The early acquisition of syntax: Evidence from Palestinian Arabic

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A dissertation submitted for the degree of Doctor of Philosophy in Cognitive Science and Language

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To my beloved husband Amer and our precious daughter Bella

Abstract

Despite the abundance of studies on parameter setting, there has been limited research conducted on early parameter settings before the two-word stage. This dissertation presents experimental work on the nature of infant's syntactic representations, focusing on word order and wh-interrogatives in Palestinian Arabic, preceded by a study of the early spontaneous productions of children entering the two-word stage and their interlocutors. The study of spontaneous production revealed on the part of young children no problems in verbal inflection, the presence of serial verb constructions, and various word order alternations (a total of 50 different word orders were found in the adults' speech sample, while 45 word orders were coded for children), with dominance of VO patterns and SVO when the subject and object are present. In the first experimental study a combination of the preferential-looking paradigm, the weird-word-order paradigm, and pseudo-verbs were employed to investigate the acquisition of the VO order (as opposed to OV) in 17-month-old native Palestinian Arabic infants. The findings indicate that native Palestinian Arabic infants have established VO by the age of 17 months, and ignore sequences of ungrammatical OV. This is in consonance with previous results from French, Hindi-Urdu and Mandarin, although the result was only available for 17-month-olds for Mandarin. In the second experimental study, also resorting to the preferential-looking paradigm, parsing of wh- questions was tested. The infants were presented with subject and object *ʔay* 'which' questions. We introduced measures of fixation on a character (not a scene) which guarantees that we targeted comprehension of the wh- question; also, unlike in previous research on wh- questions, we used pseudo-verbs. Evidence for the interpretation of subject wh-questions in an

adult-like manner was found for 18-month-olds. The performance of infant in both experiments provides evidence in favour of the Very Early Parameter Setting and is predicted by the generative account, as children were not performing based on any prior lexical knowledge of the verb, implying the presence of adult-like syntactic representation in child grammar.

Resum

Malgrat l'abundància d'estudis sobre la fixació de paràmetres, s'han realitzat poques investigacions sobre la fixació primerenca de paràmetres abans de l'etapa de dues paraules. Aquesta tesi presenta un treball experimental sobre la naturalesa de les representacions sintàctiques dels infants, centrat en l'ordre de les paraules i les interrogatives de qu- en àrab palestí, precedit per un estudi de les primeres produccions espontànies dels nens que entren a l'etapa de dues paraules i els seus interlocutors. L'estudi de la producció espontània va revelar que els nens no tenen problemes en la flexió verbal, que fan frases amb presència de construccions verbals en sèrie i diverses alternances d'ordre de paraules (es van trobar un total de 50 ordres de paraules diferents a la mostra de parla dels adults, i 45 en les produccions infantils) amb domini dels patrons VO i SVO quan el subjecte i l'objecte hi són. En el primer estudi experimental es va utilitzar una combinació del paradigma de la mirada preferent, el paradigma d'ordre de paraules estrany i l'ús de pseudoverbs per investigar l'adquisició de l'ordre VO (en contrast amb OV) en infants àrabs palestins nadius de 17 mesos. Els resultats indiquen que els nadons àrabs palestins nadius han establert l'ordre VO als 17 mesos i ignoren les seqüències d'OV agramaticals. Això està en consonància amb els resultats anteriors en francès, hindi-urdú i mandarí, tot i que el resultat només estava disponible per a nens de 17 mesos per al mandarí. En el segon estudi experimental, recorrent també al paradigma de la mirada preferent, es va testar la comprensió de preguntes de qu-. Als nadons se'ls van presentar preguntes de qu- de subjecte i d'objecte amb l'interrogatiu *ʔay* 'quin'. He introduït mesures de fixació en un personatge (no en una escena) que garanteixen que ens fixem en la comprensió de la pregunta de qu-; també,

a diferència de les investigacions anteriors sobre preguntes de qu-, vaig utilitzar pseudo-verbs. El resultat és que tenim evidència d'interpretació de les preguntes de qu- de subjecte de manera semblant a l'adulta per a nens de 18 mesos. El comportament dels infants en ambdós experiments proporciona proves a favor de la fixació de paràmetres molt primerenca i és consistent amb l'aproximació generativa, ja que el comportament dels nens no es podia basar en cap coneixement lèxic previ del verb, cosa que implica la presència d'una representació sintàctica semblant a la de l'adult.

Resumen

A pesar de la abundancia de estudios sobre la fijación de parámetros, se han realizado pocas investigaciones sobre la fijación de parámetros antes de la etapa de dos palabras. Esta tesis presenta un trabajo experimental sobre la naturaleza de las representaciones sintácticas de los bebés, centrándose en el orden de las palabras y las interrogativas de qu- en árabe palestino, precedido por un estudio de las primeras producciones espontáneas en niños en la etapa de dos palabras y sus interlocutores. El estudio de la producción espontánea reveló que los niños pequeños no tenían problemas en la flexión verbal, la presencia de construcciones verbales en serie y varias alternancias de orden de palabras (se encontraron un total de 50 órdenes de palabras diferentes en la muestra de habla de los adultos, mientras que 45 órdenes de palabras se codificaron para los niños), con predominio de patrones VO y SVO cuando el sujeto y el objeto están presentes. En el primer estudio experimental, se empleó una combinación del paradigma de la mirada preferente, el paradigma de orden de palabras extraño y el uso de pseudo-verbos, para investigar la adquisición del orden VO (en oposición a OV) en bebés árabes palestinos nativos de 17 meses de edad. Los hallazgos indican que los bebés árabes palestinos nativos han establecido el orden VO a la edad de 17 meses e ignoran las secuencias OV no gramaticales. Esto está en consonancia con los resultados anteriores de francés, hindi-urdu y el mandarín, aunque el resultado solo estaba disponible para bebés de 17 meses para mandarín. En el segundo estudio experimental, también recurriendo al paradigma de la mirada preferente, se investigó la comprensión de preguntas de qu-. A los bebés se les presentaron preguntas de qu- con el interrogativo de sujeto y objeto *ʔay* 'cuál'. Introduje medidas de fijación en un personaje (no en

una escena), cosa que garantiza que nos enfocamos en la comprensión de la pregunta de qu-; también, a diferencia de investigaciones anteriores sobre preguntas de qu-, usamos pseudo-verbos. Se encontró evidencia para la interpretación de las preguntas de qu- del sujeto para bebés de 18 meses. El comportamiento de los bebés en ambos experimentos proporciona evidencia a favor de la fijación de Parámetros Muy Temprana y es consistente con la aproximación generativa, ya que el comportamiento de los bebés no se basaba en ningún conocimiento léxico previo del verbo, lo que implica la presencia de una representación sintáctica similar a la de un adulto en la gramática infantil.

Declaration

I, *Tala Nazzal*, hereby declare that this thesis, titled *"The Early Acquisition of Syntax: Evidence from Palestinian-Arabic,"* is my original work. I submit this thesis to fulfill the requirements for the degree of Doctor of Philosophy (PhD) in Cognitive Science and Language at the Universitat Autònoma de Barcelona. The research presented in this thesis was conducted under the supervision of Prof. Anna Gavarró, following the regulations and guidelines of the university.

I confirm that this thesis has not been previously submitted for any other degree or qualification at any other university or educational institution. Furthermore, I affirm that this thesis does not infringe upon the rights of others. Throughout this work, I have diligently acknowledged and attributed the work of others by appropriately referencing their contributions within this thesis. Any direct quotations or paraphrasing from external sources are clearly identified and cited, ensuring the transparency and integrity of this research.

Barcelona, November 16, 2023

Tala Nazzal

Ethical Considerations

The experimental work presented in this thesis was conducted in accordance with the principles of the Declaration of Helsinki. Furthermore, ethical approval for the two experiments on the early acquisition of Palestinian Arabic in chapters 3 and 4 was obtained from the Comissió d'Ètica en l'Experimentació Animal i Humana of the Universitat Autònoma de Barcelona (CEEAH approval number CA23).

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Acronyms

1 1st Person.

2 2nd Person.

3 3rd Person.

ACC Accusative.

ASD Autism Spectrum Disorder.

Aux Auxiliary.

CDI Communicative Development Inventory.

CHE CALLHOME Egyptian Arabic.

D Declarative.

DLD Developmental Language Disorder.

Du Dual.

F Feminine.

I Imperative.

ICA The International Corpus of Arabic.

In Interrogative.

LCA Linear Correspondence Axiom.

LMMs Linear mixed-effect models.

M Masculine.

MLUm Mean Length of Utterance in morphemes.

MLUw Mean Length of Utterance in words.

MSA Modern Standard Arabic.

NOM Nominative.

O Object.

P&P Principles and Parameters.

Pl Plural.

RoIs Region of Intrest.

S Subject.

SD Standard Deviation.

SE Standard Error mean.

SG Singular.

UG Universal Grammar.

V Verb.

VEPS Very Early Parameter Setting.

WWO Weird Word Order.

YADAC Yet Another Dialectal Arabic Corpus.

Arabic Transcription Chart

Arabic Consonants	IPA	Descriptions
ء	ʔ	Voiceless glottal stop
ب	b	Voiced bilabial stop
ت	t	Voiceless dental stop
ث	θ	Voiceless dental fricative
ج	ʒ	Voiced palatal fricative
ح	ħ	Voiceless pharyngeal fricative
خ	x	Voiceless velar fricative
د	d	Voiced dental stop
ذ	ð	Voiced dental fricative
ر	r	Voiced alveolar trill
ز	z	Voiced alveolar
س	s	Voiceless alveolar fricative
ش	ʃ	Voiced alveolar fricative
ص	$s^ʕ$	Voiceless alveo-dental emphatic fricative
ض	$d^ʕ$	Voiced alveo-dental emphatic stop
ط	$t^ʕ$	Voiceless alveo-dental emphatic stop
ظ	$z^ʕ$	Voiced alveo-dental emphatic stop
ع	ʕ	Voiced pharyngeal fricative
غ	ɣ	Voiced velar fricative
ف	f	Voiceless labiodental fricative

ق	q	Voiceless uvular stop
ك	k	Voiceless velar stop
ل	l	Voiced alveolar lateral
م	m	Voiced bilabial nasal
ن	n	Voiced alveolar nasal
ه	h	Voiceless glottal fricative
و	w	Voiced bilabial glide
ي	j	Voiced palatal glide

Chapter 1

Introduction

1.1 Language acquisition

Despite the substantial variation in grammatical structures and semantic encoding among different languages, children can effortlessly and rapidly acquire any language without formal instructions in fairly similar time courses. Within just a few years, infants become proficient in their mother tongue without the need for explicit instruction or intentional effort, relying on positive evidence from what they hear or see (Goldin-Meadow, 2003). This ability remains constant across different languages and modalities, including sign language for deaf children (Meier & Newport, 1990). Babies begin vocal babbling at 6–8 months, produce their first words between 12 and 16 months, and start combining words into sentences by the time they reach about 20 months. By the time they are 3, irrespective of whether they are exposed to a spoken or signed language, children demonstrate a relatively advanced level of language proficiency (Guasti, 2017). Numerous approaches from various perspectives have been put forth to elucidate the process of language acquisition in children. One influential theoretical framework that has made significant contributions to our understanding of language acquisition is the generative approach. This chapter aims to explore diverse perspectives concerning the foundational aspects of word order development, with a specific focus on uncovering the initial mechanisms through which infants

construct syntax within the context of the generative approach. While my research adopts a generative approach, I consider (and raise objections to) other analyses that have been proposed for datasets resembling my own, throughout the course of my research.

The ability of children to effortlessly and rapidly acquire any language without formal instruction even when the input is degraded or lacks any pre-existing language model suggests the existence of an innate capacity for learning, genetically encoded within them (Goldin-Meadow, 2003). This capacity enables children to grasp mechanisms and principles underlying any language. Extensive evidence supporting the existence of such an innate biological capacity to acquire language has been provided by the generative approach (Chomsky, 1981; Pinker, 1984). According to this approach, children are born with a neuro-physiological entity known as universal grammar (UG), which encompasses constraints and rules of a rather abstract nature that apply universally to all languages (Chomsky, 1981, 1993a, seq.). UG was described by Chomsky as a "black box" that takes primary linguistic data as input and produces a language-specific grammar as output (Chomsky, 1981). However, it is evident that not all aspects of language grammar are universally shared. If this were the case, all natural languages would possess identical grammatical structures, rendering the process of acquiring grammar in language acquisition unnecessary. Instead, there are language-specific grammatical proprieties that children must establish for from an early age (Chomsky, 1981).

Chomsky (2005) proposes that language acquisition can be attributed to three key factors: the human genetic endowment, experience, and properties that are not exclusive to language such as cognitive abilities (including memory). By the first factor speakers of a language possess innate abstract knowledge that cannot be derived solely from the evidence available to children (positive evidence). This suggests that language acquisition is facilitated by a complex and interactive biological endowment (Chomsky, 2005). The second factor ensures that children learn the lexicon (both function

and content words) of the language they are exposed to, guiding them in the configuration of language-specific proprieties. Based on experience, children acquire a specific language (Chomsky, 2005). Lastly, the third factor contributing to language acquisition involves properties that extend beyond language itself and are not exclusive to language acquisition, such as general cognitive mechanisms (Chomsky, 2005).

The prior Principles and Parameters framework (P&P) (Chomsky, 1981) holds significance in this thesis since it serves as the foundational theoretical approach for the investigation conducted in this study. Chomsky's principles and parameters framework, introduced within the context of Government and Binding (Chomsky, 1981), is grounded to explain the diversity of languages by positing the setting of different parameter values based on the poverty of stimulus, where speakers possess innate, universal linguistic knowledge that is not directly available in the input (Chomsky, 1981, 1995). Hence the fundamental concept in Principles and Parameters revolves around distinguishing the enduring aspects of human languages, referred to as principles, from the significant areas of variation observed across different languages, known as parameters (Snyder & Lillo-Martin, 2011). During the initial phase of research in the P&P model, several parameters were proposed: The Directionality Parameter, The Null Subject Parameter, The Null Topic Parameter, The *Wh*- Movement Parameter, The Nonconfigurationality Parameter, The Polysynthesis Parameter, The Nominal Mapping Parameter, and The Relativized X- Bar Parameter, among others (Huang & Roberts, 2017).

Native speakers of a language consistently encounter and produce new sentences. They also possess the ability to distinguish between grammatically well-formed or ill-formed sentences, even though their exposure is limited to a finite number of sentences (positive evidence) and they do not receive explicit information about which sentences are grammatical or which interpretations are not allowed in their language (negative evidence). This overall description of the situation results in what Chomsky (1978) referred to as 'the argument from the poverty of the stimulus.' The existence of this knowledge is evident,

however, it raises questions regarding its source: Where does this knowledge originate? And how does it develop in individuals as they grow? This is the logical problem of language acquisition, referred to as 'Plato's problem' (Chomsky, 1986). The logical problem of language acquisition is regarded as such due to a notable discrepancy between the extensive complexity of adult linguistic competence and the comparatively brief time frame within which language is acquired, alongside the seemingly limited cognitive abilities of young children. The P&P framework offers a comprehensive explanation for this problem by reducing the process of acquiring language to a matter of parameter-setting (Huang & Roberts, 2017). According to this framework, principles constitute an innate system known as Universal Grammar (UG), while parameters are acquired properties of language through experience. In other words, young children are expected to possess knowledge of principles, whereas parameters can vary in value depending on the target language, informed by linguistic input (Wexler, 1998; Chomsky, 2005; Yang, 2006). These parameters are commonly thought of as binary, meaning that each parameter has two (and only two) possible values, for instance, language may or may not have null subjects.

The P&P model significantly simplifies the complexity of the language acquisition process and has important implications for how children acquire their native language within a relatively short span of time, without apparent effort or formal teaching, despite the poverty of stimulus. It suggests that children do not need to actively learn grammatical features that are universal because they are inherent in the language faculty and, thus, part of their genetic inheritance. Instead, the acquisition of grammar will be confined to the parametrized aspects of language structure (Radford, 2006). Moreover, considering the scarcity of stimulus and the fact that children are not explicitly corrected for producing ungrammatical utterances, the P&P framework bridges the gap caused by the limited linguistic input. Thus, it suggests that "external experience," referring to linguistic input alone, is not the sole factor in determining the parametric values of a child's native language. This is further supported by the remarkable consistency observed in

language structure despite variations in learning styles, educational attainment, and socioeconomic background (Yang, Crain, Berwick, Chomsky, & Bolhuis, 2017).

The parameter-setting model of language acquisition raises the question of how children determine the correct values for specific parameters and what type of evidence they rely on for parameter setting. Chomsky (1981: 8-9) highlighted three types of evidence that can be potentially accessible to language learners: positive evidence, which includes examples of canonical word order (such as SVO) that establish a parameter of core grammar, or instances of irregular verbs that add a marked periphery; (2) direct negative evidence, which refers to corrections provided by the speech community; and (3) indirect negative evidence, which involves the absence of certain linguistic patterns or constructions. However, direct negative evidence was found to have no significant impact on the language acquisition process. According to Radford (2006) this could be due to two primary reasons. Firstly, correction occurs infrequently, as adults do not correct all the errors made by children (Radford, 2006; Guasti, 2017). Secondly, children are known for their limited responsiveness to correction, meaning they often fail to incorporate corrections into their subsequent language use (Radford, 2006; Guasti, 2017).

Setting parameters requires experience. However, when language variation is accounted for by inherent and predetermined parameters, the role of experience is minimized (Crain & Thornton, 2013). The process of setting parameters in language acquisition poses several challenges. One point of contention within the P&P approach is whether the parameters are "unset" or "mis-set" during the process of language acquisition (Snyder & Lillo-Martin, 2011). Various models with different predictions have been developed to address this issue, such as the triggering model (Gibson & Wexler, 1994; Sakas & Fodor, 2001), and the variational model (Yang, 2002, 2004).

Gibson and Wexler (1994) introduced one of the first formal models for how children set the values of the different parameters, Triggering. According to

this computational model, infants have set parameter values at any given time, which they can modify based on the input data. Thus, when the present grammar fails to analyze an incoming sentence, the parameter values are adjusted, effectively replacing the existing grammar. Following this model, researchers like Dresher (1999) and Fodor (1998) proposed that children concentrate on specific aspects of the observed data that are associated with a particular parameter value. This suggests that children may derive this information in some manner. Certainly, children do not disregard the existing data; instead, they search the data for unambiguous cues and reward parameter values that best explain the distribution of these particular data (Dresher, 1999). The hypothesis predicts a sudden change in the quality of a child's production when s/he transitions from one grammar to another.

In contrast to the triggering model, in a quantitative model of language acquisition, the variational model by Yang (2002, 2004) and Yang et al. (2017), the learner does not select any value as an initial hypothesis for the different parameters available by UG. As per this model, parameters are initially unset, meaning that, during the language acquisition process, the learner does not start with a single grammar but rather with multiple competing grammars. Consequently, the process of language learning is gradual and probabilistic based on the frequency of so-called signatures. Following this hypothesis, as stated by Yang (2002: 26–27): for an input sentence S, the child with a probability P_i would select a grammar G_i to analyse S with G_i; if G_i succeeds, then G_i will be rewarded by increasing P_i; if G_i fails, then G_i will be punished by decreasing P_i. Thus, according to the variational model, the rise in target grammar occurs gradually in the absence of unambiguous evidence by updating the grammar's weight/probability. In contrast to an error-driven learner that only advances when there is a mismatch between the current hypothesis and the input data, the learner advances both when the data fit the current grammar and when they do not through rewarding and punishing (Sakas, 2016). The hypothesis aims to explain the grammatical errors made by children with respect to the target language before eliminating the non-target (competitor) grammar (Yang, 2002, 2004). Finally, unlike

the generative grammar approach, which has not paid sufficient attention to the role of input and experience until quite recently (Yang et al., 2017), yet consistent with the UG, the variational model directly correlates the input statistics to the language acquisition by embedding the innate universal grammar into learning from experience theory (Yang, 2002). A consequence of Yang's approach is that parameter setting is argued to take place past the two-word stage.

Therefore a question arises in this context regarding the timing of parameter setting and whether it occurs through concurrent or ordered acquisition. Very Early Parameter Setting (VEPS), a hypothesis proposed by Wexler (1998) based on empirical evidence from early word order and acquisition of inflection. VEPS aligns with the triggering model (Gibson & Wexler, 1994), which asserts that children initially possess parameters in default setting. Depending on specific information in the input data, children have the capacity to modify their initial parameter setting or consistently apply the initial value if it enables them to analyse sentences effectively (error-driven learning system). This occurs before the child enters the two-word stage at approximately 18 months of age (Wexler, 1998).

Wexler (1998) formulated VEPS as a theory wherein basic parameters are established correctly during the earliest observable stages based on the universal principles of UG and minimal input from their environment. Following Wexler (1998), the "basic parameters" include:

(a) Word order, e.g. VO versus OV (e.g. Swedish vs. German)

(b) V to T or not (e.g. French versus English)

(c) V2 or not (e.g. German versus French or English)

(d) Null subject or not (e.g. Italian versus English or French)

Wexler (1998) argues that it is implausible for children to learn the correct parameter values through negative evidence. This is primarily due to two

reasons: firstly, as mentioned earlier, adults do not correct children's ungrammatical sentences; secondly, following the assumptions of VEPS, children set the parameter values prior to demonstrating them in their own production. These arguments support the notion put forth by generative grammar that there must exist an innate genetic system underlying the early development of language structures.

Various parameters have been proposed, and their hierarchical organisation is argued based on their influence on other parameters (Baker, 2001; Biberauer, Holmberg, & Roberts, 2014; Sheehan, 2014). The majority of parameters put forth during the Government and Binding (GB) era are predominantly classified as macroparameters (Huang & Roberts, 2017). If the variation observed across languages can be attributed to different settings of a finite number of parameters, it should be feasible to encompass all these parameters within a unified list. This parameter list should accommodate all types of grammar (Baker, 2001). Macroparameters are characterised by their ability to encompass parametric variations that occur in clusters. Yet, it is sufficient for the learner to observe one of the clustering properties that represent the parameter to automatically obtain all the other clustering properties (Chomsky, 1981).

Baker (2001) introduced a hierarchical framework for representing macroparameters. Parameters are organised and ranked based on cause-and-effect relationships, reflecting how they influence one another and the relative strength they exert. Figure 1.1 represents the proposed parameter hierarchy by Baker (2001).

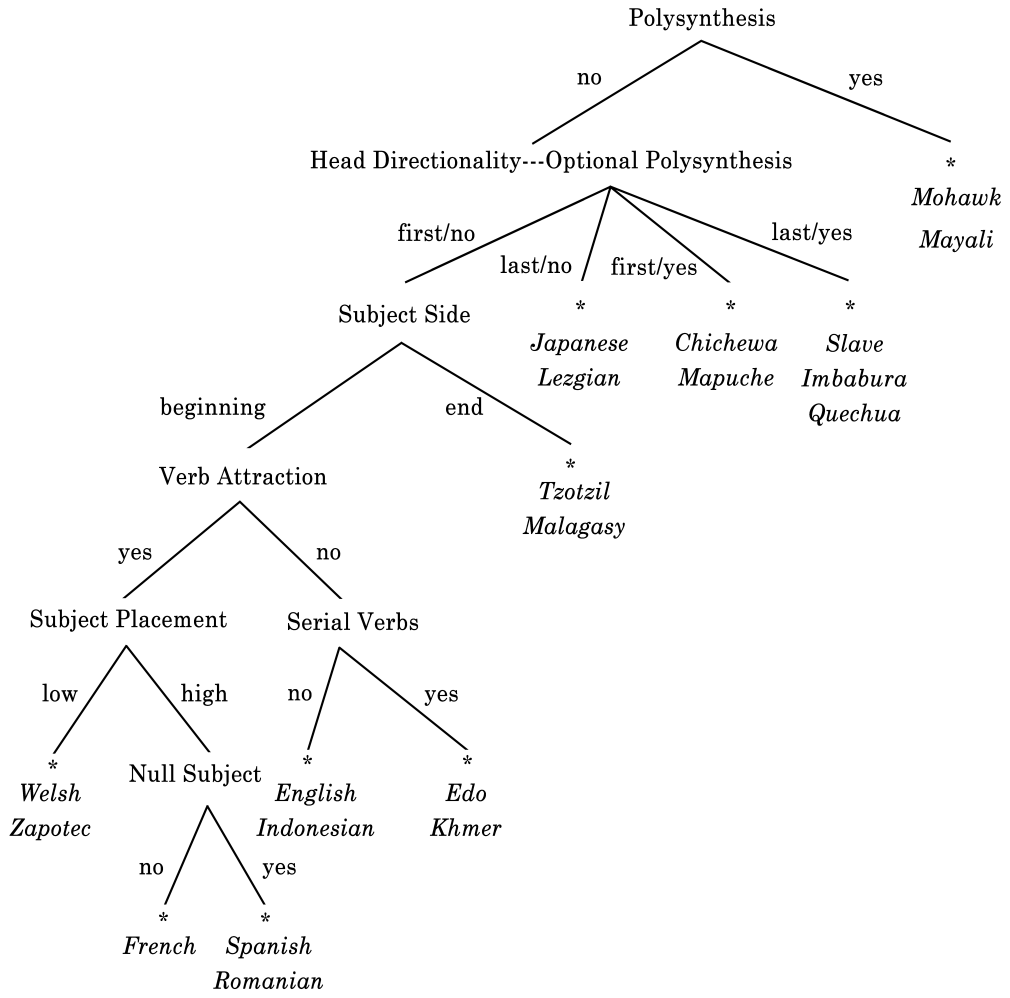


Figure 1.1: Parameter Hierarchy, Baker (2001)

However, it has become evident that this model is insufficient to describe the micro-scale parametric variation observed across languages (Kayne, 2005; Baker, 2008a; Huang & Roberts, 2017). This is particularly evident when considering the Directionality Parameter. The assumption in early generative work was that the Directionality Parameter is in charge of the canonical linear ordering of heads and complements in a language, i.e., whether the head precedes or follows its complement in a phrase (values to be selected: head-initial, head-final). Stowell (1981) proposed the head-final/head-initial

parameter under this assumption. In head initial languages, like English and French, the head precedes its complements. The cluster properties that are linked to the head-complement linear order include the following: the placement of auxiliaries before primary verbs (1), the placement of nouns before complements (2), the placement of verbs before objects (3), and the use of prepositions (4).

(1) She was dancing.

(2) The guardian of the Palace.

(3) Emilia plays piano.

(4) At the beach.

On the other hand, in head-final languages, like Japanese and Turkish, the head follows its complements. The cluster properties that are linked to the complement-head linear order include the following: auxiliaries are positioned after main verbs (5), nouns after complements (6), verbs after objects (7), and the use of post-positions (8).

(5) O dans ediyordu.
she dance was
'She was dancing.'

(6) sarayın muhafızı.
palace guardian
'The guardian of the palace.'

(7) Emilia piyano çalıyor.
Emilia piano plays
'Emilia plays piano.'

(8) sahilde
beach at
'at the beach'

Accordingly, the order of head initial languages, the head precedes its complements as represented in (9), is the mirror image of the order of the head-final languages as represented in (10).

(9) X > YP

(10) YP > X

However, there is empirical evidence that contradicts Greenberg et al. (1963)'s proposal for this harmonic word orders. For instance, although Mandarin is considered a head-initial language, it displays a number of word orders that haven't been observed in other head-initial languages (Dryer, 2013). Moreover, OV languages, such as Latin, can have complementizers at the beginning of the sentence, while other OV languages, such as Japanese, can have them at the end of the sentence. However, it seems that the option of having VO languages with final complementizers is not found in any known language (Biberauer et al., 2014). Hence, it is no longer possible to systematically explain language variance by classifying languages as head-initial or head-final. To account for these language-specific patterns, it is necessary to deconstruct the macroparameter of head directionality into smaller parameters.

Biberauer and Roberts (2012) proposed an alternative parameter hierarchy, expanding upon Baker's earlier framework with significant refinements. Within this hierarchical model, parameters were further classified into distinct sub-types: Macroparameters, situated at the highest level of the hierarchy, which are then subdivided into Meso, Micro, and Nano parameters as one descends the hierarchy. The four types of parameters are defined as follows:

For a given value v_i of a feature F that can vary parametrically:

(a) **Macroparameters**: all heads of the relevant type share v_i;

(b) **Mesoparameters**: all functional heads of a given category (e.g. all verbal heads, all nominal heads, all φ–bearing heads or all finite Cs) share v_i;

(c) **Microparameters**: a small subclass of functional heads (e.g. auxiliaries, pronouns) share v_i;

(d) **Nanoparameters**: one or more idiosyncratic lexical items are specified for v_i.

Biberauer and Roberts (2012: 268)

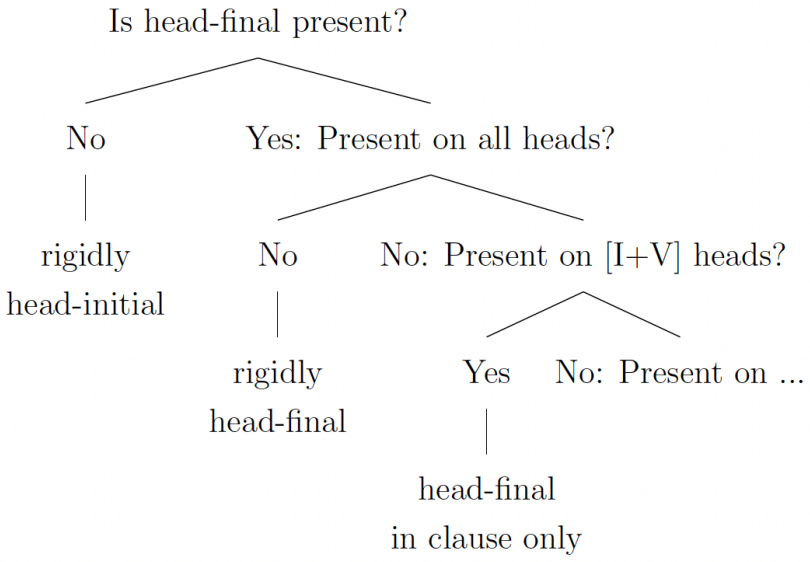


Figure 1.2: Parameter Hierarchy, Biberauer and Roberts (2012)

A macroparameter occupies the higher node in this hierarchy, and its effect is apparent on all head-complement order relations. In rigidly head-initial or rigidly head-final structures, all heads consistently adhere to the same pattern. The investigation of the mesoparameter setting depends on whether or not there is specific evidence in the primary linguistic data that only certain heads and complements follow the head-final order. The impact of a mesoparameter on grammar is not as stringent as that of a macroparameter. The last two sub-parameters, the micro and nano parameters, determine the order of only a few heads or the behaviour of a few lexical elements.

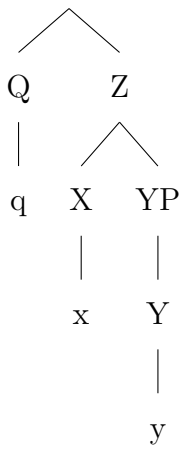
The Directionality Parameter has faced significant criticism. Its most well-known critic is Kayne (1994), who pointed out that the directionality param-

eter is unable to restrict structures to those existing in natural languages. In particular, there are no natural languages that exhibit the pattern of having the Specifier to the right of the head (Kayne, 1994; Kayne, 2013). Second, and perhaps more crucially, it appears that the Directionality Parameter does not account for a well-documented relationship between word order and syntactic phenomena. In this regard, Kayne (1994) proposed a unified, universal word order axiom (11), Linear Correspondence Axiom (LCA) that maps hierarchical structure to linear order, as represented in (12).

(11) Linear Correspondence Axiom:

'If α c-commands β, but β does not c-command α, then α precedes β in linear order'.

(12)



According to LCA, given that the specifier always asymmetrically c-commands the head, the specifier will always come before the head in the linear order; this eliminates the possibility of using the Spec to the right (see Figure 12). As a result, the Spec-Head-Complement order is the only order of language, resulting in all languages being SVO languages. The head-final order in the form of Spec-Complement-Head is derived by movement from the head-initial order (Kayne, 1994; Kayne, 2013).

Put differently, a parametric setting cannot account for the difference between so-called head-initial languages and so-called head-final languages. In-

stead, LCA implies that VO languages like English and OV languages like Japanese differ not only in the linear order but also in hierarchical structure (Kayne, 1994).

Other parameters are considered in the course of this thesis. The Null Subject (Pro-drop) parameter was among the earliest parameters proposed (Rizzi, 1982), in response to the observed distinctions among the prominent Romance languages-specifically French, Italian, and Spanish-rather than by a comparison of regional dialects within these languages (Baker, 2008b). This parameter suggests that the rich morphology of Italian permits the omission of subjects, while the limited morphology of English fails to permit and identify missing subjects, thus disallowing their omission. The parameter holds two values: one leads to languages similar to Italian, and the other results in languages similar to English. However, German, for example, which distinguishes the person and number of the subject through the verb, still requires subjects in a manner akin to English (Valian, 2016).

The *wh*-Movement Parameter is a parameter that governs the possibility of fronting *wh*-expressions: either a language permits *wh*-movement or it does not (Radford, 2006; Huang & Roberts, 2017). The *wh*-expression is relocated at the beginning of the sentence in English simple *wh*-questions. In Chinese, however, the *wh*-word stays in situ. However, in some languages, *wh*-movement appears to be optional in the main clause or in both the main and subordinate clauses.

Despite the fact that the objections that Newmeyer (2005) raises against the P&P model are misguided (Roberts & Holmberg, 2006), he made a legitimate point by highlighting that the extensive body of comparative research on languages and dialects, commonly referred to as 'microparametric' analysis, has transformed parameters into descriptive devices. This raised the question of how many parameters are there. There are potentially hundreds, and conceivably even thousands, of parameters. The existence of numerous microparameters, leads us to the question of whether Plato's Problem could resurface – how can language learners navigate a domain containing an enor-

mous number of potential grammatical structures during the first few years of language acquisition? Each time a new parameter is added, the size of the hypothesis space is doubled. It is evident that a structured approach is necessary to define parameter systems, imposing certain overarching limitations on their structure and function while preserving their descriptive capacity (Roberts, 2009).

Consequently, the minimalist approach posits that every parameter must be attributable to differences in the features of particular items (e.g., Case, φ, movement-triggering features and categorial features) in the lexicon. Baker (2008b) called this view "The Borer-Chomsky Conjecture":

(13) All parameters of variation are attributable to differences in the features of particular items (e.g., the functional heads) in the lexicon.

Baker (2008b: p.p 3)

This perspective presents several advantages compared to the previous notion of parameters (Roberts, 2009; Huang & Roberts, 2017). Firstly, it is a highly restrictive theory by reducing all parametric variations to features of functional lexical items, which limits the expression of specific parameters. Secondly, this approach facilitates language acquisition by simplifying the learning process through the association of parameter values with lexical entries. Thirdly, this approach imposes a constraint on parameter forms. Lastly, it sets an upper limit on the possible set of grammars (Roberts, 2009; Huang & Roberts, 2017).

One of the main arguments against the Borer-Chomsky Conjecture was put forward by Baker (2008b), who argued that both macroparameters and microparameters exist. He asserted that relying solely on microcomparative syntax is insufficient. He argues that we wouldn't anticipate finding broader categories like "head-initial" and "head-final" languages if all variations were microvariations (Baker, 2008b). If every linguistic category could freely and autonomously vary its position relative to its complement, we would predict an even distribution of word-order alternatives across languages. This would

imply a prevalence of diverse mixed languages and a scarcity of exclusively pure languages of either type (Baker, 2008b). This problem remains even if antisymmetry assumed. Moreover, assuming the accuracy of the Borer-Chomsky Conjecture doesn't provide any insights into the reasons behind the grouping of specific elements (cluster) in the lexicon. There must be a reason why some clusters exist while others do not (Baker, 2008b).

Biberauer and Roberts (2012) and Sheehan (2014) among others explained how features cluster by proposing a more complex description of macroparameters in terms of a parameter hierarchy. While there is variation in the specific technical aspects of these explanations, they all revolve around a core concept: the interdependency of parameter sets. This implies the existence of implicit connections between them. Macroparameters once again emerge as combinations of microparameters that work collectively due to learning strategies rooted in conservative computational principles. This perspective aligns with Kayne (2005), one of the pioneers in asserting that macroparameters aren't inherent components of Universal Grammar but rather emerge from more primitive elements. One significant advantage of this model is its substantial reduction in the range of possibilities, all the while retaining sufficient descriptive accuracy (Huang & Roberts, 2017).

Parameter hierarchies could potentially alleviate the tension between descriptive and explanatory adequacy inherent in parametric approaches. This tension stems from the requirement for a relatively extensive set of microparameters to precisely encompass the variations among different natural languages (Sheehan, 2014).

1.2 Research aims

Although production offers valuable insights into children's linguistic competence, including word order, the conventional elicited production technique is more suitable for children aged around 3 years and older, as maintaining experimental control becomes challenging for younger children. In certain

cases, apparent gaps in children's understanding of different linguistic phenomena have arisen due to flawed experimental methods (i.e. non-linguistic cognitive demands) rather than actual deficits in their linguistic knowledge (Becker & Kirby, 2016; Crain & Thornton, 2000).

It is essential to recognize that the language performance of young children may not fully reflect their linguistic competence, making it necessary to adopt appropriate methodologies that effectively tap into their linguistic knowledge (Crain & Thornton, 2000). Additionally, it is widely acknowledged that comprehension precedes production in language development (Thornton, 2016). Consequently, cross-linguistic studies on speech comprehension, using comprehension techniques such as the preferential-looking paradigm (Hirsh-Pasek & Golinkoff, 1996) are much needed to assess infants' emergent language knowledge at early stages before they begin to combine two words together (Thornton, 2016).

I build on the assumption by Crain and Thornton (2000) that the knowledge of word order in child grammar can be assessed at early ages with the right methodological approach, thereby revealing more accurate measurements of the child's linguistic competence. By utilizing suitable techniques, this thesis aims to shed light on the early acquisition of syntactic knowledge in Palestinian Arabic native children. Following the analysis of SVO in Palestinian Arabic, SVO involves subject movement to Spect TP and verb movement to T, and we assume with Shlonsky (1997) and Mohammad (2000) that object remains in-situ, which is in contrast with OV languages. The choice of the children is to decide between raising of the object or no raising to the object, and, in Palestinian Arabic, the solution is no raising to the object. Therefore, what I am considering here are two parameters: one about object raising where the parameter is set to the negative value in Palestinian Arabic, and another pertaining to *wh*-movement, specifically whether *wh*-words move to the left periphery or not where the value is positive in Palestinian Arabic, by finding out whether infants before the two word stage exposed to Palestinian Arabic have set the value of these parameters.

The thesis proceeds as follows: in the remainder of this chapter, I present the approach to language acquisition adopted and give a brief sketch of Palestinian Arabic syntax. In the next chapter (chapter 2), and in order to provide the necessary background for the subsequent experimental work, I introduce a new corpus of child production and child-directed speech for Palestinian Arabic and conduct the required analysis for the experimental work. In chapter 3, I present the background and experimental work pertaining to the parameter that determines OV versus VO, while, in chapter 4, I focus on the background and experimental work on *wh*-movement in infants. Chapter 5 draws conclusions and suggests potential avenues for future research.

1.3 A short sketch of Palestinian Arabic syntax

Arabic is a Semitic language that is ranked as the fifth most spoken language in the world and is an official language in twenty-seven countries across the Middle East, the Arabian Peninsula and North Africa (Saiegh-Haddad & Henkin-Roitfarb, 2014, Aoun, Benmamoun, & Choueiri, 2009). The Arabic language can be classified mainly into three distinct forms: Classical Arabic, Modern Standard Arabic (MSA), and Regional Spoken Arabic (Boudelaa & Marslen-Wilson, 2010). Like Classical Arabic, the language of the Holy Quran, Modern Standard Arabic (MSA), which is the formal and official form of the language that is being used for writing, has no native speakers (Saiegh-Haddad & Henkin-Roitfarb, 2014). Morphologically and syntactically, Classical Arabic and MSA are very similar. Both languages exhibit overt case marking, gender agreement, and dual as a number value together with singular and plural. Yet, they differ slightly in terms of phonology, grammar, and vocabulary. MSA is less synthetic than CA (Mousa, 2019). This is because MSA has undergone several changes and simplifications over time. This includes a reduction in the number of inflections and case endings, as well as a simplification of the verb system. MSA has a smaller phonological inventory than CA. Moreover, MSA has borrowed many words from other

languages, such as English and French. This has resulted in a larger and more diverse vocabulary compared to CA (Holes, 2004; Mousa, 2019).

On the other hand, spoken Arabic is the form used in everyday communication, and children get exposed to it from birth. Different so-called dialects of Arabic are found in different geographical regions (Boudelaa & Marslen-Wilson, 2010; Shaalan, 2010; Zbib et al., 2012; Saiegh-Haddad & Henkin-Roitfarb, 2014; Alyahya & Druks, 2016). According to Zbib et al. (2012), spoken Arabic can be grouped geographically into five varieties: Maghreb (Morocco, Algeria, Tunisia, and Western Sahara), Egyptian (Egypt), Iraqi (Iraq), Gulf (Oman, Kuwait, Bahrain, United Arab Emirates, Saudi Arabia, Yemen, Qatar), and Levant (Lebanon, Syria, Jordan, and Palestine). Levantine Arabic can be further linguistically divided into Northern and Southern Levantine. The Palestinian and Jordanian dialects correspond to Southern Levantine, while the Lebanese and Syrian dialects correspond to Northern Levantine (Haff, Jarrar, Hammouda, & Zaraket, 2022).

These dialects differ in their morphology and phonology, including syllable structure, some consonants, the quality of vowels, and their syntax (Aoun et al., 2009; Khamis-Dakwar, Froud, & Gordon, 2012; Saiegh-Haddad & Henkin-Roitfarb, 2014). The mutual intelligibility of these dialects decreases as the geographic distance increases (Shaalan, 2010; Albirini, Benmamoun, & Saadah, 2011). MSA differs from spoken Arabic in all linguistic domains, phonology, morphology, syntax, and lexicon (Saiegh-Haddad & Henkin-Roitfarb, 2014). One of the main differences between MSA and the other spoken varieties lies in the presence versus absence of Case marking, which are discussed in more detail later in this chapter.

This thesis focuses on a specific variety of spoken Arabic, namely Palestinian Arabic. This variety is used by approximately 6.8 million people in the area of Historical Palestine (Palestinian Central Bureau of Statistics, 2022). Palestinian Arabic is the spoken form that Palestinians use in everyday communication. On the other hand, MSA is the formal and official form used in the Palestinian Territories, including writing, and children only get exposed

to it at school or earlier through cartoons on national television (Boudelaa & Marslen-Wilson, 2010; Khwaileh, Body, & Herbert, 2014). An overview of the dialect being studied, along with comparisons to MSA and other Arabic dialects, is presented in the next section.

1.3.1 Modern Standard Arabic

Case, Agreement, and Tense

MSA has a rich overt Case-marking system, in which words are marked by a certain vowel or suffix for their case, as exemplified in (14a). As shown in the examples of (14), the subject *Sa:lem* is marked by the affixed short vowel *u* for Nominative Case, whereas the object *ʕamr-an* is marked by the short vowel *a* for Accusative Case. This allows considerable free word order in simple declarative sentence, as illustrated in (14b).

(14) a. سالمٌ رأى عمراً.

Salem-**un** raʔa ʕamr-**an**.
Salem.NOM saw.3M.SG ʕamr.ACC.
'Salem saw Amr.'

b. عمراً رأى سالمٌ.

ʕamr-**an** raʔa Salem-**un**.
ʕamr.ACC saw.3M.SG Salem.NOM
'Salem saw Amr.'

When the subject precedes the verb, the verb in MSA fully agrees with the subject with respect to gender and number (Aoun et al., 2009; Benmamoun & Choueiri, 2013), as in (15).

(15) الأولادُ أحرزوا هدفاً.

L-ʔawla:d-**u** ʔaħraz-**u:** hadaf-**an**.
the-boys.NOM scored.3M.SG goal.ACC
'The boys scored a goal.'

However, no matter what the subject is, the verb will show a third-person singular feature if it precedes the subject, and will only agree in gender, as exemplified in (16). This agreement system is in accordance with Greenberg's linguistic universal 33, which posits that in cases where number agreement between the noun and verb is suspended and relies on word order, the verb is consistently singular (Greenberg et al., 1963).

(16) a. أحرزَ الأولادُ هدفاً.

ʔaħraza l-ʔawla:d-**u** hadaf-**an**.
scored.3M.SG the-boys.NOM goal.ACC
'The boys scored a goal.'

b. أحرزتِ البناتُ هدفاً.

ʔaħrazat l-banat-**u** hadaf-**an**.
scored.3F.SG the-girls.NOM goal.ACC
'The girls scored a goal.'

If Tense (T) precedes the subject, it agrees with it only in gender, while the main verb agrees with it in both gender and number, as exemplified in (17).

