievement (Aksu-Koç, 1988; Ozturk & Papafragou, 2016) contrary to more recent studies conducted with children (Ünal & Papafragou, 2016; Uzundağ et al., 2018). In addition, studies with adults displayed that indirectness level of an event have both consequences for learnability (Saratsli & Papafragou, 2020) and also production of evidential markers (Ünal et al., 2016) for adult speakers. However, there is no study conducted with child participants to see whether children also demonstrate similar sensitivity while talking about their sources of event knowledge. Therefore, the aim of the current study is to investigate whether Turkish speakers (both adults and children) would mark their sources of event knowledge differently depending on the type of evidence, and particularly distinguish between different levels of indirect evidence for events.

CHAPTER 2

LITERATURE REVIEW

2.1 Event Perception and Sources of Information

How individuals obtain information regarding any event could be based on their perceptual experiences including direct observation or indirect experiences such as hearsay or inference. For instance, direct experience about any event requires an individual to witness the event at first hand. Indirect experiences about an event comprise secondhand experience such as hearsay or inference. Hearsay experience is based on the reports of others. There are various types of inferences. For instance, an individual could make pragmatic inference to understand what the speaker intends to convey. On the other hand, one might use deductive inference to make premises about a condition. Finally, individuals could make inference from visual information since they may not always witness an entire event. In this study, we focused on indirect inferential evidence whether it affects the evidential marker production of children and adults.

Previous studies demonstrated that adults are able to construct rich event representations when they witnessed both complete and partial visual evidence for events (Chen & Scholl, 2016; Dobel et al., 2007; Hafri et al., 2013; cf. also Griffin & Bock, 2000; Strickland & Keil, 2011). One of those studies investigated the relation between event perception and causal inference with adult participants (Strickland & Keil, 2011). Participants saw videos of an event (kicking ball) with a missing moment which was the moment of the contact. In other words, without the moment of contact they only were able to make inference based on a visual cue

depicting at the end. However, the majority of the participants falsely reported that they saw the moment of contact in an incomplete causal implication condition. In other words, even though participants did not see the actual contact moment, they reported as if actually saw the contact moment. Moreover, their visual perception system completed the event with an inference.

Another study conducted with adult participants demonstrated that visual perception comprise inference by reconstructing the shape of a static object (Chen & Scholl, 2016). In this study, participants saw a square which was abruptly invaded by another object that the square looked like a missing part with a similar contour of the invaded shape (e.g., square invaded by a circle shape and missing part looks like a circle). Participants also saw a square with a missing part and another shape imposed on the square which was not causally related to missing part (e.g., square invaded by a triangle shape and missing part looks like a star). In the first condition participants reported that the change was gradual contrary to second condition even though the change was abrupt in both conditions. In other words, participants' visual perception system made an inference and constitute causality between objects. Findings of these studies revealed striking results regarding the process of inference making during the event perception. Moreover, they suggest that visual perception and inference may not be as separable as previously hypothesized and a "smart vision" system may comprise an automatic inference regarding events.

How children gain knowledge about events from various sources of information can be viewed as part of a growing literature on children's event perception (e.g., Baillargeon et al., 2011; Baldwin et al., 2001; Baldwin & Kosie,

2021; Bunger et al., 2016; Göksun et al., 2010; Kominsky et al., 2017; Radvansky & Zacks, 2014; Spelke et al., 1996; Stahl et al., 2014; Tatone et al., 2015; Ünal et al., 2021; Zheng et al., 2020;) as well as a separate but related line of work on the acquisition of verbs referring to different types of events (e.g., Bowerman & Choi, 2001; Fisher et al., 1991; Gleitman, 1990; Pinker, 1989; Tomasello & Merriman, 2014) or different types of perceptual experience (e.g., Davis & Landau, 2021; Landau & Gleitman, 1985). This line of work has shown that children are also able to construct rich event representations from very early ages. However, with the exception of few studies, this literature primarily focused on events that can be directly observed in their entirety.

One exception is a recent study that investigated children's identification of events from different sources. Particularly, researchers investigated preschoolers' (4- to 6-year-olds) ability to identify events by directly seeing them or by indirectly learning about them from visual evidence (Ünal & Papafragou, 2019). Children were asked to match a verb given by an experimenter with one of two cards: one facing up and the second card facing down. The facing up card provided one of three different types of evidence for the event: direct visual access, indirect visual access- familiar and indirect visual access- unfamiliar. The familiarity of the objects was chosen whether they identify easily or not. Objects that are easy to identify were categorized as indirect visual-access familiar (e.g., two halves of a lemon next to a knife). Objects that are not easy to identify categorized as indirect visual access- unfamiliar (e.g., two halves of a turnip next to a knife). If the given verb matched the facing up card, children had to choose the facing up card, and if the given verb

did not match the facing up card, children had to choose the card that was facing down. The results of the study demonstrate that in all age groups children were able to perform in line with these predicted patterns, indicating that they could identify events based on both direct and indirect evidence. Although older children were more successful than younger children, these results still indicate early competence of children's event identification from different sources of information. Moreover, results of the study emphasize the children's competence on event identification with indirect visual access from an early age when the complexity of mental state language is removed.

Children's event knowledge from different sources of information also connects to a related line of previous research focusing on children's source monitoring abilities. Source monitoring is a crucial ability to know and attribute the information to specific sources (Johnson et al. 1993). The majority of these source monitoring studies investigated children's knowledge about objects. These studies suggested that children are able to identify the sources of their object knowledge from different sources and visual perception is considered as the first information source (Pratt & Bryant, 1990; Pillow, 1989; but see Povinelli & deBlois, 1992; Wimmer et al., 1988; Robinson et al., 1998). Children as young as 3 are able to identify visual perception as a knowledge source (Gopnik & Graf, 1988; cf. O'Neill & Gopnik, 1991; Pillow, 1989; Pillow et al., 2000; Wimmer et al., 1988; Woolley & Bruell, 1996). Despite children's success with visual perception, studies displayed that ability to grasp some types of inference as a source of knowledge is a late achievement and does not develop until 6-year-old (O'Neill & Gopnik, 1991;

Pillow, 2002; Sodian & Schneider, 1990; Sodian & Wimmer, 1987; Wimmer et al., 1988). In other words, children experienced difficulties with understanding the knowledge that was obtained indirectly.

2.2 Communicating about Information Sources

As mentioned above, an important aspect of communicating about events is whether the event is experienced directly or indirectly. Moreover, to express their experience, they use language. The linguistic encoding of information sources is known as evidentiality (Aikhenvald, 2004, 2014, 2018; Faller, 2001, 2002; De Haan, 2001; Izvorski, 1998; Johanson & Utas, 2000; Matthewson, 2012; Mayer, 1990; McCready, 2008, 2014; Speas, 2004; Willett, 1988). Furthermore, languages differ in the kinds of linguistic devices they use to encode evidentiality (Aikhenvald, 2004). For instance, Turkish has an obligatory encoding system which uses two different suffixes (-dı and -mış) to mark sources of information for past tense events. While the suffix -dı is used for marking knowledge from direct sources, the suffix -mış is used for marking knowledge from indirect sources, such as hearsay or inference (Aksu-Koç & Slobin, 1986). On the other hand, languages such as English do not have obligatory evidential systems to encode information sources. Instead, how the information is acquired is optionally encoded through lexical devices (de Haan, 1999). For instance, sentence (1a) refers to past experience of the speaker yet; does not provide information regarding the speaker's source of information for the event. similar to sentence (1a), sentence (1b) refers to past experience of the speaker yet; it also conveys that the speaker had acquired the experience indirectly through an adverb "apparently". By contrast, in Turkish sentence (2a) also refers to the

speaker's past experience regarding the event but also conveys that the speaker's source of information for the event is direct with the suffix “-dı”. Sentence (2b) conveys the indirect experience of the speaker with the suffix “-mış”.