(17) a. كانَ الولدُ يقرأُ كتاباً.

Ka:na l-wla:d-**u** jaqraʔ-**u** kitaban
was.M.SG the-boy.NOM reading3M.SG book.ACC
'The boy was reading a book.'

b. كانَ الأولادُ يقرأونَ كتاباً.

Ka:na l-ʔawla:d-**u** jaqraʔu:n-**a** kita:b-**an**.
was.M.SG the-boys.NOM reading.3M.PL book.ACC
'The boys were reading a book.'

On the other hand, if the subject precedes tense, then both T and V agree with it in both gender and number, as exemplified in (18).

(18) a. الولدُ كانَ يقرأُ كتاباً.

L-walad-**u** ka:na jaqraʔ-**u** kita:b-**an**.
the-boy.NOM was.M.SG reading.3M.SG book.ACC

'The boy was reading a book.'

b. الأولادُ كانوا يقرأونَ كتاباً.

L-ʔwala:d-**u** ka:n-**u:** jaqraʔu:-**na** kita:b-**an**.
the-boys.NOM were.M.PL reading.3M.PL book.ACC
'The boys were reading a book.'

If the subject happens to consist of two coordinated Noun Phrases (NP), the verb in MSA will show a third person singular that only agrees in gender with the left-most NP, as in (19).

(19) a. قرأَت البنات والأولادُ كتاباً.

Qaraʔ-at l-bana:t-**u** wa l-ʔawla:d-**u** qisˤat-**an**.
read.3F.SG the-girls-NOM and the-boys-NOM story.ACC
'The girls and the boys read a story.'

b. قرأَ الأولادُ والبناتُ كتاباً.

Qaraʔ-a l-ʔawla:d-**u** wa l-bana:t-**u** qisˤat-**an**.
read.3M.SG the-boys-NOM and the-girls-NOM story.ACC
'The boys and the girls read a story.'

c. ∗ قرأَت الأولادُ والبناتُ كتاباً.

*Qaraʔat l-ʔawla:d-**u** w l-bana:t-**u** qisˤat-**an**.
read.3F.SG the-boys-NOM and the-girls-NOM story.ACC
'The boys and the girls read a story.'

First Conjunct Agreement is the term used for the asymmetric agreement in coordinated structure in MSA. It involves full agreement with the left-most coordinated subject NP that precedes the verb (SV order), as in (20), and partial agreement with the subsequent coordinated subject NP that precedes the verb (Aoun et al., 2009), as in (21). This means that the verb agrees in gender, number, and person with the first subject NP while agreeing only in number with the remaining NPs.

(20) محمدٌ وأحمدٌ قرأوا قصةً.

Muħammad-**un** wa ʔaħmad-**un** qaraʔu: qisˤa-**tan**.
Mohammad.NOM and Ahmad.NOM Read.3M.PL story.ACC
'Mohammad and Ahmad read a story.'

(21) قرأ محمدٌ وياسمينُ قصةً.

Qaraʔa Muħammad-**un** wa ya:sami:n-**u** qisˤa-**tan**.
read.3M.SG Mohammad.NOM and Jasmine.NOM story.ACC
'Mohammad and Jasmine read a story.'

This phenomenon is compatible with verbs that take a plural subject, such as *taqa:samu:* 'share', *ltaʔaqu:* 'meet', and *ʕa:naqu:* 'embrace', as illustrated in (22).

(22) التقت سارة وسلمى.

Ltaqat Sa:ra: wa Salma.
meet.3F.SG Sara and salma
'Sara and Salma met.'

Morphologically Arabic has two simple verb forms: 'past/perfect' *l- ma:dˤi:* and 'present/ imperfect' *l-mudˤa:reʕ*. The past tense (the perfective verb) is not made explicit by an affix; the verb comprises a stem, which includes the root and vocalic infixes, and only takes suffixes that indicate agreement between the subject and the verb (Benmamoun, 2000). The present tense consists of a stem, which includes a root and a vocalic affix, and its subject-verb agreement is expressed through the use of a prefix or a combination of a prefix and a suffix (known as a circumfix morpheme) (Benmamoun, 2000).

In regards to tense, there are two possible ways to approach the analysis of the perfective form of verbs. One perspective is that the suffix on the verb indicates both tense and agreement. Alternatively, one could argue that the suffix indicates only agreement and that Arabic verbs do not inflect for tense (Aoun et al., 2009). If we assume that the suffix in the perfective form indicates past tense, as well as agreement, then we would predict that it only

occurs in the context of past tense. However, this prediction does not hold true since the same suffix appears in the perfective form in the context of present tense as well. Therefore, it is reasonable to conclude that the suffix indicates agreement only (Aoun et al., 2009).

The imperfective form of Arabic verbs also appears to indicate neither tense nor aspect. The primary formal distinction between the perfective and imperfective forms lies on how agreement is expressed. The perfective form expresses all agreement features through a suffix attached to the verb. On the other hand, the imperfective form displays agreement through a combination of prefix and suffix, where the prefix primarily indicates person and the suffix primarily indicates number (Aoun et al., 2009). Table 1.1 lists the perfective and imperfective affixes of the verb *daras*[1] 'studied'. First-person is not marked for gender, as shown in Table 1.1.

Table 1.1: The perfectives and imperfective affixes of the verb *daras* 'studied'

		Singular	**Plural**	**Dual**
Perfective/ Past	**1st Person F/M**	darast-**u**	daras-**na:**	daras-**na:**
	2nd Person M	daras-**ta**	daras-**tum**	daras-**tuma:**
	2nd Person F	daras-**ti**	daras-**tuna**	daras-**tuma**
	3rd Person M	daras-**a**	daras-**u:**	daras-**a:**
	3rd Person F	daras-**at**	daras-**na**	daras-**ta:**
Imperfective/ Present	**1st Person F/M**	ʔadrus-**u**	na-drus-**u**	
	2nd Person M	ta-drus-**u**	ta-drus-**u:na**	ta-drus-a:**ni**
	2nd Person F	ta-drus-i:**na**	ta-drus-**na**	ta-drus-a:**ni**
	3rd Person M	ja-drus-**u**	ja-drus-u:**na**	ja-drus-a:**ni**
	3rd Person F	ta-drus-**u**	ja-drus-**na**	ta-drus-a:**ni**

Object verbal affixes can attach to verbs (23), nouns (24), or prepositions (25) and are considered clitics rather than strong pronouns since they are insensitive to the category of their hosts (Shlonsky, 1997; Musabhien, 2009;

[1]The given form is roughly similar to the English infinitive.

Ahmed, 2015; Mousa, 2019).

(23) القصةَ قرأناها البارحةَ.

L-qisʕat-**a** qaraʔna:-**ha:** l-ba:reħa.
the-story read.2.pl-it yesterday
'The story, we read it yesterday.'

(24) رأينا لوحَتَها في المعرض.

Raʔayna: lawħata-**ha:** fel-l-maʕradʕ.
saw.2.PL painting-her in the-gallery
'We saw her painting in the gallery.'

(25) تكلمَ رامي معها.

Takalama Ra:mi: maʕa-**ha:**.
spoke.3M.SG Rami: with-her
'Rami spoke to her.'

Word order and other syntactic proprieties of MSA

The subject in MSA can occur in various positions: after the verb as in (26a) and before the verb, as in (26b).

(26) a. نامَ الولدُ.

Na:ma l-walad-**u**.
slept.3M.SG the-boy.NOM
'The boy slept.'

b. الولدُ نامَ.

L-walad-**u** na:ma.
the-boy.NOM slept.3M.SG
'The boy slept.'

Indefinite subjects cannot precede the verb in MSA; however, a modified indefinite subject can be in the pre-verbal position, as in (27) (Mohammad, 2000; Aoun et al., 2009).

(27) a. * ولدُ نامَ.

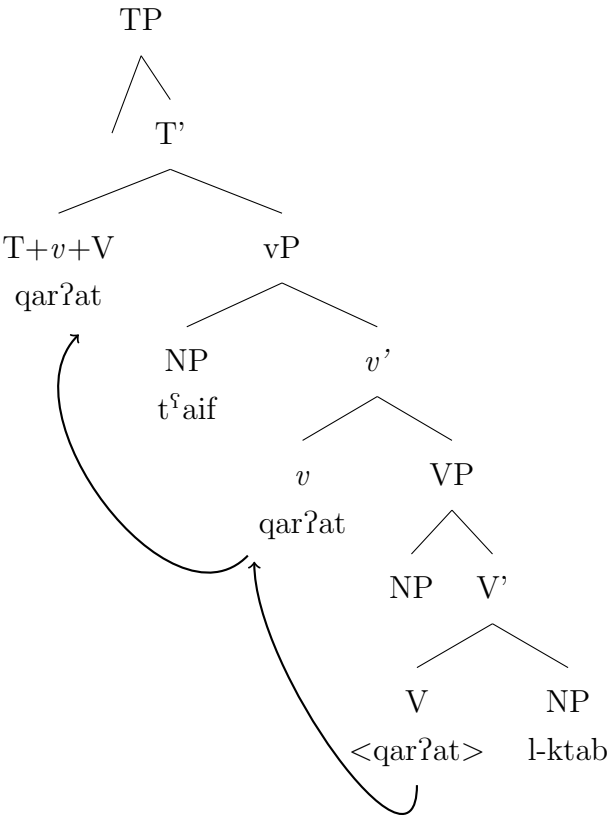
*Walad-**u** na:ma.
boy.NOM slept3M.SG
'A boy fell asleep.'

b. ولدٌ صغيرٌ نامَ.

Walad-**un** sˁaɣi:r-**un** na:ma.
boy.NOM small.NOM slept3M.SG
'A small boy fell asleep.'

In the history of studies on Arabic, MSA has been classified as a language with VSO word order (Aoun, Benmamoun, & Sportiche, 1994; Shlonsky, 1997; Mohammad, 2000). Following the VP-Internal Subject Hypothesis, the VSO order is derived by the overt movement of a verb from its base-generated position to T, while the subject remains in-situ in Spec,vP as shown in the tree diagram in (28) (Shlonsky, 1997). The subject is overtly raised in languages where a phonetically null expletive is not permitted. However, in Null-Subject languages such as Italian or MSA, the raising of the subject occurs covertly (Shlonsky, 1997).

(28)

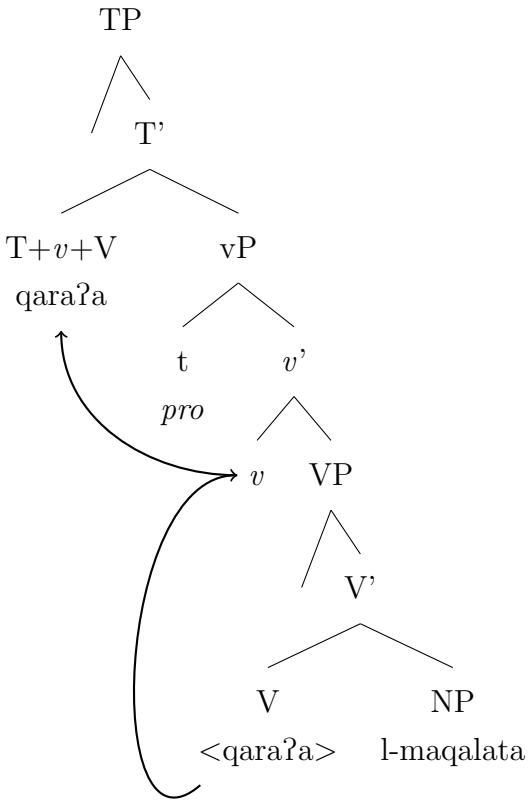


MSA is indeed a null subject language in which the subject can be dropped when the referent can be recovered from the context and the agreement morphology carried by the verb (Btoosh, 2010), exemplified in (29) and diagramed in (30). This is only achieved in the SVO order, where the verb fully agrees with the subject, but not in the VSO order, where the verbs fails to agree with number, as discussed in 1.3.1.

(29) قرأَ المقالة.

Qaraʔa l-maqa:lat-**a**.
read.3M.SG the-article.ACC
'He read the article.'

(30)



MSA has twelve subject pronouns, as represented in Table 1.2. First-person pronouns are gender-neutral. Second and third-person dual (Du) pronouns do not have gender distinctions either. In contrast, both singular and plural forms of second and third-person pronouns differentiate between masculine and feminine genders.

Table 1.2: Independent subject pronouns in MSA

person/number/gender	IPA
1st Person SG.F/M	ʔana
2nd Person SG.F	ʔanti:
2nd Person SG.M	ʔanta
3rd Person SG.M	huwa
3rd Person SG.F	hiya
2nd Person Du.F/M	ʔantuma:
3rd Person Du.F/M	huma:
1st Person Pl.F/M	naħnu
2nd Person Pl.M	ʔantum
2nd Person Pl.F	ʔntunna
3rd Person Pl.M	hum
3rd Person Pl.F	hunna

MSA has a relatively flexible word order, where SVO and VSO are commonly used. Let us consider the transitive sentences in (31), which represent the six possible word orders in a transitive sentence in MSA. All six word orders are acceptable with definite subjects (including: Pronouns, which refer to something specific only; Proper nouns; and Definite nouns that are formed by adding the Arabic definite article *al* 'the' or modified indefinite subjects. They obligatory show overt Case marking that indicates which NP is the subject (Nominative Case that is realised by the suffix *u*), and which NP is the object (Accusative Case that is realised by the suffix *a*). The first four word orders represented in the examples in (31) can be an answer to a broad focus question like 'What had happened?'

(31) a. يشربُ عامرٌ العصيرَ

Jaʃrabu ʕamir-**un** l-ʕasˤi:r-**a**.
drinks.3M.SG Amer.NOM the-juice.ACC
'Amer drinks the juice.'

b. يشربُ العصيرَ عامرٌ.

Jaʃrabu l-ʕasˁi:r-**a** ʕamir-**un**.
drinks.3M.SG the-juice.ACC Amer.NOM
'Amer drinks the juice.'

c. عامرٌ يشربُ العَصيرَ.

ʕamir-**un** Jaʃrabu l-ʕasˁi:r-**a**.
Amer.NOM drinks.3M.SG the-juice.ACC
'Amer drinks the juice.'

d. عامرٌ العصيرَ يشربُه.

ʕamir-**un** l-ʕasˁi:r-**a** Jaʃrabu-hu.
Amer.NOM the-juice.ACC drinks.3M.SG
'Amer drinks the juice.'

e. العصيرُ عامرٌ بشربُه.

L-ʕasˁi:r-**a** ʕamir-**un** jaʃrabu-hu.
the-juice.NOM Amer.NOM drinks.3M.SG
'The-juice, Amer drinks it.'

f. العصيرُ يشربُه عامرٌ.

L-ʕasˁi:r-**a** jaʃrabu-hu ʕamir-**un**.
the-juice.NOM drinks.3M.SG Amer.NOM
'The-juice, Amer drinks it.'

The examples in (31e) and (31f) represent (clitic-)left dislocation and are accompanied by a resumptive pronoun on the verb. The dislocated noun phrase cannot be indefinite (Aoun et al., 2009).

If Case-marking fails to distinguish between subject and object as they both end in long vowels, which consequently do not display overt Case-marking, as exemplified in (32), there are more restrictions on word order unless there is an indication of which NP is the subject, such as having different gender, as exemplified in (33) (where *Jana* is a female and *Issa* is a male), since verbs

in MSA agree with the subject's gender no matter what. Alternatively, a pragmatic factor may indicate which of the NPs is the subject, as shown in (31) in which the subject *Amer* and the object *l-ʕasʕi:r* 'the juice' are both masculine, but all indicates that Amer has to be the subject.

(32) رأى عيسى موسى.

raʔa ʕi:sa: Mu:sa:.
saw.3M.SG Issa Mousa
'Issa saw Mousa.'

(33) a. رأى عيسى جنى.

raʔa ʕi:sa: ʒana.
saw.3M.SG Issa Jana
'Issa saw Jana.'

b. رأت جنى عيسى.

raʔat ʒana ʕi:sa:.
saw.3F.SG Jana Issa
'Jana saw Issa.'

1.3.2 Palestinian Arabic

Case, Agreement, and Tense

Spoken varieties of Arabic, such as Palestinian Arabic and Jordanian Arabic, which are both Southern Levantine varieties, have morphological lost case markers, resulting in more restrictions on the word orders of these varieties (Aoun et al., 2009; Shaalan, 2010; Saiegh-Haddad & Henkin-Roitfarb, 2014). Consider (34) and the positions of *Salem* and *ʕamr* in the sentences: *Salem* can only be the subject in (34a) and the object in (34b) while *ʕamr* can only be the object in (34a) and the subject in (34b).

(34) a. سالم شاف آدم.

Salem ʃa:f ʔa:dam.
Salem saw.3M.SG Adam
'Salem saw Adam.'

b. آدم شاف سالم.

ʔa:dam ʃa:f Salem.
Adam saw.3M.SG Salem
'Adam saw Salem.'

Contrary to MSA, but similar to Jordanian (Almomani, 2015) and Yemeni (Qasem, 2020) dialects, in Palestinian Arabic the verb agrees with the subject in gender, number and person, no matter what the word order is, as long as the NP consists of one NP as in (35 a,b) and 36 a,b).

(35) a. سجلوا الولاد جول.

Saʒal**u:** lewlad goal.
scored.3M.PL the-boys goal
'The boys scored a goal.'

b. سجلن البنات جول.

Saʒal**en** l-banat goal.
scored.3F.PL the-girls goal
'The girls scored a goal.'

(36) a. الولاد سجلوا جول.

Lewlad saʒal**u:** goal.
the-boys scored.3M.PL goal
'The boys scored a goal.'

b. البنات سجلن جول.

L-banat saʒal**en** goal.
the-girls scored.3F.PL goal
'The girls scored a goal.'

However, some native speakers of Palestinian Arabic use the masculine as the default gender in the case of a plural subject for both masculine and feminine, as illustrated in (37) (Mousa, 2019).

(37) a. البنات سجلوا جول.

L-banat saʒal**u:** goal.
the-girls scored.3M.PL goal
'The girls scored a goal.'

b. سجلوا البنات جول.

Saʒal**u:** l-banat goal.
scored.3M.PL the-girls goal
'The girls scored a goal.'

Unlike MSA, whether the subject follows or precedes T, both T and the main verb agree with it in both gender and number, as exemplified in (38) and (39).

(38) a. كان الولد يقرأ كتاب.

Ka:n l-wlad jiqraʔ kta:b.
was.M.SG the-boy reading3M.SG book
'The boy was reading a book.'

b. كانوا الولاد يقرأوا كتاب.

Ka:n**u:** l-wla:d jaqraʔu: kta:b.
were.M.PL the-boys reading.3M.PL book.ACC
'The boys were reading a book.'

c. كانن البنات يقرئن كتاب.

Ka:n**en** l-bana:t jaqraʔen kta:b.
was.F.PL the-girls reading.3F.PL book.ACC
'The girls were reading a book.

(39) a. الولد كان يقرأ كتاب.

L-walad ka:n jaqraʔ kta:b.
the-boy was.M.SG reading.3M.SG book
'The boy was reading a book.'

b. الولاد كانوا يقرأوا كتاب.

L-wla:d ka:n**u:** jaqraʔu: kta:b.
the-boys. were.M.PL reading.3M.PL book
'The boys were reading a book.'

c. .البنات كانن يقرئن كتاب

L-ban:t ka:n**en** jaqraʔen kta:b.
the-girls were.F.PL reading.3F.PL book
'The girls were reading a book.'

However, some native speakers of Palestinian Arabic, use the masculine as a default gender in the case of a plural subject for both masculine and feminine, as illustrated in (40), just as when the subject is preverbal.

(40) a. .كانوا البنات يقرأوا كتاب

Ka:n**u:** l-bana:t jaqraʔu: kta:b.
were.M.PL the-girls reading.3M.PL book.ACC
'The girls were reading a book.'

b. .البنات كانوا يقرأوا كتاب

L-ban:t ka:n**u:** jaqraʔu: kta:b.
the-girls were.M.PL reading.3M.PL book
'The girls were reading a book.'

If the subject happens to consist of two coordinated NPs, the verb in Palestinian Arabic agrees in gender and number with the left-most subject, no matter what the word order is, as exemplified in (41).

(41) a. .قرئن البنات والولاد القصة

Qaraʔ**en** l-bana:t w l-wla:d l-qisˁa.
read.3F.PL the-girls and the-boys the-story
'The girls and the boys read the story.'

b. .* قرئن الولاد والبنات القصة

*Qaraʔ**en** lewla:d w l-bana:t l-qisˁa.
read.3F.PL the-boys and the-girls the-story

‘The boys and the girls read the story.’

c. .الولاد والبنات قرأوا القصة

L-wla:d w l-bana:t qaraʔ**u:** l-qisˁa.
the-boys and the-girls read.3M.PL the-story
‘The boys and the girls read the story.’

d. .* الولاد والبنات قرئن القصة

*L-ewla:d w l-bana:t qaraʔ**en** l-qisˁa.
the-boys and the-girls read.3F.PL the-story
‘The boys and the girls read the story.’

First Conjunct Agreement is similar to MSA and describes the agreement for spoken Arabic with a coordinated subject that appears after the verb (VS order)(Aoun et al., 2009), as exemplified in (42).

(42) .قرأ محمد وأحمد قصة

Qaraʔ Mħammad w ʔaħmad qisˁa.
read.3M.SG Mohammad and Ahmad story
‘Mohammad and Ahmad read a story.’

However, First Conjunct Agreement does not adequately account for the entire spectrum of data in spoken Arabic (Aoun et al., 2009). In contrast to MSA, when the coordinated subject appears before the verb (SV order), the verb agrees with all coordinated subjects instead of just the left-most NP in Palestinian Arabic, as exemplified in (43).

(43) a. .* محمد وأحمد قرأ قصة

*Mħammad w ʔaħmad qaraʔ qisˁa.
Mohammad and Ahmad read.3M.SG story
‘Mohammad and Ahmad read a story.’

b. .محمد وأحمد قرأوا قصة

Mħammad w ʔaħmad qaraʔ-u: qisˁa.
Mohammad and Ahmad read.3M.PL story

‘Mohammad and Ahmad read a story.’

Moreover, unlike in MSA, verbs that take a plural subject, such as *tka:samu:* ‘share’, *tla:qu:* ‘meet’, and *ħadˤanu:* ‘embrace’, as illustrated in (44), are incompatible with First Conjunct Agreement.

(44) a. * التقى سامر وحسن.

*Ltaʔa Sa:mer w ħasan.
meet.3M.SG Samer and Hasan
‘Samer and Hasan met.’

b. التقوا سامر وحسن .

Ltaʔu: Sa:mer w ħasan.
meet.3M.PL Samer and Hasan
‘Samer and Hasan met.’

Finally, Palestinian Arabic has two simple verb forms ‘past/perfect’ *l-ma:dˤi:* and ‘present/imperfect’ *l-mudˤa:reʕ*. Regarding tense, there are at least two analyses of the perfective form of the verb in Palestinian Arabic. One viewpoint is that the suffix on the perfective verb indicates both tense and agreement (Aoun et al., 2009). Conversely, another perspective suggests that the suffix only indicates agreement and that tense is not inflected in Arabic verbs. If we assume that the suffix in the perfective form represents past tense, as well as agreement, then we would predict that the suffix should only occur in past tense contexts. However, this prediction is contradicted by the fact that the same suffix appears in the perfective form in present tense contexts. This observation indicates that the suffix cannot solely represent past tense. Consequently, it is most reasonable to conclude that the suffix conveys agreement exclusively (Aoun et al., 2009).

The imperfective form of Arabic verbs appears to lack any indication of tense or aspect. The primary formal difference between the perfective and imperfective forms is the way in which agreement is expressed. While the perfective form utilizes a suffix to express all agreement features, the imperfective form

expresses agreement in a discontinuous manner. The prefix mainly indicates person, while the suffix mainly indicates number (Aoun et al., 2009).

Person, gender, and number affixes can only be attached to verb stems, meaning that nothing can intervene between them and their verb stems and that neither the morphemes nor the verb stem can stand on their own (Abu Nahleh, 1985; Mohammad, 2000; Ahmed, 2015; Mousa, 2019). In the present tense, the temporal information is conveyed through the present progressive form *b–* which attaches to the verb prefix (Jarrar, Habash, Akra, & Zalmout, 2014). Gender agreement is also realized by the verb's prefix, except in the case of the second-person singular feminine. For the second-person singular feminine, gender is expressed by the suffix *-i*. Plural number agreement, on the other hand, is indicated by the suffix *-u* attached to the verb, except for the first person. In the first person, the plural number is realized by the prefix *bni–* as noted by Benmamoun (2000). Table 1.3 exemplifies these agreement patterns of perfective and imperfective for the verb *daras* 'studied.'

Table 1.3: The perfectives and imperfective affixes of the verb */daras/* 'studied'

		Singular	**Plural**	**Dual**
Perfective/ Past	**1st Person F/M**	daras-**et**	daras-**na:**	daras-**na:**
	2nd Person M	daras-**et**	daras-**tu:**	daras-**tu:**
	2nd Person F	daras-**ti**	daras-**ten**	daras-**ten**
	3rd Person M	daras	daras-**u:**	daras-**u:**
	3rd Person F	dars-**at**	daras-**en**	daras-**en**
Imperfective/ Present	**1st Person F/M**	**ba**-drus	**bnu**-drus	**bni**-drus
	2nd Person M	**btu**-drus	**btu**-drus-**u:**	**btu**-drus-**u**
	2nd Person F	**btu**-drus-**i**	**btu**-drus-**en**	**btu**-drus-**en**
	3rd Person M	**bu**-drus	**bu**-drus-**u:**	**bu**-drus-**u:**
	3rd Person F	**btu**-drus	**bu**-drus-**en**	**bu**-drus-**en**

Subject verbal affixes can only attach to verbs, while object verbal affixes can attach to verbs (45), nouns (46), or prepositions (47) and are better

interpreted as clitics, since clitics are insensitive to the category of their hosts (Shlonsky, 1997; Musabhien, 2009; Ahmed, 2015; Mousa, 2019).

(45) القصة قرأناها امبارح.

L-qisˤa qaraʔna:-**ha:** mba:reħ.
the-story read.2.p yesterday
'The story, we read it yesterday.'

(46) شفنا لوحتها بالمعرض.

ʃufna: lawħit-**ha:** be-l-maʕradˤ.
saw.2.p painting-her in the-gallery
'We saw her painting in the gallery.'

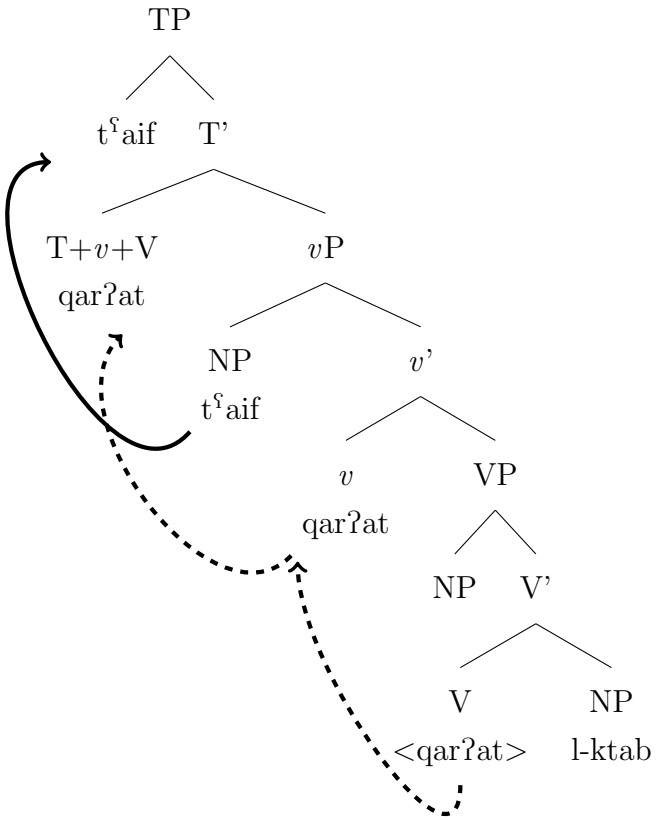
(47) رامي حكى معها.

Ra:mi: ħaka maʕ-**ha:**.
Rami: spoke.3m.sg with-her
'Rami spoke to her.'

Word Order in Palestinian Arabic

Like MSA, the subject in Palestinian Arabic can occur before the verb as in (49a) and after the verb as in (49b). SVO has been reported as the unmarked order in modern dialects such as Palestinian, Moroccan, Tunisian, Lebanese, Jordanian and Gulf Arabic (Mohammad, 2000; Shaalan, 2010), as exemplified in (49a) for Palestinian Arabic. SVO order is derived from the movement of the subject over the verb to the specifier of Tense Phrase (TP) as shown in the tree diagram in (48) (Mohammad, 2000).

(48)



Palestinian Arabic does not have the wide range of word orders of MSA; SVO, VSO, and VOS, as shown in (49), are the only well-formed word orders in declarative sentences and they can be an answer to a broad focus question like 'What had happened?'.

(49) a. لما شربت العصير

Lama ʃirbat l-ʕasˤi:r.
Lama drank.3F.SG the-juice.
'Lama drank the juice.'

b. شربت لما العصير

ʃirbat Lama l-ʕasˤi:r.
drank.3F.SG Lama the-juice
'Lama drank the juice.'

c. شربت العصير لمى.

ʃirbat l-ʕasˁi:r Lama.
drank.3F.SG the-juice Lama
'Lama drank the juice.'

The three other word orders SOV (50a), OSV (50b), and OVS (50c), that are grammatical in MSA, are ungrammatical word orders in Palestinian Arabic.

(50) a. * لمى العصير شربت.

*Lama l-ʕasˁi:r ʃirbat.
Lama the-juice drank.3F.SG

b. * العصير لمى شربت

*L-ʕasˁi:r Lama ʃirbat.
the-juice Lama drank.3F.SG

c. * العصير شربت لمى.

*L-ʕasˁi:r ʃirbat Lama.
the-juice drank.3F.SG Lama

However, the three non-canonical SOV (51a), OSV (51b), and OVS (51c) orders are acceptable if a pronominal clitic appears on the verb to resume the object (Mohammad, 2000; Aoun et al., 2009). The object in examples (51) present a (clitic-)left dislocation accompanied by a resumptive pronoun on the verb.

(51) a. لمى العصير شربته.

Lama l-ʕasˁi:r ʃirbat-**u**.
Lama the-juice drank.3F.SG-it
'Lama drank the juice.'

b. العصير لمى شربته.

L-ʕasˁi:r Lama ʃirbat-**u**
the-juice Lama drank.3F.SG it
'The juice, Lama drank it.'

c. العصير شربته لمى.

L-ʕasˤi:r ʃirbat-**u** Lama.
the-juice drank.3F.SG-it Lama
'The juice, Lama drank it.'

Indefinite subjects cannot precede the verb in Palestinian Arabic (52a). Nevertheless, similar to MSA, Palestinian Arabic allows a modified indefinite subject to be in the pre-verbal position, as in (52b).

(52) a. * بنت أكلت التفاحة.

*Bint ʔaklat t-tuffa:ħa.
girl ate.3F.SG the-apple
'A girl ate the apple.'

b. بنت طويلة أكلت التفاحة.

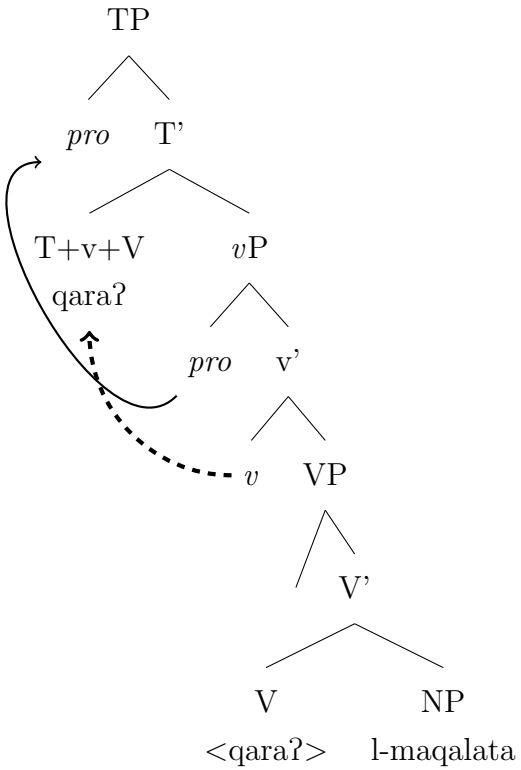
Bint tˤawi:le ʔaklat t-tuffa:ħa.
girl tall ate.3F.SG the-apple
'A tall girl ate the apple.'

Palestinian Arabic is a null subject language as the subject can be dropped when the referent can be recovered from the context, exemplified in (53) and diagrammed in (54). Null subjects are linked to a rich morphological agreement system, as verbs carry agreement markers.

(53) قرأ المقالة.

Qaraʔ l-maqa:le.
read.3.SG the-article
'He read the article.'

(54)



Only strong independent pronouns can be used as subjects in Palestinian Arabic (Aoun et al., 2009). They are frequently dropped, not obligatory, and can be used as focus elements (Mousa, 2019). Palestinian Arabic has ten subject pronouns, as represented in Table 1.4.

Table 1.4: Independent subject pronouns in Palestinian Arabic

person/number/gender	IPA
1st Person SG.F/M	ʔana
2nd Person SG.F	ʔinti
2nd Person SG.M	ʔinta
3rd Person SG.M	huwwi
3rd Person SG.F	hiyyi
1st Person Pl.FM	ʔiħna:
2nd Person Pl.M	ʔintu:
2nd Person Pl.F	ʔintin
3rd Person Pl.M	hummi:
3rd Person Pl.F	hinni:

Finally, in Palestinian Arabic dialects, as well as other varieties of spoken Arabic, but not Classical Arabic or MSA, there is a serial verb construction that shares the following characteristics with many serial verbs in other languages (Hussein, 1990): (i) the serial verbs are two or more independent verbs found in the same clause, see (55); (ii) serial verbs in each construction share the same subject, tense and mood; (iii) verbs are not separated by any boundaries (e.g., intonational, clause boundary markers) as exemplified in (56); (iv) actions expressed in each string can be simultaneous as in (55) or consecutive actions as in (56); (v) serial verbs of the same clause seem to express a single event; (vi) negation is added to the first verb but negates all verbs of the string as in (57).

(55) تعال أركض.

Taʕa:l ʔurkud.
come.3M.SG run.3M.SG
'Come running.'

(56) خد اشرب مي.

Xud ʔiʃrab may.
take.3M.SG drink.3M.SG water

'Take the water and drink it.'

(57) ما تروحش تلعب بالطابة ع الشارع.

Ma: tru:ħeʃ telʕab bet^{ʕ}-t^{ʕ}a:be ʕa ʃ-ʃa:reʕ.
not go.3M.SG play.3M.SG with the-ball on the-street
'Don't go and play ball in the street.'

Palestinian Arabic has been classified into three sociolinguistic dialects: urban *madani*, rural *fallahi*, and Bedouin *badawi:* (Abu Nahleh, 1985; Mousa, 2019). People in the major cities speak the urban variant, whereas the people in surrounding villages speak the rural variety. Bedouin is spoken by a small minority in the southern Gaza Strip, as well as in a few villages surrounding Hebron, Galilee, and Negev (Shahin, 1995; Mousa, 2019). Little linguistic variations can be found among these varieties, and variation manifests mainly in the phonological systems. To illustrate, the phonetic inventory of consonants of these dialects presents some differences. The most prominent characteristic affects the uvular stop /q/ of MSA (Abd-el-Jawad, 1986): urban Arabic is closely related to northern Levantine Arabic dialects, i.e. colloquial variants of western Syria and Lebanon. The [ʔ] pronunciation of /q/, as well as the simplification of interdentals as dental plosives, i.e. /ð/ as [d], /θ/ as [t], and /z^{ʕ}/ as [d^{ʕ}], characterize urban dialects. The plural pronouns in the urban dialects do not distinguish between masculine and feminine forms, unlike MSA; for example, *ʔntu* is both "you.M.PL" and "you.F.PL", while *humme* is both "they.M.PL", and "they.F.PL" (Palva, 2015). On the other hand, the rural Palestinian dialect shares linguistic ties with rural dialects spoken in the outer southern Levant and Lebanon. /q/ is produced as a voiceless velar stop [k], and the interdental consonants are preserved. The rural dialect differentiates between masculine and feminine plural pronouns. For instance, *ʔntu* is "you.M.PL", *ʔintin* is "you.F.PL", *humme* is "they.M.PL" and *hinne* is "they.F.PL". For the Bedouin dialect, its salient characteristic is the [g] pronunciation of /q/ and /k/, as well as maintaining the interdental consonants. It distinguishes between masculine and feminine plural pronouns as in the rural dialect (Palva, 2015). The selected distinctive features of the three dialects are summarised in Table 1.5.

Table 1.5: The selected distinctive features of the three variations of Palestinian Arabic

Dialect	**Variation of /q/**	**Variations of Interdentals**	**Plural Pronouns**
Urban	[ʔ] for /q/	[t] for /θ/ [d] for /ð/ [$d^{ʕ}$] for /$z^{ʕ}$/	No M and F
Rural	[k] for /q/	/θ/, /ð/, /$z^{ʕ}$/ are preserved	M and F
Bedouin	[g] for /q/	/θ/, /ð/, /$z^{ʕ}$/ are preserved	M and F

It is worth mentioning that, unlike most Arabic dialects, it is difficult to define a phonetic inventory of consonants for the different cities in Palestine due to the specificity of its political situation, as thousands of Palestinians were expelled from their cities and villages after the establishment of the state of Israel on the land of Palestine in 1948, and moved to the nearby cities in the West Bank; they brought with them variant dialects of Palestinian Arabic (Mousa, 2019; Horesh, 2014; Abu Nahleh, 1985). Hence rather than comparing the differences among the different cities, I summarize the variations of the consonantal inventory that were exhibited by the participants in this study in Table 1.6. The vowel inventory is identical for all subvarieties of Palestinian Arabic (Abu Nahleh, 1985).

Table 1.6: The variations of the consonantal inventory that were exhibited by the study participants

Variations of the consonants	**Examples**
/k/ and /tʃ/	/kursi:/ and /tʃursi:/
/θ/ and /t/	/mutalat/ and /muθalaθ/
/q/ and /ʔ/	/qalam/ and /ʔalam/
/q/ and /k/	/qalam/ and /kalam/
/ð/ and /d/	/ði:b/ and /di:b/
/z^{ʕ}/ and /d^{ʕ}/	/naz^{ʕ}a:ra/ and /nad^{ʕ}d^{ʕ}a:ra/

Chapter 2

An analysis of Palestinian Arabic early production

Linguistic corpora are a data source in which the natural interactions between interlocutors are transcribed and can be used to draw data and to test different hypotheses and theoretical claims. Brown (1973) was the first to suggest using child-adult interactions to assess child grammar. Since that time, there has been a rapid rise in the building and use of corpora in many languages. Corpora reflect the actual usage of a spoken language in a wide range of social contexts (Han, Arppe, & Newman, 2017). Moreover, corpora of child-directed speech are crucial for examining the nature of the input. For instance, if the findings show that the less commonly occurring word orders are acquired early, this can be used to evaluate frequency-based accounts critically. Hence, corpora of child and child-directed speech for different languages and varieties are much needed (Demuth et al., 2008). In spite of all these advantages, corpora suffer from many pitfalls; for instance, many of the corpora that have been built up so far only include data from a small number of children. Additionally, they may represent just a subset of the child's competence since the corpora are typically collected at specific times. Corpora may misrepresent the grammatical knowledge of children of a certain form (Demuth et al., 2008). Besides, corpora include the grammatical errors of children, which are impossible to exclude (Stefanowitsch, 2020).

Moreover, since the meaning is absent in the corpus data, we cannot be sure about what meaning children assign to certain constructions. Finally, and for a limited number of hours, there are numerous constructions that may not be exemplified but may be known by the child. (Stefanowitsch, 2020; MacWhinney, 2005). Therefore, the domain can immensely profit from a research framework that incorporates evidence from a variety of information sources, encompassing both corpus-based studies and experimental studies.

Here, I present a child and child-directed speech corpus focusing on spoken Palestinian Arabic. To the best of my knowledge, there is no published data on the frequency of different word orders and the production of grammatical constructions in general in the Palestinian Arabic dialect, nor any spontaneous production data for child and child-directed speech for this Arabic variety. Therefore, a corpus of child production, as well as child-directed speech, is essential as background to language acquisition studies and, here, to the two experimental studies presented in chapters 3 and 4.

2.1 Building a child and child-directed speech corpus

2.1.1 Design

Recordings of child-adult interactions were collected from February to August 2021 from 16 healthy monolingual Palestinian Arabic-speaking children aged between 18 and 56 months (Mean age in months is 36; 50% females), and their interlocutors (Mean age in years is 28; 84% females) from Hebron (in the South of Palestine), Taybeh, Jaljuliya, Tulkarm, Jenin, Nablus, and Qalqilya (in the North of Palestine), and Ramallah (Central Palestine) as can be seen from the map of Palestine in Figure 2.1. None of the recorded children were premature, had a hearing impairment or had any other health issues. All participants came from middle-class environments, as judged by the author of this thesis based on the parents' occupation, education, family size and household income with an average monthly household income of 4500 New

Israeli Shekels (NIS) (this estimation was retrieved by the author based on the Socio-Economic Conditions Survey conducted by the Palestinian Central Bureau of Statistics (2020)). People from middle-class environment represent 80% of Palestinian society according to the Palestinian Central Bureau of Statistics (2020).

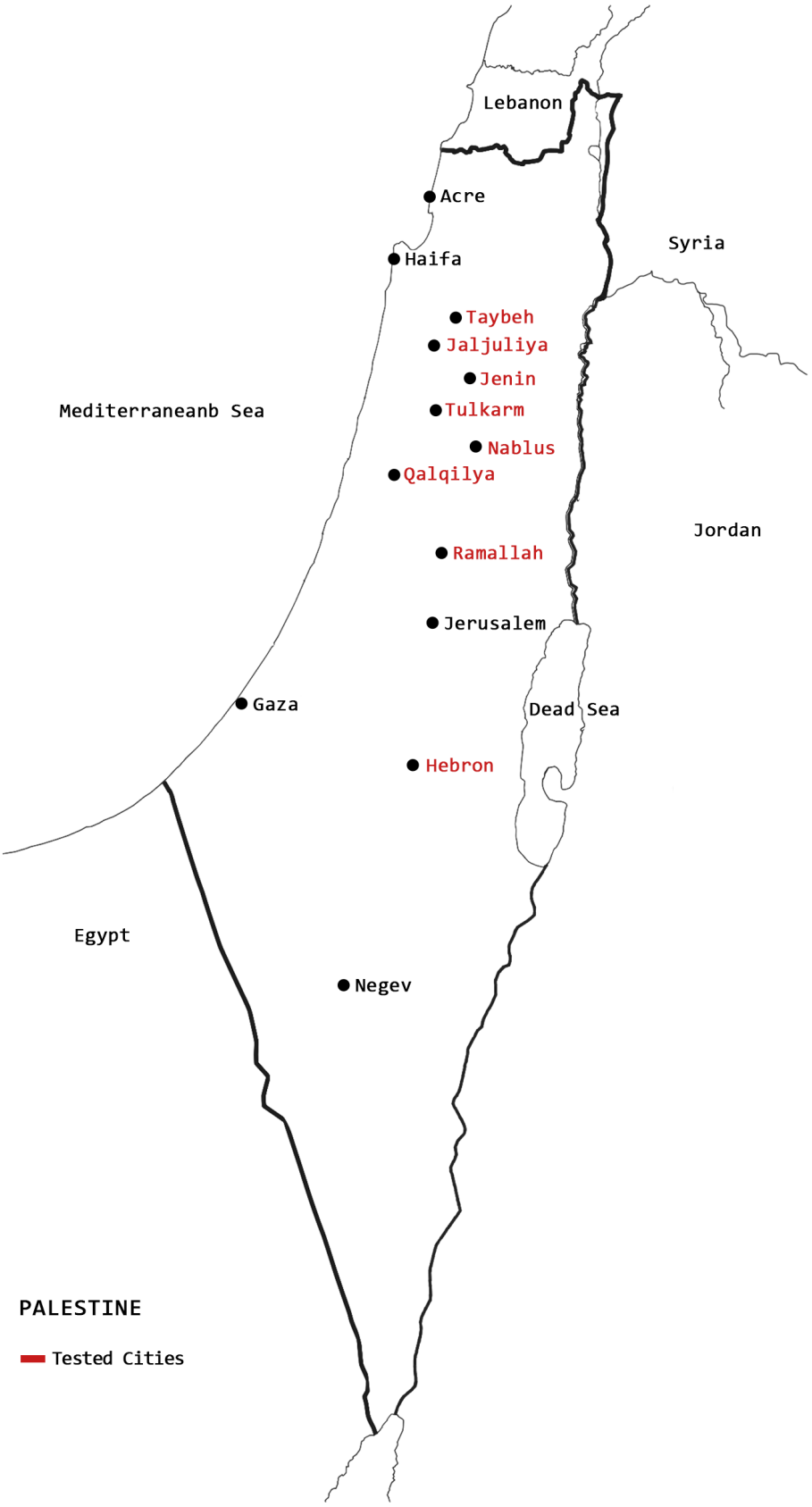


Figure 2.1: The map of Palestine

To obtain the data, I asked for permission to record from the parents of children using my personal and professional networks. After signing an informed consent form in which they agreed to record interactions with their children, they were asked to record 30-minute exchanges with their child (face-to-face spontaneous interaction) every two weeks. The child-adult interactions were recorded at the child's home and sent to the researcher by an adult family member. The adults who had agreed to be part of the cohort were asked to give details about each recording they sent. For instance, which people were present in each recording and where the recording took place (e.g., the child's house, grandparents' house, etc.). Adults were encouraged to carry out different playing activities, ask open-ended questions and discuss life events with their children to encourage them to speak as much as possible.

The latest versions of the Apple iPhone (iPhone 10 - iPhone 13) were used for the recordings. The smartphone was placed in the room where the recording was taking place, with children moving around it within a range of three meters. The audio files were sent to the author of this thesis via an internet-based computer file transfer service company (WeTransfer). Only recordings that were sufficiently clear and had high-quality sound were taken into consideration; consequently, one recording was discarded.

Fifty-nine recordings were obtained from the 16 families under the supervision of the author of this thesis and two speech-language pathologists based in Palestine, Sondos Srouji and Shireen Odeh. Each child was recorded between 2 and 5 times. The total duration of the recordings in minutes is 1,387; the mean duration of the recordings in minutes is 23.52; the shortest in minutes is 7; and the longest in minutes is 35. This resulted in 9,285 utterances of child speech and 10,496 utterances of child-directed speech.

Table 2.1 presents the characteristics of the children and their productions in this corpus. The mean length of utterance in morphemes (MLUm) and words (MLUw) are common quantitative measures of a child's linguistic production (Owens, 2016; Khater & Shaalan, 2007). MLUw was calculated manually in this corpus by counting the total number of words used in the first 100

spontaneous utterances by each child, divided by a hundred.

Table 2.1: Characteristics of children recordings and their productions.

Child	**Recordings**	**Age** (yy;mm;dd)	**MLUw**	**No. of child utterances**
Amira	Record 1	2;05;25	2.18	34
	Record 2	2;06;06	2.37	203
	Record 3	2;06;25	2.17	325
	Record 4	2;07;10	2.3	150
	Record 5	2;08;00	2.31	177
Amr	Record 1	1;09;05	1.48	108
	Record 2	1;09;28	1.66	132
	Record 3	1;10;25	1.9	193
	Record 4	1;11;16	1.35	95
	Record 5	2;02;02	1.74	61
Aysam[1]	Record 1	4;01.10	1.67	389
	Record 2	4;02.07	1.77	197
Ez	Record 1	1;11;06;14	1.05	58
	Record 2	1;08;14	1.25	12
	Record 3	1;08;29	1.28	170
	Record 4	1;11;08	1.56	69
Karam	Record 1	3;05;21	2.41	134
	Record 2	3;06;15	2.12	135
	Record 3	3;06;29	1.75	116
	Record 4	3;07;25	2.03	279
	Record 5	3;10;20	2.32	135
Mohammad	Record 1	3;07.29	2.27	347
	Record 2	3;08;15	2.26	223
	Record 3	3;09;00	2.63	80
	Record 4	3;09;19	2.18	184

[1]The MLUw is based on the first hundred exchanges. However, despite the fact that Aysam was not diagnosed with Developmental Language Disorder DLD, when I looked at the whole set of his files, his MLUw still low, and therefore, I think this might be a reason to think that he maybe delayed.

	Record 5	3;11;02	2.45	284
Naya	Record 1	4;07;28	2.54	118
	Record 2	4;08;18	2.73	142
	Record 3	4;09;13	2.98	115
	Record 4	4;10;07	3.36	542
Rahaf	Record 1	2;09;00	1.27	133
	Record 2	2;09;20	1.3	215
	Record 3	2;10;06	1.14	196
	Record 4	2;10;24	1.11	191
	Record 5	3;01;06	1.29	161
Rayan	Record 1	3;11;14	1.27	43
	Record 2	3;11;30	1.64	52
	Record 3	4;00;17	2.8	157
	Record 4	4;01;00	1.38	151
	Record 5	4;02;26	1.47	74
Sara	Record 1	2;10;08	1.06	60
	Record 2	2;11;08	1.09	251
	Record 3	3;00;28	1.08	297
Yousef	Record 1	3;11.14	1.34	44
	Record 2	3;11.24	1.69	92
	Record 3	4;00.17	1.25	60
	Record 4	4;01.00	1.57	170
Ghina	Record 1	2;08;12	2.09	250
	Record 2	2;09;05	2.15	208
Ibtisam	Record 1	2;10;15	1.47	71
	Record 2	2;10;29	1.47	97
	Record 3	2;11;14	1.48	120
Janna	Record 1	2;00;10	1.62	175
	Record 2	2;00;25	1.63	186
Tia	Record 1	1;07;21	1.06	85
	Record 2	1;08;03	1.07	101

Abdulghafer[2]	Record 1	04;01;00	1.88	143
	Record 2	04;01;17	1.89	136
	Record 3	04;02;03	1.92	159
Total	**59**			**9,285**

The characteristics of the adults who interacted with the children are shown in Table 2.2.

Table 2.2: Characteristics of adults recordings and their productions

Child	**Recordings**	**interlocutor**	**Age** (years)	**No. of adult utterances**
Amira	Record 1	Mother	31	30
	Record 2	Mother	31	262
	Record 3	Aunt	23	501
	Record 4	Aunt	23	154
	Record 5	Aunt	23	233
Amr	Record 1	Mother	28	174
	Record 2	Father and Mother	29 and 28	154
	Record 3	Mother	28	237
	Record 4	Mother	28	231
	Record 5	Mother	28	71
Aysam	Record 1	Brother	20	378
	Record 2	Brother	20	232
Ez	Record 1	Mother	26	103
	Record 2	Aunt	21	15
	Record 3	Father	35	259
	Record 4	Father	35	54
Karam	Record 1	Aunt	20	139
	Record 2	Aunt	20	164

[2]The MLUw is based on the first hundred exchanges. However, if you look at the all files, the MLU of this child is 3.52, which is more in keeping with his age.

	Record 3	Aunt	20	265
	Record 4	Aunt	20	492
	Record 5	Aunt	20	121
Mohammad	Record 1	Mother and Sister	20 and 45	375
	Record 2	Sister	20	267
	Record 3	Sister	20	64
	Record 4	Sister	20	174
	Record 5	Sister	20	274
Naya	Record 1	Aunt	21	73
	Record 2	Mother	33	25
	Record 3	Mother	33	39
	Record 4	Mother	33	87
Rahaf	Record 1	Mother	23	220
	Record 2	Mother	23	175
	Record 3	Mother	23	215
	Record 4	Mother	23	211
	Record 5	Mother	23	174
Rayan	Record 1	Mother	34	82
	Record 2	Mother	34	78
	Record 3	Mother	34	166
	Record 4	Mother	34	231
	Record 5	Mother	34	165
Sara	Record 1	Aunt	23	210
	Record 2	Mother	23	313
	Record 3	Mother	23	305
Yousef	Record 1	Aunt	21	48
	Record 2	Mother	34	138
	Record 3	Mother	34	119
	Record 4	Aunt	21	206
Ghina	Record 1	Brother	20	255
	Record 2	Brother	20	235
Ibtisam	Record 1	Mother	27	117
	Record 2	Mother	27	100

	Record 3	Mother	27	136
Janna	Record 1	Mother	26	220
	Record 2	Mother	26	248
Tia	Record 1	Father	32	136
	Record 2	Father	32	122
Abdulghafer	Record 1	Mother	35	286
	Record 2	Mother	35	243
	Record 3	Mother	35	329
Total	**59**			**10,496**

The recordings collected were first transcribed in Arabic by the author and two speech-language pathologists based in Palestine. Then a romanized transcription was produced by the author following the CHAT transcription format (MacWhinney, 2000), with the aim of uploading this corpus to the CHILDES database (see subsection 2.4). Unintelligible utterances were transcribed as 'xxx', while incomplete words were transcribed with the omitted part in parenthesis as (*ban*)*do:ra* for *bando:ra* 'tomato.' Furthermore, special form markers were used to indicate special forms of speech, such as **@**d for dialect form, **@**f for family form, **@**s$n for second-language form and **@**si for singing (MacWhinney, 2000).

2.2 Analysis

2.2.1 Methods

The analysis of the corpus carried out for the purposes of this thesis focuses on the distribution of word order alternations and the presence of null arguments in declarative, imperative and interrogative clauses in Palestinian Arabic. The analysis of Palestinian child-directed speech, as well as child speech, includes the speech samples of all participants. Following the analysis in Lassotta (2021) and Leela (2016), who have also investigated language

production with the same goals as in this study, only utterances (declarative, imperative and interrogative clauses) that contain a verb, modal, or auxiliary verb were considered in the analysis. A total of 3,110 utterances from children's utterances and 5,282 adult utterances to which children were exposed during the recording sessions were included in the analysis. Table 2.3 presents the percentage of productions that were declarative, imperative and interrogative for both children and adults.

Table 2.3: Percentage of the verbal production including declaratives (D), imperatives (I) and interrogatives (In) sentences by children and adults

	Children		**Adults**	
Utterances	**Count**	**Percentage (%)**	**Count**	**Percentage (%)**
Total	9,285	100 %	10,496	100 %
D, I & In	3,110	33.49 %	5,282	50.32 %

The rest of the productions were excluded. Songs (58) and Quran (59) were also excluded because they do not represent Palestinian Arabic.

(58) زَقزَقَ عُصفورٌ قالَ الحَمدُلِله.

Zaqzaqa ʕasˁfu:r-un, qa:la l-ħamdulila:h. (Tia's Father)
chirp.3M.SG bird, said.3M.SG thank God
'A bird chirp, said, thank God.'

(59) إِيَّاكَ نَعبُدُ وَإِيَّاكَ نَستَعِينُ (.) آهدِنَا آلصِرط آلمُستَقِيمَ

ʔiyaka naʕbudu wa ʔiyya:ka nastaʕi:n (.) ʔihdina:
'It is You we worship and You we ask for help (.) Show us
sˁ-sˁira:tˁal mustaqi:m (.) sˁira:tˁal laði:na
the straight path (.) The path of those upon whom
ʔa nʕamta ʕalajhim. (Sara's Mother)
You have bestowed favor.'

Following the analysis in Lassotta (2021) and Leela (2016), I also excluded passive sentences (60), single-word utterances, including yes/no answers (61),

verbless copular sentences[3] (62), and utterances such as reciting the months in a year, or number series (63). The following examples were extracted from the speech sample of all 16 children and the adults interacting with them.

(60) الباب اتسكر.

l-ba:b ʔetssakkar. (Janna's Mother)
the-door closed
'The door is closed.'

(61) a. أحمر.

ʔaħmar. (Rahaf, 2;10;24)
'Red'.

b. آه.

ʔa:h. (Mohammad, 3;07.29)
'Yes'.

(62) أحمد فالجامعة.

ʔaħmad fel ʒa:mʕa. (Ibtisam's Mother)
Ahmad at-the university
'Ahmad is at the university'.

(63) واحد تنين تلاتة.

wa:ħad tine:n talata. (Rahaf, 2;09;00)
'One, two, three'

When utterances consisted of more than one clause, each was analyzed separately since these clauses may have different word orders.

According to Fromkin (2013), nouns, pronouns, and determiner phrases all share the same syntactic distribution; hence a Determiner Phrase (DP) as in (64) or a strong pronoun as in (65) may occur in any argument position in a sentence.

[3]For a comprehensive analysis of the pronominal copula in Arabic, see Choueiri (2016).

(64) a. بابا رسم دائرة.

Ba:ba: rasam da:ʔira.
daddy draw.3M.SG circle

'Daddy draw a circle.'

b. آدم راح عالحارة.

ʔa:dam ra:ħ ʕal ħa:ra.
Adam went.3M.SG to-the street

'Adam went to the street.'

(65) a. أنا رسمت دئرة.

ʔana rasamet da:ʔira.
I draw.1SG circle

'I draw a circle.'

b. هو أخد الكاسة.

Hu ʔaxad l-ka:se.
he took.3M.SG the-glass

'He took the glass.'

I also encounter objects in clitic form (66), which appear in the same position as the strong pronouns (67). Nevertheless, in the coding, I kept the distinction between clitic and objects which are to be taken as either DP or strong pronouns, since clitics are required in certain positions.

(66) ئيميها.

ʔi:mi:-**ha:**. (Amira, 2;06;25)
take.2F.SG-it off

'Take it off.'

(67) بتعلموا إنجليزي.

Betʕalamu: ʔingli:zi:. (Amira, 2;06;25)
learn.3M.PL English

'They learn English.'

Furthermore, since the analysis focuses on word order, *wh*-elements are coded as S, which denotes a subject, O, which denotes an object (direct or indirect, including reflexives) depending on their grammatical function. I also consider other *wh*- elements like *we:n* 'where' and *ʔe:mta:* 'when' which denote a Prepositional Phrase (PP). Finally, the term auxiliary verb 'Aux' has been used in this study to refer to auxiliary verbs like *kana* 'was' and its sisters *sˁa:r* 'become,' and modals verbs such as *biddi* 'I want,' *la:zim* 'have to,' *yimken* 'may, could', *baqdar* 'can' (Aoun et al., 2009; Alharbi, 2002), all assumed to belong to the TP-field.

As discussed in 1.3.2, Palestinian Arabic, like many other Arabic dialects, is a null subject language as the subject can be dropped when the referent can be recovered from the context, as exemplified in (68).

(68) اشترينا بوظة.

ʃtare:na: bu:za. (Ghina, 2;08;12)
bought.1.PL ice-cream
'We bought ice-cream.'

2.2.2 Results

In this section, I first present the findings on the agreement errors in the production of children, followed by the findings on null subjects. Afterward, I turn to word order distribution. Then I report the serial verb constructions in the productions of children and adults. Finally, I report the findings on the VO/OV alternation as well as *wh*- questions in the production of both children and adults, since they bear directly in the experimental work in chapters 3 and 4.

Subject-verb agreement errors were calculated for all children, considering both main and auxiliary verbs since they both exhibit inflectional affixes in Palestinian Arabic. The results revealed a low incidence of agreement errors in young children with an average of 1.92% (1.31% of total speech samples were gender errors; 0.48% of total speech samples were number errors; and 0.12% of total speech samples were person errors). The majority

of agreement errors (68.33% of total agreement errors) were gender agreements where children substituted the masculine verb for the feminine verb. This was followed by number agreement errors (25%) and, finally, person agreement errors (6.66%). Table 2.4 summarizes the number and types of agreement errors for each child.

Table 2.4: Subject-verb agreement errors in children production

Child	**Number of verbs**	**Agreement errors**		**Types of errors**		
		Count	**Percentage**	**Number**	**Gender**	**Person**
Amira	434	8	1.84%	4	2	2
Amr	146	21	14.38%	0	21	0
Aysam	140	3	2.14%	0	3	0
Ez	46	4	8.69%	1	3	0
Karam	335	7	2.08%	3	3	1
Mohammad	470	0	0%	0	0	0
Naya	703	0	0%	0	0	0
Rahaf	49	0	0%	0	0	0
Rayan	87	5	6.41%	3	2	0
Sara	82	4	4.87%	2	2	0
Yousef	46	1	2.17%	0	0	1
Ghina	227	1	0.44%	1	0	0
Ibtisam	38	1	2.63%	1	0	0
Janna	91	2	2.19%	0	2	0
Tia	39	3	7.69%	0	3	0
Abdulghafer	181	0	0%	0	0	0
Total	**3114**	**60**		**15**	**41**	**4**

Since Palestinian Arabic is an "INFL-licensed" null subject language, it is expected that children do not go through an Optional Infinitive stage (Wexler, 2011). This was the case here, as no infinitives were found as verbs of a main clause.

The analysis of the distribution of null subjects vs overt subjects shows a similar distribution in adults' and children's speech samples, as shown in Table 2.5.

Table 2.5: Distribution of overt and null subjects by children and adults

	Adults		**Children**	
Feature of subjects	**Count**	**Percentage (%)**	**Count**	**Percentage (%)**
Overt subjects	1,082	20.48%	710	22.82%
Null subjects	4,200	79.51%	2,400	77.17%
Total	5,282		3,110	

The proportion of null subjects over null and overt subjects was calculated for both children and adults and then analyzed using the non-parametric Wilcoxon signed rank test to examine whether there is a statistically significant difference between the performance of children and adults with regard to null subjects. Results revealed no significant difference between children's and adults' performance (Z = -0.776, p = .438, r = .14). Additionally, the child group covers a wide age- and MLU- range.

I analyzed manually all sentences produced which corresponded to declaratives, imperatives and interrogatives. The analysis of word order distribution in Palestinian Arabic showed that out of all utterances included (5,282 from adult's speech sample and 3,110 from children's speech sample), only 403 sentences had a subject S, a verb V and an object O in adults' production and 170 sentences in the children's production. Table 2.6 shows the percentage of different word orders in adults' production with both an overt subject and an overt object. It is worth noting that the children's and the adults' productions were all grammatical.

Table 2.6: Percentage of different word orders of sentences with a S, V, O, adults

Word Order	**Count**	**Percentage (%)**
S V O	223	38.51 %
S V O_{Clitic}	134	23.14 %
O V S	72	12.43 %
S O V	57	9.84 %
V O_{Clitic} S	22	3.79 %
O S V	18	3.10 %
V O S	16	2.76 %
V S O	12	2.07 %
S V V O	8	1.38 %
O S V O_{Clitic}	5	0.86 %
Aux V O_{Clitic} S	2	0.34 %
Total	**579**	

On the other hand, Table 2.7 show the percentage of these sentence types as produced by children.

Table 2.7: Percentage of different word orders of sentences with S, V, O, children

Word Order	**Count**	**Percentage (%)**
S V O	125	47.34 %
S V O_{Clitic}	94	35.6 %
S Aux V O	15	5.68 %
V S O	11	4.16 %
V O S	6	2.27 %
S V V O	5	1.89 %
Aux V S O	4	1.51 %
S O V	1	0.37 %
O V S	1	0.37 %
O S V	1	0.37 %
O S V O_{Clitic}	1	0.37 %
Total	**264**	

These results are graphically represented for the two populations in Figure 2.2 and Figure 2.3.

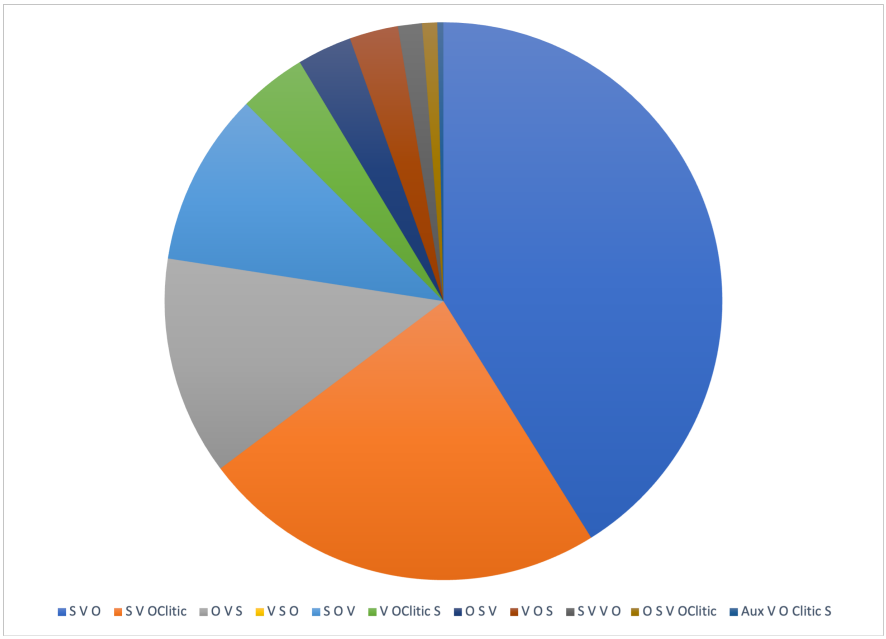


Figure 2.2: Frequency of different word orders of sentences with S, V, O in adults

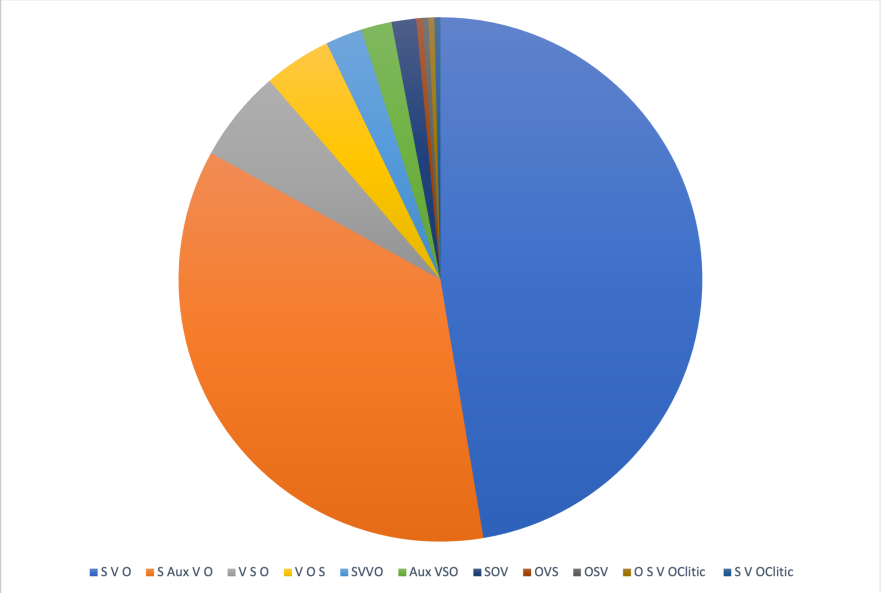


Figure 2.3: Frequency of different word orders of sentences with S, V, O in children

As can be seen from Tables 2.6 and 2.7, SVO was the predominant order among sentences containing the two arguments, in children and adults, with 365 sentences in the adult speech sample (63.03 %) and 224 sentences in children (84.83 %). Among the sentences that contain the two arguments, 377 sentences produced by adults (65.1 %) and 166 sentences produced by children (96.18 %) were of canonical word order[4]. On the other hand, 274 sentences produced by adults (34.9 %) and 10 sentences produced by children (3.57 %) were of the non-canonical word orders OVS, SOV, OSV, $VO_{Clitic}S$, VOS, Aux $VO_{Clitic}S$ and OSV O_{Clitic}. The non-canonical word order OSV O_{Clitic} is grammatical as a pronominal clitic appears on the verb as a resumptive pronoun, as exemplified in (69).

(69) المي أنا شربتها.

l-may ʔana ʃribt-**ha:**. (Ghina, 2;09;05)
the-water I drank.1.SG-it
'The water I drank it.'

OVS, SOV and OSV, exemplified in (70), were grammatical because they correspond to interrogative questions with *ʃu:* 'what' which is the only *wh*-phrase that does not allow a resumptive pronoun (Mohammad, 2000).

(70) a. شو بعمل هاد؟

ʃu: beʕmal ha:d? (Amira, 2;07;10)
what does.3M.SG this
'What did this do?'

b. إنتوا شو سميتوا أختكم ؟

ʔintu: ʃu: smetu: ʔuxtkum? (Naya, 4;09;13)
you what named.2M.PL your-sister
'What did you name your sister?'

c. شو أنا أرسم ؟

[4]If we assume that SVO and VSO are canonical word orders because they can be an answer to a broad focus question like 'What had happened?'

ʃu: ʔana ʔarsum? (Aysam, 4;01.10)
what I draw.1.SG
'What do I draw?'

When I took into account sentences without an overt subject, a total of 50 different word orders were found in the adults' speech sample, while 45 word orders were coded for children. The different word orders that were found in both adults and children are summarized in Table 2.8. Figure 2.4 shows all different word orders for both adults and children.

Table 2.8: Frequency and percentage of different word orders, adults and children

	Adults		**Children**	
Word Order	Count	Percentage (%)	Count	Percentage (%)
V	1016	19.23%	815	26.20 %
V O	743	14.06 %	489	15.72 %
V PP	389	7.36 %	246	7.9 %
V O_{Clitic}	387	7.32 %	243	7.81 %
O V	373	7.06 %	23	0.73 %
V O_{Clitic} O	268	5.07 %	51	1.63 %
S V	236	4.46 %	193	6.2 %
S V O	203	3.84 %	125	4.01 %
S V O_{Clitic}	134	2.53 %	94	3.02 %
V V	123	2.32 %	28	0.09 %
Aux V	116	2.19 %	88	2.82 %
S V PP	112	2.12 %	103	3.31 %
O Aux V	94	1.77 %	0	0 %
Aux V O	87	1.64 %	93	2.99 %
V S	84	1.59 %	87	2.79 %
O V PP	77	1.45 %	4	0.12 %
O V S	72	1.36 %	2	0.06 %

V V O	63	1.19 %	15	0.48 %
Aux V PP	63	1.19 %	39	1.25 %
O Aux	58	1.09 %	2	0.06 %
S O V	57	1.07 %	2	0.06 %
Aux O	49	0.92 %	32	1.02 %
V O_{Clitic} PP	47	0.88 %	42	1.35 %
V PP O	45	0.85 %	35	1.12 %
S Aux V	43	0.81 %	25	0.80 %
Aux V	39	0.73 %	0	0 %
O V O_{Clitic}	31	0.58 %	23	0.73 %
PP V	31	0.58 %	0	0 %
O Aux V PP	28	0.53 %	6	0.19 %
V O_{Clitic} S	22	0.41 %	0	0 %
V V PP	21	0.39 %	9	0.28 %
V O PP	20	0.37 %	7	0.22 %
S V V	18	0.34 %	6	0.19 %
O S V	18	0.34 %	2	0.06 %
V O S	16	0.3 %	6	0.19 %
S Aux V O	12	0.22 %	15	0.48 %
V S O	12	0.22 %	11	0.35 %
V PP S	11	0.2 %	12	0.38 %
Aux	11	0.2 %	40	1.28 %
Aux V V O	8	0.15 %	4	0.12 %
S V V O	8	0.15 %	5	0.16 %
Aux V S	6	0.11 %	4	0.12 %
O V V	6	0.11 %	0	0 %
V V S	6	0.11 %	1	0.03 %
V S PP	5	0.09 %	12	0.38 %
O S V O_{Clitic}	5	0.09 %	1	0.03 %
PP V O_{Clitic}	3	0.05 %	0	0 %
Aux V O_{Clitic} S	2	0.03 %	0	0 %
V V V	2	0.03 %	0	0 %
PP V O	2	0.03 %	0	0 %

Aux V O_{Clitic}	0	0 %	54	1.73 %
O Aux V O_{Clitic}	0	0 %	6	0.19 %
V S PP	0	0 %	5	0.16 %
Aux V S O	0	0 %	4	0.12 %
Total	**5,282**		**3,110**	

* The order of presentation of word orders is based on their incidence in adult production.

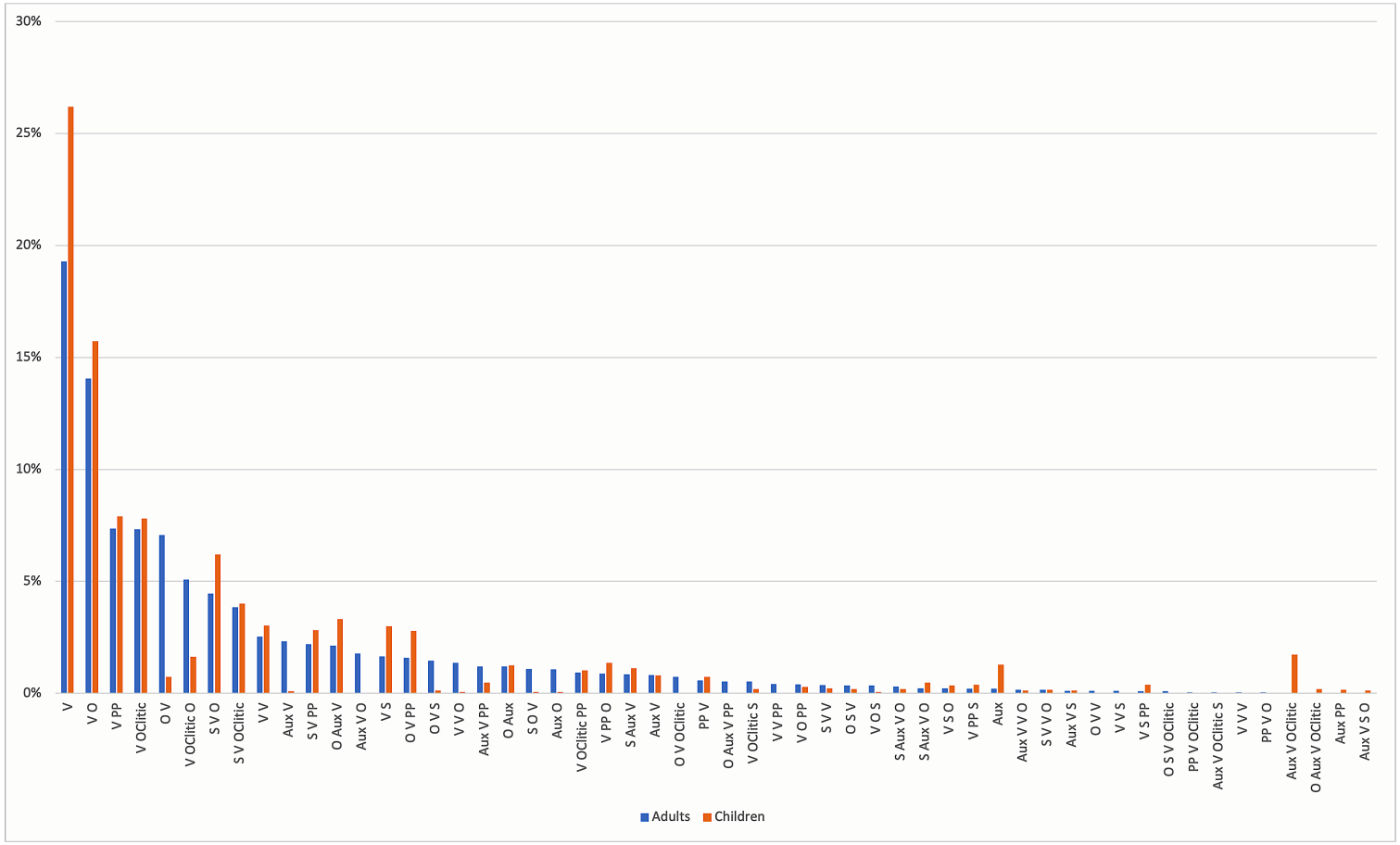


Figure 2.4: Percentage of different word orders, children and adults

Four word orders were only found in the children's speech samples: O Aux V O_{Clitic} (71), V S PP (72), Aux V O_{Clitic} (73) and Aux VSO (74).

(71) هدول بدي أطعميهم.

Hado:l biddi: ʔatˤaʃmi:-**hum**. (Mohammad, 3;11;02)
those want feed.1.SG-them
'Those I want to feed.'

(72) رحنا أنا وبابا ع أريحا.

went ʔana w ba:ba: ʕa ʔari:ħa. (Ghina, 2;09;05)
Went1PL me and daddy to Jericho
'My daddy and I went to Jericho.'

(73) لازم تربطيها.

La:zem turbutˤi:-**h**. (Mohammad, 3;11;02)
have tie.2F.SG-it
'You have to tie it.'

(74) صارت تقول إمي يلا.

sˤa:rat tqu:l ʔimi: yalla. (Abdulghafer, 4;01;17)
became say.3F.SG My-mother hurry
'My mother said to hurry.'

The following seven word orders were only found in the speech sample of adults: VVV (75), O Aux V PP (76), PP VO (77), PP V (78), OVV (79), Aux V O_{Clitic} S (80) and PP V O_{Clitic} (81).

(75) قومي روحي غسلي.

ʔu:mi: ru:ħi: ɣasli:. (Tia's aunt)
get.2F.SG up go.2F.SG wash.2F.SG
'Get up and go wash.'

(76) إيش بدك ترسم بالقلم ؟

ʔe:ʃ biddak tursum be-l-ʔalam? (Ez's mother)
what want draw.2M.SG with the-pencil?

'What do you want to draw with the pencil?'

(77) عَ إيش حطيتوا أغاني؟

ʕa: ʔeːʃ ħattˤeːtuː ʔaɣaːniː? (Sara's mother)
on What put.2.PL songs
'What is that you have used for music?'

(78) من شو بتخافي؟

Min ʃuː bitxaːfiː? (Ibtisam's mother)
from what afraid.2F.SG?
'What are you afraid of?'

(79) شو نزلنا عملنا؟

ʃuː nzilnaː ʕmelna? (Aysam's brother)
what went.1.PL did1.PL
'What did we do?'

(80) بتضلي تطعميها إنت.

Betdˤdˤali ʔettˤaʕmiː-**ha** ʔintiː. (Ghina's brother)
keep feed.2F.SG-her you
'You keep feeding her.'

(81) فالزبالة بنحطهم.

Fez zbala benħutˤ-**hum**. (Rahaf's mother)
in-the garbage put.1.PL-them
'In the garbage, we put them.'

In this analysis, I also found the Palestinian Arabic serial verb construction exemplified in (82), in which two or more verbs occur in the same clause, sharing the same tense and same subject with no clause boundary markers between them, with actions expressed in each string being either simultaneous or consecutive actions (Hussein, 1990) (see section 1.3.2). Among adults' speech samples, 4.68% displayed the serial verb construction in different word orders: VV (83), VVO, VV PP (84), SVV (85), SVVO, Aux VVO, VVS (86), and VVV (75).

(82) روحي جيبي الدفتر.

Ru:ħi: ʒi:bi: d-daftar. (Ibtisam's mother)
go.2F.SG bring.2F.SG the-notebook
'Go and bring the notebook.'

(83) رحت سبحت.

Ru:ħt sabaħet. (Yousef 4;00.17)
went.1.SG swim.1.SG
'I went swimming.'

(84) راحو يلعبوا في التلج.

Ra:ħu: yelʕabu: fet-taleʒ. (Karam 3;07;25)
went.3M.PL play.3M.PL with the-snow
'They went and played with the snow.'

(85) بابا راح يجيبه.

Ba:ba: ra:ħ yʒi:b-u. (Ibtisam, 2;10;15)
daddy went.3M.SG bring.3M.SG-it
'Daddy went to bring it.'

(86) خد ارسم إنت.

Xud ʔursum ʔinta. (Aysam 4;02.07)
take.2M.SG draw.2M.SG you
'You, take and draw.'

On the other hand, only 1.35% of the included utterances displayed the serial verb construction in children as early as 23 months of age, with the same word orders as adults except for VVV, which was only found in adults. Table 2.9 represents the age of first occurrence of the serial verbs in children production.

Table 2.9: Age of the first occurrence of the serial verbs in children's production

Child	Age of first occurrence
Ez	1;11;08
Amira	2;06;25
Ghina	2;08;1
Karam	3;06;15
Mohammad	3;09;00
Yousef	4;01.00
Aysam	4;02.07
Naya	4;08;18

As Table 2.8 shows, out of the 5,282 sentences produced by adults, 2,981 contained an overt object (60.91%), and 1,412 % out of the 3,110 sentences produced by children (45.24%) contained an overt object. Sentences with an overt object have been categorized into: VO and OV. The VO order includes the following 14 word order structures in adults: VO (87), V O_{Clitic} O (88), SVO (66), Aux VO (89), VVO (90), Aux O (91), V PP O (92), VO PP (93), VOS, S Aux VO (94), VSO, SVVO (95), Aux VVO (96) and PP VO. The same word order structures were found in children except for PP V, which was only found in adults, and Aux VSO which was only found in children.

(87) بنوكل بوظة.

bnokel bu:za. (Ghina 2;08;12)
eat.1.PL ice-cream.
'We are eating ic-cream.'

(88) طعمتني لوز.

tˤaʕmat-**ni:** lo:z. (Mohammad 3;09;19)
fed.3F.SG-me almonds
'She fed me almonds.'

(89) كنت أحضر السناجب.

Kunt ʔaħdˤdˤar ʔes-sana:ʒeb. (Karam 3;06;29)
was watch.1.SG the-squirrels
'I was watching the squirrels.'

(90) راحت تجيب بطة.

Ra:ħat tʒi:b batˤtˤa. (Amira 2;07;10)
went.3F.SG bring.3F.SG duck
'She went to bring a duck.'

(91) بدي وردة.

Biddi: warda. (Ez 1;08;29)
want.1.SG flower
'I want a flower.'

(92) حطوا فيه رمل.

ħatˤtˤu: fi:h ramel. (Amira 2;06;06)
put.3M.PL in-it sand
'They put sand in it.'

(93) طلع الأرنوب من الدار.

tˤileʕ l-ʔarnu:b min d-da:r. (Karam 3;10;20)
came.3M.SG out the-rabbit from the-house
'The rabbit came out of the house.'

(94) أنا بدي أحط المعجونة.

ʔana biddi: ʔaħutˤ l-maʕʒu:na . (Amira 2;06;06)
I want.1.SG put.1.SG the-dough
'I want to put the dough.'

(95) أنا بعرف أغني طبطبة.

ʔana baʕref ʔaɣani: tˤabtˤabe. (Amira 2;05;25)
I know.1.SG sing.1.SG tabtaba
'I know how to sing tabtaba.'

(96) بدي أروح أجيب معلقة.

Biddi ʔaruːħ ʔaʒiːb maʕlaʔa. (Naya, 4;09;13)
want.1.SG go.1.SG bring.1.SG spoon
'I want to go to bring a spoon.'

On the other hand, the OV sequence includes nine word orders in children: OV (97), OV O_{Clitic} (98), O Aux V O_{Clitic}, O Aux V (99), OV PP (100), O Aux (101), OVS, OSV, and OSV O_{Clitic}, while it includes two more structures in adults: OVV and O Aux V PP.

(97) شو رسمتي؟

ʃuː rasamtiː? (Karam 3;05;21)
what painted.2F.SG
'What did you paint?'

(98) اللعبة سميتها.

l-luʕbe samːeːt-**haː**. (Naya 4;09;13)
the-toy named.1.SG-it
'The toy, I named it.'

(99) شو بدي أعمل؟

ʃuː biddiː ʔaʕmal? (Naya 4;10;07)
what want.1.SG do.1.SG
'What do I want to do?'

(100) شو نعمل على بالمعلقة؟

ʃuː neʕmal bel-maʕlaʔa? (Naya 4;07;28)
what do.1F.PL with the-spoon
'What did we do with the spoon?'

(101) شو بدك؟

ʃuː biddak? (Mohammad 3;09;00)
what want?
'What did you want?'

Of all the sentences with an overt object in adults, 71.48% displayed the VO order, while OV order was present only for 27.47 %. On the other hand, 94.12% displayed VO order in the children's production, whereas the OV order occurred only for 5.87% of the sentences (see Figure 2.5). The higher frequency of OV order among adults can be partially attributed to the higher occurrence of *wh*- questions in the adults' sample. Of all sentences with OV order, 31.32% were *wh*- questions in children, whereas 78.33% were of *wh*- questions in adults sample (marked with diagonal shading in the figure). The rest of the OV structures in the production of children and adults were instances of topicalization with a pronominal clitic that appears on the verb as a resumptive clitic pronoun. On the other hand, of all sentences with VO order, 0.22% were of subject *wh*- questions in children, whereas 2.2% were of *wh*- questions in the adult sample (marked with diagonal shading in the figure).

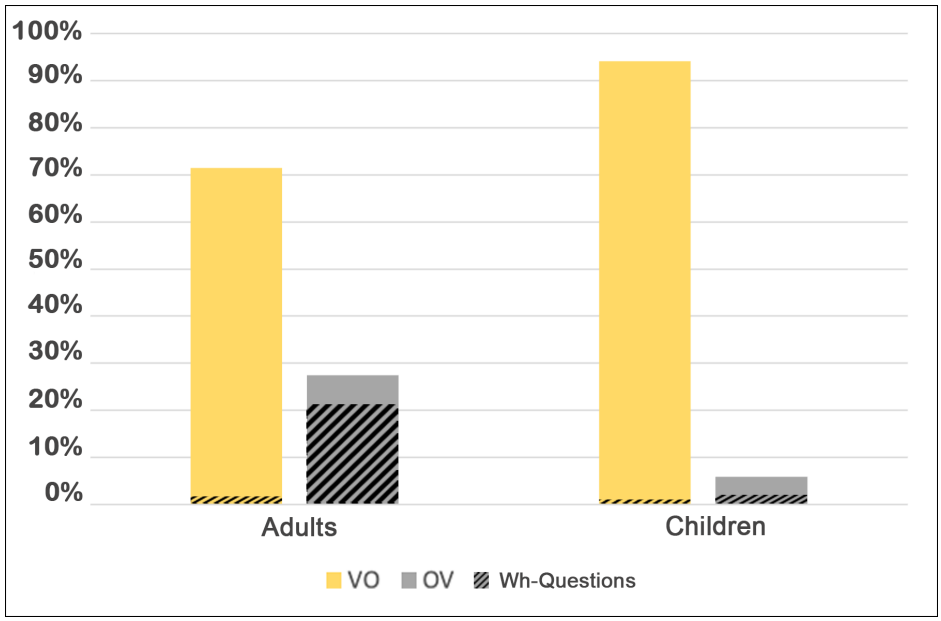


Figure 2.5: Distribution of VO/OV order in Palestinian Arabic

After excluding the *wh*- questions from all the sentences with an overt object, the proportion of the sentences with OV order over sentences with OV and

VO orders was calculated for both children and adults and then computed using the non-parametric Wilcoxon signed rank test to examine whether there is a statistically significant difference between the production of children and adults with regard to OV order. Results revealed a significant difference between children's and adults' performance (Z = -3.516, $p < .001$). I also calculated the proportion of the sentences with OV over sentences with OV and VO orders for both adults and children with only an MLU above 1.75. Children with MLU below 1.5 were excluded as they had not fully reached the two-word stage. However, results also revealed a significant difference between the production of children and adults with regard to OV order (Z = -2.201, $p = .028$).

Out of 3,110 utterances, only 30 utterances were *wh-* questions in the children's speech sample. Out of the 30 *wh-* questions in children's production, two were subject questions, and 28 were object *wh-* questions. Two of the 30 questions were *wh-* in situ questions in the speech sample of children. On the other hand, 688 of the 5,282 utterances were *wh-* questions in the adults' speech sample. Of these 688 *wh-* questions, 557 were object questions, 128 were subject questions, two were *we:n* 'where' questions and one was *ʔe:mta* 'when' question. Finally, eight of the 688 questions were*wh-* in situ questions in the speech sample of adults. These findings are inconsistent with Mohammad (2000), who argued that *wh-* questions are grammatical only if the *wh-* word is fronted, or otherwise, the in-situ *wh-* questions are echo questions. However, these results are in line with what was found in other Levantine varieties, such as Lebanese Arabic (Aoun et al., 2009), as well as Syrian Arabic (Sulaiman, 2016).

2.3 Discussion

The purpose of this corpus was to determine the frequency of different word orders in Palestinian Arabic-speaking children and adults. Unlike classical Arabic and MSA, in which VSO is considered the unmarked word order, Palestinian Arabic speech production of both children and adults reveals

that SVO is the predominant order in spontaneous speech. This study aligns with Saiegh–Haddad (2003), Mohammad (2000), Shlonsky (1997), and Benmamoun (1997), who pointed out that SVO is the unmarked word order in Palestinian Arabic, while VSO is the basic word order in Standard Arabic. The SVO order also seems to be the unmarked word order of other varieties of spoken Arabic, such as Jordanian (El-Yasin, 1985), Egyptian (Almomani & Alsaidat, 2010), and Moroccan (Announi, 2021). However, the predominant order of the mentioned varieties was not established based on corpora or frequency counts but on the authors' personal judgments as native speakers of these varieties.

Similar word order structures were found in both children and adults. No ill-formed word order sequences were found in the analysis of the speech samples of children (or adults). Finally, the distribution of verbs and objects was also calculated. The finding was that 71.48% and 94.12% of the sentences with an overt object display the VO order in adults and children, respectively.