(1a) The boy sliced the cucumber.

(1b) Apparently, the boy sliced the cucumber

(2a) Çocuk salatalığ-ı doğra-dı.
 boy cucumber-ACC slice-PST.DIRECT.3sg
 “The boy sliced the cucumber (I saw)”

(2b) Çocuk salatalığ-ı doğra-mış.
 boy cucumber-ACC slice-PST.INDIRECT.3sg
 “The boy sliced the cucumber (I heard/inferred)”

Since encoding information sources vary across languages, when children acquire to encode evidential systems in a specific language is a fundamental question to ask. This question has been investigated across several different languages (Turkish: Aksu-Koç, 1988; Aksu-Koç, et al., 2009; Ozturk & Papafragou, 2016; Ünal & Papafragou, 2013, 2016; Korean: Choi, 1995; Papafragou et al., 2007; English: Rett & Hyams, 2014; Tibetan: de Villiers et al., 2009; Bulgarian: Fitneva, 2009, see also Fitneva, 2018, Matsui, 2014 and Ünal & Papafragou, 2020 for recent reviews). Particularly, Turkish is one of the languages that have an obligatory evidential system part of their grammar. Moreover, how do Turkish children acquire evidentiality is a prolonged question that has been asked. Yet, the debate regarding the acquisition of evidentiality revealed contradictory results.

Aksu-Koç (1988) conducted a pioneering study to investigate the acquisition of the Turkish evidential system in children between age 3 and 6. Experimenters asked children to describe events. Children learned about events by either witnessing them completely (direct events) or inferring what happened based on clue depicting the end state of the event (inferred events). The study demonstrated that 3- to 3.5-year-olds produced *-dı* for direct events with 90% success rate. Contrary to the early production of *-dı*, the production of *-mış* occurred around 4-year-olds. This early study of production of evidential markers in Turkish children revealed that production of *-dı* is an earlier achievement compared to the production of *-mış*.

A later study examined the production of evidentiality in Turkish preschoolers aged 5 to 7 (Ozturk & Papafragou, 2016). Animated scenarios were used to elicit evidential markers. “See” condition required children to watch an event that happened. In “hear” condition, an experimenter told children what they had done. Lastly, “infer” condition included a picture of an event that was going to provide a clue regarding the event (e.g., a child next to a wrapped present). At the end of each condition, experimenter asked children to complete a sentence presented by an experimenter (e.g., “*çocuk dondurmayı ...*”- *lit.* “the child the ice cream ...”). Results of the study demonstrated that children’s production of *-dı* for direct access was more consistent than their production of *-mış*. However, the production of indirect evidential differed according to the types of indirect access. For instance, 5-year-olds did not produce *-mış* for either hearsay and inference conditions and instead used direct evidential (*-dı*). On the other hand, 6- to 7-year-olds produced -

miş for hearsay condition, but not for inference condition. The findings of the study revealed difficulties in the production of indirect evidential markers, particularly when children had to communicate about their inferential evidence for an event. Both studies have underlined the difficulties in the production of indirect evidential markers particularly when they have to consider different indirect evidence.

These findings contrast with the findings of another study that measured the production of evidential markers with Turkish-speaking 3- to 6-year-olds using a puppet theatre task (Ünal & Papafragou, 2016). This task aimed to emphasize the differences between seen and inferred events while maintaining the naturalness of the context. The study consisted of two different conditions. In the seen condition children observed the whole event which was performed by a puppet in front of the curtain (e.g., a puppet inflates a balloon). In the inferred condition, only the beginning (e.g., a deflated balloon) and the ending (e.g., an inflated balloon) of an event were visible to children. While the puppet performed the event (e.g., inflating the balloon), curtains were closed and when the curtains opened again, children witnessed the end state of the event. Unlike previous tasks, children began producing both *-dı* and *-miş* according to their evidential function in both seen and inferred conditions from age 3 onwards, possibly due to the structure of the task that highlights the contrast between direct and indirect/inferential evidence.

Finally, one longitudinal corpus study conducted with very young Turkish speaking children (8- to 36-month-olds) and their mothers found that production of indirect evidential marker “*-miş*” for hearsay and inferential production exhibits unique pattern for each child even though the primary aim of using indirect

evidential was to convey non-factual and new information (Uzundağ et al., 2018). Besides, children from high socioeconomic backgrounds correctly produced indirect evidential marker “-mıŝ” 4 months earlier than children from low socioeconomic backgrounds, possibly due to the input that they have received. With the exception of one study (Ünal & Papafragou, 2016), this work has shown that Turkish-speaking children begin using the direct evidential marker (-dı) to mark the direct access to information earlier than they use the indirect evidential marker (-mıŝ). However, a longitudinal corpus study with 8- to 36-month-olds investigating the acquisition of different functions of the indirect evidential marker (-mıŝ) revealed more optimistic results (Uzundag et al., 2018). That is, children could use indirect evidential (-mıŝ) before age 3, even though they used it to mark hearsay earlier than they used it to mark inference.

Studies that we have mentioned above yielded to a consensus on the production of -dı of children. However, except two recent finding, previous studies revealed pessimistic results in terms of the production of -mıŝ due to challenges children experience distinguishing visual perception from visual inference. Therefore, focusing on different types of inferential evidence is required to demonstrate its possible role on encoding information sources in language.

2.3 Different Types of Inferential Evidence

As already mentioned above, in Turkish indirect evidential marker (-mıŝ) is used for marking different types of indirect evidence which include both hearsay and inference. Furthermore, there might be even more fine-grained distinctions between types of inference, such as inferences based on visual evidence or

inferences for communication. In fact, two pieces of evidence suggest that inferences from visual evidence is not a homogeneous category and the variation in types of inferential evidence is linked to evidential encoding in language. One piece of evidence comes from a cross-linguistic study conducted by Ünal et al. (2016) with Turkish- and English- speaking adults. Various pictures were presented to participants that depicted seen events and inferred events. Seen events included photographs that enabled participants to see the event directly (e.g., a woman blowing bubbles). Inferred events included photographs that enable participants to make an inference about an event by looking at the visual evidence on photographs (e.g., a woman next to bubbles floating in the air). Participants were asked to describe what happened in each photographs. Also, both language groups were asked to select their information sources by choosing one of the options which were presented as seen or inferred. Result of the study revealed that both English and Turkish speakers' judgments about whether an event was seen or inferred, was similar across language groups. In other words, while Turkish speakers identified an event as a seen event, English speakers' event identification was the same.

On the other hand, although both groups successfully identified both seen and inferred events, only Turkish adults used evidential markers in their descriptions to linguistically mark their sources of information. Specifically, Turkish adults used direct evidential marker *-dı* for seen events and used indirect evidential marker *-miş* for inferred events. Yet, the salient part of the study is that Turkish adults' usage of *-miş* varied depending on the types of post-event visual evidence. In other words, Turkish speakers opted to preserve indirect evidential marker *-miş* when the end-

state of the event provided highly indirect visual evidence (e.g., A woman pushed the chair). However, when the end state of the event provided less indirect visual evidence (e.g., A man cracked nuts), they were equally likely to use direct evidential marker *-dı* and indirect evidential *-miş*.