The findings of the current analysis align closely with those of other child languages. There is no significant difference between the proportions of null subjects in the production of children and adults, with 79.30% of the sentences with null subjects in adults' production and 76.25% in children's production in Palestinian Arabic. Similar findings were reported by Zhu and Gavarró (2019) in their analysis of subject production in Mandarin-speaking children and adults. They also found no significant difference in the production of dropped subjects between the two groups. However, the percentage of occurrence of null subjects in the analysis of Zhu and Gavarró (2019) was lower than what was found in Palestinian Arabic with a mean of 48.98% in Mandarin-speaking children and 49.83% in Mandarin-speaking adults. This may be attributed to grammatical differences as Mandarin is a topic drop language, not a null subject language.

The results of the current study are also align with the findings of Cabré-Sans and Gavarró (2006), who analyzed longitudinal corpora of three Catalan-speaking children and their interlocutors from the Serra - Solé corpus in

CHILDES. They found a similar rate of null subjects in Catalan-speaking children and adults, with a higher distribution of null subjects than overt subjects in both groups' speech production. Similar results were also observed in Italian (Lorusso, Caprin, & Guasti, 2005), where the percentage of null subjects in Italian-speaking children and adults' speech samples was similar, and null subjects occurred more frequently than overt subjects (around 70% of productions in both groups). An earlier study by Bel (2003) on language productions of six children (three Catalan-speaking and three Spanish-speaking) also supports these findings. The results from the Spanish-speaking children and the two Catalan-speaking children - whose ages ranged from 1;6 to 2;8 for Catalan and from 1;7 to 2;8 for Spanish showed a higher occurrence of null subjects than overt subjects in both languages: Catalan (67.7 %) and Spanish (67.3 %). Comparing these results with the percentage of null subjects in Catalan-speaking adults in the study by Casanova (1999) reveals a close similarity between the percentage of occurrence of null subjects in the productions of Catalan-speaking children and adults (62 %).

The results of the current study are consistent with what was found by Qasem (2020), who examined a longitudinal corpus of two Yemeni Ibbi Arabic speaking children aged two. Qasem found that null subjects appeared at a high proportion in the children's speech compared to overt subjects, with 86-87% being null subjects and 12-14% being overt subjects. No results were reported for their interlocutors.

As expected by Wexler (1998, 2011), as in other null subject languages, Arabic-speaking children do not go through an Optional Infinitive stage. Moreover, Schütze (2004) considers *be* omission at the optional infinitive stage and observes that, when finite, *be* is omitted at the same rate and for the same period as optional infinitives occur; it is therefore an optional-infinitive-stage phenomenon. On the other hand, he finds that *be* is not omitted when non-finite (*I'm gonna be driver*). He argues that this derives from the fact that some languages, but not others, require a verb to be present in all sentences (*be* being, in his analysis, V); his proposes the parameterization of

this requirement, with English illustrating its positive value and Arabic its negative value. The results of the corpus analysis here bear on this issue, as no copular sentences produced by the children ever presented V in the present tense (102).

(102) a. أحمد فالجامعة.

ʔaħmad fel ʒa:mʕa. (Ibtisam's Mother)
Ahmad at-the university

'Ahmad is at the university'.

b. ماما بالشغل.

Ma:ma: beʃ-ʃuɣul. (Ibtisam 2;11;14)
Mama at the-work.
'My mom is at work.'

According to Benmamoun (2000) and Aoun et al. (2009), in Arabic, sentences does not always have to have a verb or a VP, such as the present tense verbless sentences with no copula or VP, as in (102). In all the instances found, V omission was applied as in the adult grammar. This would constitute, therefore, another example of VEPS (Wexler, 1998).

Regarding verb-subject agreement, challenges associated with subject-verb agreement may be expected as the subject and verb must align in various grammatical aspects, such as person, number, and gender (Taha, Stojanovik, & Pagnamenta, 2021). Additionally, in Palestinian Arabic, a single inflectional marker represents multiple agreement categories. For instance, the suffix *-at* in *darsat* simultaneously indicates third person, feminine gender, and singular number. In other cases, agreement categories are expressed through a circumfix affix, which requires both a prefix and a suffix. An example of this is the circumfix *byi—u* in *byidrusu*, where it signifies third-person plural agreement without gender distinction (Taha et al., 2021). However, the results of the analysis are of VEPS (Wexler, 1998) as children produced very few errors, accounting for only 1.92% of the total forms produced within the tested age range (18 and 56 months).

Taha et al. (2021) conducted a research study to examine the proficiency of typically developing Palestinian Arabic-speaking children in producing tense and subject-verb agreement. The study evaluated performance accuracy and error patterns in a group of 32 children aged 3;0 to 8;0. The participants completed a picture-based verb elicitation task designed to assess their accurate production of tense and subject-verb agreement inflections in Arabic. Consistent with the findings of the current analysis, they found a remarkably high level of subject-verb agreement accuracy, reaching 97%, suggesting a near-ceiling effect.

This study has not confirmed previous research on Palestinian Arabic regarding the acquisition of SV/VS and SVO/VSO orders by Friedmann and Costa (2011) and SVO/VSO orders by Khamis-Dakwar (2011). Friedmann and Costa (2011) conducted a study investigating the acquisition of SV/VS orders as well as SVO/VSO orders in four languages; Hebrew, European Portuguese, Spanish and Palestinian Arabic. Sentence repetition task, story retelling and spontaneous production were used for the first three languages while only the sentence repetition task was used for Palestinian Arabic. For the first sentence repetition task, ten Palestinian Arabic-speaking children aged between 1;9 and 3;0 were selected. This task tested the SV order in sentences with unaccusative and unergative verbs. For the second sentence repetition task, 24 Palestinian Arabic-speaking children aged between 2;6 and 3;6 were selected to test the SV order with transitive verbs. In both tasks, the children were given sentences to repeat that had been produced by a native speaker of the target language. There were no accompanying pictures for these tasks.

Ten sentences with unaccusative verb (103), and 10 sentences with unergative verb (104) were used in the first task.

(103) a. البالون انمرع.

l-balo:n inmazaʕ.
the-balloon got-torn.3M.SG
'The balloon torn.'

b. انمزع البالون.

Inmazaʕl-balo:n.
got-torn3M.SG the-balloon.
'The balloon torn.'

(104) a. الولد ركض.

l-walad rakad.
the-boy ran.3M.SG
'The boy ran.'

b. ركض الولد.

Rakad l-walad.
ran3M.SG the-boy.
'The boy ran.'

In the second task 40 sentences with transitive verbs were used: 20 sentences with SVO order (105) and 20 sentences with VSO order (106).

(105) البنت باست الست.

L-bent basat s-set. (SVO)
the-girl kissed.3F.SG the-grandma
'The girl kissed the grandma.'

(106) باست البنت الست.

Basat l-bent s-set. (VSO)
kissed.3F.SG the-girl. the-grandma
'The girl kissed the grandma.'

Results revealed that in the very early stages of sentence production, Palestinian Arabic-speaking children, similar to Spanish-speaking children, in the youngest age group in both experiments (1;9-2;5 years) were able to repeat VS sentences significantly better than SV sentences for unergatives ($t(9) = 4.36$, $p < .001$), unaccusatives ($t(9) = 2.90$, $p = .009$) and for VSO sentences with transitive verbs ($t(7) = 2.38$, $p = .02$). The results of the first task

are presented in Table 2.10, whereas the results from the second task are presented in Table 2.10.

Table 2.10: Palestinian Arabic- Experiment (1): Repetition of unergative and unaccusative verbs, Friedmann and Costa (2011)

		Unergative		**Unaccusative**	
Age	**N**	**SV**	**VS**	**SV**	**VS**
1;9-2;4	10	20%	62%	20%	46%
2;6-3;0	10	74%	90%	84%	90%

Table 2.11: Palestinian Arabic- Experiment (2): Repetition of transitive verbs, Friedmann and Costa (2011)

		Transitive	
Age	**N**	**SVO**	**VSO**
2;0-2;5	8	27%	51%
2;7-3;0	7	78%	80%
3;2-3;6	9	88%	72%

Although SV order is the more frequent order in Palestinian Arabic, the result revealed a preference for VS order with both unergative/transitive verbs and unaccusative verbs up to age two and a half (Friedmann & Costa, 2011). Hence, they concluded that frequency in the input is not what determines their production pattern but rather underlying syntactic considerations. Friedmann and Costa (2011) explained these results by suggesting that V-to-I is available for all languages, but not the movement of the subject outside VP (subject to Spec IP). However, when considering the patterns found in Hebrew and European Portuguese-speaking children, who only used SV with unergative/transitive verbs but employed both SV and VS with unaccusative verbs, an explanation was needed for why the V-to-I movement, assumed to be available for all languages occurs in the early stages of Span-

ish and Palestinian Arabic acquisition but is absent in early acquisition of Hebrew and European Portuguese.

Friedmann and Costa (2011) observed that both SV and VS are possible in Hebrew, Palestinian Arabic, Spanish and European Portuguese. However, in the results of their studies of the spontaneous production and experimental work, they find that Hebrew patterns with European Portuguese and Palestinian Arabic patterns with Spanish in different word orders preferences. For the first two languages they find a preference for SV and in Palestinian Arabic and Spanish they find a preference for VS. They argue that this is the result of verb movement and lack of subject raising. In Spanish and Palestinian Arabic, children accordingly move the verb and leave the subject within VP, but in Hebrew and European Portuguese they also fail to raise the verb because, according to these authors, VP is the spell out domain unlike in Palestinian Arabic and Spanish.

Similar results were reported by Khamis-Dakwar (2011), who investigated the acquisition of SVO and VSO orders in 15 Palestinian Arabic speaking children aged 1;7 and 3 years using three repetition tasks: two sentence repetition tasks and a story telling task. The responses of children were categorized into three response types: accurate imitation when the child repeated the provided sentence exactly as presented, inversion when the child's answer involved an inversion of the original sentence type, and other types of responses which includes null subject and single-word responses. Khamis-Dakwa found that children repeated the VSO order earlier than the predominant SVO order, which appears later since only five participants aged 2;6, and 3 years had a correct imitation of the sentences with the unmarked SVO order. Table 2.12 presents the percentages of the correct imitations, as well as the inversion responses of both SVO and VSO sentences.

Table 2.12: Imitation of SVO and VSO sentences, Khamis-Dakwar (2011).

	SVO		**VSO**	
Age	Correct imitation	Inversion response	Correct imitation	Inversion response
1;8-2;0	2%	29%	58%	0%
2;3-2;5	33%	14%	42%	8%
2;6-3;0	67%	3%	40%	27%

No significant differences regarding the correct repetition of VSO sentences between the three age groups were found ($p > .01$). On the other hand significant differences regarding the correct repetition of SVO sentences between the three age groups were reported. Correct repetitions of SVO were significantly less in the first age group than in the second age group and in the second age group than in the third. Moreover, in the first age group, the correct repetitions of SVO were significantly less than VSO. In the second age group, although correct repetitions of VSO were higher than those of SVO, the difference was not significant. Finally, the percentages changed in the third age group in which the correct repetitions of SVO was found to be significantly higher than those of VSO.

However, no context in which the sentences were produced was given, and therefore we cannot be certain that what children were producing was appropriate for the story context. An additional problem is that the experimental design of Khamis-Dakwar (2011)'s study allowed children to have other alternatives, but capitalized on less than half of the answers of the children. Moreover, if the children were given SVO and the subject was well-known to them, they might use the VO when they repeated (as was the case in her Khamis-Dakwar (2011)'s study) since Palestinian Arabic is a null subject language. This doesn't mean that children can't repeat SVO but rather they are dropping the subject. However, if they were given a context where SVO is what is pragmatically expected and in that context they failed to produce it, one could argue that they don't know it or they avoid it. Lastly, Khamis-Dakwar (2011) combined the results of the three tasks rather than presenting the results for each experiment separately, given that each task has a different design and pragmatic context.

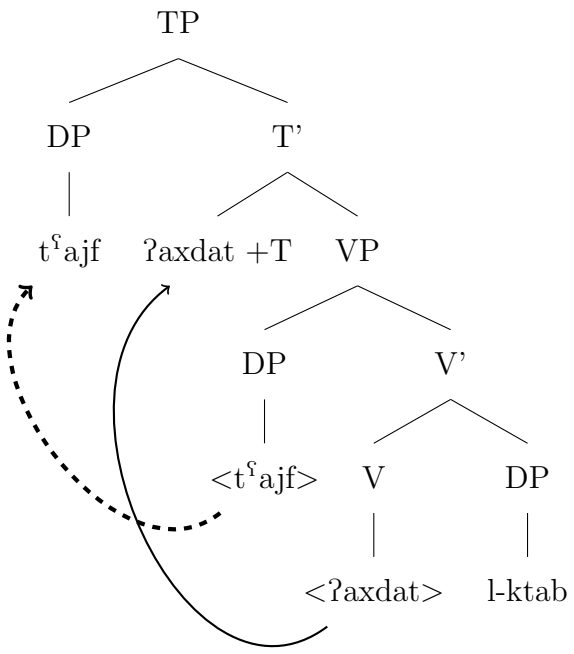
Khamis-Dakwar (2011) suggested that the late acquisition of NP movement (subject to Spec IP), but not V movement (V to I), can explain this preference for VSO, where the verb is moved to a position before the subject. The results in this thesis, in contrast, have revealed that SVO is in the speech production of all children aged 19-57 months.

Following the assumption that, regardless of their surface word order, the subject is base-generated inside VP, the movement of the subject to the specifier of TP (Shlonsky, 1997; Mohammad, 2000) would result in the SVO order, exemplified in (107) and diagrammed in (108), whereas the raising of the verb to T leaving the subject inside VP would result in the VSO order, exemplified in (109) and diagrammed in (110). Here I skip *v*P phrase, but I assume, in any case, that the verb moves to T in Palestinian Arabic and the subject moves to Spec as in the tree diagrams shown below.

(107) طيف أخدت الكتاب.

t$^{\text{ʕ}}$ajf ʔaxdat l-kta:b.
Taif took.3F.SG the-book
'Taif took the book.'

(108)

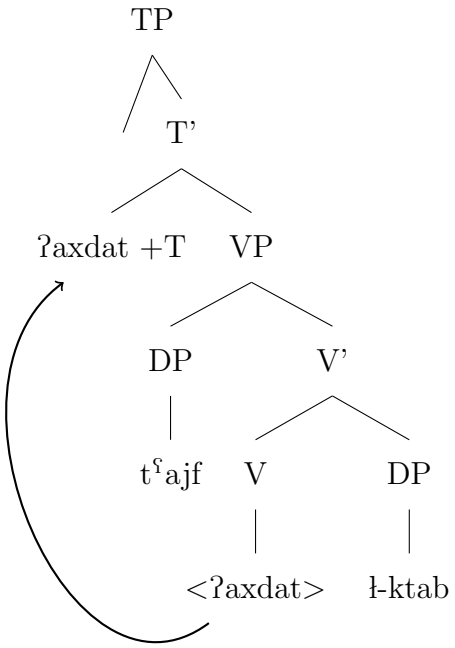


(109) أخدت طيف الكتاب.

ʔaxdat t$^{\text{ʕ}}$ajf l-kta:b.
took.3F.SG Taif the-book

'Taif took the book.'

(110)



Compared to the VS order, which does not require subject movement, the SV order requires the child to execute an additional syntactic movement - that of the subject to the higher subject position. Given that the SV order requires this extra movement, it's possible that younger children would avoid this additional step during the sentence repetition tasks. However, the performance of the tested children is not entirely in line with Khamis-Dakwar (2011) conclusion, as even at 2;3 years, there were instances when those children preferred to use the SVO despite the extra movements when they were given VSO sentences, which is according to Khamis-Dakwar more difficult. In any event, the results in my study do not corroborate the findings.

Still, Friedmann and Costa (2011) are correct to argue that frequency in the input does not determine the pattern of language acquisition, considering that SVO order was found in only 6.52% of adults' input and over 76.25% of the child-directed speech included null subjects.

On the other hand, the results of my study are quite similar to those reported by Abboud, Choueiri, Seifeddine, and Tuller (2022) in a study of 19 two-years native Lebanese Arabic children with the goal to investigate the emergence of subjects in Lebanese Arabic. Abboud et al. (2022) analyzed a corpus of child and child-directed speech for Lebanese Arabic. Similar to what was found from the results of the current analysis, their results are inconsistent with Friedmann and Costa (2011) and Khamis-Dakwar (2011), indicating that both SV and VS orders emerge simultaneously. However, unlike what was found in the analysis of the Palestinian Arabic speaking children and their interlocutors that SVO order was the predominant order in the speech production of both groups, there was no frequency difference between VS and SV in the speech sample of the youngest Lebanese children nor in the speech sample of their mothers. A slight preference for the SV was found in the speech samples of older children but not in the speech samples of their mothers, who showed no preference for that order (Abboud et al., 2022). Given that young Lebanese children produce lexical subjects in verbal clauses in both available positions (VS and SV) from very early stages, with no indications of avoiding subject movement in SV order, and considering the early production of various forms of displacements, such as subject movement to Spec-TP, *wh*- movement, and topicalization, Abboud et al. (2022) interpret their results under the assumption of VEPS by Wexler (1998) that syntactic movement is acquired very early. Finally, Abboud et al. (2022) suggested an explanation for the inconsistency of their findings with those reported by Friedmann and Costa (2011) and Khamis-Dakwar (2011), stating that Sentence Repetition tasks assess the ability to decode, process, and store in memory in order to reproduce a particular grammatical structure. That is to say; sentence repetition tasks may necessitate higher cognitive abilities implying that children may struggle with more complex constructions in such tasks.

Turning to serial verb constructions, there is some literature on their acquisition, which is largely ignored in the literature of the acquisition in Arabic (Hussein, 1990). For other languages, an analysis of serial verb construc-

tions was carried out by Adone (2012) for spontaneous data from Creole children (Seselwa and Morisyen). Results revealed that Morisyen-speaking children first produced serial-like constructions around the age of 2;4. However, children produced these constructions with some errors. For instance, they produced the subject between the two verbs, which is not the case in the productions of adults. They also reversed the verbs in some constructions as in (111).

(111) Mo al zet dan lamer.
3.SG go throw in sea
'I throw it into the sea.'

Adone (2012) also carried out an experiment on serial verbs using the elicitation method. Sixty-eight children aged between 3;0 and 5;11 years, divided into six age groups, were tested. The experimenter first introduced the puppets in the story and told the children that this puppet was trying to learn Seselwa. As a result, when it spoke, it would make mistakes, and the kids were asked to correct the puppet. In the event that it was not, the children were asked to assist the puppet by providing the correct sentence. Results reveal that children of all age groups were able to produce serial verb constructions productively. The results here revealed that Palestinian-speaking children, as early as 23 months of age, do produce grammatical serial verb constructions.

Finally, in the production of both children and adults, I found both in-situ *wh*- questions and fronted *wh*- questions, which are exemplified in (112) and (113). Despite the fact that in-situ *wh*- questions are considered more economical because the *wh*- phrase remains in place in the sentence without overtly moving to Spec, CP (Grolla, 2009; Vieira & Grolla, 2020), only two of the native Palestinian Arabic children's questions (6%) were of the *wh*-in situ type, intended for seeking answers rather than serving as echo questions.

(112) شو سميتوا أختكم ؟
ʃu: smetu: ʔuxtkum? (Naya, 4;09;13)
what named.2M.PL your-sister

'What did you name your sister?'

(113) أنا شو بعمل؟

ʔana ʃu: baʕmal? (Ghina, 2;09;05)
I what do.1.SG
'What am I doing?'

These findings align with the results of a study conducted by Vieira and Grolla (2020) using an elicited production task on Brazilian Portuguese, a language that offers both in-situ *wh*-questions and fronted *wh*-questions as options. The results from 52 Brazilian Portuguese-speaking children aged 4;6 and 5;6 and 60 adults indicate a preference for the fronted *wh*-questions (79.4% and 56.1%, respectively) over in-situ *wh*-questions (20.6% and 43.9%, respectively). Moreover, native children were observed to avoid producing the in-situ *wh*-questions in spontaneous production (Vieira & Grolla, 2020). Nevertheless, the occurrences of in-situ *wh*-questions were not distributed randomly. Specifically, they were found to be significantly more common in the prominent Common Ground condition (both the speaker and the listener have previously exchanged information in the conversation. So, they both share that information, and both know that each of them is aware of that information as well.) compared to the non-prominent Common Ground condition.

The percentages of *wh* in-situ in Palestinian Arabic are lower than those found in the Brazilian Portuguese varieties investigated in Vieira and Grolla (2020) and resemble more closely the percentages in the São Paulo dialect and the Bahia dialect of Brazilian Portuguese where they represent 9% of the questions produced by adults. Still, in these two dialects there are other grammatical options (Grolla, 2009). What is striking is that in all these varieties the percentages of *wh* in-situ are very similar for adults and children.

The observations made by Grolla (2009) in favor of an economy driven account of child *wh*- questions are consistent with the claims of an earlier study conducted by Hamann (2006), who investigated the spontaneous production

in a language that has both options, French. The investigation of the spontaneous production was based on the Geneva corpus (Cronel-Ohayon, 2004), along with elicited production experiments involving 11 French children with Developmental Language Disorder DLD aged between 3;10 and 9;1, conducted by Baranzini (2003) and Rasetti (2003). Results reveal that both typically developing French-speaking children and French-speaking children with DLD prefer *wh-* in-situ over moved *wh-* questions with a percentage of in-situ *wh*-questions ranges from 33% to 100% in children with DLD and from 73% to 90% of in-situ *wh*-questions in typically developing children (Hamann, 2006). Hamann (2006) attributed the preference for in-situ *wh*-questions in the early stages of production to the assumption that child grammar is economy driven, in which children tend to opt for the most economic construction, which is in-situ *wh*-questions, in the case of French. The results for French are, nevertheless, controversial (see Oiry (2008)). The results for Palestinian Arabic do not provide evidence for economy in the derivation of *wh-* questions.

2.4 The Nazzal corpus

There are several corpora available for adults for Modern Standard Arabic: the Corpus of Contemporary Arabic (Alsulaiti & Atwell, 2006), the International Corpus of Arabic (ICA) (Alansary, Nagi, & Adly, 2007), and the Arabic Gigaword corpus (Parker & et al., 2011). Additionally, there are corpora available for different Arabic dialects. For instance, there is one morphologically annotated corpus available for Palestinian Arabic called *Curras* 'notebook' (Jarrar, Habash, Alrimawi, Akra, & Zalmout, 2017). It consists of 56,000 tokens from written sources such as Facebook, Twitter, as well as blogs, forums, Palestinian stories and TV shows. Three corpora are found for Egyptian Arabic called CALLHOME Egyptian Arabic (CHE) (Gadalla et al., 1997), CALIMA (Habash, Eskander, & Hawwari, 2012), and Yet Another Dialectal Arabic Corpus (YADAC) (Alsabbagh & Girju, 2012). For Gulf Arabic, there is the Gumar Corpus, consisting of 100 million words from 1,200 long conversational novels published anonymously online (Khalifa, Habash,

Abdulrahim, & Hassan, 2016). Efforts have been made for other dialects as well, including corpora on Emirati (Khalifa et al., 2018; Ntelitheos & Idrissi, 2017), Tunisian and Algerian (Harrat, Meftouh, Abbas, & Smaïli, 2014; Zribi, Ellouze, Belguith, & Blache, 2015), and Yemeni and Moroccan (Alshargi, Kaplan, Eskander, Habash, & Rambow, 2016). However, to the best of my knowledge, no child corpora for any Arabic variety is available except for Egyptian Arabic, the Salama corpus, which can be found on the CHILDES platform (https://childes.talkbank.org/access/Other/Arabic/Salama.html). Hence, child corpora for each and every dialect of the spoken varieties of Arabic are much needed.

The Child Language Data Exchange System (CHILDES) is the child language component of the TalkBank system, a project set up by MacWhinney and Catherine Snow in 1984 (MacWhinney, 1987; MacWhinney, 2000). CHILDES is one of the most significant corpora of child language acquisition developed over the years, providing researchers with corpora from a wide variety of languages. The CHILDES database consists of six major directories: English, non-English, narratives, language impairments, and bilingual acquisition (MacWhinney, 1996). It consists of around 44 million spoken words from 28 different languages such as Chinese, the languages of the Romance family, the Germanic family, the Slavic family, Hebrew, and Japanese (MacWhinney, 2000). The CHILDES database is the contribution of researchers who initially gathered the data to carry out their own research. The vast majority of the database comprises interactions between adults and children (Corrigan, 2012). Besides the database, the CHILDES platform includes software for analyzing the transcripts, such as Computerized Language Analysis (CLAN) and a discourse notation and coding system called Codes for the Human Analysis of Transcripts (CHAT).

Due to the lack of spontaneous production data for child and child-directed speech for Palestinian Arabic, the transcriptions of the collected data here were uploaded on Child Language Data Exchange System (CHILDES) platform in collaboration with B. MacWhinney. The corpus created, named the

Nazzal corpus, was manually transcribed following the CHILDES manual (MacWhinney, 2000) and checked using the CLAN software. The Nazzal corpus can be found under the subdirectory of Arabic in the Other directory (https:sla.talkbank.orgTBBchildesOtherArabic-Nazzal), which contains two corpora; the Salama corpus for Egyptian-Arabic, and the Nazzal corpus. They were both made public around the same time in 2021. Only the parents of 11 participants of those reported in 2.1.1 gave permission for their transcripts to be part of the CHILDES platform, whereas the other 5 participants did not give permission because personal family issues were discussed in the recordings. Table 2.13 presents the characteristics of the children whose files were included, as well as features of their productions in this corpus, including MLUw. The characteristics of the adults interacting with the children are shown in Table 2.14.

Forty-seven recordings were obtained from the 11 participants. Each child was recorded between 2 and 5 times, and the total duration of the recordings in minutes is 1,387; the mean duration of the recordings in minutes is 23.52; the shortest in minutes is 7; the longest in minutes is 35. This resulted in 7,554 utterances of child speech and 8,703 utterances of child-directed speech. This constitutes only a subset of the spontaneous production data analyzed above.

Table 2.13: Characteristics of children recordings and their productions

Child	**No. of files** (identifier)	**Age** (yy;mm;dd)	**MLUw**	**No. of child utterances**
Amira	20525, 20606, 20625, 20710, 20800	2;05;25-2;08;00	2.18-2.37	889
Amr	10905, 10928, 11025, 11116, 20202	1;09;05-2;02;02	1.35-1.9	589
Aysam	40110, 40207	4;01.10-4;02.07	1.67-1.77	586
Ez	10614, 10814, 10829, 11108	1;11;06;14-1;11;08	1.05-1.56	309
Karam	30521, 30615, 30629, 30725, 31020	3;05;21-3;10;20	1.75-2.41	799
Mohammad	30729, 30815, 30900, 30919, 31102	3;07.29-3;11;02	2.18-2.63	1,118
Naya	40728, 40818, 40913, 41007	4;07;28- 4;10;07	2.54-3.36	917
Rahaf	20900, 20920, 21006, 21024, 30106	2;09;00-3;01;06	1.11-1.29	896
Rayan	31114, 31130, 40017, 40100, 40226	3;11;14-4;02;26	1.27-1.47	477
Sara	21008, 21100, 30028	2;10;08-3;00;28	1.06-1.09	608
Yousef	31114, 31124, 40017, 40100	3;11.14-4;01.00	1.25-1.69	366
Total		**1.86**		**7,554**

* No. of files are exactly as they appear on the CHILDES platform.

Table 2.14: Characteristics of the adults' recordings

Child	**No. of files** (identifier)	**interlocutor**	**Age** (years)	**No. of adult utterances**
Amira	20525, 20606	Mother	31	292
	20625, 20710, 20800	Aunt	23	888
Amr	10905, 11025, 11116, 20202	Mother	28	713
	10928	Father and Mother	29 and 28	154
Aysam	40110, 40207	Brother	20	610
Ez	10614	Mother	26	103
	10814	Aunt	21	15
	10829, 11108	Father	35	313
Karam	30521, 30615, 30629, 30725, 31020	Aunt	20	1,181
Mohammad	30729	Mother and Sister	20 and 45	375
	30815, 30900, 30919, 31102	Sister	20	779
Naya	40728	Aunt	33	73
	40818, 40913, 41007	Mother	21	151
Rahaf	20900, 20920, 21006, 21024, 30106	Mother	23	995
Rayan	31114, 31130, 40017, 40100, 40226	Mother	34	722
Sara	21008	Aunt	23	210
	21100, 30028	Mother	23	618
Yousef	31114, 40100	Aunt	21	254
	31124, 40017	Mother	34	257
Total				**8,703**

* No. of files are exactly as they appear on the CHILDES platform.

Chapter 3

The acquisition of the VO parameter

3.1 Introduction

Two theoretical frameworks diverge in their assumptions regarding the presence of abstract linguistic knowledge in infants and young children to explain their convergence to target word order; one posits that children are born with an innate predisposition to acquire language (Chomsky, 1981; Chomsky, 1995) as outlined in the introduction, while the other claims that children acquire word order through usage-based learning (Ambridge, 2020; Abbot-Smith, Lieven, & Tomasello, 2001; Tomasello, 2000). Several studies from the extensive literature on these theories are addressed in the next section.

3.1.1 Generative approach

How word order parameters are set was a central question in the field of language acquisition; according to P&P, UG aids in setting the values of different parameters based on the input from the target language (Chomsky, 1995). According to Chomsky (1993b: 628):

"There is, of course, a relation of some kind between sensory inputs and behaviour; a child who has not been presented with data of Japanese will

not be able to carry out the behaviour of speaking Japanese. Presented with appropriate data from Japanese, the child's mind/brain undergoes a significant change; the mind/brain comes to incorporate within itself knowledge of Japanese, which then enables the child to speak and understand Japanese. But there is no direct relation between the data presented to the child and what the child says, and it is hopeless to try to predict what the child will say, even in probabilistic terms, on the basis of the sensory data that led to the acquisition of knowledge of Japanese."

Hirsh-Pasek and Golinkoff (1996) used the preferential-looking paradigm to investigate the sensitivity to word order in infants at the one-word stage of language production in their native language. A total of 48 infants aged 16 to 19 months, with a mean age of 17.5 months, were tested. Participants were presented with videos accompanied by audio stimuli. In the training phase, character identification was conducted. During the experimental phase, reversible transitive sentences like the one shown in (114) were presented. Each sentence was was accompanied by two simultaneous video events: one in which the agent and patient roles matched the test sentence and the other in which the roles were reversed. For example, infants saw Big Bird washing Cookie Monster on one screen and Cookie Monster washing Big Bird on the second screen while hearing sentence (114).

(114) Big Bird is washing Cookie Monster.

The 17-month-old infants correctly identified the agent and patient. These findings support the notion that children are aware of syntax and word order from an early age, since they can only rely on linguistic information to guide their interpretation.

Fisher (2002) introduced the use of pseudo-verbs and exposed forty-seven 2;6, and 3 year-old native English children to transitive and intransitive contexts with pronouns across two experiments to assess children's sensitivity to structural proprieties of sentences like (115). The use of pronouns and no nominal requires children to depend on the structure of the sentences in

order to determine their interpretation.

(115) a. She *stipes* her over there.
b. She *braffs* her over there.
c. She *pilks* her back and forth.
d. She *gishes* her around.

Observations suggested that children who heard the novel verbs in transitive constructions responded correctly on tests of comprehension more often than children who listened to the novel verbs in intransitive constructions. That abstract syntactic knowledge guided the performance of children as young as 28 month old. Another experiment in line with Fisher (2002) is the study conducted by Gertner, Fisher, and Eisengart (2006).The twenty-four participants watched synchronised pair of causative action videos accompanied by a transitive sentence with a novel verb. The duck was the agent as in (116a) for half of the children, whereas the bunny was the agent for the other half as in (116b). All children showed longer visual fixation on the matching screen. Hence, Gertner et al. (2006) concluded that 21 and 25 month old children can use the abstract knowledge of canonical word order in English to parse the transitive sentences.

(116) a. The duck is *gorping* the bunny.
b. The bunny is *gorping* the duck.

3.1.2 The usage-based approach

The core of the usage-based approach and the Verb-Island hypothesis is that the language competence of young children should be described in terms of more concrete and item-based (verb by verb basis) rather than an abstract adult-like syntactic competence (Tomasello, 1992, 2000; Akhtar, 1999; Abbot-Smith et al., 2001; Abbot-Smith & Tomasello, 2006). According to the Verb-Island Hypothesis, children's early language is ordered and structured entirely around individual verbs and other predicates. Consequently, lexical categories that function as predicates and thematic rules such as AGENT

and PATIENT do not follow from general grammatical rules at two years of age. For instance, it is predicted that, for a verb like *kiss*, the child will store it with its arguments i.e., *John kisses Mary* with *John* being the KISSER and *Mary* the KISSEE and only later will the child assign the AGENT theta role to the first NP and the PATIENT theta role to the second NP.

Tomasello (2000) argued, against the continuity hypothesis, that children's early production of language is not productive but rather conservative and based on very item-specific knowledge. Children do not utilise verbs in contexts where they have not heard them before (Tomasello, 2000). This lack of productivity indicates that young children do not yet have abstract, verb-general argument structure constructions. Instead, they have to learn verbs as particular lexical items on a verb-by-verb basis from social, cultural and imitating learning (Tomasello, 1992, 2000). However, this claim raises objections since children are found to produce 'incorrect' forms, that are not produced by adults (Guasti, 2017).

Akhtar (1999) was the first to use the eye-tracking and the Weird Word Order (WWO) paradigm. He exposed thirty-six English-speaking children, 12 children in each age group (2:8, 3:6, and 4:4), to three novel verbs with known nouns: one in the context of the canonical SVO model, and two in the weird word orders SOV and VSO. Examiners ensured that children knew the names of all the puppets that would serve as agents and patients during the experimental session. Children were then presented with the three novel verbs for the test and given opportunities to model the action and verbally described them to elicit spontaneous utterances with the novel verbs to see whether or not children would use the novel verbs that were modelled in weird word orders when they asked 'what is happening? Akhtar found that children of all ages tend to produce the new verbs in canonical SVO order; however, children behaved differently when they heard the novel verbs in any weird order. Older children attempted to correct the weird order to the canonical SVO order. Younger children, on the other hand, alternated between imitating the weird word orders and converting them to SVO order.

The conclusion was that the SVO order had not been mastered yet.

Abbot-Smith et al. (2001) replicated the study by Akhtar (1999) but used intransitive constructions with SV and VS orders instead of transitive ones. They tested sixteen two-year-old children and sixteen three-year-old children. Participants engaged in three tasks over two sessions, two of the tasks were with novel verbs, while the third one was with a familiar verb. One of the novel verbs was presented in an intransitive VS order as in (117), whereas the other novel verb was presented in an intransitive SV order as in (118).

(117) Meeked the dog.

(118) The cow baffed.

The results showed that older children tried to match the non-canonical orders to the canonical one in English in 66% and 59% of cases. However, younger children tried to correct the non-canonical VS order with novel words 21% of the time. These findings parallel those of Akhtar (1999), leading Abbot-Smith and colleagues to point out that word order knowledge is item-based and develops gradually with age.

Matthews, Lieven, Theakston, and Tomasello (2007), who also used the WWO methodology to investigate the effect of verb frequency on the use of word order in French-speaking children with a mean age of 2;10 and 3;9 years old. During the training phase, the low-frequency and high-frequency verbs were taught to the children in a weird SOV order. However, it was anticipated that children would respond using the canonical SVO order when asked a question like '*What happened there?'*. Matthews et al. (2007) found that French children match the high-frequency verb, modelled in a weird French order, to the canonical SVO order. However, this was not the case for the low-frequency verbs; children tended to adopt this WWO with the low-frequency verbs. Since the younger children performed better only when exposed to high-frequency verbs, it was concluded that kids gradually learn word order through specific lexical items.

Therefore the argument is made by usage-based proponents that the fre-

quency of verbs in the child's language affects the learning of the verb; in other words, the more frequently the child is exposed to a verb, the earlier the acquisition of this verb. Brooks, Tomasello, Dodson, and Lewis (1999) exposed seventy-two English-speaking children aged between 3;6-8;0 years old to four pairs of English verbs that were either exclusively transitive or exclusively intransitive. One verb of each pair was of high frequency, whereas the other was less frequent (and with later age of acquisition). Children of all ages showed a significant preference to overgeneralise from transitive to intransitive and vice versa the less frequent verbs rather than the frequent and early acquired ones. These findings were used as evidence to support the hypothesis that the use of verbs is affected by frequency.

The pending issue is the transit from this item-based knowledge to abstract knowledge, raised in Abbot-Smith, Lieven, and Tomasello (2008). However, there are many reasons to question the findings obtained in the context of the usage-based approach. Franck, Millotte, and Lassotta (2011) critically reviewed the four main arguments that were taken to support the lexical hypothesis. The first argument is that younger children have a tendency to match WWO. However, the percentage of this tendency is very low (0.9% and 7.5%), and older children were also found to match WWO at a similar rate, if not more frequently sometimes, which means this argument cannot be used as evidence of absence of abstract syntactic representations in younger children. This similarity in matching WWO among the two age groups was sometimes hidden by the high rate of missing data in the ungrammatical condition, which was ignored in most of the studies, in which children refused to use the WWO (Franck et al., 2011).

The second argument is that young children do, in fact, revert from WWO less frequently than older children, but when they do, they turn to the grammatical order. The correction of the WWO cannot be carried out without the presence of a syntactic representation. On the other hand, the lack of correction might be because children might think that this is what the experimenter is expecting them to do and not because of the lack of syntactic

representation.

As a third argument, taking into consideration that older children who already have a syntactic representation are also sensitive to lexicality, being sensitive to lexicality can't be used as evidence to support the lack of syntactic presentation in younger children (Franck et al., 2011). Likewise, the usage-based proponents argue that younger children are not sensitive to grammaticality. Following the same logic as in argument 2, not showing sensitivity to grammaticality would not be evidence against the existence of grammatical representations. Yet, sensitivity to grammaticality would lend strong support to it (Franck et al., 2011).

See also Franck and Lassotta (2012), who conducted a systematic study to address a number of issues concerning the findings of four main studies in the usage-based account (Akhtar, 1999; Abbot-Smith et al., 2001 and Matthews, Lieven, Theakston, & Tomasello, 2005, 2007). See, in particular, their concern with the high rate of missing data, whether Missing children or Non-responses in the reviewed studies, which is known as 'Missing Not At Random,' as these data are not equally distributed across the different experimental conditions, which would affect the consistency of the obtained findings.

3.2 The early acquisition of VO order

In the experimental study in Franck et al. (2011), they presented two familiar verbs and two pseudo-verbs in canonical French SVO order, as exemplified in (119a) and (119b), and the two other pseudo-verbs and familiar verbs were introduced in the WWO NP-NP-V order, as exemplified in (119c) and (119d). Sixty-four sentences accompanied by sixty-four pairs of videos were used.

(119) a. La vache mord le chien.
the cow bite the dog
'The cow bites the dog.'

b. Le lion dase le cheval.
the lion PSEUDO-VERB the horse
'The lion PSEUDO-VERB the horse.'

c. La vache le cheval lave.
the cow the horse washes
'The cow the horse washes.'

d. L'âne le cheval poune.
the donkey the horse PSEUDO-VERB
'The donkey the horse PSEUDO-VERB.'

Three variables were manipulated in this experiment: Age (Young (mean age of 2;11) vs. Older group (mean age of 3;11)), lexicality of the verbs (Familiar verbs vs. Pseudo-verbs) and the grammatically of the sentences (Grammatical vs. Ungrammatical sentences). After familiarizing the infants with the names of the puppets, the experimental session started. For the test, children were asked to describe the presented videos. Children from the two age groups performed identically. Both age groups reproduced WWO at a similar, low rate. They also corrected WWO at a similar rate, even when using pseudo-verbs, and reused the grammatical SVO order more frequently than the WWO. Finally, they only produced grammatical markers within grammatical sentences, suggesting productive use. These findings cannot be explained by the lexical hypothesis, but they do have a natural explanation if it is assumed that children as young as those who were tested have an abstract representation of word order. Hence, in light of the absence of the effect of age on children's performance, Franck et al. (2011) concluded that young children, as early as 20 months, do have abstract word order representation.

Turning to a younger age group, a widely accepted method to investigate spoken language comprehension and early syntactic development in infants aged 1;1 to 2;0 is eye movement via the intermodal preferential looking paradigm developed by Golinkoff, Hirsh-Pasek, Cauley, and Gordon (1987). The intermodal preferential-looking paradigm is a low-demand procedure that measures the time course of gaze patterns of young children as young as 14 months (Fernald, Zangl, Portillo, & Marchman, 2008). The logic in this method is

that children focus more (fixate their gaze significantly longer) on an image that corresponds to what they are hearing (in this case, a linguistic stimulus) than an image that does not (Hirsh-Pasek & Golinkoff, 1996). Measurements in this paradigm are taken for specific regions of interest for each stimulus sentence, depending on the study's goals and design (Fernald et al., 2008).

Franck, Millotte, Posada, and Rizzi (2013) was the first to investigate the VO/OV parameter sensitivity in 19-month-old infants exposed to French, a VO language. They used a combination of the preferential-looking paradigm, the WWO paradigm and the use of pseudo-verbs. The adapted French version of the MacArthur Communicative Development Inventory (CDI) was used to assess the comprehension of vocabulary by infants. Infants' scores ranged between 8 to 389 words, with a mean score of 87 words. A total of six sentences were presented to infants, three grammatical NP-V-NP sentences, and three ungrammatical NP-NP-V sentences. Two pseudo-verbs were used, *pouner* in the grammatical order (NP-V-NP) as in (120a) and *daser* in the ungrammatical NP-NP-V order as in (120b).

(120) a. Le lion poune le cheval.
the lion PSEUDO-VERB the horse
'The lion poune the horse.'

b. La vache le lion dase.
the cow the lion PSEUDO-VERB
'The cow the lion dase.'

The rationale behind this experiment is that comprehension of SVO, as found by Golinkoff et al. (1987), Hirsh-Pasek and Golinkoff (1996) and Gertner et al. (2006), does not prove that infants know in which position the object has to be in their language. The prediction of Franck et al. (2013) study is that, on the one hand, if French native children have set the value of the VO parameter at 19 months, they would look at the event that matched the auditory stimulus longer than the event that did not when hearing the grammatical sentences, while no such preference might be expected in the ungrammatical condition. On the other hand, if infants acquired word order through lexicalized learning (Abbot-Smith & Tomasello, 2006; Tomasello, 1992, 2000),

neither grammatical nor ungrammatical sentences would be parsed if pseudo-verbs are used, resulting in random gazing pattern.

The training session was divided into three phases. The first phase aimed at introducing the puppets to the infants and familiarizing them with the videos being displayed on the left and right sides of the screen. Hence, a single presentation of each animal, accompanied by an audio stimulus identifying the animal, was made, either on the left or right windows, as shown in figure 3.1.

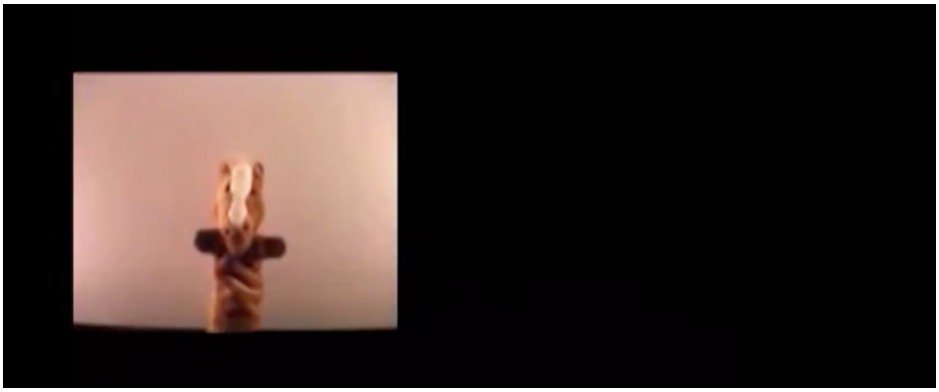


Figure 3.1: Visual stimuli used in the character-identification phase in the French experiment

The second phase introduced the infant to the simultaneous presentation of two videos on the screen. On each screen, two different animals were shown (see Figure 3.2), and the audio stimulus asked the infants if they saw one of them.

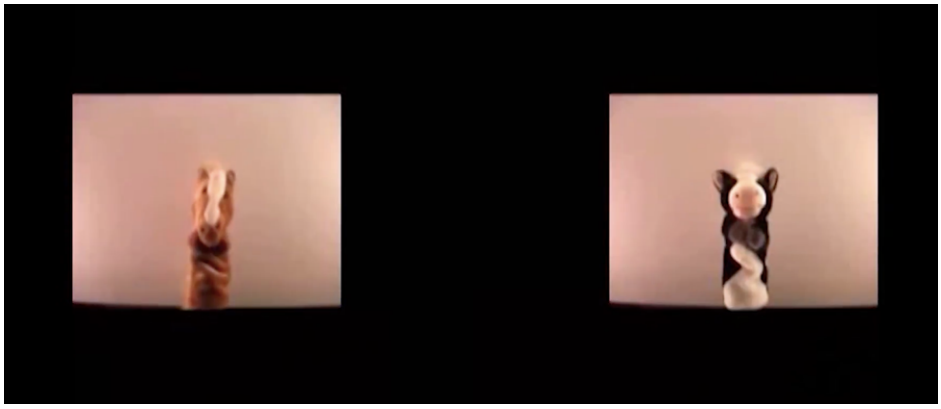


Figure 3.2: Visual stimuli used in introducing the simultaneous presentation phase in the French experiment

The third phase introduced infants to the novel actions depicted in the experimental videos: a causative (or transitive) action and a non-causative (or reflexive) action. Each action was shown twice on the left and right sides of the screen, once in its causative form and once in its non-causative form, accompanied by a sentence like *Look, what's happening?* as presented in Figure 3.3. The pseudo-verbs were not introduced at the training session to ensure that children would not be exposed to the verbs before the experimental phase. The reason for not introducing pseudo-verbs to the participants prior to the experimental phase is to examine whether word order is inherently linked to the lexical properties of the verb, as posited by usage-based theories of language acquisition or whether children have abstract knowledge of word order very early. Since these sentences include pseudo-verbs for which children have no lexical knowledge, it is anticipated that there will be no preference for the causative scene when presented with NP-V-NP sequences in the experimental sentences under the usage-based hypothesis, whereas there will be a preference for the causative scene when presented with NP-V-NP under the hypothesis of early abstract word order representations.

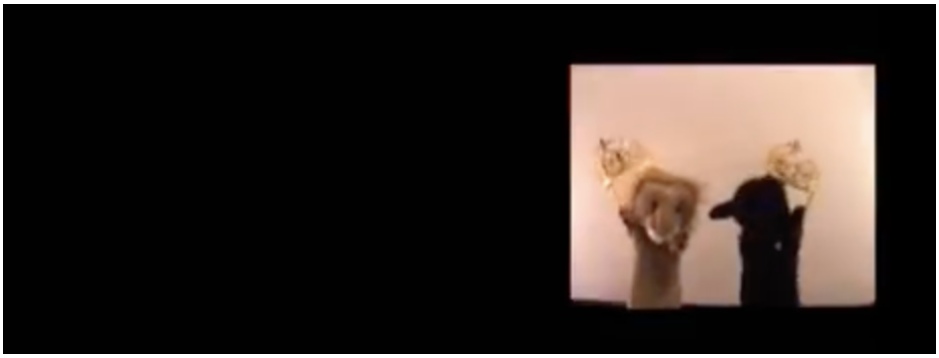


Figure 3.3: Visual stimuli used in introducing the novel actions in the French experiment

In the causative action video, an AGENT performed an action on the PATIENT, while in the non-causative action video, both agents performed the actions on themselves, as demonstrated in Figure 3.4. This keeps the verb's lexical meaning and the characters consistent.

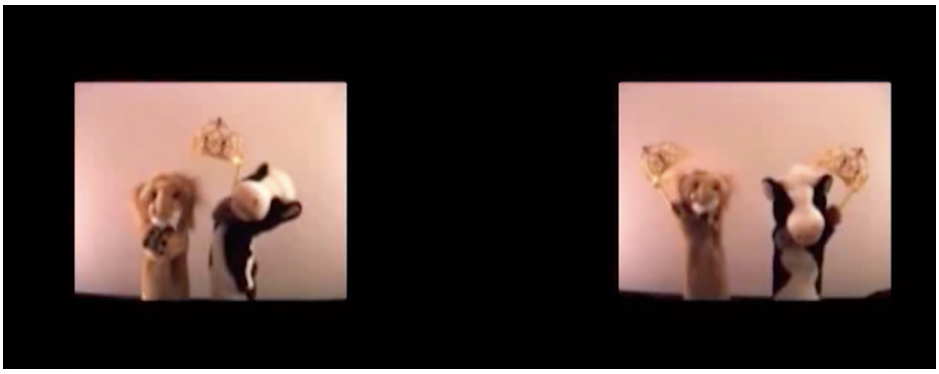


Figure 3.4: Visual stimuli used in the testing phase in the French experiment

The analysis against chance level (defined as Baseline) showed a preference for the causative over the non-causative action in the grammatical condition during the 8-12 second time window. This preference peaked during the subsequent time window (12-16 seconds) after the second presentation of the test sentence and decreased in the last time window at 16-20 seconds.

No preference was observed during the ungrammatical condition, and the results were at chance. The above chance looking time to the causative action during the 12-16s frame in the grammatical condition ($p > .01$), means that infants preferred the causative action over the non-causative action when they heard the grammatical NP-V-NP but not when they heard the ungrammatical NP-NP-V order (Franck et al., 2013). The results are graphically represented Figure 3.5 whereas mean looking times for the two videos in the two experimental conditions are presented in Table 3.1.

Table 3.1: Mean looking time in (ms) across the five-time windows in infants, Franck, Millotte, Posada, and Rizzi (2013).

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline (0-4s)	1591 (647)	1846 (655)	1912 (756)	1536 (766)
Sentence 1 (4-8s)	1981 (813)	1595 (835)	2148 (872)	1367 (759)
Sentence 2 (8-12s)	2056 (903)	1434 (767)	1759 (635)	1749 (631)
Sentence 3 (12-16s)	**2410* (535)**	**1121*(607)**	1491 (761)	1774 (833)
Sentence 4 (16-20s)	1919 (736)	1434 (638)	1593 (706)	1678 (783)

Standard deviations in parentheses.

* p <.05 (in bold) .

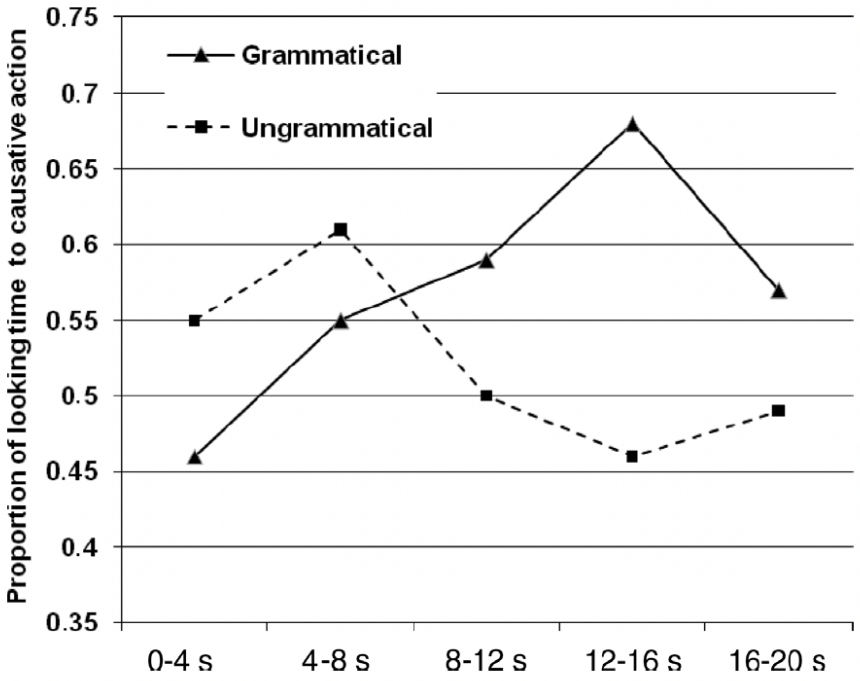


Figure 3.5: Proportions of looking time to the causative scene in the five-time windows, French infants (Franck, Millotte, Posada, & Rizzi, 2013).

The study concluded that infants exposed to French at the age of 19 months show sensitivity to VO parameter to the extent that they parse VO sequences but not OV sequences.

Omaki et al. (2012) assessed the early acquisition of VO/OV order, using the preferential looking paradigm, the WWO paradigm and pesudo-verbs, in 19, 27 and 32 month old infants exposed to an OV language, Japanese. The experimental items consisted of six sentences as in Franck et al. (2013): three grammatical NP-NP-V sentences with pseudo-verbs as in (121a) and three ungrammatical NP-V-NP sentences with pseudo-verbs as in (121b). Two pseudo-verbs *neketteru* and *isetteru* were used in the grammatical and ungrammatical sentences.[1]

[1]This was a modification of the original Franck et al. (2013)'s design that seems in the right direction.

(121) a. Wanchan-ga nekochan-o neket-teru.
Dog-NOM cat-AAC PSEUDO-VERB

b. Wanchan-ga neket-teru nekochan-o
Dog-NOM PSEUDO-VERB cat-AAC

Nineteen month old infants showed a significant preference for non-causative action in the four windows while hearing the grammatical NP-NP-V order compared to baseline as illustrated in Figure 3.6. According to Omaki et al. (2012), this may reflect a strategy of treating two consecutive nouns as a coordinated NP.

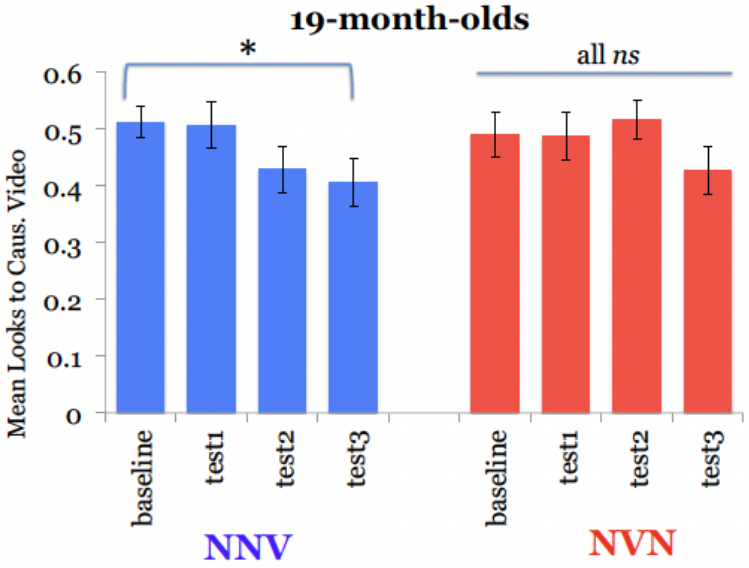


Figure 3.6: Performance of 19-month-old Japanese children (Omaki et al., 2012).

In contrast, no preference was shown for the ungrammatical NP-V-NP order. Infants aged 27 month old did not show any preference for any of the two conditions, as can be seen in Figure 3.7.

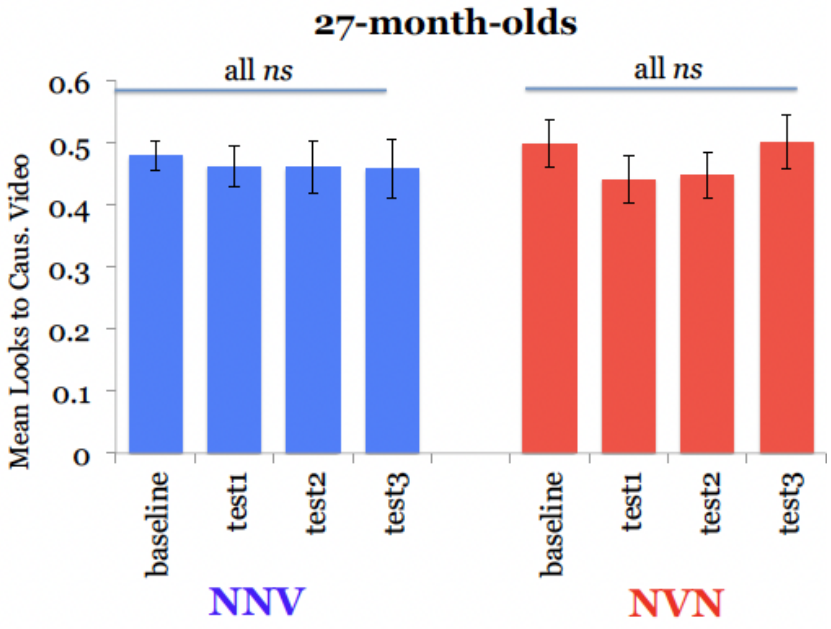


Figure 3.7: Performance of 37-month-old Japanese children (Omaki et al., 2012).

Finally, 32-month-old children showed a preference for the causative action while hearing the grammatical NP-NP-V order in comparison to the baseline, and no preference in the ungrammatical condition, as illustrated in Figure 3.8. This implies that abstract syntactic knowledge guided word order processing at this age, but no evidence for it is found at an earlier stage.

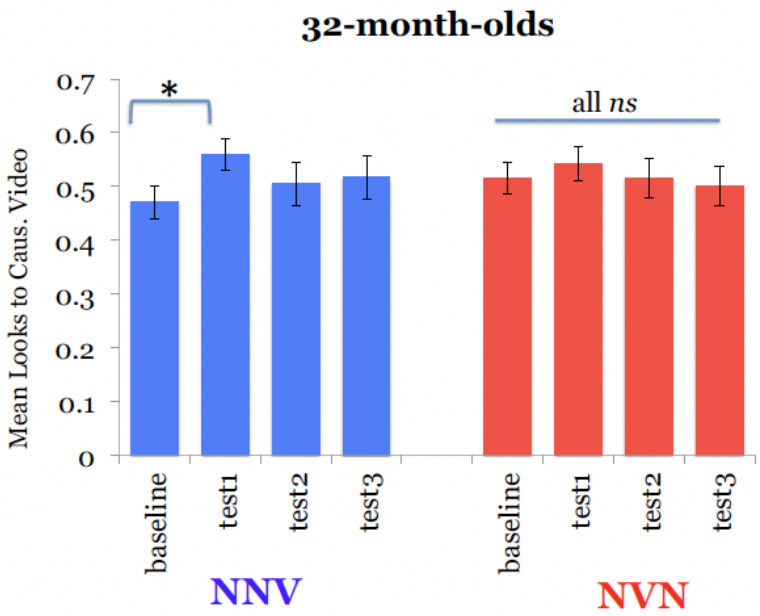


Figure 3.8: Performance of 32-month-old Japanese children (Omaki et al., 2012).

This delayed sensitivity to the OV order was attributed to the late mastery of parsing sentences with two overt arguments, due to the presence of null arguments in Japanese that might make the input of Japanese not informative to set the parameter for the canonical word order. According to the Miyata corpus (Miyata, 2004) on Japanese, only 12% of the child-directed speech included both subject and object arguments. Furthermore, sentences with SOV order accounts for 8.9% as can be shown in Figure 3.9.

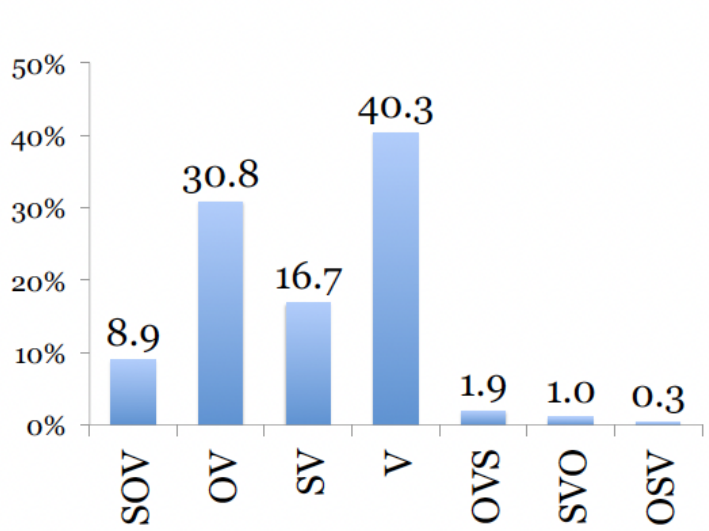


Figure 3.9: Child-directed speech in Japanese (Miyata, 2004 corpus from Omaki et al., 2012).

However, these results are hard to reconcile with the fact that Japanese children before 32 month old children can produce OV sentences, as can be found in Yokoyama and Miyata (2017) corpus in CHILDES.

The setting of the VO/OV parameter was also explored by Gavarró, Leela, Rizzi, and Franck (2015) (see also Leela, 2016) with another OV language with null arguments and overt case marking, Hindi-Urdu, using the same combination of the preferential-looking paradigm, the WWO paradigm and pseudo-verbs. Two pseudo-verbs were used, *khalayaa* in the grammatical condition (122a) and *chona* in the ungrammatical condition (122b). The ungrammatical V-NP-NP sequence was chosen for the ungrammatical condition because it was the least frequent non-canonical word order in the word order frequency analysis of Hindi-Urdu spontaneous speech that was carried out by Leela (2016), and was furthermore used with an ill-formed intonation.

(122) a. Gay-ne bakri-ko khalayaa.
cow-ERG sheep-ACC PSEUDO-VERB
'The cow pseudo-verb the sheep.'

b. Chona gadhe-ne kuthe-ko.
PSEUDO-VERB donkey-ERG dog-ACC

The method was as in Franck et al. (2013). If infants have set the value of the parameter responsible for the VO/OV alternation, they would be expected to direct their gaze to the causative video upon hearing the grammatical SOV sentences. At the same time, random behaviour was expected when they heard the ungrammatical sentences. Although Gavarró et al. (2015) used the same methodology as in Omaki et al. (2012) and with an OV language with null arguments, they obtained different results. The analysis against chance level (defined as 50%) showed that, unlike Japanese infants, in the grammatical condition, 19-month-old infants looked significantly longer at the causative video than at the reflexive video during the second ($p = .003$) and third presentations of the grammatical sentences ($p = .033$). No significant preference was found in the ungrammatical condition nor in the baseline (See Figure 3.10 and Table 3.2).

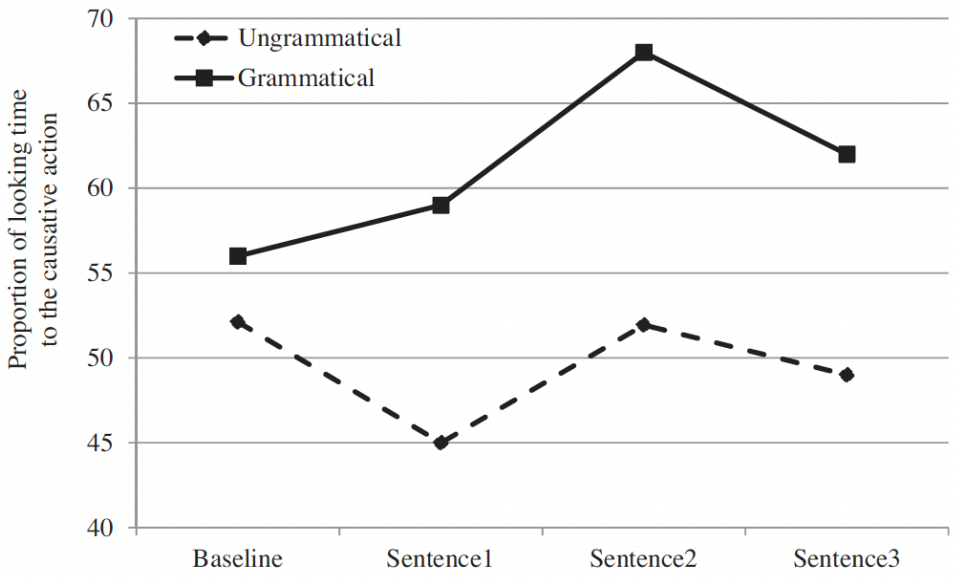


Figure 3.10: Proportions of looking time to the causative scene in the four-time windows, Hindi-Urdu infants (Gavarró, Leela, Rizzi, & Franck, 2015).

Table 3.2: Mean looking time in (ms) across the four-time windows in infants, Gavarró, Leela, Rizzi, and Franck (2015).

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline (2-6s)	2250 (787)	1754 (744)	1951 (590)	1791 (598)
Sentence 1 (6-10s)	**2372* (1018)**	**1536* (766)**	1514 (564)	2072 (1083)
Sentence 2 (10-14s)	**2560* (1034)**	**1152* (772)**	1785 (823)	1728 (985)
Sentence 3 (16-20s)	**2021* (1140)**	**1139* (768)**	1665 (884)	1814 (1086)

Standard deviations in parentheses.

* p <.05 (in bold) .

Gavarró et al. (2015) concluded that infants at 19 months of age could parse the SOV sequences. These findings suggest that Hindi-Urdu infants, like French children, have set the value of the VO/OV parameter correctly by 19 months, which is in favour of the VEPS (Wexler, 1998) and against the lexical approach (Tomasello, 1992, 2000). These findings also challenged Omaki et al. (2012) on the ground that Hindi-Urdu is also a language with null arguments and relatively free word order, which means that the reason why Japanese children did not demonstrate early understanding of the head-final order is still unclear.

In more recent work, Zhu, Franck, Rizzi, and Gavarró (2022) also replicated the studies of Franck et al. (2013) and Gavarró et al. (2015) with younger infants to examine abstract knowledge of word order in infants aged 17 months exposed to a VO language with null arguments, no agreement and no case marking, Mandarin. The Mandarin version of the CDI was used to assess the vocabulary of infants. Infants aged 13 to 16 months had comprehension scores ranging between 9 to 36 words, with a mean score of 25 words and production scores ranging between 0 to 11 words, with a mean score of 5 words, whereas infants aged 17 to 21 months had production scores ranging between 0 to 102 words, with a mean score of 43 words. The study used three grammatical and three ungrammatical sentences with two pseudo-verbs, *chei* with well-formed sentences, as in (123a) and *nui* with the deviant, as in (123b). The intonational pattern of both well and ill-formed sentences was the same (rising-falling-raising), which means the grammaticality difference between the two conditions resulted solely from word order, not the intonational pattern.

(123) a. Xiao-gou chéi le xiao-lv.
little-dog PSEUDO-VERB PERF little-donkey
'The little dog pseudo-verb the little donkey.'

b. Xiao-niu shi-zi nuí le.
little-cow the-lion PSEUDO-VERB PERF
'The little cow the lion pseudo-verb.'

The materials, methods and procedure were similar to those in the previous

studies. The results indicate that Mandarin infants showed a significant preference for videos illustrating the transitive actions when they heard the SVO sentences during the first and second presentation of the sentences; however, no preference was found when they heard the ungrammatical SOV order (see Figure 3.11 and Table 3.3).

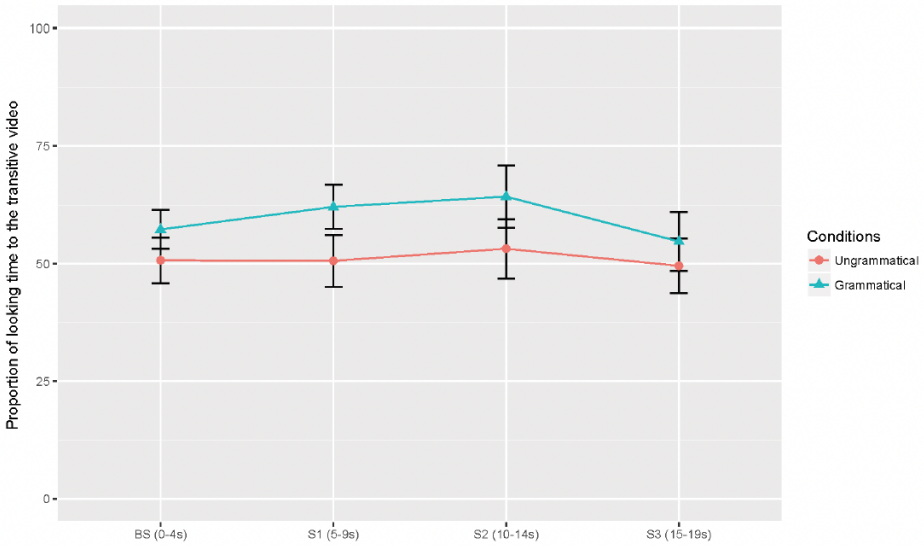


Figure 3.11: Proportions of looking time to the causative scene in the four-time windows, Mandarin infants (Zhu, Franck, Rizzi, & Gavarró, 2022).

Table 3.3: Mean looking time in (ms) across the four-time windows in infants, Zhu, Franck, Rizzi, and Gavarró (2022).

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline (0-4s)	1438 (619)	1098 (689)	1198 (779)	1072 (569)
Sentence 1 (5-9s)	**1386 (665)***	**928 (724)***	1198 (779)	1072 (569)
Sentence 2 (10-14s)	**1266 (903)***	**793 (831)***	974 (680)	1041 (1012)
Sentence 3 (15-19s)	931 (772)	852 (662)	1153 (1021)	876 (779)

Standard deviations in parentheses.

* p <.05 (in bold) .

Zhu et al. (2022) also explored the effect of age and vocabulary on children's performance. Results reveal that the preference observed for the transitive video as compared to the reflexive video when presented with a grammatical sentence is not influenced by either age (p = .66) or vocabulary (p =.34). In other words, there was no relation between the developmental measures (age and vocabulary) and performance. Table 3.4 summarizes the methods used across the papers referenced.

Taken together, the experiments reported using the preferential looking paradigm indicate that, by 19 months, infants have set the value of the parameter responsible for the VO/OV alternation regardless of lexical knowledge of the verb. This is so regardless of case marking, availability of null arguments in the input, relatively free word order and agreement. In this study, I focus on sentence comprehension to assess infants' emergent language knowledge in Palestinian Arabic, for which no studies are available. I hypothesize that similar to Mandarin, children at 17 months will have set the VO parameter according to the target grammar and, as a result, will choose the causative action when hearing an SVO sentence and will not parse an ill-formed SOV sequence.

Table 3.4: Summary of the main studies investigating VO/OV alternation under review

Articles	**Language**	**VO/OV**	**Findings**
Franck, Millotte, Posada, and Rizzi (2013)	French	VO	They parse VO but do not parse OV at 19 months.
Omaki et al. (2012)	Japanese	OV	They do not parse OV at 19 months. They do not parse OV at 27 months. They parse OV but do not parse VO at 32 months.
Gavarró, Leela, Rizzi, and Franck (2015)	Hindi-Urdu	OV	They parse OV but do not parse VO at 19 months.
Zhu, Franck, Rizzi, and Gavarró (2022)	Mandarin	VO	They parse VO but do not parse OV at 17 months.

3.3 Experiment 1: The acquisition of VO in infants

3.3.1 Method

The design closely followed that used by Franck et al. (2013) and Gavarró et al. (2015), who used a combination of the preferential looking paradigm, the WWO paradigm and pseudo-verbs. Pseudo-verbs were used to ensure that children rely on knowledge of the syntactic representation rather than the lexical knowledge of specific verbs. Under the usage-based approach, children are not expected to be able to parse a sentence if they do not have any lexical knowledge of the pseudo-verbs used, which they are first exposed to during the experimental phase. Contrary to the usage-based approach, the generative approach assumes that children do have abstract knowledge of word order. Consequently, above-chance looks at a scene matching a grammatical sentence are expected, and, in view of previous results, at chance performance upon the presentation of the ungrammatical sentence.

The word orders selected for the experiment are SVO and SOV. The rationale behind choosing SVO and SOV results from the word order frequency analysis of spontaneous speech and child-directed speech in chapter 2. Around 63% of the sentences with an S, V, O were in SVO order in adults' productions and 84% in children's productions (see example 124), which is in line with the finding of Mohammad (2000) that SVO is the predominant order in Palestinian Arabic.

(124) ماما بتسوق السيارة.

Ma:ma bitsu:ʔ s-sayya:ra. (Abdulghafer, 04;01;17)
mom driving.3FEM.SG the-car
'Mommy is driving the car.'

On the other hand, the SOV order was never found in declarative sentences as it is ungrammatical in Palestinian Arabic. It was only found in 9% of the sentences with an S, V, O in adult production and 0.37% of children productions in the form of *wh*-questions, which is the only form that licences the

SOV order in Palestinian Arabic, as discussed earlier in chapter 2. Moreover, SVO and SOV sequences are the same as used by Franck et al. (2013) and Zhu et al. (2022), which allows exact crosslinguistic comparison. The videos used were the original ones from Franck et al. (2013).

Two pseudo-verbs were used to ensure that children do not rely on lexical knowledge to parse the sentences (Franck et al., 2013). The pseudo-verbs were formed in accordance with the phonotactic and phonological features of Palestinian Arabic. They were presented with a progressive marker *b* at the start of the verb to indicate a present form (Jarrar et al., 2014), as well as a prefix to indicate the third person masculine singular *e besayyeʕ* or the third person feminine singular *t btemraʃ* since the verb agrees with the subject in number, gender and person in Palestinian Arabic as discussed earlier in chapter 1. Fourteen Palestinian Arabic native speaker adults (Mean age in years 32.7) were asked to judge if the pseudo-verbs sounded familiar to them and whether or not they could assign any meaning to them. Participants' answers were reported on a yes/no scale. Only the verbs that sounded familiar but had no meaning in Arabic were selected. The two pseudo-verbs corresponding to different non-lexicalised actions in Palestinian Arabic were *besayyeʕ*, which corresponded to "put a crown on someone's head" and *bemraʃ* which corresponded to "put someone's head under a net." *Besayyeʕ* was used in the well-formed SVO order, and *bemraʃ* was used in the ill-formed SOV order. Highly frequent animal names, such as a dog, a horse, a donkey, a cow, a lion, and a sheep, as found in Franck et al. (2013) were introduced with the definite article *al* 'the'. The experimental protocol can be found in Appendix 5.6, and the complete list of experimental items appears in (125) and (126).

(125) a. الكلب بسيغ الحمار.

l-kalb besayyeʕ leħma:r.
the-dog PSEUDO-VERB.3M.SG the-donkey
'The dog besayyeʕ the donkey.'

b. البقرة بتسيغ الخروف.

L-baqara betsajjeʕ l-xaru:f.
the-cow PSEUDO-VERB.3FEM.SG the-sheep
'The cow betsayyeʕ the sheep.'

c. الأسد بسيْع الحصان.

L-ʔasad besayyeʕ leħsˁa:n.
the-lion PSEUDO-VERB.3M.SG the-horse
'The lion besayyeʕ the horse.'

(126) a. البقرة الأسد بتمرش.

*L-baqara l-ʔasad btemraʃ.
the-cow the-lion PSEUDO-VERB.3FEM.SG
'The cow the lion btemraʃ.'

b. الحمار الكلب بمرش.

*Leħma:r l-kallb bemraʃ.
the-donkey the-dog PSEUDO-VERB.3M.SG
'The donkey the dog bemraʃ.'

c. الخروف الحصان بمرش.

*L-xaru:f leħsˁa:n bemraʃ.
the-sheep the-horse PSEUDO-VERB.3M.SG
'The sheep the horse bemraʃ.'

The sentences were recorded by the author, a female native speaker of Palestinian Arabic from Ramallah, Palestine. They were recorded at a soundproof lab in the Universitat Autonòma de Barcelona. The speaker was given a practice session to ensure the use of the same prosody in all sentences. All of the sentences were recorded using the Palestinian Arabic neutral declarative intonation contour. Praat was used to cut the utterances to ensure that all repetitions were the same lengthwise, and Adobe Premier Pro CC 2017 (v. 11.0.2) was used to combine the audio with the videos.

Each sentence was associated with two accompanying videos of causative and non-causative modes of action along with the auditory stimuli. While in the

causative action video the AGENT performed an action on the THEME, both characters performed the same action on themselves in the video of the non-causative action. The videos used were the original ones from Franck et al. (2013).

Materials

The materials include videos for a training session and the experimental session. In the training session all characters were introduced to familiarize the participants with them. This was achieved by using training videos along with an auditory stimuli, i.e., *ʃu:f, mi:n fi: ho:n, ha:d l-kalb* 'Look, who is here, it's the dog'. The puppets were presented on one half of the screen for 6s, whereas the other half remained blank, as illustrated in Figure 3.12. A blank screen that lasted 2s was displayed before introducing each item.

Figure 3.12: Visual stimuli used in the character-identification phase in the training session.

This was followed by a familiarization phase with the simultaneous presentation of two characters on opposite sides of the screen while asking about one of them i.e., *ʃu:f, ʃa:jef l-baqara? we:n l-baqara?* 'Look, do you see the cow? Where is the cow?'. Figure 3.13 provides a sample still image of the video stimuli used in this phase. As in the previous phase, a blank screen that lasted 2s was displayed before introducing each item.

Figure 3.13: Visual stimuli used in introducing the simultaneous presentation phase of the experiment.

Finally, participants were introduced to the novel actions in a neutral context without using the verbs to ensure that later understanding of the test sentences could not be attributed to lexical learning during the training phase. Consequently, videos of the novel actions were paired with sentences like *ʔettˤalaˤ, ʃu: bisˤiːrʔ* 'Look, what is happening?' as illustrated in Figure 3.14. Again, a blank screen that lasted 2s was displayed before introducing every experimental item. At the end of the training session, a short cartoon video was presented. Participants were given a short break before proceeding to the experimental session.

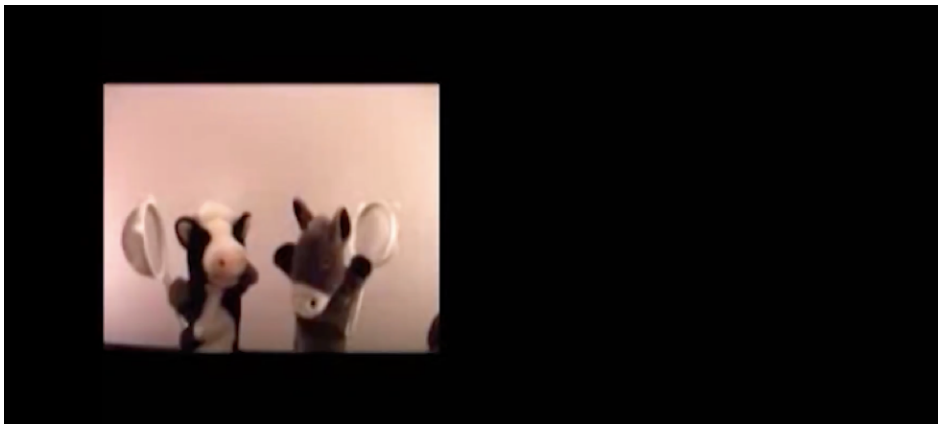


Figure 3.14: Visual stimuli used in introducing the novel actions in the experiment

During the experimental session, six videos with two scenes: causative and

reflexive modes of action, were played. Each pair of videos lasted 18s. The six test items were presented in a random order, with the presentation of the target and reverse actions counterbalanced across the left and right sides (see Figures 3.15 and 3.16).

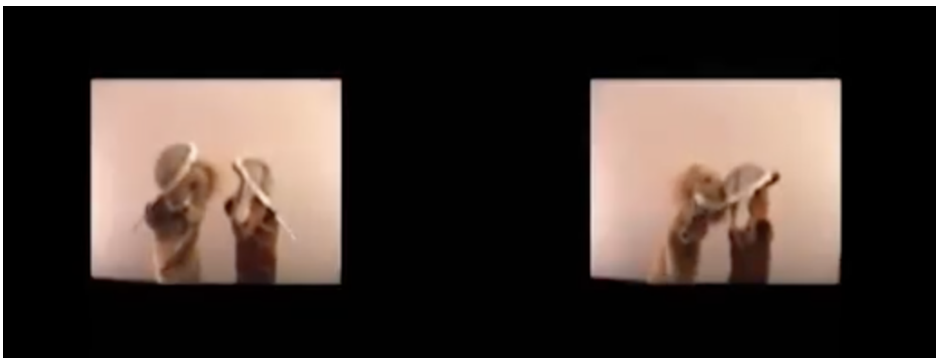


Figure 3.15: Visual stimuli used in the grammatical condition.

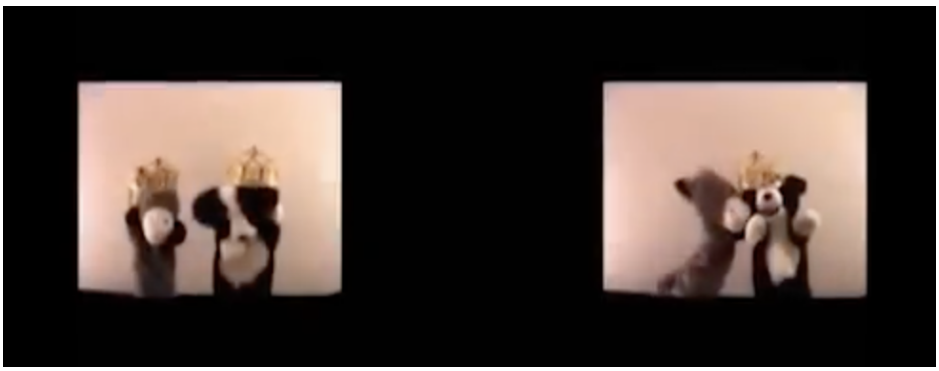


Figure 3.16: Visual stimuli used in the ungrammatical condition.

A blank screen was displayed between the six experimental items for 2s, at the beginning of the experiment and after items 3, 4, and 5, a clip of a national cartoon (a Teletubbies landscape) was presented to hold the child's attention as shown in Figure 3.17.

Figure 3.17: Teletubbies cartoon clips

All videos began with a baseline sentence that drew the child's attention, e.g., *ʔettˤalaˤ, ʃaːjef ʃuː bisˤiːrʔ* 'Look, do you see what is happening?' that lasted for 3s, followed by three repetitions of the experimental sentences. As a result, the gazing time was recorded in four windows: the baseline at (0 to 4 seconds), and three sequential exposures of the test sentences starting at 5, 10, and 15 seconds. The entire session lasted for 10 to 15 minutes.

Participants

Data were collected in May 2022 in Palestine from thirty-five healthy native Palestinian-Arabic infants, 18 boys and 17 girls, aged 15 to 19 months (Mean age in months 17.6, $SD = 1.4$). All participants were exposed to Palestinian-Arabic. Thirteen of them were attending kindergarten. Children with a history of language delay, language disorders, hearing loss or congenital malformations were excluded from the study. Eleven participants were excluded due to either a low percentage of gaze sample (lower than 55%) (9 children) or technical failure (2 children).

The age range for children was determined based on similarity with the age range used in previous studies on the acquisition of VO/OV parameter: 19-20 months (with a mean age of 19 months) in Franck et al. (2013), 19 months in

Gavarró et al. (2015), and 13-21 months (with a mean age of 17 months) in Zhu et al. (2022). Hence, in this experiment, I tested children aged 15 to 19 months which is closer to the age range in the study by Zhu et al. (2022).

The Arabic Communicative Development Inventory (Arabic CDI-Words Only) was used to assess language development (Abdelwahab, Forbes, Cattani, Goslin, & Floccia, 2021). The Arabic CDI is an online standardised parental assessment tool to screen language development in children between 8 and 30 months (Abdelwahab et al., 2021). The word list that was translated into the Palestinian dialect consisted of words understood and words produced. Table 3.5 summarises infants' scores. For descriptive purposes, I divided the participants into two groups.

Table 3.5: Infants' vocabulary

Age	**Comprehension**		**Production**	
(Months)	Mean	Range	Mean	Range
15-17	40 ($SD = 15$)	24-65	14.12 ($SD = 5.3$)	3-19
18-19	53.3 ($SD = 13.7$)	30-73	16.2 ($SD = 7.7$)	7-29
15-19	43.1 ($SD = 14.3$)	24-73	14.9 ($SD = 6$)	3-29

Procedure

The procedure matched that used by Franck et al. (2013). First, eye calibration, second, the training session, and third, the experimental session. Children's eye gaze was recorded via a Tobii Pro X3-120 infrared eye-tracking camera running at 120 Hz interfaced with a computer. Tobii StudioTM (v3.4.8) was used as the platform for recording and analysing eye gaze data.

Upon the arrival of parents and their infants at the lab in the Department of Applied Medical Sciences, Faculty of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine, the experimenter explained the procedure to parents and asked them to sign the consent form and fill

out the vocabulary CDI checklist before proceeding with the experiment. Infants were tested individually. They sat on the lap of the mother/caregiver at a comfortable distance (approximately 60 cm) from a computer screen in a quiet room. Parents were asked to keep their eyes closed while running the experiment, not to guide their children, but they had their eyes open during the training session. The experiment started with a 9-point calibration procedure. After the eye calibration, the training session began. The recording of eye movements took place from the onset training session to the end of the experiment.

Data analysis

Following Franck et al. (2013) and Gavarró et al. (2015), only children who had a percentage of gaze sample of 55% or more were included in the analysis (an exclusion threshold which is standard). The data recorded from twenty-four participants were included. Of the 24 participants, 6 were excluded as they were not looking at the Regions of Interest (RoI), but rather at the red dots that appeared on the eye tracking device. Hence, 18 participants were included in the final analysis.

The software package used to analyze the data was R, version 4.0.4 (R Development Core Team, 2015). Bivaried paired student t-tests and non-parametric Wilcoxon signed-rank tests were performed for mean comparison and Linear mixed-effect models using the *lme4* package in R (Bates, Maechler, Bolker, Walker, et al., 2014) for total fixation duration. The dependent measure was total looking time in milliseconds for each trial. Fixed effects included age in months, scene, RoIs, vocabulary as well as all interactions. The full model included a random intercept for subjects and a random slope for items.

The proportion of looking time to the causative scene was calculated and then computed using the non-parametric Wilcoxon signed-rank test against chance level (defined as 50%) as well as Generalised linear mixed models (GLMMs) against baseline (Bolker et al., 2009) in each condition (grammat-

ical and ungrammatical). In the full model, the dependent variables included Regions of Interest (RoIs) (Baseline, Sentence 1, Sentence 2, Sentence 3), with participants and items as random effects.

Finally, the GLMMs were performed to investigate the effect of age and vocabulary on proportions of looking time to the causative scene in which the proportions of looking time to the causative scene were treated as the dependent variable and Condition, Vocabulary (as continuous variable) and Age (as continuous variable) as factors.

3.3.2 Results

The mean looking time to each scene (Causative and Reflexive) of both conditions (Grammatical and Ungrammatical) of each of the four windows (Baseline, Sentence 1 (S1), Sentence (S2) and Sentence (S3)) were taken into account as presented in Table 3.6 for infants.

Table 3.6: Mean looking time in (ms) across the four-time windows to the causative and reflexive scenes in the grammatical and ungrammatical conditions, infants

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline (0-4s)	6204 (1936.5)	5046 (1743.9)	6204 (1730.7)	5949 (2040)
Sentence 1 (5-9s)	5093 (1693.9)	4770 (1413.4)	4217 (1602)	5084 (1568.2)
Sentence 2 (10-14s)	**4517 (1697.9)***	**3849 (1126.3)***	5310 (1562.9)	3377 (1201.5)
Sentence 3 (15-19s)	5414 (1352.5)	4765 (895.3)	5266 (1464.7)	3981 (1123.8)

Standard deviations in parentheses.

* p <.05 (in bold) .

Paired t-tests were used on mean looking time to provide an overview of eye movement. Results reveal that infants looked significantly longer to the causative action in the grammatical condition in the second presentation of the grammatical sentence (t(53) = 2.04, p = .047, d = .28). No significant preference was found in the baseline, first and third presentations of the grammatical sentence. No significant difference was found in the ungrammatical condition. These results were confirmed by linear mixed-effects models that found a significant effect of scene after the second presentation of the sentence (β= 571, SE = 220, t =2.59, p =. 01). Linear mixed-effects models ran on the second RoI showed a significant effect of Condition, and found no main effect of age (p = .73), no interaction between Condition and age (p = .91), nor Condition and CDI Production score (p = .89), nor Condition and CDI Comprehension score (p = .87). Besides, the Four-way interaction was not significant either (p = .85).

The proportions of total fixation time to causative scenes over the causative and non-causative scenes were calculated in the four RoIs. As shown in Figure 3.18, the preference for the causative over the reflexive scene in the grammatical condition emerged in the first presentation (mean = .5811), increased at the second presentation (mean = .6108), and peaked in the third presentation of the test sentence (mean = .6591).