This study revealed prominent results for linguistic encoding of evidentiality across different language groups and universality of judgments on perception and inference of a visual evidence. Particularly the study underlined similarities regarding event identification across language groups even though they differentiate in terms of obligatory evidential production. While English speakers do not have to encode their sources of event knowledge in language, Turkish speakers marked their sources of event knowledge obligatorily as a part of their grammar. The difference between Turkish and English lead Turkish speaker to produce direct marker *-dı* for seen events and indirect marker *-miş* for inferred events. Furthermore, Turkish speaker's judgments on post-event visual evidence varied and that circumstance affect their evidential marker production contrary to English speakers.

Another piece of evidence comes from artificial language learning studies in the domain of evidentiality conducted with English-speaking adults (Saratsli et al., 2020; Saratsli & Papafragou, 2020). In one of these studies, participants were taught an artificial language with an evidential marker (*-ga*) that marked either visual perception or inference based on visual cues. Each scenario was presented to participants with a puppet theatre setup. Participants were asked to watch the event displayed in a puppet theatre and judged the puppet's description whether it was used correctly or not based on the production of *-ga* marker. Participants

experienced difficulty learning the evidential system when visual perception was contrasted to inferences made by observing the end-state of an event that also included the agent. However, when the visual cues did not include the agent, and hence were more indirect, participants successfully learned the evidential system. These findings suggest that part of the challenge in the acquisition of evidentiality in language can be attributed to the difficulties in distinguishing visual perception from visual inference, especially when the visual cues giving rise to inferences that are less indirect.

Together, findings of prior work with adults indicate fine-grained distinctions within types of indirect inferential evidence have consequences for both how mature speakers use evidential markings (Ünal et al., 2016) and the learnability of evidential systems by novice learners (Sarastli & Papafragou, 2020). The striking part of these studies is that even though both speakers of two different languages differs in term of encoding the sources of their event knowledge in language, both speakers judged the indirectness level of visual evidence similarly. Moreover, a language like Turkish which has obligatory evidential systems to encode sources of their information with a two suffixes displayed sensitivity to the level of indirectness of an event and adjust their production of evidential marker according to that sensitivity linguistically. However, it remains an open question whether these distinctions within types of indirect inferential evidence also have consequences for the acquisition of grammaticalized evidentiality. Therefore, the aim of the current study is to investigate this question with child and adult Turkish speakers by using a production task with a puppet theatre setup.

2.4 The Present Study

The present study comprised an experiment to investigate whether different types of evidence for events (direct event, indirect-low event, indirect-high event) affect the production of evidential markers. In the experiment, we used a task which is modified from the puppet theatre setup (Aksu-Koç, 1988; Ünal & Papafragou, 2016) that aims to elicit the production of evidential markers. The task included videos of different events (e.g., slicing a cucumber, cutting a piece of paper) which were performed by an actor.

Since puppet theatre task manipulation affected the production of evidential marker in previous studies (Aksu-Koç, 1988; Ünal & Papafragou, 2016), we decided to adapt to the current online study by adding a curtain animation with video editing software iMovie in a Macbook Air device. In order to create different indirectness levels (indirect- low and indirect-high events), curtains were closed and then opened in certain points while actor were performing the event. When the curtains were opened again, the end-scene changed according to the indirectness level of an event. Further information regarding the materials is given in Chapter 3.

The current study has two aims. First aim of the study is to demonstrate whether different types of evidence sources affect the linguistic encoding of the evidential marker for Turkish speakers. As Ünal et al. (2016) revealed in their study, Turkish speaking adults used direct evidential marker *-dı* for seen events and used indirect evidential marker *-mış* for inferred events. When we take those findings into consideration, we expect to replicate the findings of Ünal et al. (2016) and predict that adult speakers will use direct evidential marker *-dı* for seen events. On

the other hand, prior work with adults indicated that fine-grained distinctions within types of indirect inferential evidence have consequences for both how mature speakers use evidential markings (Ünal et al., 2016) and the learnability of evidential systems by novice learners (Sarastli & Papafragou, 2020). As findings displayed that adult Turkish speakers used indirect evidential marker *-miş* according to the types of post-event visual evidence. In other words, Turkish speakers evaluated the indirectness level of an event and used required indirect evidential marker as a result of their evaluation. Therefore, our second prediction is that adult speakers will not use direct marker *-dı* and instead they will use indirect marker *-miş* for high-indirect events. For indirect-low events, they will use less *-dı* than direct events but more *-dı* than indirect-high events.

Our second aim is whether distinctions within types of indirect inferential evidence also have consequences for the acquisition of grammaticalized evidentiality. Since there is no study conducted with Turkish speaking children, we want to investigate whether there is any developmental difference between adult and child speakers (4- and 5-year-olds and 6- and 7-year-olds) in terms of encoding the sources of their event knowledge particularly for indirect events. Since even the first studies conducted with child participants displayed the success of children's production for direct evidential marker *-dı* (Aksu-Koç, 1988; Ozturk & Papafragou, 2016; Ünal & Papafragou, 2016), we expect to see that both younger and older children will produce direct evidential marker *-dı* for direct events. Apart from the direct evidential marker production, we foresee two possibilities for the production of indirect evidential marker for child participants. First, both younger (4- and 5-

year-olds) and older children's (6- and 7-year-olds) production will be adult-like and produce direct marker -dı more frequently for direct, followed by indirect-low events. Furthermore, they should produce direct marker –dı least frequently (and hence indirect marker -miş most frequently) for indirect-high events. Second possibility is that older age group's (6- and 7-year-olds) production will be more adult-like compared to younger age group (4- and 5-year-olds). That is, younger age group (4- and 5-year-olds) may have difficulty adjusting their evidential marker production particularly for two types of indirect evidence.

CHAPTER 3

METHODS

The methods reported in this study have been approved by the Ethics Committee of Özyeğin University. The stimuli are available at the Open Science Framework Repository

https://osf.io/ra7eb/?view_only=0fc62d095fb64623b87d1875aa3cb88d. The methods and analyses plans are preregistered at the Open Science Framework <https://osf.io/ra9ch>

3.1 Participants

We recruited a preregistered a sample of 108 native speakers of Turkish distributed across three age groups: adults ($n = 36$, 31 Female, *Mean Age* = 21), 4- and 5-year-olds ($n = 35$, 17 Female, *Mean Age* = 4.9) and 6- and 7-year-olds ($n = 37$, 19 Female, *Mean Age* = 6.6). Data from one additional 4- to 5-year-old were excluded due to interference from the parent during data collection.

This sample size is calculated based on an a priori power analysis using a web application for power analysis with crossed random effects (Westfall, Kenny, & Judd, 2014; <https://jakewestfall.shinyapps.io/crossedpower/>). This tool enables researchers to calculate the number of participants and power which is also suitable for mixed effect models that include one fixed factor with two levels (see the Analysis Plan section below). When we consider the previous study of Ünal & Papafragou (2016), the difference between conditions resulted in an effect size of $d = 2.11$. We estimated a more conservative effect size of $d = 1.05$ for the present study. If we were to directly compare two conditions, we would have 8 data points

for each participant. We did not change the default settings for random effects provided by the application. The application revealed that in order to reach a power level of 0.90 we would need a minimum of 18.4 participants in each group. Since our independent variable has 3 levels and to be able to detect smaller effect sizes we chose to double the number of participants for each age group and decided to recruit 36 participants for each age group.

All child participants were monolingual and there was no significant exposure to second language among child participants. Since adult participants were university students, majority of them were able to speak English.

Child participants were recruited via online platforms such as Instagram posts and online participant recruitment platforms (e.g., Bilimsever Çocuklar) and at the end of an experiment, children received a participation certificate for their participation. Adult participants were recruited through the university's research participation system and they received course credit for their participation. Both adult and child participants provided informed consent at the beginning of an experiment. Parents provided informed consent for child participants.

3.2 Materials

There were two types of stimuli: target items and filler items. Target items consisted of 12 different change of state events which were performed by an actor (e.g., slicing cucumber). The same male actor performed all events in front of a plain wall and a table that did not contain any distractive items. Each event had visibly distinct beginnings, midpoints and endpoints. We created a puppet theatre scenario using the video editing program iMovie. We added curtain effects at

different parts of the event (e.g., beginning, midpoint) to manipulate type of evidence for the event (henceforth Event Type). There were three Event Types. For Direct events, curtains opened at the beginning remained open while the actor was performing the event, so that the entire event was directly visible to the participants (Figure 1- top row). For Indirect-Low events, only the beginning and endpoint of the event was visible to the participants. At the beginning of the event, participants saw the actor and an object with curtains open for 3 seconds (Figure 1 - middle row, first picture). Then the curtains closed for 2 seconds (Figure 1 - middle row, second picture). When the curtains opened again, participants saw the endpoint of the event depicted by the post-change state of the object together with the actor (Figure 1- middle row, last picture). Indirect-High events were exactly same as the Indirect-Low events, except that when the curtains re-opened at the end, the actor was not present (Figure 1-bottom row). (This manipulation was based on previous work showing that seeing an agent vs. not at the endpoint has implications for learnability of evidential systems; Saratsli & Papafragou, 2020.)

Three presentation lists were created by assigning one version of each target event (Direct, Indirect-Low, Indirect-High) to one of the lists. Thus, each list included 12 target items in total, with 4 examples of each Event Type. Each list arranged the items in a single fixed order. Each participant was randomly assigned to one of the three lists.

Filler items consisted of 12 different videos of objects (e.g., pencils, cars) placed on a table in front of a plain wall. They were fully visible throughout the trial. The actor was not present in the videos. Participants were asked to identify the

objects and answer a question about a property of the object (e.g., color, number, function). Filler trials were included to avoid priming of evidential markers from one trial to the next one. Although we initially decided to add filler items before each target items, we needed to change this plan after pilot study when child participants were taken into consideration. Specifically, we had to make the total time of the study shorter. To do so, we added one filler item in between every two target items item thus, obtained shorter list. Nevertheless, due to an experimenter error, the 6 filler items that were included in each list were not exactly the same 6 items.

Figure 1

Snapshots of Sample Stimuli for Direct, Indirect-Low and Indirect-High Events.



3.3 Procedure

Children participated in the study from their home and by interacting with a live experimenter over Zoom who navigated a PowerPoint slideshow. Experimenter informed the parent and child about the process of the experiment and asked them to test their microphone and camera in order to avoid technical problems during experiments (instructions and materials are adapted from Stanford Social Learning Lab, 2020). Parents who wanted to stay with their children stayed with them until the end of the experiment and asked them to not to interfere during the experiment beforehand.

Before the experiment, participants were randomly assigned one of the three lists. After a warm-up session with the child (warm-up session included a video of two birds eating their food and then asked them to explain what happened in the video), the test phase of the experiment started and the experimenter gave the instruction of the task and said, “*You will watch videos and after watching each video, I want you to tell me what happened in the video.*” If the child did not say anything or too shy to say something, the experimenter encouraged the child and could say the beginning of the sentence something like “*Salatalığı...*” lit. “*Cucumber...*”. Since, Turkish is a verb-final and head-final language, the evidential markers are attached to the end of the verb, which also appears last in the sentence. Thus, the fact that the experimenter started the sentence is unlikely to affect the production of evidential markers. Furthermore, since in Turkish the verb is marked for person and number, the noun phrases or pronouns referring to the agent can be omitted. Thus, naming only the object that went under a change is a

natural way to begin a sentence describing a change of state event in Turkish. There were no additional differences during the implementation part of the experiment for adult participants except while child participants were accompanied by their parents and adult participants were alone during the experiment. The answers of the child and adults were recorded for later analysis to measure the production of evidential markers in different conditions.

3.4 Coding

Descriptions were transcribed and coded by a native speaker of Turkish. We coded whether participants marked their event descriptions with direct evidential marker “-dı” (1), indirect evidential marker “-mış” (2), or something different than -dı and -mış coded as “other” (3).

- | | | | | |
|-----|--|------------------------|---------------------|--------------|
| (1) | Adam | balon | şişir-di. | |
| | man | balloon | blow-PST.DIRECT.3sg | |
| | “The man blew the balloon (I saw)” | | | |
| (2) | Muz | soy-ul-muş | | |
| | banana | peel-PASS-PST.INDIRECT | | |
| | “The banana was sliced (I heard/inferred)” | | | |
| (3) | Şişe-den | bardak-a | su | dökü-yor |
| | bottle-ABL | glass DAT | water | pour-PRS.3sg |
| | “(He) is pouring water into a glass.” | | | |

CHAPTER 4

RESULTS

Data and analysis scripts are available at the Open Science Framework Repository https://osf.io/ra7eb/?view_only=0fc62d095fb64623b87d1875aa3cb88.

We excluded the data from the trials in which the parents interfered with the children's responses or when there was an experimenter error (2.3% of the target trials).

4.1 Descriptive Statistics

As a descriptive analysis, we checked the frequency of evidential marker production (-dı, -mı, other linguistic forms) for event types across age groups (Table 1).

4.2 Inferential Statistics

4.2.1 Analytical Strategy

Data were analyzed with binomial linear mixed effects model with crossed random intercepts for Subjects only (Baayen, 2008; Baayen, Davidson, & Bates, 2008). Models were fit using *lme4* package (Bates et al. 2015) in R (R Core Team 2020). This analytical strategy enables researchers to use both subjects and items as a random factors in a single model. Besides, it is also suitable for categorical data (Jaeger, 2008, cf. Barr, 2008, Fraundorf et al., 2013). We used an optimizer bobyqa (Powell, 2009) and ggplot for data visualization (Wickham, 2016).

Table 1

Frequency of Evidential Markers and Other forms Across Event Types and Age Groups

Event Type	Age Group			
	Younger	Older	Adult	Total
Direct Events				
Direct evidential (-dı)	104	108	109	321
Indirect evidential (-mıſ)	21	10	3	34
Other forms	13	29	30	72
Indirect-low				
Direct evidential (-dı)	51	63	63	177
Indirect evidential (-mıſ)	64	59	72	195
Other forms	17	22	11	50
Indirect-high				
Direct evidential (-dı)	47	55	57	159
Indirect evidential (-mıſ)	71	78	80	229
Other forms	10	12	7	29
Total	398	436	432	1266

Note. Other forms include any other linguistic forms different than -dı and -mıſ marker.

4.2.2 Confirmatory Analyses

This analysis focused on the trials in which participants used one of the two evidentiality markers. Therefore, before analyzing the data, we excluded the trials in which participants did not use evidential markers to describe the events (i.e., “other” category in Section 4.2) from the analyses (11.9% of the data).