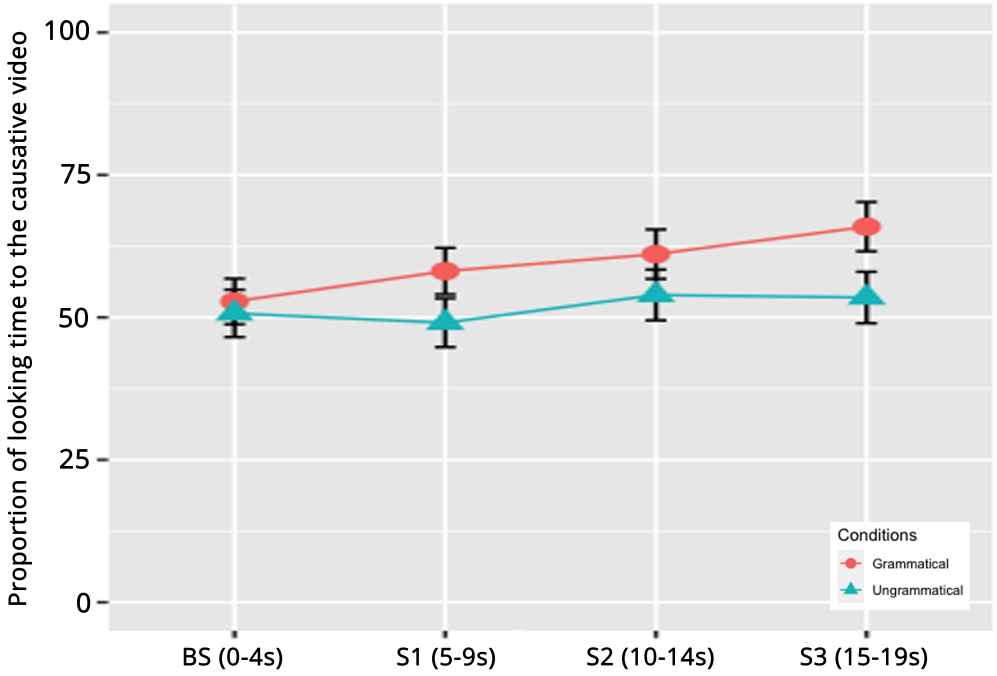


Figure 3.18: Proportions of looking time to the causative scene in the four-time windows, infants

The proportions of total fixation time to causative scenes over the causative and non-causative scenes were computed using the Wilcoxon signed-rank test. The analysis against chance level reveals a significant preference for the causative over the non-causative scenes in the second (Z = -2.04, p = .041, r = .28) and third (Z = -3.13, p = .002, r = .43) presentations of the grammatical sentence. During the ungrammatical condition, there was no significant preference for the causative scenes in any of the four frames ($p >$. 05).

Traditional LMMs or ANOVA methods based on normal distribution cannot be applied directly. Hence, Generalised linear mixed models (GLMMs), which do not require a normal distribution (Bolker et al., 2009), were run with the proportion of looking times to the causative scene as a dependent variable and the four RoIs (Baseline, Sentence 1, Sentence 2, Sentence 3) and condition (Grammatical, Ungrammatical) as factors. The successful model

was only found in the grammatical condition. Hearing grammatical sentences triggered more fixations on the causative scene (β=.18, SE = .09, z =2.03, p =. 042) during the second presentation of the sentence. However, no significant effects were found in the ungrammatical condition (p = .31).

3.4 Experiment 2: The acquisition of VO in adults

3.4.1 Background

Comprehension of canonical word orders with pseudo-verbs among adults was investigated in Finnish (Keidel, Leela, Zhu, & Kunnari, 2021) and Mandarin (Zhu et al., 2022). Keidel et al. (2021) replicated Franck et al. (2013)'s methodology to investigate the comprehension of canonical word orders with pseudo-verbs among Finnish adults. Six sentences were used for the test: three grammatical sentences following a SVO sequence as in (127a) and three ungrammatical sentences following a SOV sequence as in (127b).

(127) a. Leijona täkee hevosen.
lion-NOM PSEUDO-VERB horse-ACC

b. Lammas hevosen raistaa.
sheep-NOM horse-ACC PSEUDO-VERB

Results reveal that Finnish adults performed above-chance levels when hearing both grammatical sentences. However, Finnish adults also performed above chance level when they were exposed to ungrammatical sentences, as represented in Figure 3.19 and in Table 3.7.

Table 3.7: Mean looking time in (ms) across the four-time windows in adults, Keidel, Leela, Zhu, and Kunnari (2021).

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline	1610 (763)	1540 (734)	1860 (868)	1470 (795)
Sentence 1	**2510 (986)*** **	**1050 (647)*** **	**2950 (1100)*** **	**762 (647)*** **
Sentence 2	**3250 (1300)*** **	**872 (641)*** **	**3420 (1200)*** **	**879 (896)*** **
Sentence 3	**3180 (1180)*** **	**853 (620)*** **	**3000 (1300)*** **	**929 (847)*** **

Standard deviations in parentheses.

*** p <.001 (in bold) .

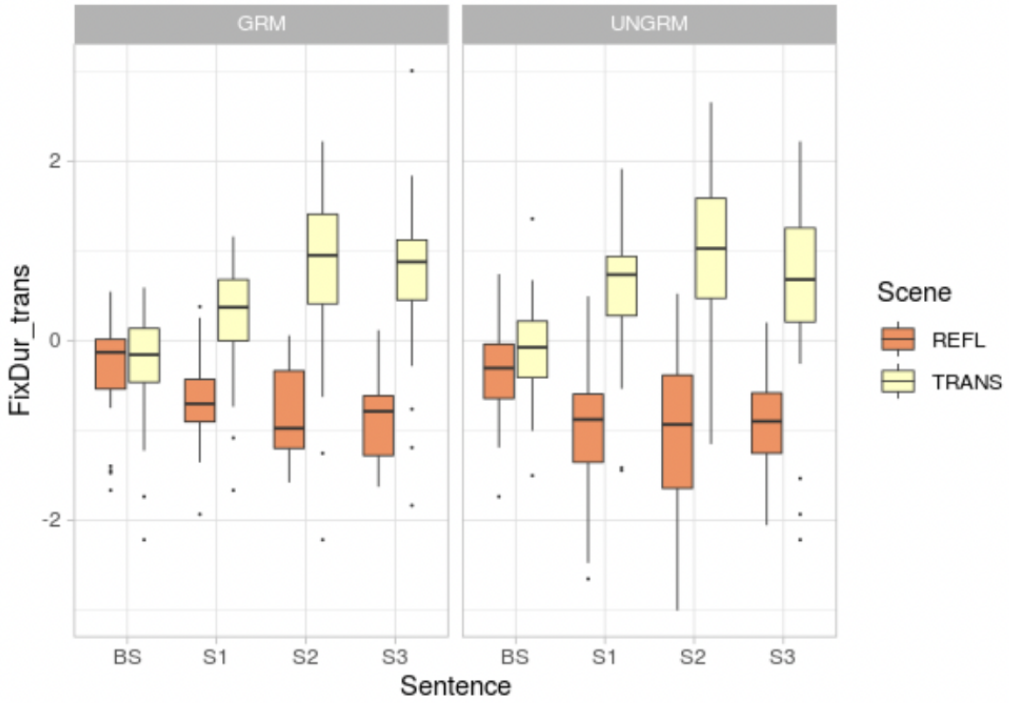


Figure 3.19: Proportions of looking time to the causative scene in the four-time windows, Finnish adults (Keidel, Leela, Zhu, & Kunnari, 2021)

On the other hand, in the study conducted by Zhu et al. (2022) in which the same materials, methods and procedure as in Franck et al. (2013) were used, Mandarin-speaking adults looked significantly longer at the transitive video during the three presentations of the experimental sentences in the grammatical condition ($p < .001$), ($p < .001$) and ($p < .001$), respectively. No such preference was reported for the baseline or the ungrammatical condition as shown in Figure 3.20 and Table 3.8.

Table 3.8: Mean looking time in (ms) across the four-time windows in adults, Zhu, Franck, Rizzi, and Gavarró (2022).

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline	1765 (511)	1437 (503)	1833 (533)	1567 (556)
Sentence 1	**2585 (617)*** **	**909 (397)*** **	1711 (613)	1829 (662)
Sentence 2	**3140 (967)*** **	**325 (504)*** **	1626 (1070)	1639 (963)
Sentence 3	**3267 (720)*** **	**379 (451)*** **	1730 (740)	1790 (711)

Standard deviations in parentheses.

*** p <.001 (in bold) .

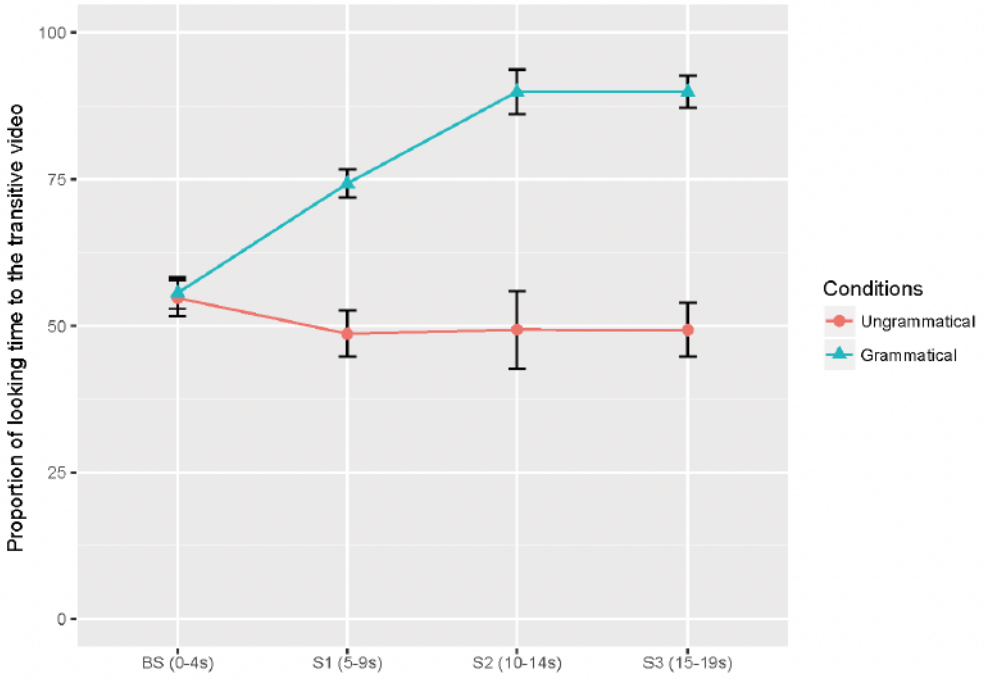


Figure 3.20: Proportions of looking time to the causative scene in the four-time windows, Mandarin adults (Zhu, Franck, Rizzi, & Gavarró, 2022)

Here I report the results of the experiment administered to infants when administered to adult Palestinian Arabic speakers.

3.4.2 Method

Materials

The materials were identical to those of the infants' experiment.

Participants

The adult participants were twenty native Palestinian Arabic speakers with a mean age of 35.2 (age range = 18 – 65, SD = 13.6) recruited in the west bank in Palestine.

Procedure

The procedure was similar to the infants' experiment, except for the fact that adults sat alone, whereas infants sat on their parent's laps.

Data analysis

Bivaried paired student t-tests on mean looking time and non-parametric Wilcoxon signed-rank tests were performed for the proportion of looking time to the causative video.

3.4.3 Results

The mean looking time in milliseconds across the four frames of the causative and transitive scenes in both conditions (grammatical vs ungrammatical) for adults is presented in Table 3.9.

Table 3.9: Mean looking time in (ms) across the four-time windows of the causative and reflexive scenes in the grammatical and ungrammatical conditions, adults

	Grammatical		**Ungrammatical**	
	Causative	Reflexive	Causative	Reflexive
Baseline (0-4s)	**2510.6 (966.9)*** **	**1828.9 (793)*** **	2048.9 (974.2)	2360.3 (1031.1)
Sentence 1 (5-9s)	**3670.4 (1011.4)*** **	**827 (665)*** **	2520.4 (16291.6)	1881.5 (1482)
Sentence 2 (10-14s)	**3988.6 (1284.9)*** **	**345.8 (396.5)*** **	**3071.3 (2037.1)*** **	**1362.8 (1538)*** **
Sentence 3 (15-19s)	**3997.5 (1308.3)*** **	**345.8 (407.2)*** **	**2910 (2216.9)*** **	**1391.6 (1750.4)*** **

Standard deviations in parentheses.

***p <.001 (in bold) .

Paired t-tests were used on mean looking time. The results reveal that adults looked significantly longer to the causative action in the grammatical condition during the first ($t(117) = 24.869$, $p < .001$, Cohen's $d = 3.32$), second ($t(117) = 27.215$, $p < .001$, Cohen's $d = 3.83$) and third presentation of the grammatical sentence ($t(117) = 26.683$, $p < .001$, Cohen's $d = 3.8$) as well as in the baseline window ($t(117) = 5.611$, $p < .001$, Cohen's $d = .77$). On the other hand, adults looked significantly longer to the causative action in the ungrammatical condition only during the second ($t(59) = 3.946$, $p < .001$, Cohen's $d = .95$) and third ($t(59) = 3.219$, $p = .002$, Cohen's $d = .76$) presentations of the ungrammatical sentence.

As shown in Figure 3.21, the calculation of the proportions of total fixation time to causative scenes (over the causative and non-causative scenes) reveals a significant preference for the causative over the non-causative scenes in the grammatical condition in the three presentations of the grammatical sentence (Mean = .8191, Mean = .9055, and Mean = .8846, respectively) as well as in baseline (Mean = .5786). During the ungrammatical condition, they showed a significant preference for the causative scenes that emerge in the second and third presentation of the ungrammatical SOV sentence (Mean = .6651, and Mean = .6967, respectively).

Despite the fact that a significant preference was found in the baseline, the difference between the preference to the causative scene highly increased in the three presentations of the grammatical sentence. On the other hand, and unlike children, adults are also willing to interpret ungrammatical sentences.

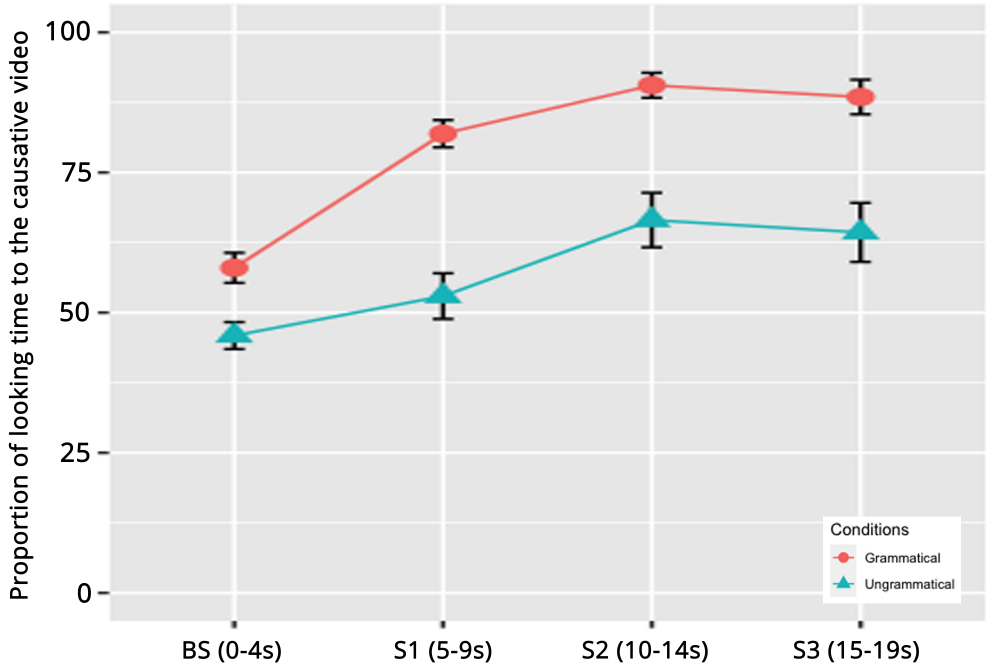


Figure 3.21: Proportions of looking time to the causative scene in the four-time windows, adults

The calculation of the proportions of total fixation time to causative scenes (over the causative and non-causative scenes) against chance level (50%) reveals a significant preference for the causative over the non-causative scenes in the grammatical condition in the three presentations (Z = -5.540, p = .00, r = .71; Z = -6.081, p = .00, r = .78; and Z = -5.153, p = .00, r = .66 respectively). During the ungrammatical condition, adults showed a significant preference for the causative scenes that emerge in the second and third presentation of the ungrammatical SOV sentence (Z = -3.386, p = .001, r = .44; and Z = -3.600, p = .00, r = .46, respectively).

3.5 Discussion

Replicating the methodology of Franck et al. (2013) and Gavarró et al. (2015), I tested grammatical SVO and ungrammatical SOV sentences with pseudo-verbs using eye tracking techniques in 17-month-old native Palestinian Arabic

infants. The results reveal that native Palestinian Arabic infants showed a significant preference for the scene illustrating the causative event when they encountered the grammatical SVO sentences. Similar results were obtained from Palestinian Arabic-speaking adults who looked significantly longer to the causative scene upon hearing the grammatical sentences. However, unlike infants, Palestinian Arabic-speaking adults also directed their gaze to the scene displaying the causative event when they encountered an ungrammatical SOV sentence.

Comparing the findings of this experiment with experiments in the same framework, the findings of this study are consistent with the studies on French, a VO language (Franck et al., 2013), Hindi-Urdu, an OV language (Gavarró et al., 2015) and Mandarin Chinese, a VO language (Zhu et al., 2022). However, due to the differences in video length and the number of frames among the four studies (5 frames in the French experiment, four frames in Hindi-Urdu, Mandarin and Palestinian Arabic), a direct comparison is not possible. Nevertheless, some observations can be drawn. First, the preference for the causative over the reflexive scenes was significant in the window 12-16s in French, 6-10s in Hindi-Urdu, and in the window corresponding to 5-9s in Mandarin. The preference for the causative action emerged in the window of 6-11s in Palestinian Arabic and reached significance in the window 10-14s. According to Zhu et al. (2022), the earlier emergence of the preference for the causative over the reflexive action in Hindi-Urdu and Mandarin might be due to the fact that, unlike French pseudo-verbs, the pseudo-verbs in Mandarin have a perfective aspect marker (*le*) the same as in Hindi-Urdu (*(y)aa*). However, pseudo-verbs in Palestinian Arabic involve a perfective aspect marker, and yet the preference for the causative action emerged later, in second presentation of the sentence. Therefore, the presence of the aspect marker does not seem to play a role.

The vocabulary comprehension scores in Palestinian Arabic (53, range = 30-73) were higher than in Mandarin Chinese (43, range = 0-102), but lower than in French (87, range = 8-389). No results of vocabulary scores were

reported for Hindi-Urdu. In the two studies where the vocabulary score was taken into account for the analysis of the results, it was found that there is no relation between the vocabulary size and comprehension. This is also the case here.

On the other hand, the results of the study conducted by Omaki et al. (2012), who used the same methodology used in Franck et al. (2013), reveal a delayed sensitivity to the head-final order, which was only found by 30 month old. This delay was attributed to the presence of null arguments in Japanese that might make the input of Japanese not informative for infants. However, Hindi-Urdu, as well as Palestinian Arabic, also have null arguments (20% and 79.5%, respectively). Evidently, delayed sensitivity to the head-final order that was found by Omaki et al. (2012) cannot be attributed to the presence of null arguments in Japanese.

The results of the current study on adults are consistent with a study on Finnish word order (Keidel et al., 2021), in which Finnish adults performed above-chance level when hearing ungrammatical sentences. The preference for causative scenes in the ungrammatical condition is expected if the performance of adults was not only guided by word order alone. In contrast, this preference was not found in Mandarin-speaking adults who performed at chance level when hearing the ungrammatical sentences, which Zhu et al. (2022), which was attributed to the restricted word order of Mandarin. The contrast between Mandarin and Finnish/ Palestinian Arabic remains for future research.

Returning to the main question of whether children aged 15-19 months have an abstract adult-like syntactic representation of word order or not, the performance of children in this experiment, as well as in the previous experiments in French, Hindi-Urdu and Mandarin, cannot be explained by the usage-based hypothesis (Tomasello, 1992, 2000). If children acquire word order on a verb-by-verb basis, random behaviour would be expected in both grammatical and ungrammatical conditions since the sentences were presented with a pseudo-verb for which the child has no lexical knowledge to rely on. Moreover, no

familiarization phase for the pseudo-verbs was conducted in this study, so there cannot be any lexical learning during the training phase. Hence, the correct parsing of the VO order indicates the presence of abstract knowledge of the VO order in infants in the age range of 15 to 19 months of age.

Furthermore, unlike in Gertner et al. (2006), who used two videos displaying the same actions with reversed roles and subject-first sentences, children's performance in my experiment cannot be guided by an AGENT-first strategy (as proposed by Bates and MacWhinney (1982) and Lidz, Gleitman, and Gleitman (2001)) since the two experimental sentences, grammatical SVO and ungrammatical SOV, are AGENT-first. Yet infants behaved differently in the two conditions.

To sum up, the cross-linguistic comparison was conducted between four different languages: French (an SVO language with no case markers on nominal arguments), Hindi-Urdu (an SOV language with pro-drop, case markers, and free word order), Mandarin (an SVO language with null arguments), and Palestinian Arabic (an SVO language with null arguments in subject position and no case markers). The results indicate that infants in these languages demonstrate sensitivity to the syntactic representation of their native language before they start producing sentences themselves. Furthermore, there is no relation between age and vocabulary size with respect to the sensitivity to this grammatical phenomenon. Finally, the study focusing on Palestinian Arabic stands out from previous research due to the inclusion of younger children with an average age of 17.6.

Chapter 4

The acquisition of filler-gap dependencies

4.1 Introduction

There is a growing body of literature investigating the early properties of syntax in relation to movement, using different methods, such as the preferential looking paradigm (Franck et al., 2013; Gagliardi, Mease, & Lidz, 2016; Perkins & Lidz, 2020), among others, and infants' listening time (Perkins & Lidz, 2021). The infants' comprehension of clauses with syntactic movement such as *wh*- questions is the topic that I aim to investigate. It has only been the focus of a few experimental studies in children younger than two years old and contrasting results have been found on how children process these utterances.

It is widely agreed that an adult parser relies on an active-filler strategy in resolving filler-gap dependencies (Frazier & Clifton, 1989). According to this strategy, once the filler (the moved constituent) is identified, the parser needs to hold it in working memory and immediately starts looking for a gap, identifies the gap, and its thematic role, and then assigns the filler to its appropriate gap (Hawkins, 1999). Here I focus on a particular case of filler-gap dependencies: that of fronted *wh*- questions.

One of the early studies that investigated the comprehension of *wh-* questions in preverbal children was conducted by Seidl, Hollich, and Jusczyk (2003) using the preferential looking paradigm. Seidl and her colleagues examined subject (128) and object *what* questions (129) as well as *where* questions (130) across three age groups: 13, 15 and 20-month-olds.

(128) What hit the keys?

(129) What did the apple hit?

(130) Where is the flower?

The experiment consisted of 5 trial blocks: two subject *what* questions, two object *what* questions and one *where* question. Each block began with two training trials in which an action was displayed twice. This was followed by two test trials in which a split-screen displayed the two 3-D drawing objects side by side, accompanied by either an answer to the subject, object or *where* questions. For instance, in a subject *what* question block, it began with a video of a book hitting some keys, displayed twice. This was followed by two test trials in which a split-screen displayed the two 3-D drawing objects side by side, as shown in Figure 4.1, accompanied by the subject question 'What did the book hit?', which appeared twice. The rationale was that comprehension of the question would make the participant direct her/his gaze to the keys.

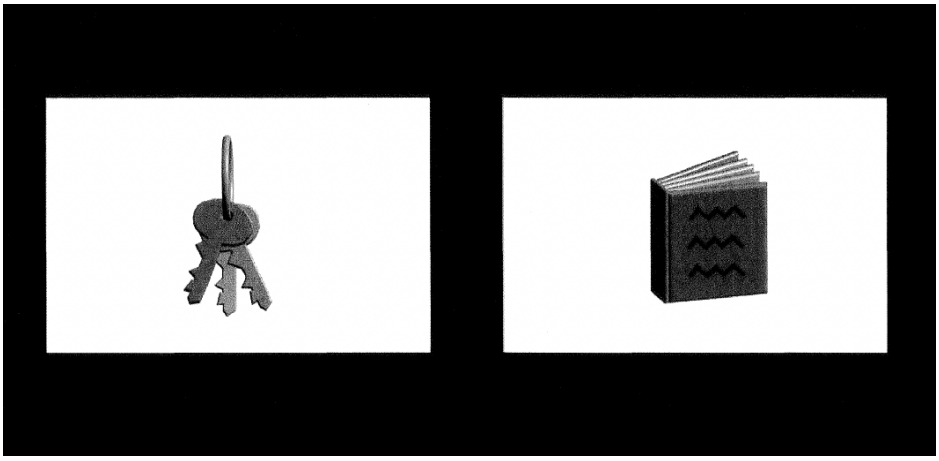


Figure 4.1: Split-screen displays the two 3-D drawing objects side by side (Seidl, Hollich, & Jusczyk, 2003).

Seidl et al. (2003) reported different behavioural patterns across different age groups. On the one hand, no evidence for comprehension for any of the three question types, subject, object and *where* questions were found at thirteen-months-old infants. Fifteen months infants fixated more on the target when they heard the *where* question and the subject *what* questions but not the object *what* questions. Twenty-month-old children fixated more on the target when they heard any of the three types of questions: subject, object and *where* questions indicating that children at this age are sensitive to *where* questions as well as *what* questions; however, they performed better in the subject *what* questions than the object *what* questions. The overall Mean looking times for all age groups are presented in Table 4.1.

Table 4.1: Overall mean looking times for all age groups, Seidl, Hollich, and Jusczyk (2003)

Age	Question Type	Target	Non-Target	Diff	Means to Target
13	Subject	1.92 (.16)	1.61 (.16)	.31	n= 11
	Object	1.64 (.16)	1.67 (.15)	-.03	n = 9
	Where	1.73 (.11)	1.61 (.13)	.12	n= 11
15	Subject	2.11 (.15)	1.49 (.13)	.62*	n. = 17
	Object	1.81 (.13)	1.66 (.09)	.15	n = 10
	Where	1.95 (.12)	1.38 (.13)	.57*	n = 14
20	Subject	2.25 (.12)	1.41 (.12)	84*	n = 18
	Object	2.43 (.14)	1.17 (.12)	.126*	n = 17
	Where	2.45 (.12)	1.23 (.09)	1.22*	n = 18

Standard errors in parenthesis.

* p <.05 .

This inability to parse object *what* questions was accounted for by the inability to access the adult-like syntactic representation of filler-gap dependencies at this age (Seidl et al., 2003).

Omaki, Davidson White, Goro, Lidz, and Phillips (2014) conducted three story-based comprehension experiments (a question-after-story task) to examine active gap filling in ambiguous bi-clausal *where* questions, as in (131), with 5-year-old English and Japanese children. Each story was accompanied with six-phase stories, as illustrated in Figure 4.2. Children where engaged in a play activity with a puppet, during which they watched a cartoon movie (the six phases stories) and were then asked by the experimenter through the puppet about a specific location using the ambiguous *where* questions.

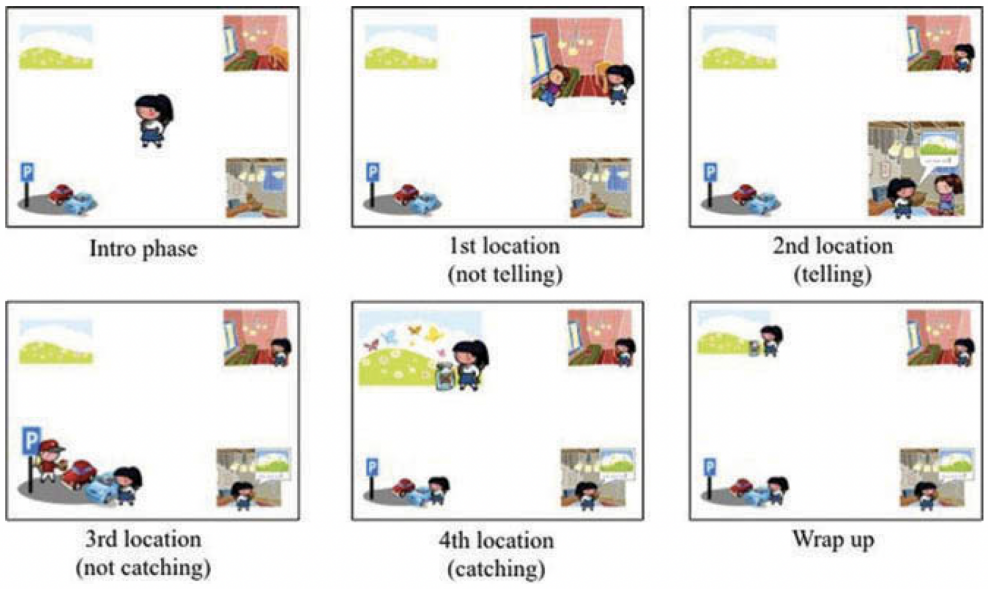


Figure 4.2: A sample sequence from the scenes used to accompany the stories (Omaki, Davidson White, Goro, Lidz, & Phillips, 2014).

(131) a. Where did Lizzie tell someone that she was gonna catch butterflies?

b. Doko-de Yukiko-chan-wa choucho-o tsukamaeru-to itteta-no?
where-at Yukiko-Dim-Top pro butterfly-Acc catch-

Comp was telling-Q
'Where was Yukiko telling someone that she will catch butterflies?'

In the previous scenario, the response could pertain to either the specified location for sharing information (interpreted in the main clause) or the specific location for catching butterflies (interpreted in the embedded clause). Assuming the presence of an active tendency to complete dependencies, it is anticipated that a preference towards interpreting the *wh-* constituent as part of the main clause would be exhibited. This prediction is made on the basis that the main clause's verb phrase (VP) serves as the foremost available position for interpretation.

Results indicate that five-year-olds show sensitivity to the active-filler strategy as they tended to assign the filler to the first predicate in the sentence, however, unlike adults, they were not able to revise the active *wh-* association preference (Omaki et al., 2014). Similar results were reported earlier by Love (2007) with English-speaking children aged between 4 and 6 and later by Lassotta, Omaki, and Franck (2016) with French-speaking children aged 5 to 8 years. As one can see, the age ranges tested were beyond infancy.

Another study was conducted by Goodwin, Fein, and Naigles (2015), who investigated the effect of the caregivers' input on the acquisition of *what* questions in typically developing English-speaking children aged 18-23 months, as well as in children with Autism spectrum disorder (ASD) aged 2:3-3:1 years, using the preferential-looking paradigm. Goodwin et al. (2015) used a modified version of the videos used by Seidl et al. (2003). In these videos, pairs of familiar objects, such as an apple and a flower or keys and a book, initially appeared together side by side without any accompanying audio as control trials. Following this, the objects were depicted in "hitting" events, such as the apple hitting the flower or the keys hitting the book. Subsequently, the objects reappeared simultaneously in static picture pairs for the test trials. During these test trials, children were exposed to three types of questions for the test: subject *what* questions (132a), object *what* questions (132b), and *where* questions (132c). Each question was repeated three times.

(132) a. What hit the flower?
b. What did the key hit?
c. Where is the apple?

Their results reveal that typically developing children looked longer at the matching video when they heard the *where* question. On the other hand, they showed significantly less looking time at the named object for the *what* questions.

Gagliardi et al. (2016) replicated the study by Seidl et al. (2003), who used the preferential looking paradigm, but with some modifications to the design

to address the methodological factors that could potentially impact the performance of children. For instance, Gagliardi et al. (2016) used videos instead of still images of inanimate objects. Additionally, they incorporated three characters in their videos, rather than two, to render the question felicitous. They also used six trials of the same question types rather than two in the test phase to give children more time to adapt to task demands. Gagliardi et al. (2016) examined two filler-gap dependencies: *wh-* questions as in (133) and relative clauses as in (134) in children aged 15 and 20 months. The rationale was that if the modified factors were responsible for the asymmetrical performance in the study of Seidl et al. (2003), they would find symmetrical performance in the subject and object *wh-* questions.

(133) a. Which dog bumped the cat?
b. Which dog did the cat bump?

(134) a. Show me the dog that bumped the cat.
b. Show me the dog that the cat bumped.

Each trial involved three phases: (1) character familiarization; (2) action familiarization; and (3) a test phase. Each question was repeated three times in the test phase. First, children were presented with the target question (e.g., 'Which dog bumped the cat?') accompanied with two animals of the same kind that participated in the action event. This presentation lasted 6 seconds and was followed by a black screen for 3.3 seconds. During this black screen period, the target question 'Which dog bumped the cat?' was repeated one more time. The end of the target question coincided with the reappearance of the two animals. A second later, the infants were presented with the question 'Can you find him?' followed by another repetition of the target question 'Which dog bumped the cat?'.

The data were divided into two blocks (first three trials vs last three trials) to test the objection they raised against Seidl et al. (2003) that the use of only two trials might not be suffice for children to adapt to task requirements. Indeed, the preference for the target video appears in the second

block, which means that their assumption that the use of only two trials may have masked the participants' ability is correct. All children from both age groups performed as expected assuming the comprehension of subject and object *wh-* questions. A significant preference for the target video in the 1-second window following the second presentation of the question was reported for 15-month-old and 20-month-old children. No such preference was found in the 1-second window after the first or third presentations of the question neither in 15-month-olds nor in 20-month-olds. Figure 4.3 shows the mean proportion looks to the agent in *wh-* questions by 15-month-olds across all subjects in the first block versus the second block of trials, whereas Figure 4.4 shows the mean proportion looks to the agent in *wh-* questions by 20-month-olds across all subjects in the first block versus the second block of trials. (Abbreviations: DO, Direct Object Questions; S, Subject Questions.) The lines in the graphs consist of data points that indicate the average percentage of attention directed towards the character who previously acted as an agent. The agent in the two figures below represents the target response in the subject conditions and the non-target response in the direct object conditions. In other words, if children did not look at the agent in the object condition, it implies that they were looking at the patient, which is the correct (target) response. Clearly children are on target only in the second block.

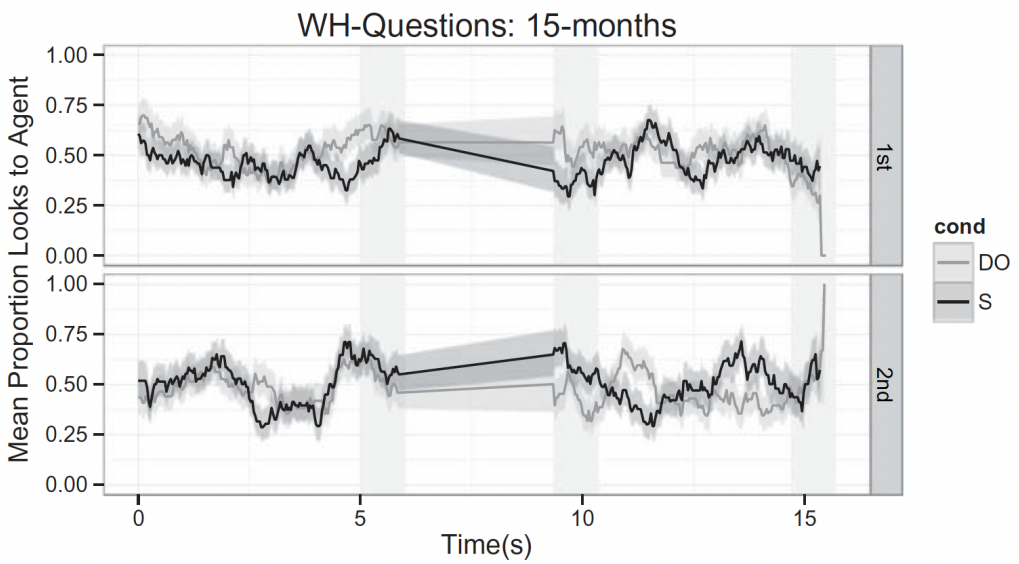


Figure 4.3: Timeline showing mean proportion looks to AGENT in *wh*-questions averaged across all subjects in the first block versus the second block of trials (Gagliardi, Mease, & Lidz, 2016)

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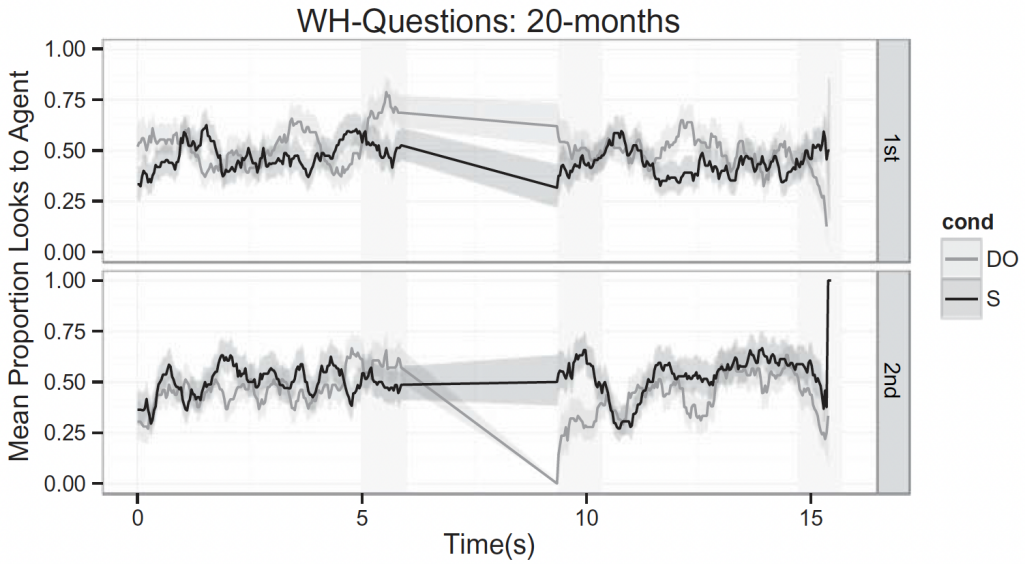


Figure 4.4: Timeline showing mean proportion looks to AGENT in *wh*-questions averaged across all subjects and all trials (Gagliardi, Mease, & Lidz, 2016).

As can be seen in Figures 4.3 and Figures 4.4, a significant preference to the agent character (target response) in the window after the second question in the subject *wh*- questions was found for both 15-months-old (Figure 4.3) and 20-months-old (Figure 4.4). On the other hand, in the object *wh*- questions, the mean proportion looks to the agent, which is the non-target response, was lower, meaning that children were looking significantly longer at the patient indicating comprehension of subject and object *wh*- questions. Lastly, the fact that the preference for the target in the subject *wh*- questions and for the patient in the object *wh*- questions only appears in the second block was interpreted by Gagliardi et al. (2016) as proof that the small trials (only two trials) of each question type may have masked the children' ability in the study by Seidl et al. (2003).

On the other hand, they found a discontinuous pattern of the development of filler-gap dependencies in relative clauses among the two age groups. Children in the youngest age group seemed to perform better on the trial of comprehension of relative clauses with a significant interaction in the 1-second

window after the second question, compared to older children who failed to interpret the relative clauses. Consequently, Gagliardi et al. (2016) conducted a subsequent study to test whether the inability of the 20-month-olds infants to parse relative clauses is due to a pragmatic factor or to an inability to access the abstract syntactic representation in the absence of a *wh-* word. Hence, subject (135a) and object relative clauses (135b), with a *wh-* word for a relative pronoun, were used.

(135) a. Show me the dog *who* bumped the cat.
b. Show me the dog *who* the cat bumped.

The results revealed that 20-month-olds English-speaking children were able to parse relative clauses that had a *wh-* word. This lead Gagliardi et al. (2016) to hypothesize that 15-month-olds children performed better in the earlier experiments because they have relied on lexical knowledge and not an abstract representation of filler-gap dependencies, whereas 20-month-olds children have an abstract syntactic representation for filler-gap dependencies but they still can't deploy it when the filler is not a *wh*-word. Two contrastive hypotheses that account for the correct interpretation of filler-gap dependencies in children have therefore been proposed: the filler-driven hypothesis and the gap-driven learning hypothesis. I present these in turn.

The filler-driven hypothesis argues that, for a speaker to acquire filler-gap dependencies, they must initially identify the filler that can serve as an indicator for an upcoming missing argument (Frazier & d'Arcais, 1989). Moreover, infants need to interpret a *wh-* word as a verb argument in *wh-* questions to accurately parse gap-driven dependencies. In simpler terms, this hypothesis assigns a displaced argument to its canonical thematic position in the sentences as shown in (136) (Perkins & Lidz, 2020). In (136b), the co-occurrence of the object *wh-* word and the direct object is ungrammatical due to their shared argument relation with the verb.

(136) a. **What** are you looking for <what>?
b. ***What** are you looking for my watch?

However, some *wh-* words, mainly adjunct *wh-* words such as *where* and *when*, do not require a missing argument, as shown in (137).

(137) a. **Where** did you loose the key?

b. **When** did you leave last night?

Following this hypothesis, it is unclear how the learner, when dealing with adjunct *wh-* words that do not provide any indication of forthcoming argument gaps, would progress from recognizing this group of words to determining the specific non-local relationships they are involved in. Furthermore, certain filler gap dependencies, such as relative clauses, may not include a *wh-* filler, as in (138).

(138) Show me the horse that won the race.

Alternatively, according to the gap-driven learning hypothesis, developing verb argument structure drives the acquisition of filler-gap dependencies (Gagliardi et al., 2016; Perkins & Lidz, 2020). Under this hypothesis, infants who have not yet encoded an abstract representation of filler-gap dependencies will detect the gap of a missing argument using their knowledge of verb transitivity rather than representing the *wh-* word as a displaced argument of the verb. In other words, they will ignore the presence of the *wh-* word. Therefore, it is expected that younger children who possess the understanding that the verb *eat*, for example, necessitates a direct object, may ignore the *wh-* word and recognize the absence of such an object following the verb when encountered in an object *wh-* question as in (139).

(139) What did Suzan eat?

In support of the gap-driven hypothesis, which posits that the comprehension of filler-gap dependencies depends on vocabulary size, Perkins and Lidz (2020) examined the effect of vocabulary on the comprehension of two filler-gap dependencies: *wh-* questions (140) and relative clauses (141) in children aged 15 months using the preferential-looking paradigm. The rationale behind this study is that if the hypothesis put forth by Gagliardi et al., 2016, that 15-month-old infants rely on lexical knowledge when interpreting

filler-gap dependencies, is accurate, then children with larger vocabulary size would perform better than those with smaller vocabulary size.

(140) a. Which monkey is feeding the frog?
b. Which monkey is the frog feeding?

(141) a. Find the monkey that's feeding the frog.
b. Find the monkey that the frog is feeding.

Perkins and Lidz modified the procedure used by Gagliardi et al. (2016) by using videos rather than still images. In their experiment, infants were shown two videos simultaneously, where one video depicted a monkey performing an action on a frog, and the other video showed the frog performing the same action on a second monkey (See Figure 4.5).

Figure 4.5: Sample video stimuli, one pair of videos for "feeding" event (Perkins & Lidz, 2020).

The results showed that vocabulary plays a significant role in parsing both types of filler-gap dependencies. The comprehension of filler-gap dependencies is evident exclusively among 15-month-olds with a large vocabulary size, *wh*- questions ($t = 3.044$, $p < .005$) and relative clauses ($t = 2.815$, $p < .009$). Consequently, the more verbs the infants know, the better they perform in interpreting filler-gap dependencies. The relationship between looks to target and vocabulary size in the first test window is represented in Figure 4.6

(Perkins & Lidz, 2020). As shown in Figure 4.6, the larger the vocabulary size, the longer the total fixation duration towards the target.

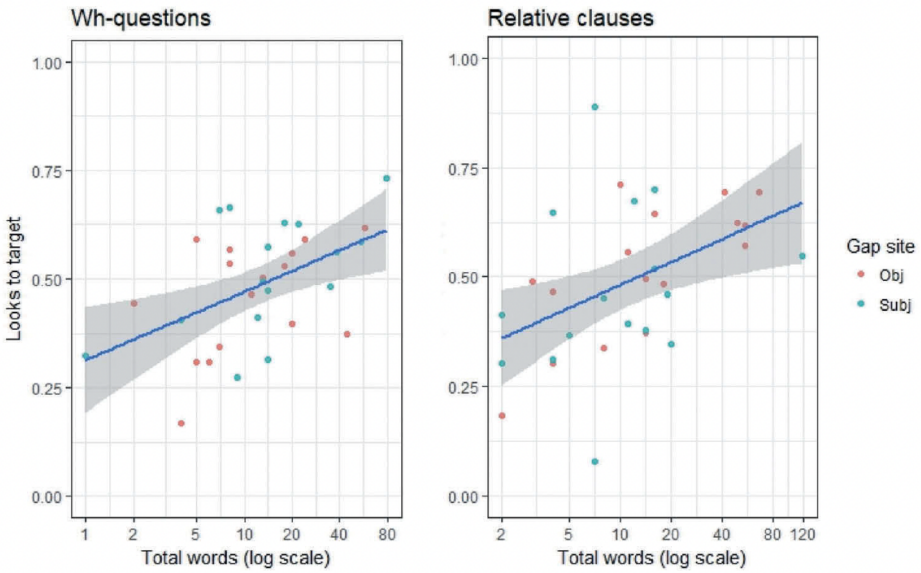


Figure 4.6: The relationship between looks to target and vocabulary in the first test window (Perkins & Lidz, 2020).