Our dependent variable was binary values of the use of the evidential marker $-d_1$ (1 = $-d_1$ is used, 0 = $-d_1$ is not used) at the item level. Since the analysis was conducted on only the trials in which an evidential marker was used, when participants did not use direct evidential ($-d_1$) they used indirect evidential ($-m_1\text{ş}$). The fixed effect of Age was tested with two planned contrasts. The first contrast compared children to adults (4- to 5-year-olds contrast coded as 1/3, 6- to 7-year-olds contrast coded as 1/3, adults contrast coded as -2/3). The second contrast compared younger vs. older children (4- to 5-year-olds contrast coded as 1/2, 6- to 7-year-olds contrast coded as -1/2, adults contrast coded as 0). The fixed effect of Event Type was also tested with two planned contrasts. The first contrast compared direct events to indirect events (Direct contrast coded as -2/3, Indirect-Low contrast coded as 1/3, Indirect-High contrast coded as 1/3). The second contrast compared the two types of Indirect events to each other (Direct contrast coded as 0, Indirect-Low contrast coded as 1/2, Indirect-High contrast coded as -1/2). The model included crossed random intercepts for Subjects only. A more complex model that also included random intercepts for Items produced singular fit error indicating that the model was over-fitted and too complex for the data. Thus, random intercepts for Items were excluded from the model.

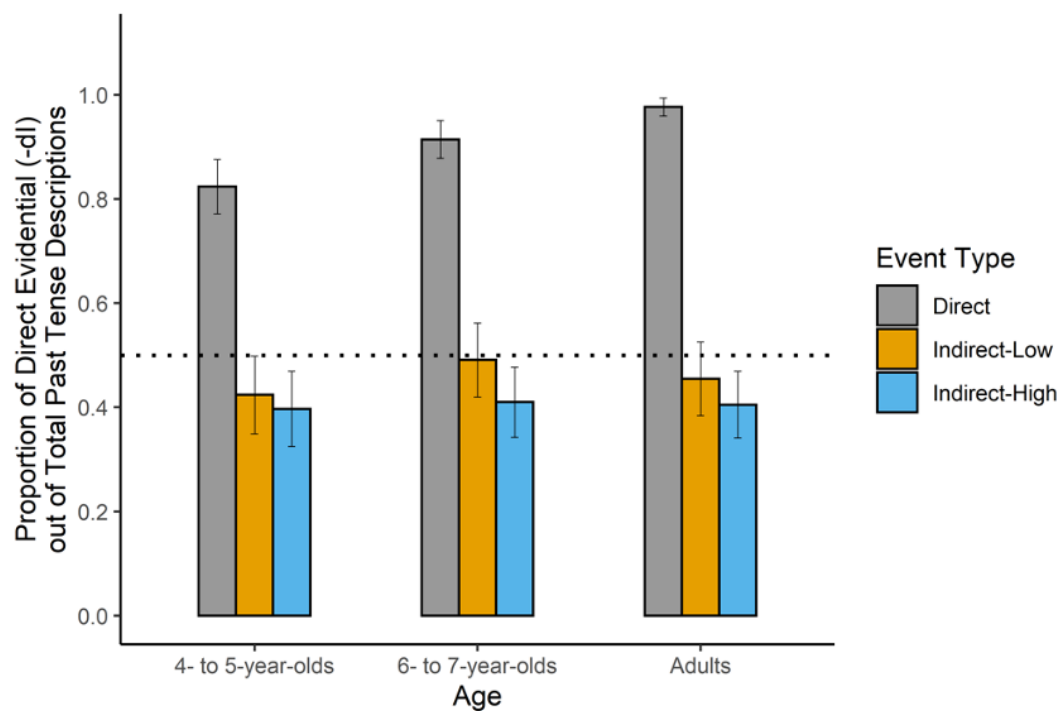
The model revealed a significant intercept indicating that overall participants were more likely to produce direct evidential marker ($-d_1$) than the indirect evidential marker ($-m_1\text{ş}$) (see Figure 2). Furthermore, both contrasts of Event Type were significant indicating that participants modified the evidential marking in the description according to type of evidence. More specifically, participants were more

likely to produce direct evidential (-dı) for direct events than indirect events.

Furthermore, participants were more likely to produce direct evidential marker (-dı), and thus less likely to produce indirect evidential (-mıř), for indirect-low events than indirect-high events. No other effects or interactions were statistically significant, indicating that these patterns were similar across children and adults (see Table 1)

Figure 2

Proportion of the Use of Direct Evidential Marker (-dı) for Different Event Types Across Different Age Groups



Note. Proportion of direct evidential marker (-dı) out of all past tense uses. Error bars indicate standard error. Scores above the dotted line and closer to 1 indicate that participants were more likely to use direct evidential (-dı); and scores below the

dotted line and closer to zero indicate that participants were more likely to use indirect evidential (-miş).

Table 2

Parameter Estimates for the Fixed Effects from Glmer Model for the Production of Direct Evidential Marker (-dı)

Effect	β	SE	z	p -value
Intercept	1.13	0.31	3.58	<.001
Condition (Direct vs. Indirects)	-5.06	0.45	-11.18	<.001
Condition (Indirect-high vs. Indirect-low)	0.47	0.22	2.11	.034
Age (Adults vs. Children)	-0.62	0.68	-0.91	.359
Age (Older vs. Younger Children)	-0.66	0.74	-0.89	.371
Condition (Direct vs. Indirect): Age (Adults vs. Children)	1.68	1.01	1.66	.096
Condition (Indirect-low vs. Indirect-high): Age (Adults vs. Children)	0.08	0.45	0.17	.860
Condition (Direct vs. Indirect): Age (Younger vs. Older Children)	1.08	0.81	1.33	.181
Condition (Indirect-low vs. Indirect-high): Age (Younger vs. Older Children)	-0.54	0.55	-0.97	.330

Formula in R: $DI \sim \text{CONDITION} * \text{AGE} + (1 | \text{ID})$

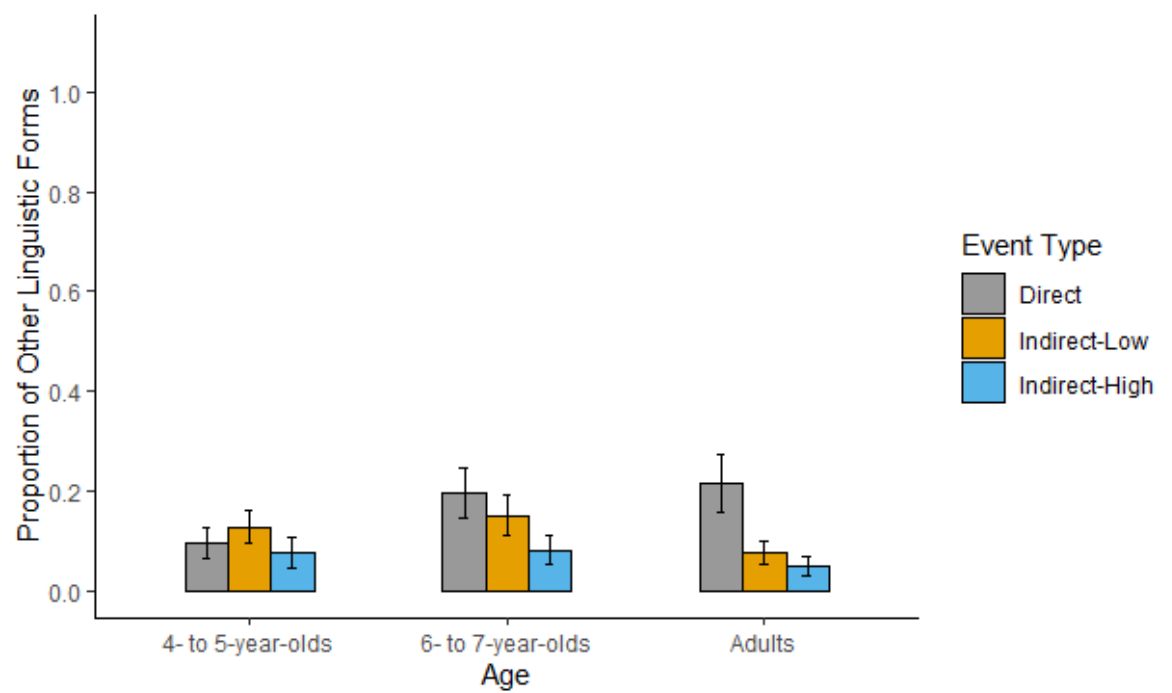
4.2.3 Exploratory Analyses

We conducted an exploratory analysis to see both children's and adult's tendency to use other linguistic forms particularly to describe indirect-high events since participants did not use -miş marker overwhelmingly. Once again, data were analyzed with binomial linear mixed effects model with crossed random intercepts for Subjects only (Baayen, 2008; Baayen, Davidson, & Bates, 2008). Models were fit using *lme4* package (Bates et al. 2015) in R (R Core Team 2020).

The fixed effect of Age was tested with two planned contrasts. The first contrast compared children to adults (4- to 5-year-olds contrast coded as $1/3$, 6- to 7-year-olds contrast coded as $1/3$, adults contrast coded as $-2/3$). The second contrast compared younger vs. older children (4- to 5-year-olds contrast coded as $1/2$, 6- to 7-year-olds contrast coded as $-1/2$, adults contrast coded as 0). The fixed effect of Event Type was also tested with two planned contrasts. The first contrast compared direct events to indirect events (Direct contrast coded as $-2/3$, Indirect-Low contrast coded as $1/3$, Indirect-High contrast coded as $1/3$). The second contrast compared the two types of Indirect events to each other (Direct contrast coded as 0, Indirect-Low contrast coded as $1/2$, Indirect-High contrast coded as $-1/2$). The model included crossed random intercepts for Subjects only. The model revealed a significant intercept indicating that both children and adults did not frequently produce other linguistic forms as expected (see Figure 3). The model also revealed a significant interaction between age and the first contrast for event type. Adults produced more other linguistic forms more frequently for direct events compared to the two types of indirect events. However, children did not produce other linguistic forms more frequently for direct events compared to the two types of indirect events. Finally, the model revealed a significant fixed effect of the second contrast for event type: all age groups produced other linguistic forms more frequently for indirect-low events as opposed to indirect-high events (see Table 2).

Figure 3

Proportion of the Use of Other Linguistic Forms for Different Event Types across Different Age Groups



Note. Proportion of other linguistic forms across age groups. Error bars indicate standard error.

Table 3

Parameter Estimates for the Fixed Effects from Glmer Model for the Production of Other Linguistic Forms

Effect	β	SE	z	p -value
Intercept	-3.08	0.27	-11.40	<.001
Condition (Direct vs. Indirects)	-0.91	0.21	-4.17	<.001
Condition (Indirect-high vs. Indirect-low)	0.72	0.28	2.56	.010
Age (Adults vs. Children)	0.28	0.47	0.60	.542
Age (Older vs. Younger Children)	-0.37	0.53	-0.70	.482
Condition (Direct vs. Indirect): Age (Adults vs. Children)	1.45	0.46	3.12	.001
Condition (Indirect-low vs. Indirect-high): Age (Adults vs. Children)	0.26	0.63	0.42	.671
Condition (Direct vs. Indirect): Age (Younger vs. Older Children)	1.01	0.52	1.92	.054
Condition (Indirect-low vs. Indirect- high): Age (Younger vs. Older Children)	-0.26	0.65	-0.40	.684

Formula in R: OTHER ~ CONDITION * AGE + (1 | ID)

CHAPTER 5

DISCUSSION

5.1 General Discussion

People gain information from various sources such as people, objects and events. However, the way of someone gains information regarding an event could vary due to the perspective of the observer (Gleitman, 1990). For instance, someone may directly observe an event and gain information regarding an event at first hand. On the other hand, the same person might obtain information indirectly that is could hear from someone else or could make inference from visual evidence. Although studies with both adult and child participants demonstrated that they are able to identify events, majority of studies conducted with children focused on events that can be directly observed in their entirety. How children identify events from indirect evidence as well as direct evidence and how they mark the sources of their event knowledge in language is a significant question to ask.

Languages differs in terms of evidential devices that they use to encode information sources. Turkish is one of the languages which has an obligatory evidential system to encode past experiences with two suffixes (-dı and -mış). Turkish speakers use direct evidential marker -dı for directly obtained experiences and use -mış for indirectly obtained experiences. Although there is an agreement on the acquisition of direct evidential marker (-dı) from very early ages, producing indirect evidential marker -mış is considered as late achievement except two recent findings (Ünal & Papafragou, 2016; Uzundağ et al., 2018). What makes producing indirect marker relatively harder compared to direct marker might be the nature of

indirect experience since distinguishing visual perception from visual inference could be challenging particularly for children. In fact, two pieces of evidence suggested that inference from visual evidence may not be a homogenous category and the distinction within types of indirect inferential evidence has impact on both production of evidential markers (Ünal et al., 2016) and learnability of evidential systems (Saratsli & Papafragou, 2020) for mature speakers and novice learners of a language.

In this study, we investigated how children (and adults) linguistically encode the sources of their event knowledge with an emphasis on inferential evidence with different degrees of indirectness. We had two main aims. First, we asked whether participants would mark their event knowledge source differently depending on the type of evidence, and especially distinguish between different types of indirect inferential evidence. Second, we asked whether there were any developmental differences in the adult-like uses of evidential markers. In the following sections, we discussed our findings and suggested possible reasons regarding evidential marker production for different event types in children and adults.

5.2 Production of Evidential Marker -Dİ According to Event Type

With regards to our first question, as we expected, there were differences between direct events and both types of indirect events in terms of production of evidential markers. Participants overwhelmingly produced direct evidential marker (-dİ) for direct events and this tendency was lessened for both types of indirect events, as participants frequently produced indirect evidential marker (-mİş) for these events. This finding is consistent with previous research showing that Turkish-

speaking children and adults mark the events they see with direct evidential marker (–dı) and events they infer with indirect evidential marker (–mış) (Aksu-Koç, 1988; Ozturk & Papafragou, 2016; Ünal & Papafragou, 2016; Ünal et al., 2016).

We also found some subtle differences between the two types of indirect events in terms of the linguistic marking of the presence of an inference. That is, both children and adults were more likely to use direct evidential marker (–dı) for indirect-low events which yielded more secure inferences about what happened compared to indirect-high events that provided weaker visual evidence and hence yielded less secure inferences. This indicates that, as in previous work with Turkish-speaking adults (Ünal et al., 2016), Turkish-speaking children’s use of indirect evidential marker (–mış) is sensitive to the indirectness level of inferential evidence for events. These findings also cohere with recent evidence from artificial language studies on the learnability of evidential systems (Saratsli & Papafragou, 2020; Saratsli et al., 2020). In those studies, novice learners had less difficulty learning an evidential system distinguishing visual perception from visual inference based more indirect cues. Similarly, in our study Turkish-speaking children (and adults) had less difficulty modifying the evidential marking in their descriptions when they inferred what happened based on more indirect cues.

5.3 Developmental Patterns in the Use of Evidential Marker

Our second main aim was to see whether there were any developmental differences in the use of evidential markers across different types of evidence for events. We found no developmental differences, indicating that even the youngest group of 4- to 5-year-olds were adult like. These findings are consistent with recent

experimental evidence on the acquisition of evidentiality (Ünal & Papafragou, 2016) as well as evidence from corpus studies focusing on the acquisition of different functions of the indirect evidential marker (-miş) in Turkish (Uzundag et al., 2018). On the other hand, these data seem to contrast with other work showing that the production of indirect evidential, especially to mark an inference, is a late achievement (Aksu-Koç, 1988, Aksu-Koç et al., 2009; Ozturk & Papafragou, 2016). We believe this difference can be explained by the contrastive nature of the puppet theater setup which provides visible cues (i.e., curtains opening and closing) to distinguish different sources of information from each other. These cues might have facilitated children's ability to modify the evidential marking in their descriptions. Future work can utilize this setup and introduce the curtain effect at different phases of the event (e.g., before the agent acts on the object) to better understand how sensitive children are to the amount of information they miss and thus the kind of inference they need to make.