According to the gap-driven hypothesis, it is assumed that the 15-month-old children in Perkins and Lidz (2020) study performed better than 20-month-old children in Gagliardi et al. (2016) study due to the use of their knowledge of verb argument structure rather than resort to an abstract representation of filler-gap dependencies, which are immature in 20-month-old children according to Perkins and Lidz (2020). Therefore, Perkins and Lidz (2020) account for the discontinued pattern of performance in relative clauses that was reported by Gagliardi et al. (2016) by the fact that 15-month-old children rely on their knowledge of verb argument structure and verb transitivity, while 20-month-old children rely on an immature adult-like syntactic representation of filler-gap dependencies, which they cannot apply online when processing relative clauses without a *wh-* word, but can rely on when parsing *wh-* questions.

These results contradict what was reported by Seidl et al. (2003), who found an asymmetrical performance between subject and object *wh-* questions. According to Perkins and Lidz (2020), the asymmetric performance in Seidl et al. (2003) might be due to some methodological factors, also noted earlier by Gagliardi et al. (2016).

Although infants in the previous studies that used the preferential-looking paradigm showed longer visual fixation at the matching screen, alternative interpretations are possible for these findings (Perkins & Lidz, 2020). It might be concluded that infants comprehended the question and thus expressed it syntactically adult-like. Alternatively, if infants identify that a question is being asked (e.g., *what did the girl eat?*) and understand that *eat* in the constituent is the verb, and *the girl* is the subject, they might be more likely to look at the green apple the girl ate, even without recognizing the phrase *which apple* as the object of the verb. Hence, to see if infants understand the non-local predicate-argument relationships in these sentences, Perkins and Lidz (2021) tested whether children understand the complementarity between the *wh*-constituent and the local object of the verb.

They conducted an experiment on four groups of English-speaking children with mean ages 14;13, 15;14, 17;14 and 18;12 to investigate filler-gap dependency representations at these ages using infants' listening time. In their experiment, children were presented with a video of moving abstract shapes while listening to the testing sentences. A video recorder, connected to a video monitor in another room, was placed on the screen to record children's looking time (eye fixations) at the screen, which was used as a measure of interest in the presented sentences. The eye fixations of the participants were live-coded by the experimenter in the other room, who would press a key on the computer as long as the participant looked at the screen and release it when he/she looked away. The trial stopped if the participant looked away from the screen for more than 2 seconds or if the trial ended. Children were introduced to six highly transitive verbs in one syntactic construction in declarative sentences in the training phase. For the testing phase, infants

were randomly assigned to one of two conditions: declarative sentences, as exemplified in (142), or *wh-* questions, as exemplified in (143). Of these sentences, crucially (144b) is ill-formed due to the simultaneous presence of a DP object and the fronted *wh-* constituent. Sentence were paired with one of the two videos of abstract shapes as illustrated in Figure 4.7. The rational was that a difference in attention to the video, if relating to a difference in grammaticality in the linguistic input, could be taking as evidence for sensitivity to grammaticality.

(142) a. Ooh, a bug! The giraffe should tickle.

b. Hey, a dog! The cat should bump her.

(143) a. Hey, which puppy should the butterfly kiss?

b. Wow, which elephant should the duck cover her?

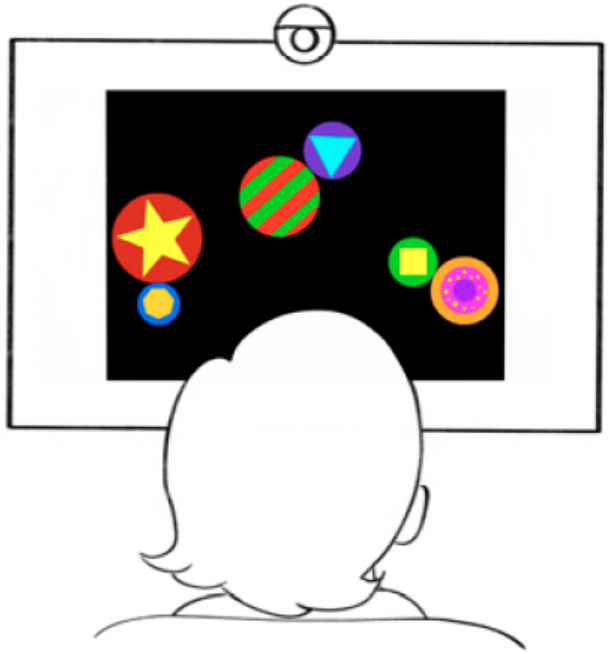


Figure 4.7: The video used while the infant hears the *wh-* questions or the declarative sentences (Perkins & Lidz, 2021).

Different performance was reported for different conditions among different age groups. Fourteen, fifteen and, seventeen-month-old infants showed no significant difference for declarative sentences with or without a direct local object. Similarly, infants who heard *wh-* questions also showed no difference for or against *wh-* questions with the local object. These findings indicate that 14, 15 and 17-month-old infants do not represent the *wh*-constituent as a verb argument (Perkins & Lidz, 2021). The results are illustrated graphically in Figure 4.8, and blue bars indicate trials with local objects.

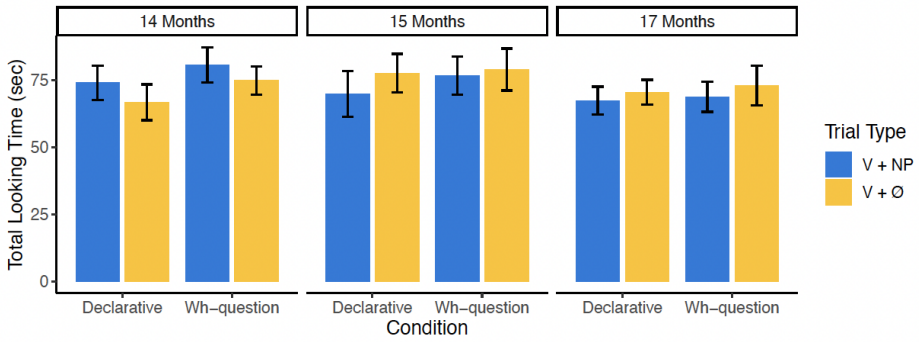


Figure 4.8: Mean total looking time at test for 14, 15, and 17-month-olds (Perkins & Lidz, 2021).

On the other hand, 18-month-old infants showed an awareness of the abstract dependency between the *wh-* phrase and the verb– this is indicated by longer looking time at the screen when hearing declarative sentences with a direct object or *wh-* questions without a direct object compared to declarative sentences without a direct object or *wh-* questions with a direct object. Results for 18-month-old infants are presented in Figure 4.9, and blue bars indicate trials with local objects. As can be seen from Figure 4.8, in the declarative sentence condition, children fixated significantly longer when the local object was present. In contrast, they showed more interest (by listening longer) when they heard questions without local objects. Hence, the abstract representation of filler-gap dependency is acquired according to Perkins and Lidz (2021) between 17 and 18 months of age.

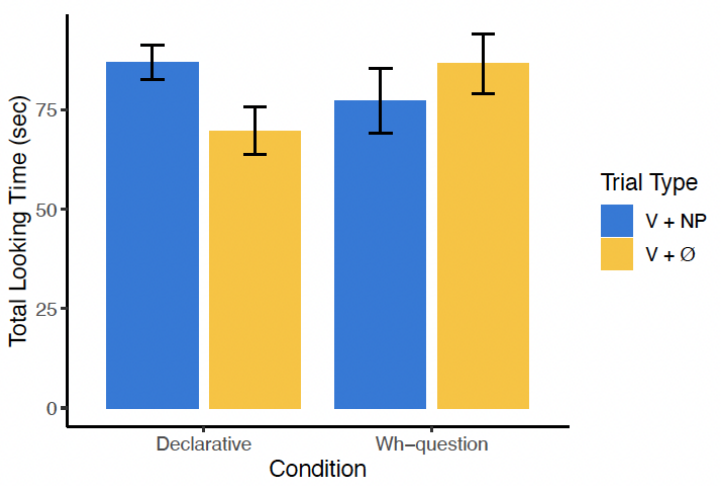


Figure 4.9: Mean total looking time at test for 18-month-olds. Blue bars indicate trials with local objects (Perkins & Lidz, 2021).

Table 4.2 summarizes the methods used across the various papers presented so far. Some of these studies are in contradiction with others, leaving ample space for further research in this field. Additionally, to the best of my knowledge, no experiment has been conducted to investigate the comprehension of filler-gap dependencies in preverbal Arabic-speaking children. Therefore this study aims to consider whether infants aged 17 to 19 months, exposed to Palestinian Arabic, have developed an adult-like abstract representation of filler-gap dependencies or not. A brief overview of *wh*- questions in Palestinian Arabic is given in the next section before presenting the experiment. The performance of infants is also compared to that of Palestinian Arabic-speaking adults.

Table 4.2: Summary of the methods used in the five studies under review

Articles	**Language**	**Age (months)**	**Lexical status of the V**	**Methods**	**Structures**
Seidl, Hollich, & Jusczyk, 2003	English	13, 15 & 20	Familiar verbs	Preferential-looking	*wh*- questions relative clauses
Goodwin, Fein, & Naigles, 2015	English	18-23	Familiar verbs	Preferential-looking	*wh*- questions
Gagliardi, Mease, & Lidz, 2016	English	15 & 20	Familiar verbs	Preferential-looking	*wh*- questions relative clauses
Perkins & Lidz, 2020	English	15	Familiar Verbs	Preferential-looking	*wh*- questions relative clauses
Perkins & Lidz, 2021	English	14, 15, 17 & 18	Familiar verbs	Infants' listening time	*wh*- questions relative clauses

4.2 *Wh-* questions in Palestinian Arabic

Wh- questions in Palestinian Arabic can be classified, based on the strategy of question formation, into in-situ *wh-* questions and fronted *wh-* questions (Mohammad, 2000). On the other hand, the *wh-* questions in MSA can only be fronted *wh-* questions (Mohammad, 2000). The fronted *wh-* questions in Palestinian Arabic follow the same word order pattern as in MSA, where *wh-* phrases occur at the front and are followed by the verb as in (144) for MSA and (145) for Palestinian Arabic.

(144) ماذا قالَ خالدٌ؟

Ma:ða: qa:la Xaled-**un**?
what said.3M.SG Khaled.NOM
'What did Khaled say?'

(145) شو حكى خالد؟

ʃu: ħaka Xaled?
what said.3M.SG Xaled
'What did Khaled say?'

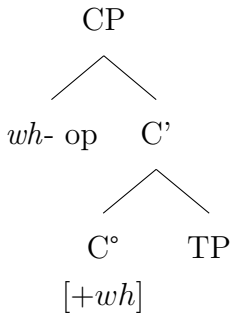
Rizzi (1996) proposes that the subject is not permitted to intervene between the *wh-* element and the inflected verb when constructing *wh-* interrogatives in many languages such as English and Italian. In these languages, the verb, whether it's the main verb (in Italian, among many other languages like Spanish, Catalan, Romanian) or an auxiliary (in English), undergoes two movements, first to T and then to C, in *wh-* interrogatives, to fulfil the *Wh-* Criterion (146) (Rizzi, 1996). This results in a structure represented in (147), adopted from Rizzi (1996).

(146) *Wh-* Criterion:

(A) A *wh-* operator must be in a Spec-head configuration with [+wh]X°

(B) An [+wh]X° must be in a Spec-head configuration with a *wh-* operator.

(147)



However, the restriction that the subject is not permitted to intervene between the *wh-* element and the inflected verb does not apply to Hebrew (Shlonsky, 1997), Caribbean Spanish (Ordóñez & Olarrea, 2006; Brown & Rivas, 2011; Cominguez, 2017; Zimmermann, 2019), and Brazilian Portuguese (Silva, 2013), in which the subject is allowed to intervene between the *wh-* element and the inflected verb, exhibiting the *wh*-S-V order. This can also be extended to Palestinian Arabic in which we come across cases in the corpus analysis, as presented in chapter 2, where the subject intervenes between the *wh-* element and the inflected verb (two out of the 30 questions in the children's production, 22 out of the 688 in the adults' production). In these languages, it is argued that the *wh-* feature originates directly in C under dynamic agreement (Rizzi, 1996). In order to fulfil the *Wh-* criterion, only the operator needs to move to SpecCP; there is no necessity for the verb to move to C since the feature is already situated in the appropriate position. Consequently, these languages do not demand adjacency between the operator and the verb, allowing for the grammaticality of the *wh*-S-V order (Shlonsky, 1997; Silva, 2013). This is exemplified in (148), (149), (150) and (151) for Hebrew (Shlonsky, 1997), Brazilian Portuguese (Silva, 2013), Caribbean Spanish (Ordóñez and Olarrea, 2006) and Palestinian Arabic, respectively.

(148) ʔyzo tšuva Ruti yodaʕat?
which answer Ruti know
'Which answer does Ruti know?'

(149) O que o Paulo comprou?
what D Paulo bought?
'What did Paulo buy?'

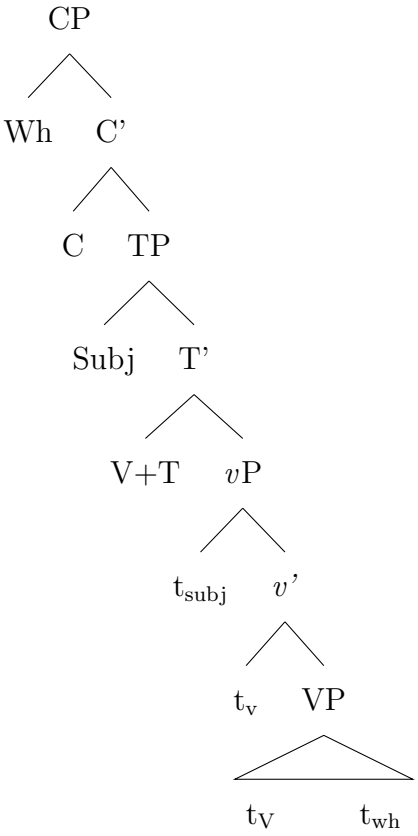
(150) ¿Cuál de esos dos carros el novio de Juana había comprado?
which of these two cars the boyfriend Juana's had bought
'Which of these two cars had Juana's boyfriend bought?'

(151) أي بنت الإم بتبوسها؟

ʔay binet l-ʔem betbu:s-**ha:**?
which girl the-mother kisses.3M.SG-her
'Which girl does the mother kiss?'

The structure presented in (152) illustrates how *wh-* interrogatives in Brazilian Portuguese are analysed in Silva (2013). In (152), it can be observed that the *wh-* element undergoes movement to [Spec, CP], while the subject moves to [Spec, TP].

(152)



Ordóñez and Olarrea (2001, 2006) propose that Caribbean Spanish (spoken in Cuba, Puerto Rico, Dominican Republic) displays an inconsistent

non-inversion pattern, and one of the primary factors contributing to this inconsistency is the distinct morphological character of the subject. Non-inversion patterns in Caribbean Spanish are limited to specific pronominal subjects, such as subject pronouns, which, unlike in other varieties of Spanish, are considered weak pronouns in certain contexts like interrogatives. The weak pronoun, which is a component of TP, undergoes movement to occupy a Specifier position within the CP domain and is then observed in a position preceding the verb. The weak pronouns occupy a pre-verbal position in [Spec, AgrS], which is located above the verb's final agreement position. This positioning allows them to intervene between the *wh-* elements and the verb. Moreover, it is widely accepted that subject preposing is most common in Caribbean Spanish when the subject is the familiar second-person singular pronoun *tú*. However, the acceptance of other preposed subject constituents appears to vary to some extent, possibly depending on the dialect of the speaker. Generally, singular pronouns are more readily accepted than plural pronouns, and second-person pronouns are more accepted than first and third-person pronouns, in that particular order. Zimmermann (2019) established a scale of acceptance for subject in interrogatives with *wh*-S-V word order in Caribbean Spanish by drawing on the existing literature, represented in (153). However, according to Gutiérrez-Bravo (2008), other pronominal subjects such as DPs or strong pronouns can also be preverbal subjects.

(153) tú > usted, ustedes > yo > nosotros/nosotras, él/ella > ellos/ellas > full DP subject

The tendency reported in Ordóñez and Olarrea (2001, 2006) was confirmed in the results obtained from an experimental questionnaire conducted by Ordóñez and Olarre with a total of 92 subjects at the Universidad Autónoma de Santo Domingo. Monosyllabic pronouns are more prevalent than longer pronominal forms in *wh*-S-V interrogatives. This suggests that there might be a prosodic requirement at play in such constructions. However, the fact that a full DP can appear in the preverbal position indicates that this prosodic requirement alone cannot explain all the various types of *wh*-S-V interrogatives found in the Caribbean Varieties. Furthermore, Ordóñez and Olarrea (2006)

noted that despite the fact that simple *wh-* words like *qué* 'what' require adjacency between the *wh-* phrase and the finite verb in Non-Caribbean Spanish, non-inversion is possible when using complex *wh-* words. The example of this in (154) is extracted from Ordóñez and Olarrea (2006).

(154) a. *¿A quién tu hermana visitó?
to who your sister visited
'Who did your sister visit?'

b. ¿A cuál de estas chicas tu hermana (la) había visitado en
to which of these girls your sister (her) had visited in
Sicilia?
Sicily
'Which of the girls your sister had visited in Sicily?'

According to Silva (2013), the subject-verb (SV) order is obligatory in interrogatives regardless of the *wh-* word used in Brazilian Portuguese.

Moving to the Semitic languages, an analysis for the subject-verb inversion was provided by Shlonsky (1997) for Hebrew. In Hebrew, inversion is optional in the majority of cases (155). The examples in (155) are extracted from Shlonsky (1997).

(155) a. Ba-pšita ha-leilit ha-mištara ʕacra peʕilim
in-the-raid the-nightly the-police detain(PAST)-3F.SG many
rabim.
activists
'The police detained many activists in the nightly raid.'

b. Ba-pšita ha-leilit ʕacra ha-mištara
in-the-raid the-nightly detain.(PAST)-3F.SG the-police
peʕilim rabim.
activists many
'The police detained many activists in the nightly raid.'

The optionality can be attributed to differences in dialects or registers. Formal written Hebrew necessitates inversion—especially evident when the trigger is a *wh-* expression or a relative operator—while spoken Hebrew avoids

it. However, negative inversion is a noteworthy exception, as it is obligatory across all dialects (156) (Shlonsky, 1997).

(156) *Lə-ʕolam ha-memšala lo taskim lə-farek
never the-government NEG 3F.SG-(FUT)agree to-dismantle
hitnaxaluyot
settlements
'The government will never agree to dismantle settlements.'

Interrogative clauses exhibit subject-verb inversion, achieved when the inflected verb raises to the C head position. When T moves to C, this leads to the formation of a Spec-head relation and the Spec-head configuration can also satisfy Rizzi's *Wh*-Criterion (Shlonsky, 1997). The difference between the two dialects of Hebrew—where T to C occurs and where it does not—can plausibly be attributed to the strength or weakness of the features involved in questions [1]. In the dialect with inversion, these features are strong and necessitate pre-Spellout-checking, whereas in the non-inversion dialect, the features are weak. Consequently, the absence of inversion merely indicates that overt T to C does not occur. To check the weak features, T to C movement takes place in Logical Form (LF) (Shlonsky, 1997).

Moving on to *wh-* questions in Palestinian Arabic, subject *wh-* questions are superficially SVO as exemplified in (157), whereas object *wh-* questions display word orders in which the PATIENT precedes the AGENT: OSV-clitic[2] or O V-clitic S, as exemplified in (158) and (159), respectively.

(157) أي ولد باس الأرنب؟

ʔay walad baːs l-ʔarnab?
which boy kissed.3M.SG the rabbit?
'Which boy kissed the rabbit?'

(158) أي أرنب الولد باسه؟

[1] Or, in more modern terms, on whether an uninterpretable feature is present or not.

[2] As a native speaker of colloquial Palestinian Arabic, I find it easier to accept the complex *wh-* word like *ʔay* 'which' rather than simple ones, such as *ʃuː* 'what' in the order OSV-clitic.

ʔay ʔarnab l-walad ba:s-**o**?
which rabbit the-boy kissed.3M.SG-him
'Which rabbit did the boy kiss?'

(159) أي أرنب باسه الولد؟

ʔay ʔarnab ba:s-**o** l-walad?
which rabbit kissed.3M.SG-him the-boy
'Which rabbit did the boy kiss-clitic?'

However, unlike in MSA, it is acceptable in the Arabic dialects for the *wh*-word to appear in-situ, in the original canonical position of the *wh*- element, as exemplified in (160).

(160) اشترت مي إيش؟

ʔeʃtarat may ʔe:ʃ?
bought.3F.SG Mai what
'What did Mai buy?'

Yet, Arabic dialects differ in the type of constituents that occur in-situ (Aoun et al., 2009). For instance, all constituents can occur in-situ in Egyptian Arabic (Aoun et al., 2009; Gad, 2011), whereas only a few of them can occur in-situ in Syrian Arabic (Sulaiman, 2016). Note that the resulting questions are not echo questions. In Palestinian Arabic, all nominal *wh*- elements except *ʃu:* 'what' can be used in the in-situ strategy, while more restrictions are imposed on the adverbial *wh*- elements, as detailed later in this section.

Putting aside the in-situ strategy, in Arabic, there are three ways for forming *wh*- interrogatives: the gap strategy, the resumptive strategy, and the class II resumptive strategy (Mohammad, 2000). For MSA, see examples of the gap strategy, resumptive strategy, and class II resumptive strategy, in (161).

(161) a. ماذا اشتريت منَ معرضِ الكتبٍ؟

Ma:ðaː ʔeʃtarayta min maʕradˤel-kutub-**i**?
what bought.2M.SG from the-book gallery.GEN
'What did you buy from the book gallery?'

b. أيُ كتابٍ اشتريتَهُ منَ معرضِ الكتبِ؟

ʔayu kitab-**en** ʔeʃtarayta-**hu** min maʕradˁel-kutub-**i**?
which book.GEN bought.2M.SG-it from the-book.GEN gallery
'Which book did you buy from the book gallery?'

c. ما الذي اشتريتَهُ منَ معرضِ الكتبِ؟

Mal-laði: ʔeʃtarayta-**hu** min maʕradˁel-kutub-**i**?
what that bought.2M.SG-it from the-book.GEN gallery
'What is that you bought from the book gallery?'

For the Palestinian Arabic dialect, see examples of the gap strategy, resumptive strategy, and class II resumptive strategy strategies in (162).

(162) a. إيش اشتريت من معرض الكتب؟

ʔe:ʃʔeʃtare:t min maʕradˁ l-kutub?
what bought.2M.SG from gallery the-book
'What did you buy from the book gallery?'

b. أي كتاب اشتريته من معرض الكتب؟

ʔay ktab ʔeʃtare:t-**o** min maʕradˁ l-kutub?
which book bought.2M.SG-it from gallery the-book
'Which book did you buy from the book gallery?'

c. إيش اللي اشتريته من معرض الكتب؟

ʔe:ʃ ʔelli: ʔeʃtare:t-**o** min maʕradˁ l-kutub?
what that bought.2M.SG-it from gallery the-book
'What is that you bought from the book gallery?'

In questions (161a) and (162a), the gap strategy is employed. The gap strategy is the default strategy for forming *wh-* interrogatives in MSA and the majority of Arabic dialects, including Palestinian Arabic. The *wh-* phrase is moved to the left periphery of the clause leaving a silent copy in its original position.

According to Aoun et al. (2009), in Arabic, *wh-* words are categorized into two groups: nominal *wh-* words and adverbial *wh-* words. Table 4.3 presents the *wh-* words used in Palestinian Arabic dialects (adopted from Aoun et al. (2009) for Lebanese Arabic).

Table 4.3: *Wh-* words in Palestinian Arabic

Nominal		**Adverbal**	
mi:n	'who'	ki:f	'how'
ʃu:/ʔeʃ	'what'	leʃ	'why'
kam	'how many'	ʔade:ʃ	'how much'
ʔaj	'which'	we:n	'where'
		ʔemta/waʔte:ʃ	'when'

Like in Lebanese Arabic (Aoun et al., 2009), both types of *wh-* phrases (nominal and adverbal) can be used with the gap strategy in Palestinian Arabic, as illustrated in (163).

(163) a. مين كسر الكاسة؟

Mi:n kasar l-ka:seh?
who broke.3M.SG the-cup
'Who broke the cup?'

b. أي ساعة اختارت أسيل؟

ʔay sa:ʕa ʔexta:rat ʔas:l?
which watch chose.3F.SG Aseel
'Which watch did Aseel choose?'

c. إيمتا رجع آدم من الجامعة؟

ʔe:mta: riʒeʕ ʔa:dam min l-ʒa:mʕa?
when came.3M.SG back Adam from the-university
'When did Adam come back from the university?'

d. كيف رح تروحي عَ الحفلة بكرة؟

Ki:f raħ tru:ħi: ʕal ħafle bukra?
how will go.2F.SG to-the party tomorrow

‘How will you go to the party tomorrow?’

In questions (161b) and (162b), the resumptive strategy is employed. The *wh-* phrase appears in the initial position of the clause, accompanied by a resumptive pronoun in its extraction site. (164) illustrates the fact that adverbial words cannot be used with the resumptive strategy. However, some nominal phrases are also excluded from this strategy, such as *ʃu:* ‘what’, *kam* ‘how many’, and *ʔade:ʃ* ‘how much’ as illustrated in (165).

(164) * إيمتا اشترته يارا الكتاب؟

*ʔe:mta: ʔeʃtara:t-**u** ya:ra l-kta:b?
when bought.3F.SG-it Yara the-book
‘When did Yara buy the book?’

(165) * شو أكلته عَ العشا؟

*ʃu: ʔakalt-**o** ʕal-ʕaʃa?
what ate.2M.SG-it on-the-dinner
‘What did you have for dinner?’

In questions (161c and 162c), the so-called ‘Class II Resumptive Strategy’ is employed. The *wh-* phrase is fronted and followed by the relative complementizer, *l-laði:* in MSA and *ʔelli:* in Palestinian Arabic and is associated with a resumptive pronoun. Only nominal *wh-* phrases can be used with the class II resumptive strategy as illustrated in (166).

(166) a. مين إللي شفتو بالمطعم؟

Mi:n ʔilli: ʃeft-**u:** bel-matʕʕam?
who that saw.3M.SG-him in-the-restaurant
‘Who you saw in the restaurant?’

b. * إيمتا إللي شفتو بالمطعم؟

*ʔe:mta: ʔilli: ʃeft-**u:** bel-matʕʕam?
when that saw.3M.SG-him in-the-restaurant
‘When did you see him in the restaurant?’

Finally, all nominal *wh-* words except *ʃu:* ‘what’ can be used with the in-situ strategy as illustrated in (167).

(167) * ريم شربت شو؟

*Reem ʃerbat ʃu:?
Reem drank.3F.SG what
'What did Reem drink?'

More restrictions are enforced on the adverbial *wh-* words in the in-situ strategy. For instance, only referential adverbial *wh-* phrases are acceptable in this strategy, such as *we:n* 'where' and *ʔemta:* 'when' as in (168) but not the non-referential adverbial *wh-* phrases like *ki:f* 'how' and *le:ʃ* 'why' as in (169).

(168) أمير راجع إمتا؟

ʔami:r ra:ʒeʕ ʔe:mta:?
Ameer coming.3M.SG back when
'When is Ameer coming back?'

(169) * كسرت إيدك كيف؟

*Kasaret ʔi:dak ki:f?
broke.2M.SG your-hand how
'How did you break your hand?'

4.3 Experiment 1: The acquisition of *wh-* questions in infants

4.3.1 Method

The goal of this experiment was to investigate whether native Palestinian Arabic infants aged 17-19 months have abstract knowledge of filler-gap dependencies or not. My experimental set-up bears a close resemblance to Perkins and Lidz (2020), although whereas the study by Perkins and Lidz (2020) used familiar verbs, pseudo-verbs were used in the current study to rule out the possibility that children might be relying on knowledge of the argumental structure of verbs to comprehend the questions. If infants aged between 17 and 19 months did not have a syntactic representation of filler

gap dependencies and were relying on the argumental structure to find out that the verb is missing an argument as argued by Gagliardi et al. (2016) under the gap-driven hypothesis, they would not be able to parse the *wh*-questions with pseudo-verbs as they have no lexical knowledge to rely on while parsing them. On the other hand, if they had an adult-like syntactic representation of filler gap dependencies, they could successfully interpret the *wh*- questions.

The second difference between the two studies concerns the number of puppets and verbs used. In Perkins and Lidz (2020)'s study, only three puppets (two monkeys and a frog) were used to represent the six events (bump, hug, kiss, feed, tickle, and wash). In the Palestinian Arabic study, I used eight puppets (two rabbits, two bears, two horses, a sheep, and a dog) to represent the two pseudo-verbs. But the characteristics of the puppets used for each pair of videos were similar in the two studies as detailed below.

The third difference concerned the familiarization phase. Unlike children in the study of Perkins and Lidz (2020) who were familiarized with the verb (*Look, feeding! Somebody's feeding somebody*), for Palestinian children there was no familiarization of the pseudo-verbs in the procedure. Also, the familiarization phase was conducted prior to the test phase rather than for each trial as in Perkins and Lidz (2020).

For the experiment, the word order chosen was *which*SV-clitic rather than *which*VS-clitic because the latter was not found in the production of children nor in those of adults in the corpus analysis. Questions headed by the Palestinian Arabic *ʔay* 'which' were used. Finally, taking into account that verbs in Palestinian Arabic agree in number and gender with the subject, the puppets used were all of the same gender (masculine), so children can not rely on the verb inflections in parsing these questions.

The same pseudo-verbs of the first experiment were used for this experiment: *besayyeʕ* and *bemraʃ*. *Besayyeʕ*, which corresponds to 'put a crown to someone's head', was used with subject *which* questions and *bemraʃ*, which

corresponds to 'put someone's head under a net', was used with the object *which* questions. The two pseudo-verbs were formed in accordance with the phonotactic and phonological features of Palestinian Arabic. They incorporated a progressive marker *b* at the beginning of the verb to indicate a present tense, as well as a prefix *e* to indicate the third person masculine singular form.

Six *which* questions were constructed as test stimuli: three subject *which* questions (170) and three object *which* questions (171). The experimental protocol and a complete list of experimental items can be found in Appendix (5.7).

(170) a. أي أرنب بسيْع الحصان؟

ʔaj ʔarnab besayyeʕ leħsˁaːn?
which rabbit PSEUDO-VERB.3M.SG the-horse
'Which rabbit PSEUDO-VERB the horse?'

b. أي حصان بسيْع الكلب؟

ʔaj ħsˁaːn besayyeʕ l-kalb?
which horse PSEUDO-VERB.3M.SG the-dog
'Which horse PSEUDO-VERB the dog?'

c. أي دب بسيْع الخروف؟

ʔaj dub besayyeʕ l-xaruːf?
which bear PSEUDO-VERB.3M.SG the-sheep
'Which bear PSEUDO-VERB the sheep?'

(171) a. أي دب الحصان بمرشه؟

ʔaj dub leħsˁaːn bemraʃ-**u**?
which bear the-horse PSEUDO-VERB.3M.SG-clitic
'Which bear the horse PSEUDO-VERB-clitic?'

b. أي حصان الخروف بمرشه؟

ʔaj ħsˁaːn l-xaruːf bemraʃ-**u**?
which horse the-sheep PSEUDO-VERB.3M.SG-clitic
'Which horse the sheep PSEUDO-VERB-clitic?'

c. أي أرنب الكلب بمرشه؟

ʔaj ʔarnab l-kalb bemraʃ-**u**?
which rabbit the-doge PSEUDO-VERB.3M.SG-clitic?
'Which rabbit the dog PSEUDO-VERB-clitic?'

Each question was associated with a pair of videos including two puppets of the same type but differed in their colour and one of a different type. One video depicted an animal performing an action, the other video depicted the same action performed on the other animal of the same kind as illustrated in Figure 4.10. The purpose of this design was to render the *which* question felicitous.

Figure 4.10: Visual stimuli used in this experiment

We interpret the results as follows. If the participant understands the question he/she will direct his/her gaze to the agent character in subject *which* questions and to the patient character in the object *which* questions. Because the surface order is SVO in subject *wh-* questions, it is not possible to tell with certainty whether the infants are aware of the underlying movement link that exists between the *wh-* phrase and its gap or if they interpret it as a transitive sentence, in which case the infant could possibly point at least

to the correct video if they interpret the *wh-* question as a SVO sentence (Which horse PSEUDO-VERB the dog? could be identified with the horse PSEUDO-VERB the dog). Therefore, I identified the Region of Interest by character (i.e., the brown horse as the target character and the grey horse as the reverse one) and not by the whole event. This is a departure from a more standard analysis of preferential-looking paradigm studies in which the standard way of interpreting eye movements is by testing whether participants were looking at an event or another.

Materials

The materials consisted of a set of videos corresponding to the introduction phase and the experimental phase. The experiment started with the characters' introduction phase, where infants were familiarised with the puppets used. Each puppet was introduced in a video along with an auditory stimulus *ʃu:f, ha:d xaru:f? ʃa:jef l-xaru:f?* 'Look, it's a sheep! Do you see the sheep?'. Each puppet was presented for 7s on one half of the screen while the other half remained blank, as illustrated in Figure 4.11.

Figure 4.11: Visual stimuli, character-identification

This was followed by a familiarization phase with simultaneous presentation, which involved introducing characters on both sides of the screen while inquiring about one of them i.e., *ʃu:f, ʃa:jef l-xaru:f? we:n l-xaru:f?* 'Look do you see the sheep? Where is the sheep?'. A blank screen that lasted

for 2 seconds was displayed prior to introducing every item. Then, different puppets of the same kind were presented simultaneously on both sides of the screen, as illustrated in Figure 4.12, with an auditory stimulus like *ʔettˤalaʕ meʃ zay baʕadˤ. Ha:d d-dub ɣe:r ʕan ha:d d-dub* 'Look, they're different. This bear is different from this bear'.

Figure 4.12: Visual stimuli, simultaneous presentation.

Finally, to make sure that knowledge of the test phrases could not be attributed to lexical learning during the training phase, participants were presented to the novel actions in a neutral context without utilising the pseudo-verbs. Consequently, videos demonstrating these novel actions were accompanied by sentences like *ʔettˤalaʕ, ʃu: bisˤi:rʔ* 'Look, what is happening?' as shown in Figure 4.13. Once again, a blank screen lasting for 2 seconds was shown before introducing each experimental item. Following the training session, a brief cartoon video was shown, and participants were given a short break before moving on to the experimental phase.

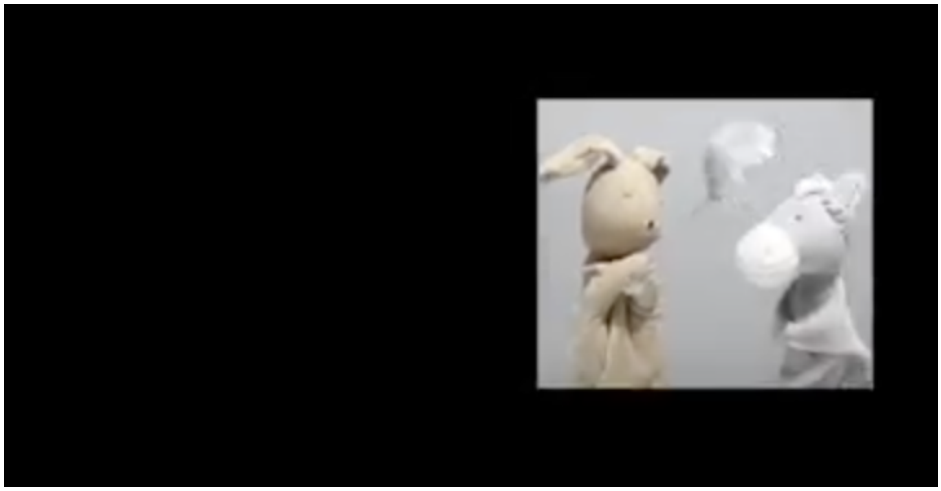


Figure 4.13: Visual stimuli used, novel actions

The familiarization phase was followed by a test phase. For the test, infants heard six trials illustrated earlier in (170) for subject *which* questions and in (171) for object *which* questions. The items were displayed in random order.

In each condition, the matched and mismatched videos were counterbalanced over the left and right sides of the screen (see Figures 4.14 and 4.15).

Figure 4.14: Visual stimuli used in the subject *which* question condition.

Figure 4.15: Visual stimuli used in the object *which* question condition.

A blank screen was displayed between the six experimental items for 2 seconds. A clip of a Teletubbies cartoon of a landscape was presented to hold the child's attentiont at the beginning of the experiment and after items 3, 4, and 5, as shown in Figure 4.16.

Figure 4.16: Teletubbies cartoon clips

All videos began with a baseline sentence that drew the child's attention, e.g., *ʔettˤalaˤ, ʃaːjef ʃuː bisˤiːrʔ* 'Look, do you see what is happening?' that lasted for 3s, followed by three repetitions of the experimental sentences. As a result, the gazing time was recorded in four windows: the baseline at 0 to

7 seconds, and three sequential exposures of the test sentences starting at 8, 16, and 24 seconds. The entire session lasted from 10 to 15 minutes.

Participants

Data were collected in May 2022 from fifty-six healthy native Palestinian Arabic infants, 29 girls and 27 boys, aged 17 to 19 months (Mean age in months is 18.27, SD = .79) recruited in Palestine. All participants were raised with Palestinian Arabic as their mother tongue language. Twelve of them were attending kindergarten. None of the included participants was diagnosed with language delay, language disorders, hearing deficits or congenital malformations. Of the total 56 infants, 23 were discarded due to a gaze sample of less than 55% (an exclusion threshold which is standard); because they did not complete the test (1 infant), or technical failure (5 infants). Seventeen more participants were excluded from the final analysis as they were looking at the bright red dots that appeared on the eye-tracking device instead of looking at the Regions of Interest. Therefore only the results of 16 participants, eight girls and eight boys, aged 17 to 19 months (Mean age in months is 18.12, SD = .81) are reported.

In order to assess the language development of the infants, the Arabic Communicative Development Inventory (Arabic CDI-Words Only, Abdelwahab et al., 2021) was used. Table 4.4 summarises the infants' scores.

Table 4.4: Infants' vocabulary

Age	**Comprehension**		**Production**	
(Months)	Mean	Range	Mean	Range
17-19	62.75 (SD = 16.13)	20-86	24.12 (SD = 15.67)	7-47

Procedure

Upon the arrival of parents and their children at the lab, the experimenter explained the procedure to parents and asked them to sign a written in-

formed consent before the experiment began. Parents were also asked to fill out the CDI checklist before proceeding with the experiment. Infants were tested individually. They were seated on the lap of the mother/caregiver at a comfortable distance (approximately 60 cm) from a computer screen in a quiet room. Parents were asked to keep their eyes closed while running the experiment in order not to guide their children; however, they had their eyes open during the training phase. The experiment started with a 9-point calibration procedure. The recording of eye movements took place from the onset training session to the end of the experiment via the Tobii Pro X3-120 infrared eye-tracking camera operating at a frequency of 120 Hz interfaced with a computer. Tobii StudioTM (v3.4.8) was used as the platform for recording and analysing eye gaze data.

Data analysis

Following Zhu et al. (2022), to provide an overview of eye movement, statistical models were applied using the lme4 package (Bates et al., 2014) from R (v4.0.4, R Development Core Team, 2021). Bivaried paired student t test, and non-parametric Wilcoxon signed-rank tests were performed for mean comparison and linear mixed-effect models for total fixation duration. The proportion of looking time to the target character was also calculated and computed using the non-parametric Wilcoxon signed-rank test as well as Generalised linear mixed models (GLMMs) (Bolker et al., 2009).

Finally, the GLMMs were also performed to investigate the effect of age and vocabulary on proportions of looking time to the target character in which the proportions of looking time to the Target character were treated as the dependent variable while Condition, Vocabulary (as a continuous variable) and Age (as a continuous variable) were treated as factors.

4.3.2 Results

The mean looking time to each scene (to the Target and the Reverse character) of both conditions (Subject and Object questions) of each of the four-

time windows (Baseline, Sentence 1 (S1), Sentence 2 (S2) and Sentence 3 (S3)) are presented in Table 4.5.

Table 4.5: Mean looking time in ms across the four-time windows of the subject and object questions characters in the target and reverse, infants

	Subject Questions		**Object Questions**	
	Target	Reverse	Target	Reverse
Baseline (0-7s)	1480.6 (816.2)	1613.2 (943.4)	1828.3 (1036.7)	1433.1 (863.4)
Sentence 1 (8-15s)	**1099.7 (877)***	**696 (894.6.3)***	1371.8 (892.4)	1714.1 (1185.8)
Sentence 2 (16-23)	835.1 (896.6)	842.2 (915.7)	1404.3 (991.1)	1177.5 (912.8)
Sentence 3 (24-31s)	862.4 (844)	928.6 (1011)	1278.3 (881.2)	1075.9 (877.5)

Standard deviations in parenthesis.

*p <.05 (in bold) .

Paired t-tests were used on mean looking time for means' comparison. The results reveal that infants showed a significant preference for the target character in subject questions in the first presentation of the subject question (t(48) = 2.279, p = .027, d = .48). No significant preference was found in the second or third presentations of the subject question, nor in the baseline. On the other hand, there was no significant preference for the target character when infants were exposed to the object question neither in any of the three presentations of the question (S1, S2, and S3), nor in the baseline.

The proportions of looking time to the target character (over total looking time to the target and reverse characters) in the four frames were calculated. As illustrated in Figure 4.17, a preference for the target character in the subject *wh-* question condition only emerges in the first presentation of the subject question (Mean = .6386). No significant preference for the target character was found for the object condition.

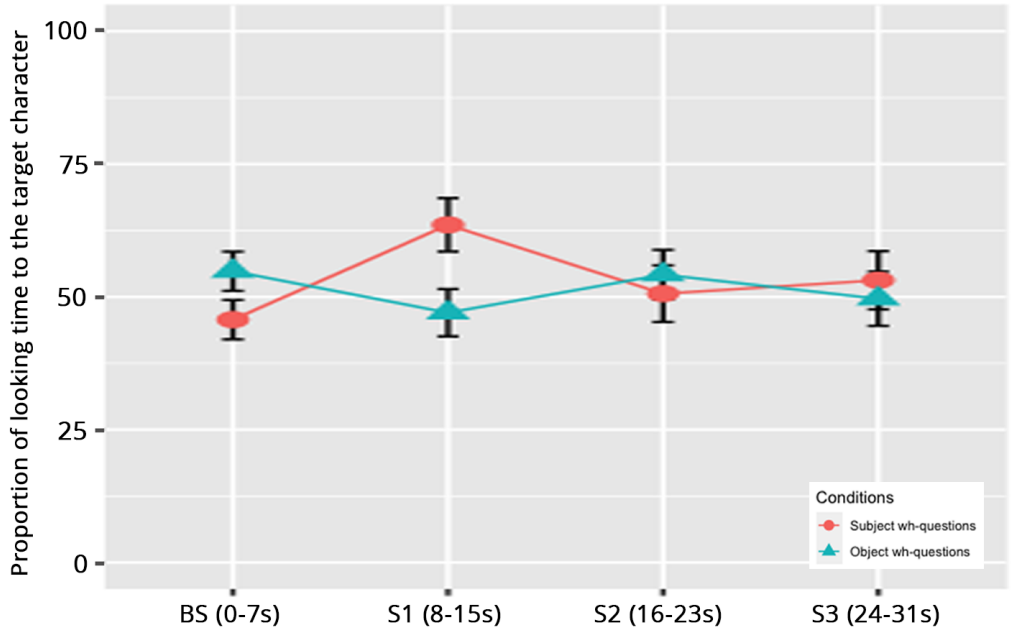


Figure 4.17: Proportions of looking time to the target character in the four windows, infants

The linear mixed-effects models using the lme4 package in R (Bates et al., 2014) with total fixation time in milliseconds as the dependent variable and RoIs and Scene and their interactions as factors showed a main effect of RoIs ($F(3, 343) = 14.13$, $p < .001$), which means that infants performed significantly different depending on which RoIs they were looking at. So I explored this effect in each RoIs.

Table 4.6: Fixed effects from the best-fitting model of the probability of looks to the target and reserve characters in the subject condition, infants

Fixed effects	Estimate	SE	t-value
(Intercept)	30.4	170	.2956
RoIS (S1)	.184	170	.0142 *
RoIS (S2)	.047	170	.5210
RoIS (S3)	.071	170	.3384

Formula in R: Proportion Scene*RoIs+(1+Scene+RoIs—Subject)+ (1+Scene+RoIs—Item)
*$p < .05$ (in bold) .

The proportion of total fixation time to target character over the target and reverse characters was computed using the Wilcoxon signed-rank test. The analysis against chance level, which is defined as 50%, reveals a significant preference for the target over the reverse character in the first presentations of the subject questions ($Z = -2.553$, $p = .011$, $r = .36$). During the object questions condition, the proportion of total fixation time showed no significant preference for the target character in any of the four frames ($p > .05$).