There is one aspect of our findings that needs to be considered in more detail. Although the fact that both children's and adults' use of evidential markers was sensitive to the types of inferential evidence, neither children nor adults produced the indirect evidential marker (-miş) overwhelmingly for highly indirect events. On average, they used the indirect evidential marker (-miş) for about 60% of the time. This contrasts with previous findings with Turkish-speaking adults (Ünal et al., 2016) and children (Ünal & Papafragou, 2016). In those studies, participants produced the indirect evidential marker for events equivalent to our Indirect-High

events for about 80% of the time. This difference can be attributed to the following factors.

First, unlike previous work requiring children to contrast two different types of events (e.g., seen vs. inferred; Ozturk & Papafragou, 2016; Ünal & Papafragou, 2016), in the current paradigm, children had to contrast three different types of events (i.e., direct vs. indirect-low vs. indirect-high). The requirement to make a three-way distinction might have made the production task more challenging for children and skewed the description data towards higher use of direct evidential marker. Since distinguishing three events could be more challenging for children, they might use *-dı* marker which could be considered as the default past tense in Turkish compared *-miş* marker that has more specific functions. Nevertheless, this aspect of the task was similar to previous paradigms used with adults (Ünal et al., 2016) and thus would not explain why adults did not overwhelmingly use indirect evidential for the highly indirect events.

Second, the individual events used in the present study were not identical to the events used in prior studies. The highly indirect versions of some of our events may not be as indirect as those used in previous work. Although all of our events were examples of change-of-state events, the internal structure of events may vary. For example, some events (e.g., *building blocks*) may consist of more distinct sub-stages. Other events (e.g., *inflating a balloon*) might have sub-stages that are more continuous or similar to each other. Differences in event structure might lead participants to perceive some of the indirect-high events as relatively less indirect.

Besides, the visual cues depicting the end-states of different events may also vary in terms of their indirectness. As we have mentioned before, due to the differences between the nature of events, some of the post-event visual cues might be less indirect compared to another event's post-event visual cues. In fact, for some of the events that labelled as indirect-low may be perceived as highly indirect compared to other events labelled as indirect-high which included only post-change of an event. Therefore, what makes an event more or less indirect requires further investigation. Future work is needed to better understand the contribution of these factors to how children reconstruct events from different types of visual cues, as well as how they linguistically convey what they have reconstructed.

Furthermore, it is also possible that even though children and adults made inferences from highly indirect visual cues, they might have conveyed the presence of an inference using different means, such as lexical devices. Alternatively, participants might have chosen not to communicate about their inferences at all. For this possibility, we conducted an exploratory analysis to see the production of other linguistic forms different than *-dı* and *-miş* across age groups. Results demonstrated that other responses were preferably used to depict direct events compared to indirect-high events contrary to our expectations particularly for adult participants. Since *-miş* has more specific function than *-dı* in everyday conversation and that circumstance might lead participants to use less irrelevant linguistic forms for indirect-high events. Therefore, the unexpected proportion of low the production of *-miş* for indirect-high events could not be explained with other linguistic forms which was expected to compensate the production of *-miş*. We can claim that

participants chose to produce -miş when they perceived an event indirect enough to mark with -miş marker. Therefore, factors that make any event more indirect or less indirect becomes more noteworthy and open further investigation to understand Turkish speakers' tendency use -miş as an indirect evidential marker.

In addition to the characteristics of a visual cue, there might be several explanation why participants did not produce -miş overwhelmingly. One of the explanation could be pragmatic factors which is likely to affect evidential marker production particularly for indirect evidential marker -miş. In the current study, participants were aware that the experimenter is also watching the same events at the same time which might lead participants to use less -miş in their description. In other words, while speakers were deciding when to produce -miş, they might have also considered the listener's perspective and especially whether the listener also witnessed the same event or not. Therefore, future work can create tasks which manipulates whether the listener will be witness the same events with the participant to better understand the consequences of listener's perspective on -miş marker production.

Another factor that might affect the production of -miş of participants could be the interval between the experience and the description of the event. Particularly, whether participants describe the events right after experiencing them or after a delay internal affect the production of -miş. Therefore, the production of -miş of participants may not solely hinge on the characteristics of the visual cue that the speaker perceived. Besides, speakers could also consider the referential aspects of the communication and adjust their description according to that. All these possible

explanation lead us to think about individual differences on evidential marker production and how speakers judge and choose to produce their information sources in language with a different evidential marker.

In addition to this issue, as mentioned in the materials section due to the experimenter error, three different filler list were shown to participants. Later, we checked whether there was any difference across filler list and found that one of the list is significant. However, the list consisted of the same filler items with a different order. Therefore, the significance of the filler list could not be explained by mere effects of the filler list. Since each experiment lists also distinguished in terms of the event types and internal event structure (e.g. slicing cucumber event with indirect-high version in the second slide list is shown as indirect-low version in the last slide list), the difference between event types were likely to cause such a result.

5.4 Types of Inferential Evidence

One of the prominent findings of the study was that both children and adults' production of evidential marker varied depending on the indirectness level of an event. In other words, both children and adults were sensitive the indirectness level of an event and they adjusted their evidential marker production according to degrees of indirectness. Even though previous work with adult participants displayed adults' sensitivity to the different indirectness level of an event (Ünal et al., 2016), our study presents a novel finding which also reveals Turkish speaking children's sensitivity to indirectness level of events which lead them to produce different evidential marker.

Although our findings supported the previous finding (Ünal, et al., 2016), we were expecting more difference between indirect-low and indirect-high in terms of evidential marker production. As mentioned above, what makes any event more indirect or less indirect compared to other one in order to adjust the evidential marker production is not well understood. Therefore, allowing different event types for the future studies could be significant in terms of demonstrating the effects of different indirectness level of an event on evidential marker production.

Finally, even though the present study only focused on the linguistic encoding of evidence for events, our findings may also have implications for how people draw the boundary between visual perception and visual inference or between different types of visual inference in cognition. Our findings suggest that these boundaries may not always be very clear. Instead, what makes a particular piece of visual evidence as less or more indirect seems to be collectively characterized by several features, potentially, including knowledge about who performed the event as well as other factors, such as event structure, individual differences.

5.5 Implications of the Study

5.5.1 Theoretical Implications

The aim of the current study was to investigate whether events with different indirectness level have impact on evidential marker production across different age groups in Turkish which has an obligatory evidential system as a part of their grammar. Contrary to previous findings, we found that children are able to identify events from different sources (particularly indirect inferential sources) and express

their experience in a language with evidential markers. Moreover, both adults and children demonstrated sensitivity to the level of indirectness of an event and express their sensitivity in language using different evidential markers which revealed adult-like competency of even younger children (4-to 5-year-olds). In addition, one of the salient findings of the study was that even though both children and adults used different evidential markers for indirect-low and indirect-high events, the proportion of the production of -miş was lower than our expectations. This finding leads us to think about the indirectness level of an event and factors that makes any event more indirect. Since one of the cross-linguistic study conducted with adult participants displayed the universality of judgements on event perception (Ünal et al., 2016), there might be several features which makes any event more or less indirect regardless of the impact of the language such as event structure, post-event visual evidence and so on.

When the previous studies are taken into consideration with the current findings, we can support the idea that that event perception and inference making are not dependent to the language even though the way of expressing their information sources may differs across languages. Moreover, there was no developmental differences between 4-to 5-year-old children and adults in terms of evidentiality production in Turkish which has an obligatory evidentiality system as a part of their grammar. These findings suggested that even 4-to 5-year-old children are able to identify events from different sources and express their experience in language.

5.5.2 Methodological and Practical Implications

The current study has prominent implications for future studies both conducting with children and adults. As mentioned before, there was no study conducted with children in online settings in terms of investigating the production of evidential markers in Turkish-speaking children and adults. Although we conducted the study on an online platform, our study supported the findings of the recent studies (Ünal & Papafragou, 2016; Uzundağ et al., 2018) conducted with younger children and revealed the early success of children in producing indirect evidential marker considering the event types with a different indirectness level. The result of the study provides promising evidence for the applicability of experiments to online platforms.

Our study has also practical implications and offer possible explanation in terms of understanding how individuals convey their event experiences in language. Although we focused on a certain function of evidential marker production in the current study, evidential markers *-dı* and *-miş* could also be used to mark the reliability of the relevant information as *-dı* marker frequently is used for first-hand experience and *-miş* marker is used for second-hand experience. Since second-hand experience tend to be judged as less reliable than participants' own, that circumstance might also lead participants to produce *-miş*. Moreover, some participants' production of *-miş* could be based on to specify their uncertainty instead of the mere effects of post- event visual evidence. Besides that evidentiality production also provide a possible pathway in terms of investigating its impact on memory. In addition to the studies investigated the effects of evidentials in source

memory performance, investigating the effects of evidentials is particularly prominent for younger children due to their susceptibility towards misinformation. Moreover, it is also significant in terms of eyewitness testimony of children in forensic settings and the way the forensic interviews should be conducted (Aydin & Ceci, 2013).

5.6 Limitations and Future Directions

The current study revealed informative findings which also give directions for future studies in order to enlighten the process between perception and language. Yet, there are some limitations which needs to be taken into consideration for future studies.

Even though we compared events according to the indirectness level as indirect-low and indirect-high, we do not exactly know whether participants perceived an indirect-high event as we considered as highly indirect due to the absence of a protagonist at the end of an event. Therefore, categorizing events according to indirectness level would be beneficial for future studies whether the indirect-high event yielded more the production of -mıř for future studies.

The current study also provokes many research ideas regarding both event cognition and evidentiality across age groups. First issue that could be considered for future research is investigating the event structure and its impact on indirectness level of an event. Particularly, the temporal structure of the events might have impact on indirectness level of an event since the level of distinctness of the substages differs across events. Besides, the visual cues giving rise to an inference

at the end of each event varies across different events which might affect the indirectness level of an event.

Second, as we have mentioned above, one of the remarkable findings of our study was that even the youngest children 4-to 5-year-olds were adult-like in terms of evidential marker production. However, we do not know whether younger children 2- to 3-year-olds) will demonstrate adult-like patterns. Therefore, conducting study with younger children would complete the developmental pattern in terms of evidential marker production. In addition to production task, seeing whether same age groups of the current study would perform adult-like competence as we displayed in the production task. Consequently, conducting a comprehension study with the same age groups would contribute the acquisition of evidentiality literature in Turkish.

The last issue that we want to mention is regarding conducting online developmental studies and its possible advantageous and drawbacks that researchers might experience. Since our study was conducted via online platform Zoom due to the Covid-19 restrictions, it differed from previous studies, even though we used similar methodology with puppet theatre tasks (Aksu-Koç, 1988; Ünal & Papafragou, 2016). Before conducting the experiment, there are many issues that researchers need to take into consideration such as ethical issues, material production, communicating with parents and so on (Öner et al., 2021). In other words, researchers need to adjust all face-to-face process to an online environment. For the current study, we prepared materials and guidelines for both research team and families to create controllable lab-like environment. For instance, parents

received a parent guideline before the experiment day including the preferred online equipment and Zoom guidance. Besides, all research assistants were trained on the application process of the experiment. Despite that, there were some unpredictable situations that the research assistants could not control such as the quality of Internet connection which sometimes causes disconnections. However, the majority of the participants did not report any negative comments about the image quality. Despite some challenges which researchers need to consider such as the inconsistent internet connection, conducting online developmental research has many advantageous in terms of increasing the participation of families, saving time and allowing flexibility for both researchers and families (Öner et al., 2021).

5.7 Conclusion

The current study investigated the effects of indirectness level of an event on evidential marker production with adults and 4-to 7-year-olds children. Except two recent findings, previous studies revealed the struggle of children while producing indirect evidential marker -miş due to the requirement of making an inference regarding different indirectness level of an event. Besides, two recent study with adult participants demonstrated that the subtle distinction within types of inferential evidence yielded to different evidential marker production and learnability of evidential systems. The result of our study showed that both Turkish speaking children and adults used direct evidential marker -dı for direct and indirect-low events. On the other hand, they used indirect evidential marker -miş for indirect-high events. We did not find any age difference across participants which means children's production of evidential marker was adult-like. There was one salient

finding of the study which contradicted with our expectations was the overall the production of -mıř. Although there was a significant difference between -dı and the production of -mıř for indirect low and indirect-high events, participants did not prefer to use -mıř overwhelmingly. We also made exploratory analysis to see the production tendency of each age group apart from -dı and -mıř. We found that adults significantly used more -dı for direct events compared to two types of indirect events and all age groups used more other linguistic forms for indirect-low events compared to indirect-high events. In other words, when the indirectness level increased, the production amount of other linguistic forms decreased. Therefore, we concluded that less the production of -mıř tendency could not be explained by other linguistic forms' production. We offered possible explanations regarding this finding and suggested that future studies are needed to elucidate the factors which make any event more indirect or less indirect that affect the evidential marker production in Turkish.

APPENDIX A

List of target events used in experiment

	Target events
1	Stacking blocks
2	Drinking milk
3	Plucking a cake
4	Slicing cucumber
5	Pouring water
6	Putting M&Ms into transparent cup
7	Drawing paper
8	Cracking an egg
9	Eating cookie
10	Blowing balloon
11	Cutting paper with scissor
12	Peeling banana

APPENDIX B

Presentation lists used in experiment

List A	List B	List C
Ball	Books	A lamp
Stacking (direct)	Stacking (indirect-high)	Stacking (indirect-low)
Drinking (indirect-low)	Drinking (direct)	Drinking (indirect-high)
Two cups	Pens	Cars
Plucking (indirect-high)	Plucking (indirect-low)	Plucking (direct)
Slicing (direct)	Slicing (indirect-high)	Slicing (indirect-low)
Glasses	Pencil case	Laptop
Pouring (indirect-high)	Pouring (direct)	Pouring (indirect-low)
Putting (indirect-low)	Putting (indirect-high)	Putting (direct)
A mouse	Laptop	Glasses
Drawing (indirect-high)	Drawing (direct)	Drawing (indirect-low)
Cracking (indirect-low)	Cracking (indirect-high)	Cracking (direct)
A lamp	Snow globe	Pens
Eating cookie (direct)	Eating (indirect-low)	Eating (indirect-high)
Blowing (indirect-low)	Blowing (direct)	Blowing (indirect-high)
Two pots	Cars	Balls
Cutting (indirect-high)	Cutting (indirect-low)	Cutting (direct)
Peeling (direct)	Peeling (indirect-low)	Peeling (indirect-high)

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