I computed generalized linear mixed models with proportions of the looking times towards the target video as a dependent variable and RoIs (BS, S1, S2, S3), age and vocabulary and their interaction as fixed effects with random intercept and slope for participants and items. A significant effect of RoIs after the first presentation of the sentence was only found in the subject *wh*-

condition (β= .18, SE = .07, t = 2.48, p = .01). This confirms the significant preference for the target over the reverse character in the first presentations of the subject questions. Generalized linear mixed models ran on the ROI that showed a significant effect of condition (S1 in the subject *wh*- question condition) showed no main effect of age (p = .30), no main effect of CDI Comprehension score (p = .29), nor CDI production score (p = .27).

4.4 Experiment 2: The acquisition of *wh*- questions in adults

4.4.1 Method

Materials and procedure

The materials and procedure were similar to the infants' experiment, except for the fact that adults sat alone, whereas infants sat on their parents' laps.

Participants

The adult participants (who acted as a control group) were twenty-three native Palestinian Arabic speakers with a mean age of 36.17 (age range = 19 – 67, SD = 13.52) recruited from the west bank in Palestine.

Data analysis

Bivaried paired student t-test on mean looking time and non-parametric Wilcoxon signed-rank tests were performed for the proportion of looking time to the target character.

4.4.2 Results

The mean looking time in milliseconds across the four frames to the target and reverse characters in both conditions (subject- vs object *wh*- questions) for adults are presented in Table 3.9.

Table 4.7: Mean looking time in ms across the four-time windows to the subject and object questions character in the target and reverse, adults

	Subject questions		**Object questions**	
	Target	Reverse	Target	Reverse
Baseline (0-7s)	1499 (822.6)	1631.2 (844.5)	1382.4 (758.5)	1593 (871.6)
Sentence 1 (8-15s)	**2196.9 (1136.7)*** **	**1096.8 (661)*** **	1687.8 (1148.3)	1566.9 (1055.5)
Sentence 2 (16-23s)	**3229.3 (1429.9)*** **	**163.7 (355.5)*** **	**2951.2 (1473.4)*** **	**498.9 (938.7)*** **
Sentence 3 (24-31s)	**3155.8 (1260.6)*** **	**298.4 (639.8)*** **	**2982 (1516.7)*** **	**336.5 (822.6)*** **

Standard deviations in parenthesis.

***p <.001 (in bold) .

Paired t-tests were used on mean looking time. The results reveal that adults looked significantly longer to the target character in the subject question condition during the first ($t(65) = 6.78$, $p < .001$, Cohen's $d = 1.18$), second ($t(65) = 16.76$, $p < .001$, Cohen's $d = 2.94$) and third presentation of the subject *which* questions ($t(65) = 15.07$, $p < .001$, Cohen's $d = 2.86$). No such preference was found in the baseline. On the other hand, adults looked significantly longer to the target character in the object question condition only during the second ($t(65) = 9.427$, $p < .001$, Cohen's $d = 2.15$) and third ($t(65) = 10.529$, $p < .001$, Cohen's $d = 2.17$) presentations of the object *which* questions. No such preference was found in the baseline or the first presentation of the object *which* questions.

The proportions of looking time to the target character (over total looking time to the target and reverse characters) in the four frames were calculated for adults. As illustrated in Figure 4.17, a preference for the target character in the subject *wh-* question condition occurs in the three presentations of the subject *wh-* question condition (S1 Mean = .6526, S2 Mean = 0.9543, and S3 Mean = .9262). On the other hand, the preference for the target character in the object *wh-* question condition emerges in the second and third presentation of the object question (Mean = .8478, Mean = .8889).

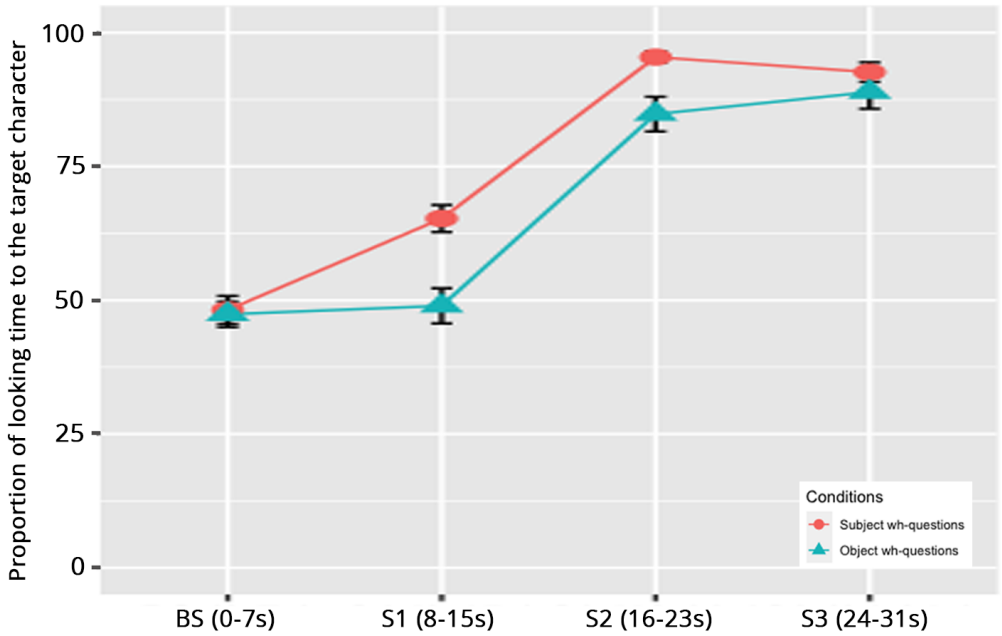


Figure 4.18: Proportions of looking time to the target character in the four-time windows, adults

The analysis against chance level reveals above chance look at the target event in the subject *wh*- question condition in the three presentations of the subject *wh*- question condition (Z = -3.660, $p < .001$, r = .32), (Z = -9.634, $p < .001$, r = .84), (Z = -9.681, $p < .001$, r = .84) respectively), as illustrated in Figure 4.18. On the other hand, the above chance look at the target event in the object *wh*- question condition emerges in the second and third presentation of the object question (Z = -6.071, $p < .001$, r = .75), (Z = -6.5010, $p < .001$, r = .8, respectively).

4.5 Discussion

The comprehension of subject and object *which* questions with pseudo-verbs in native Palestinian Arabic infants aged 18 months as well as Palestinian Arabic speaking adults, has been investigated using the preferential-looking paradigm. The results of the study on adults reveal an above-chance per-

formance in both conditions: subject and object *which* questions, and this corroborates the adequacy of the experimental design. The results of the study on infants indicate that infants acquiring Palestinian Arabic show a preference for the matching character when they heard a subject *wh-* question with a novel verb, but not when they heard an object *wh-* question with novel verb. On the other hand, in the adult experiment, adults directed their gaze toward the target character in both subject and object *wh-* questions. However, for adults, the significant preference for the target character emerged later in the object *wh-* question condition (second and third presentation of the question) than in subject *wh-* questions (first, second and third presentations). Another difference between infants and adults was that adults maintained their gaze on the target character once they had identified it while infants did not. Finally, no preference for the target character was observed in the baseline in infants or adults, as expected.

The main difference in methodology between the Palestinian Arabic and the three English studies by Seidl et al. (2003), Gagliardi et al. (2016), and Perkins and Lidz (2020) was the use of pseudo-verbs rather than familiar verbs in this study. The use of pseudo-verbs to assess whether children aged 18 months have an abstract representation of *wh-* questions or not ensures that children are not performing based on any prior lexical knowledge of the verb. The prediction of my experiments is that, on the one hand, if an adult-like abstract representation of filler-gap dependencies is available for Palestinian native infants at 18 months, they would look longer at the target character when hearing the *wh-* questions. On the other hand, if infants acquired filler-gap dependencies through lexicalized learning as in use-based accounts (Tomasello, 1992, 2000) or rely on the argumental structure of the verb as in the gap-driven learning hypothesis (Perkins & Lidz, 2020), infants will show random behavior due to the use of pseudo-verbs.

The results of my experiment show that children aged 17 to 19 months do understand subject *which* questions but not object *which* questions. The results also show a latency in the preference for the target character in the ob-

ject questions in adults, indicating a slight asymmetrical performance among subject and object *which* questions interpretation. According to Perkins and Lidz (2021), infants know when they have a well-formed or ill-formed subject and object *which* question at 18 months but not at 13, 15 or 17 months. Perkins and Lidz (2021) argued that abstract knowledge of *wh-* dependencies emerges around 18 months using infants' listening time. The results here are in line with these results although the earliest age of my participants is 17 months.

The results of the current study are inconsistent with the results of the study conducted by Perkins and Lidz (2020), who reported symmetrical performance in subject and object *which* questions in English in infants aged 15 months, and the study by Gagliardi et al. (2016), who used the same methodology and found symmetrical performance in subject and object *which* questions in English in infants aged 15 and 20 months.

On the other hand, the results of the study on Palestinian Arabic are partially in line with the study conducted by Seidl et al. (2003), who also used a preferential-looking paradigm and found asymmetrical performance between subject and object *what* questions at 15 months but not at 20 months. Twenty-month-olds showed symmetrical performance in the subject and object *what* questions (Seidl et al., 2003). Gagliardi et al. (2016) and Perkins & Lidz, 2020 proposed that this asymmetry in performance is due to some methodological factors in Seidl et al. (2003). None of the objections raised by Gagliardi et al. (2016) and Perkins and Lidz (2020) against the study by Seidl et al. (2003) apply to the experiment here. First of all, I used puppets to perform the actions rather than inanimate objects. Second, infants were presented with three trials of each question type. Third, I used two videos of the same event; in one video, one puppet (e.g., a brown horse) acted on another puppet (a dog), while in the other video, the role was reversed, and the second puppet (the dog) acted on a third puppet that is of the same type as the first puppet but differed in colour (a grey horse) as illustrated earlier in Figure 4.10 to render the *which* question felicitous. Palestinian infants

showed a preference for the target character in subject questions in this experiment, which means the asymmetric performance cannot be attributed to the low number of trials. Furthermore, it is unclear why such methodological factors would affect the children's performance in object questions but not subject questions.

The vocabulary production mean score in Gagliardi et al. (2016) study was 19.2 (range = 0 to 60) for 15-month-olds and 125 (range = 21 to 574) for 20-month-olds. The vocabulary production mean score for 20-month-olds was higher than that in Palestinian Arabic, where it was 24 (range = 7-47) for infants aged 17-19 month old. On the other hand, the vocabulary production score in Perkins and Lidz (2020) 19 (range = 0-119) was lower than the study on Palestinian Arabic, where it was 24 (range = 7-47). Both Gagliardi et al. (2016) and Perkins and Lidz (2020) considered vocabulary scores in their analysis and found that vocabulary correlates with parsing filler gap dependencies in *wh-* questions in children in the age range of 15 to 20 months. However, in contrast, vocabulary size does not seem to relate to children's performance in Palestinian Arabic within the age range of 17 to 19 months. Still, the age range here is narrower than in Gagliardi et al. (2016) and Perkins and Lidz (2020).

The performance of children in this experiment is consistent with the generative account and cannot be explained by the lexical account, which would predict a random behaviour in both subject and object questions with pseudo-verbs, especially with no prior familiarization with the pseudo-verb in the procedure. The correct parsing of the subject *wh-* questions indicates the presence of abstract syntactic representation of filler gap dependencies in subject *wh-* questions in infants before production starts, as suggested by the VEPS (Wexler, 1998).

The results of the current study on adults reveal, as expected, their ability to parse subject and object *which* questions. Adults also demonstrated a slight asymmetrical performance between subject and object *which* questions. Palestinian Arabic-speaking adults understood subject *which* questions faster

than object *which* questions, as we have seen. These results are consistent with other studies that investigated subject and object *which* questions in adults. For instance, De Vincenzi (1991) reported that adults experienced difficulties with object *which* questions, resulting in poorer performance by having a longer time to understand object *which* questions than subject *which* questions.

One of the available approaches to explain the asymmetrical performance is the Relativized Minimality approach, which was proposed in Friedmann, Belletti, and Rizzi (2009). They argued that the similarity of the intervening subject with the moved object in terms of lexical restriction increased the difficulty in parsing some object *which* questions and object relatives (see also Friedmann & Szterman, 2006, Friedmann et al., 2009, Botwinik, Bshara, & Armon-Lotem, 2015, Grolla & Augusto, 2016, Lau & Tanaka, 2021 and Gavarró & el Hadef, 2023 for relative clauses, among others). However, by hypothesis, Child Relativised Minimality may account for the infants' behaviour, not the adults'.

Under the Relativized Minimality approach, the asymmetrical performance may be attributed to the similarity in φ -features between the NPs in the test questions. In fact, in the experiment here, the subject and the moved object in the three object *which* questions were featurely identical, for instance, a bear and a horse are masculine singular and project an NP. A study conducted by Biran and Ruigendijk (2015) had already identified the impact of gender on the comprehension of object *which* questions (172) in Hebrew, using a picture-matching task as well as a sentence repetition task.

(172) a. Et eize drakon ha-dov kosher?
ACC which dragon.M the-bear.M ties.M?

b. Et eize leican ha-malka mecalemet?
ACC which clown.M the-queen.F photographs.F?

Typically developing Hebrew-speaking children aged 3-6;8 years old were recruited for the study. Asymmetrical performance was observed between subject and object *which* questions in the two experiments. The results also

indicated that the presence of a gender mismatch improved the comprehension of object *which* questions. Table 4.8 presents the percentage of correct responses of Hebrew speaking children on *which* questions in the picture-matching task, and Table 4.9 presents the percentage of correct responses of Hebrew speaking children on *which* questions in the repetition task.

Table 4.8: The performance of Hebrew speaking children on *which* questions in the picture-matching task (%correct), Biran and Ruigendijk (2015).

	***Which* subject**		***Which* object**	
	Same gender	**Diff gender**	**Same gender**	**Diff gender**
3 years	82	67	58	67
4 years	85	95	62	85
5 years	94	94	66	96
6 years	93	97	57	85
Total	89	88	60	83

Table 4.9: The performance of Hebrew speaking children on *which* questions in the repetition task (%correct), Biran and Ruigendijk (2015).

	***Which* subject**		***Which* object**	
	Same gender	**Diff gender**	**Same gender**	**Diff gender**
3 years	62	54	33	37
4 years	91	87	64	51
5 years	92	100	93	92
6 years	80	100	90	100
Total	81	85	70	70

A similar effect was also discovered by Belletti, Friedmann, Brunato, and Rizzi (2012) in their study on the comprehension of relative clauses, where intervention effects were also observed. The effect of gender was investigated using a sentence–picture matching task in two languages with two different

statuses for gender: Hebrew and Italian. In Hebrew, gender is included in the characteristics of the clausal inflectional head, and thus it is one of the features that attract the subject (as is also the case in Palestinian Arabic). intervention effects on the other hand, in Italian, where gender is not reflected in verbal inflection, it does not play a role in inducing intervention effects. The study involved 62 children ranging in age from 3 years and 9 months to 5 years and 5 months. Among them, 31 were native speakers of Hebrew, and the other 31 were native speakers of Italian. The experiment was a sentence-picture matching task, and the materials are illustrated in Figure 4.19.

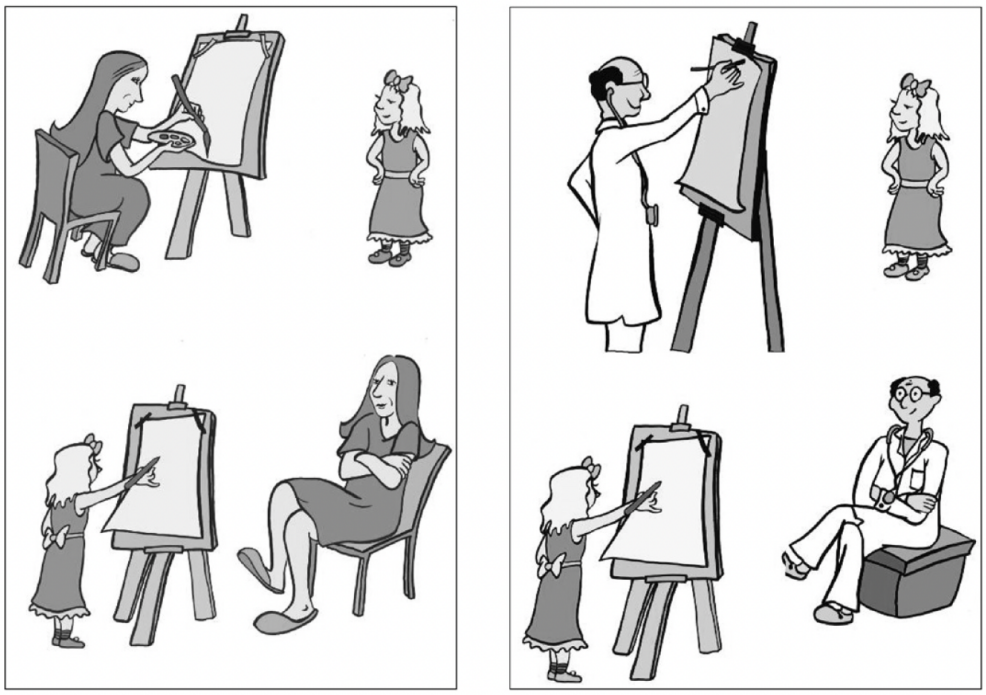


Figure 4.19: Visual stimuli used in Belletti, Friedmann, Brunato, and Rizzi (2012)

All the depicted figures and noun phrases were in the singular form. In half of the relative clauses, the figures shared the same gender, such as a feminine grandmother and a feminine girl, or a masculine elephant and a masculine lion. In the remaining half, the figures had different genders,

such as a feminine girl and a masculine boy, or a masculine penguin and a feminine she-rabbit. The test included four types of relative clauses: subject relative clauses with the relative head and the embedded object having the same gender (173a), subject relative clauses with the relative head and the embedded object having different genders (173b), object relative clauses with the relative head and the embedded subject having the same gender (173c), and object relative clauses with the relative head and the embedded subject having different genders (173d).

(173) a. Tare li et ha-isha she-mecayeret et ha-yalda.
show to-me ACC the-woman that-draws.F ACC the-girl
'Show me the woman that draws the girl.'

b. Tare li et ha-rofe she-mecayer et ha-yalda.
show to-me ACC the-doctor that-draws-masc ACC the-girl
'Show me the (male)doctor that draws the girl.'

c. Tare li et ha-yalda she-ha-isha mecayeret.
show to-me ACC the-girl that-the-woman draws.F
'Show me the girl that the woman draws'

d. Tare li et ha-yalda she-ha-rofe mecayer.
show to-me ACC the-girl that-the-doctor draws.M
'Show me the girl that the (male)doctor draws.'

Belletti et al. (2012) reported that while gender mismatch led to a significant improvement in the comprehension of object relatives in Hebrew, its impact on comprehension in Italian was not statistically significant.

To the best of my knowledge, no previous studies have investigated the early acquisition of filler gap dependencies in *wh-* questions in Palestinian Arabic infants or the comprehension of *wh-* questions in Palestinian Arabic adults. Comparing the findings of this study with a study on a language that is close to Palestinian Arabic, Hebrew, the findings of the current study are in line with what was found by Friedmann and Szterman (2011) according to whom typically developing Hebrew-speaking children aged 9-12 years old performed better in comprehending subject *which* questions as in (174) than object *which* questions as in (175), using a picture selection task.

(174) Eyzo yalda melatefet et ha-ima?
which girl caresses ACC the-mother
'Which girl caresses the mother?'

(175) Et eyzo yalda ha-ima melatefet?
ACC which girl the-mother caresses
'Which girl does the mother caress?'

Similar results were reported earlier in Friedmann et al. (2009) with Hebrew-speaking children with mean age of 4;3. Friedmann et al. (2009) examined the comprehension of *which* (176) and subject and object *who* questions (177) in 22 Hebrew-speaking speakers 3;7–4;10 years using a picture selection task. Pictures with three animals (two of them of the same type and one of a different type) were used in this task, as illustrated in Figure 4.20. As in my experiment in Palestinian Arabic, in which all characters were always of the same gender and number, every sentence in the experiment in Hebrew contained nouns that consistently shared the same gender and number.

(176) a. Eize kelev noshex et ha-xatul?
which dog bites ACC the-cat
'Which dog bites the cat?'

b. Et eize kelev ha-xatul noshex?
ACC which dog the-cat bites-him
'Which dog does the cat bite?'

(177) a. Mi noshex et ha-xatul?
who bites ACC the-cat
'Who bites the cat?'

b. Et mi ha-xatul noshex?
ACC who the-cat bites
'Whom does the cat bite?'

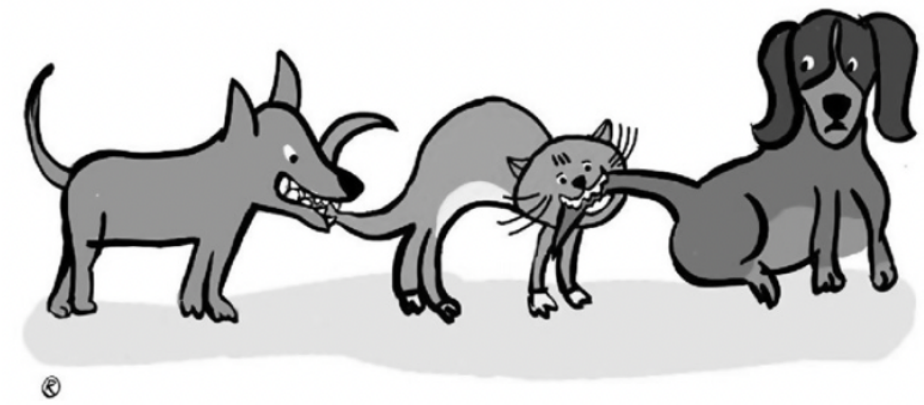


Figure 4.20: Visual stimuli used in Friedmann, Belletti, and Rizzi (2009)

Asymmetric performance was reported between subject and object *wh*- questions, with more difficulty interpreting object *which* questions than all *who* and subject *which* questions. These children performed significantly better (78%) in the comprehension of the subject *which* questions than the object *which* questions (58%), and Friedmann et al. (2009) explained such a pattern as a result of the crossing element and the intervener including a lexical NP restriction in object *which* questions.

These asymmetries have been found in numerous studies. See Friedmann and Haddad-Hanna (2014) for Palestinian Arabic speakers and Friedmann and Szterman (2006) for Hebrew speakers who are older and affected by hearing loss, Friedmann and Szterman (2009), Friedmann and Novogrodsky (2011) and Biran and Ruigendijk (2015) for Hebrew, Guasti, Branchini, and Arosio (2012) for Italian, Metz, van Hout, and van der Lely (2010) for Dutch, Stewart and Sinclair (1975) and Avrutin (2000) for English who found that children's performance on subject and object *which* questions is different. Children performed worse in the object *which* in which the crossing element and the intervener included a lexical NP restriction compared to subject *which* questions and other types of object questions (i.e., *who* object question) in which no such lexical NP restriction appeared.

Finally, some researchers attribute the asymmetrical performance in com-

prehending subject and object *wh*- questions, especially since children were found to be able to produce object *wh*- questions around age 1;10 (Stromswold, 1995), to processing-base rather than a lack of abstract knowledge. In fact, Friedmann et al. (2009) also cast their hypothesis in the processing of *wh*-movement. Still, the question remains as to why the infants aged 15 and 20 months in Gagliardi et al. (2016) comprehend object *wh*- questions or infants at 18 months processed the object *wh*- questions as grammatical in Perkins and Lidz (2021) while the infants aged 17-19 months here did not. As mentioned, the Child Relativized Minimality account is hard to reconcile with asymmetries when found in adults.

Chapter 5

Conclusions and further work

The primary objective of this thesis was to investigate the early acquisition of word orders before the onset of two words stage in a specific variety of spoken Arabic, namely Palestinian Arabic. The early acquisition of the parameter responsible for the VO/OV alternation in Palestinian-Arabic was investigated in infants aged between 15 and 19 month old. Similarly, the parameter corresponding to *wh-* movement in interrogatives was investigated in infants aged between 17 and 19 month old using the preferential-looking paradigm and the use of pseudo-verbs.

As a background to the two experimental studies presented in this thesis, a corpus of child production and child-directed speech for Palestinian-Arabic was established and uploaded to the CHILDES platform (MacWhinney, 2000). The analysis of word order frequencies of the child production and child-directed speech (in chapter 2) revealed that the predominant word order used in spontaneous speech among children in Palestinian Arabic is SVO with a percentage of 85% of the sentences containing the two arguments. Among adults, when a sentence includes an object, 71.48% of them appeared in the VO order, while 94.12% of them were VO order in children. During my analysis, I observed the use of serial verb constructions in Palestinian Arabic children as early as 23 months of age. I have also found a very low incidence of subject-verb agreement errors in young children, with an average of only 1.92% of the total speech samples within the tested age range.

Given that none of the Palestinian Arabic-speaking children insert the copula where it isn't inserted in the adult language (no copular sentences in the present tense), the prediction made by Wexler (2011) that Arabic-speaking children are not expected to insert a copula in sentences where adults don't is fulfilled.

The analysis also showed high percentages of occurrence of null subjects in the production of both children (76.25%) and adults (79.30%), with no significant difference between the proportions of null subjects in the two groups. Regarding *wh*- questions, the results showed that they were overwhelmingly *wh*- movement questions, with very marginal in-situ *wh*-questions (only two question in the children's production). I have also made some findings about adult Palestinian Arabic which indicate that SVO is absolutely predominant, accounting for 63% of the sentences with overt subject and object, over VSO, which was very marginal with only 2% of such sentences. Additionally, the in-situ *wh*- questions are very marginal (only 8 questions out of the 688 questions in the adults production) and the majority of *wh*-questions are *wh*- movement questions.

Let us return to the research question of whether native Palestinian-Arabic children in the tested age range have set the values for the parameter responsible for the VO/OV alternation, as well as the parameter responsible for *wh*- movement. The evidence from the two experimental studies in this thesis is that children have indeed set the values of the VO parameter as well as the parameter responsible for *wh*- movement within the tested age range. Moreover, the results of the two experimental studies did not reveal any significant effect of age or vocabulary size within the age ranges that were tested (15-17 months in the first experiment and 17-19 months in the second experiment). The lack of an age and vocabulary size effect in the first experiment and in the second experiment implies that knowledge of VO and the syntactic representation of filler-gap dependencies in subject *wh*-questions is possessed earlier than 18 months of age.

In line with the few studies on the setting of the VO/OV parameter before

the two-words production stage (French, Franck et al., 2013; Hindi-Urdu, Gavarró et al., 2015; Mandarin, Zhu et al., 2022), the findings of the first experiment on setting the VO parameter challenged the claim made by the usage-based approach (Tomasello, 1992) that children acquire word order on a verb-by-verb basis. Within the tested age range infants parsed grammatical SVO sentences with pseudo-verbs, despite lacking lexical knowledge of those verbs. This suggests that they must possess abstract syntactic representations to parse such sentences. Furthermore, infants ignore word orders that do not align with the grammatical restrictions of the target language, indicating that they are no longer able to parse constructions that deviate from it, and that an AGENT-first strategy is not at play. Finally, in my experiment I have infants with a mean age of 17 months, younger than in most VO/OV studies, but also weaker results, since I only found significantly longer looks to the target in one window (cf. Mandarin).

The second study contributes new data on the interpretation of Palestinian Arabic *wh-* questions with a method that, I believe, is improved from previous methods in two respects: the use of pseudo-verbs and a new way to determine the Region of Interest in the gazing behaviour, based on looks to a character, rather than a scene, which departs from a more standard analysis of preferential-looking paradigm studies in which eye movements are interpreted by testing whether participants look at an event or another. This study concludes that native Palestinian-Arabic infants have an abstract representation of filler-gap dependencies in subject *wh-* questions but this cannot be demonstrated for object *wh-* questions. This re-opens the case of the well-known subject-object asymmetry in *which-* questions and relative clauses in the literature. The results from this study contradict the claims of the gap-driven learning hypothesis, which posits that children rely on the argumental structure of the verb when parsing filler-gap dependencies, for the age range tested (tested younger ages remains for future research).

These results bear on two options that the infant has in the development of his/her grammar: a VO grammar (as opposed to an OV grammar), and a

grammar with *wh-* movement (as opposed to a grammar with *wh-* in situ). For both choices, I argue that the target parameter value has been set by 17 to 18 months. The results of the two experiments are consistent with the generative approach and provide evidence in favour of Very Early Parameter Setting.

The results in this thesis open up the possibility for many follow-up studies. To start with studies conducted with young children, one could consider the reason why some findings in the existing literature on basic word order in Palestinian Arabic such as the studies by Khamis-Dakwar (2011) and Friedmann and Costa (2011) are very different from the results from the spontaneous production study here. A possibility that comes to mind is the design of an experiment eliciting various word orders, including SVO, but in which the pragmatic context of the sentences was taken into account.

For infants, I have found evidence for the VO order setting in an SVO language with no case markers and no scrambling, a result similar to that obtained for French by Franck et al. (2013) and later in a language with null arguments, namely Mandarin by Zhu et al. (2022). My results revealed that native Palestinian-Arabic infants could parse VO order but not OV order at the tested age range. However, the results obtained were weaker than those obtained in French and Mandarin (meaning that infants look at the target for just one window). The reason why this effect was weaker remains a question for future research. Testing younger infants and older children also remains for future research. To exclude these results being an experimental artifact, we might also want to investigate word order using other measurement techniques such as EEG or fMRI. Another finding from the current experiment is that, similar to Finnish adults but in contrast to Mandarin adults, Palestinian adults interpreted sentences even when they were ungrammatical. It would be interesting to investigate if that relates in any systematic way to the adult grammar of the respected languages (Mandarin being more rigid in word order than perhaps Finnish or Palestinian Arabic).

Finally the results obtained from the second experiment on the comprehen-

sion of *wh-* questions revealed that children aged 17 to 19 months could understand subject *which* questions but not object *which* questions by that age. The question remains whether this is due to methodological factors or truly derives from grammatical or processing sources. Therefore, one could investigate *wh-* comprehension with alternative methods, as well as extend the age range tested. One would expect older children to show comprehension of subject and object *wh-* questions and younger infants to reach a point where no *wh-* question was comprehended. Moreover, since adults also showed a slight asymmetrical performance between subject and object *wh-* question interpretation, which can not be explained by child Relativised Minimality, a hypothesis encompassing child and adult results would be germane.

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5.1 Ethical Letter Approval

UAB
Universitat Autònoma de Barcelona
Vicerectorat d'Investigació

Comisión de Ética en la Experimentación Animal y Humana (CEEAH)
Universitat Autònoma de Barcelona
08193 Bellaterra (Cerdanyola del Vallès)

La Comisión de Ética en la Experimentación Animal y Humana (CEEAH) de la Universitat Autònoma de Barcelona, reunida el día **10-12-2021**, acuerda informar favorablemente el proyecto con número de referéncia **CEEAH CA23** y que tiene por título **"Comprehension of word order in infants of 19 months exposed to Palestinian Arabic"** presentado por **Tala Nazzal.**

Elaborado:	**Aprobado:**
Nombre: Nuria Perez Pastor Cargo: Secretària de la CEEA de la UAB Fecha:	Nombre: José Luis Molina González Cargo: President de la CEEAH de la UAB Fecha:

5.2 Information Sheet-English Version

Universitat Autònoma de Barcelona

Centre de Lingüística Teòrica

Knowledge of the VO parameter value at 19 months of age: Evidence from Palestinian-Arabic - *Information Sheet*

You and your child are being invited to take part in a research project. Before you decide whether or not to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if deemed necessary. Please request further information if you need more clarification from our side. Take time to decide whether or not you wish to take part. Thank you for reading this.

This information sheet provides you with information about the study. You can decide whether you would like to take part after reading this sheet. You can ask the researcher any question you need on your involvement in this study.

What is the project's purpose?

This study aims to assess the early acquisition of syntactic knowledge in typically developing Palestinian-Arabic Speaking children aged between 16 and 19 months old from Palestine using eye-tracker.

Do my child have to take part?

It is up to you to decide whether for your child to take part or not. After you have read this information sheet, you can decide whether or not your child to take part in the study. If you choose to take part, you will be given consent form to sign. At any stage, you and your child are free to withdraw from this project without giving any reason and without bearing any negative consequences. If you withdraw from the study at any time, all your data will be deleted.

What will happen to my child if s/he take part? What do they have to do?

They will be asked to sit on the lap of the mother/caregiver at a comfortable distance (approximately 60 cm) from a computer screen. Parents will be asked to keep their eyes closed while running the experiment, not to guide their child. We will record infants' eye gaze patterns while they are listening to spoken utterances using canonical and non-canonical word orders in Palestinian Arabic.

Study duration

Each experiment takes approximately 20 minutes.

What are the possible benefits, disadvantages and risks of taking part?

No physical or psychological harm is expected nor you will bear any negative consequences. There are no direct benefits for you to gain. However, your participation will help in understanding infants' emergent language knowledge before production starts.

Will my taking part in this project be kept confidential?

Participants will be anonymized in all recordings with an ID number anonymised from the beginning of the study, so the child will not be identifiable. Data files will only be available for the research project team. Participants will be referred to anonymously in publications arising from the project.

Who has ethically reviewed the project?

The project has been reviewed via Universitat Autònoma de Barcelona ethics review procedure, as administered by Departamento de Filología Catalana. The University's Research Ethics Committee monitors the application and the delivery of the university's ethics review procedure across the university.

Contact for further information

Researcher: Tala Nazzal
Universitat Autònoma de Barcelona
Barcelona
Spain
tala.nazzal@-campus.uab.cat

Supervisor: Anna Gavarró
Universitat Autònoma de Barcelona
Barcelona
Spain
Anna.Gavarro@uab.cat

You will be given a copy of the information sheet and the signed consent form for your own reference.

Thank you for considering taking part in this study

5.3 Information Sheet-Arabic Version

Universitat Autònoma de Barcelona

Centre de Lingüística Teòrica

Knowledge of the VO parameter value at 19 months of age: Evidence from Palestinian-Arabic

ورقة معلومات خاصة بالمشاركين

أنت وطفلك مدعوان للمشاركة في مشروع بحث. قبل ان تقرر ما إذا كنت ستقبل أو ترفض المشاركة، فإن من المهم أن تعي ماهية هذا البحث وماذا سيتناول. الرجاء اخذ الوقت الكافي لقراءة المعلومات التالية بعناية ومناقشتها مع اخرين اذا رغبت، وعدم التردد في السؤال أو الاستيضاح عما تراه بحاجة الى مزيد من الايضاحات. الرجاء أخذ ما يلزم من الوقت كي تقرر ما اذا كنت تقبل او ترفض المشاركة، شاكرين لك قيامك بقراءة هذه الورقة.

ورقة المعلومات هذه تزودك بمعلومات حول البحث. ولك ان تقرر ما اذا كنت ترغب وطفلك في، أو تمتنع عن المشاركة بعد قراءة هذه الورقة. بإمكانك الاستفسار من الباحث عن أي سؤال لديك يتعلق بمشاركتك.

هدف المشروع

تهدف هذه الدراسة لدراسة اكتساب اللغة عند الأطفال الفلسطينيين العرب والذين تتراوح أعمارهم بين 16 و19 شهر نحن تجريبيًا باستخدام مراقبة تتبع حركة العين.

هل يتوجب علي المشاركة؟

الأمر متروك لك لتقرر ما إذا كنت ستشارك أم لا. حالما قررت المشاركة ، سيتم إعطاؤك ورقة المعلومات هذه مرفقة بنموذج موافقة لنقوم بالتوقيع عليه. سيكون في إمكانك الانسحاب من هذا المشروع في أي وقت دون إبداء أية اسباب و بدون تحمل أية عواقب سلبية وسيتم حذف بياناتك من الدراسة.

ماذا على طفلي أن يفعل إذا شارك في الدراسة؟

سيطلب من الأطفال المشاركين والذين تتراوح أعمارهم بين ١٧ و ١٩ شهر مشاهدة زوج متزامن من مقاطع الفيديو الذي تصور الشخصيات (الدمي) المستخدمة على شاشة الكمبيوتر، مصحوبة بالتزامن مع سماعه لجمل مسجلة مسبقا باللهجة الفلسطينية بينما يتم تتبع حركة عينه.

المدة الزمنية

تستغرق كل تجربة حوالي ٢٠ دقيقة.

المخاطر والفوائد المحتملة من المشاركة

ليست هناك أية أضرار جسدية او نفسية متوقعة أو أية عواقب سلبية. لا توجد فوائد مباشرة للمشاركة. ومع ذلك، فإن مشاركتك ستساعد في فهم اكتساب اللغة عند الأطفال الفلسطينيين على عمر مبكر.

السرية والخصوصية

سيتم تجميع بيانات تتعلق بحركة عين الطفل بالإضافة الى جنسه وعمره. ستكون المعلومات التي يتم جمعها مجهولة المصدر، ولن تتم إضافة أي معلومات تحدد هوية الطفل. في حال موافقتك على مشاركة طفلك/طفلتك سيكون الباحث والمشرف هما الشخصان الوحيدان اللذان يستطيعان الوصول إلى البيانات. لن يكون ممكنا التعرف على المشاركين في أي تقارير أو عروض تقديمية للبيانات.

من قام بمراجعة المشروع أخلاقياً؟

تمت مراجعة المشروع من خلال "آلية مراجعة الأخلاقيات بجامعة برشلونة المستقلة، وفقًا لإدارة الخدمات الاحترافية". تراقب لجنة أخلاقيات البحث في الجامعة تطبيق إجراءات مراجعة أخلاقيات الجامعة عبر الجامعة.

الباحثة: تالا نزال
جامعة برشلونة المستقلة
برشلونة - إسبانيا
tala.nazzal@-campus.uab.cat

المشرفة: آنا غافارو
جامعة برشلونة المستقلة
برشلونة - - إسبانيا
Anna.Gavarro@uab.cat

نشكرك على المشاركة في هذه الدراسة !

5.4 Consent Form-Spanish Version

Laboratori d´Adquisició i Patologia (APL)

Centre de Lingüística Teòrica. Universitat Autònoma de Barcelona

FORMULARIO DE CONSENTIMIENTO

Investigadora principal:
Dra. Anna Gavarró Algueró, Directora del Centre de Lingüística Teòrica CLT, UAB.

Descripción del proyecto de investigación:
El Centro de Lingüística Teórica realiza un estudio sobre la adquisición de la sintaxis del árabe palestino. Nos proponemos investigar experimentalmente, mediante el recurso a la monitorización de la fijación de la mirada (eye-tracking), el establecimiento de parámetros funcionales en niños de 16-19 meses. Es por este motivo que le pedimos su consentimiento expreso para participar en el estudio.

El estudio requiere que los participantes miren una serie de videos animados en una pantalla del ordenador acompañados de algunas frases en árabe palestino mientras el aparado monitoriza cada movimiento de los ojos. La duración del estudio es aproximadamente 20 minutos.

Anonimato:
El investigador preservará en todo momento el anonimato del participante. Una vez se han recogido los datos, a cada participante se le asigna un código para que sea identificado en el contexto de la investigación, así como en la difusión de los resultados de la misma. De los resultados se hará un uso exclusivamente científico y su participación es totalmente voluntaria -puede dejar el estudio en cualquier momento sin que haya ninguna consecuencia. Si algún participante/tutor legal decide retirarse del estudio, se destruirán inmediatamente todos los datos sobre los mismos.

Le agradecemos sinceramente su colaboración, cualquier cosa que necesite, no dude en ponerse en contacto con Anna Gavarró (anna.gavarró@uab.cat) o Tala Nazzal (tala.nazzal@e-campus.uab.cat).

Nombre y firma del participante o de la persona responsable:

Nombre y firma de la persona que realiza el experimento):

5.5 Consent Form-Arabic Version

Laboratori d´Adquisició i Patologia (APL)
Centre de Lingüística Teòrica. Universitat Autònoma de Barcelona
FORMULARIO DE CONSENTIMIENTO

نموذج موافقة خاص بأهالي الأطفال المشاركين

الباحث الرئيسي:
د. أنا غافارو، مدير مركز اللغويات النظرية، جامعة برشلونة المستقلة.

وصف الدراسة:
يجري مركز اللغويات النظرية دراسة حول اكتساب اللغة والنحو للهجة العربية الفلسطينية. من جانبنا سنقوم بإجراء بحث تجريبي، باستخدام جهاز يراقب تتبع حركة العين، لقياس المؤشرات الوظيفية لدى الأطفال في إنشاء معلمات وظيفية لدى الأطفال الذين تتراوح أعمارهم بين 16 و 19 شهرًا، وعليه فإننا موافقتك الصريحة على مشاركة طفلك في هذا البحث.

تتطلب الدراسة من المشاركين مشاهدة سلسلة من مقاطع الفيديو المتحركة على شاشة الكمبيوتر بالتزامن مع بعض العبارات باللهجة الفلسطينية بمساعدة الدمى حيث سيراقب الجهاز حركة كل عين. وستستغرق الدراسة حوالي 20 دقيقة.

الخصوصية والسرية:
سيحافظ الباحث في جميع الأوقات على سرية هوية المشاركين. سيتم تعيين رمز لكل طفل مشارك، بمجرد جمع البيانات، وسيعتمد هذا الرمز في سياق البحث، ونشر النتائج التي ستستخدم النتائج حصريًا للأغراض العلمية .المشاركة في هذا البحث طوعية تمامًا ويمكنك الانسحاب في أي وقت دون أن يترتب على ذلك أية مسؤولية.، وفي حال قرر أي مشارك / وصي قانوني الانسحاب سيتم إتلاف جميع البيانات المتعلقة به على الفور.

نقدر عميقاً تعاونك كمسؤول/ وصي قانوني، ونرجو عدم التردد في التواصل معنا بشأن أية استفسارات لديكم:
آنا غافارو (anna.gavarró@uab.cat) وتالا نزال (tala.nazzal@e-campus.uab.cat)

اسم وتوقيع الشخص المسؤول /وصي قانوني عن الطفل المشارك:

اسم وتوقيع الباحث الذي أجرى التجربة:

5.6 Palestinian Experiment I Test sentences

Table 5.1: The full set of audio stimuli during the experiment

Phase		**Audio**
Familiarization	Character identification	ʃu:f, mi:n fi: ho:n? ha:d ʔel-kalb.
		'Look, who's here? It's the dog'
		ʃu:f, mi:n ha:d? ha:d leħma:r.
		'Look, what's this? It's the donkey'
		ʔettˤalaʕ, ʃa:yef mi:n fi: ho:n? ha:d ʔel- ʔasad.
		'Look, do you see who's here? It's the lion'
		ʃu:f, mi:n ho:n? ha:d leħ sˤa:n.
		'Look, who's here? It's the horse'
		ʃu:f, mi:n ho:n? hay ʔel-baqara.
		'Look, who's here? It's the cow'
		ʔettˤalaʕ, ʃa:yef mi:n fi: ho:n? ha:d ʔel-xaru:f.
		'Look, do you see who's here ? It's the sheep'
	Simultaneous presentation	ʃu:f, ʃa:yef ʔel-kalb? we:n ʔel-kalb
		'Look do you see the dog? Where is the dog?'
		ʃu:f, ʃa:yef leħma:r? we:n leħma:r?
		'Look do you see the donkey? Where is the donkey?'
		ʃu:f, ʃa:yef ʔel-ʔasad? we:n ʔel-ʔasad?

		‘Look do you see the lion? Where is the lion?’
		ʃu:f, ʃa:yef leħsˤa:n? we:n leħsˤa:n?
		‘Look do you see the horse? Where is the horse?’
		ʃu:f, ʃa:yef ʔel-baqara? we:n ʔel-baqara?
		‘Look do you see the cow? Where is the cow?’
		ʃu:f, ʃa:yef ʔel-xaru:f? we:n ʔel-xaru:f?
		‘Look do you see the sheep? Where is the sheep?’
	The novel actions	ʔettˤalaʕ, ʃu: bisˤi:r?
		‘Look, what is happening?’
Testing	Well-formed sentences (SVO)	ʔel-kalb besayyeʕ leħma:r
		‘The dog PSEUDO-VERB the donkey.’
		ʔel-ʔasad besayyeʕ leħsˤa:n.
		‘The lion PSEUDO-VERB the horse.’
		ʔel-baqara betsayyeʕ ʔel- xaru:f.
		The cow PSEUDOV-f the sheep.’
	Ill-formed sentences (SOV)	ʔel-baqara ʔ-el ʔasad btemraʃ.
		‘The cow the lion PSEUDO-VERB.’
		leħma:r ʔel-kalb bemraʃ.
		‘The donkey the dog PSEUDO-VERB.’
		ʔel-xaru:f leħsˤa:n bemraʃ.
		‘The sheep the horse PSEUDO-VERB’

5.7 Palestinian Experiment II Test sentences

Table 5.2: The full set of audio stimuli of experiment II

Phase		**Audio**
Familiarization phase	Character identification	ʃu:f, mi:n ha:d? ha:da ʔel- ʔarnab.
		Look, what's this? It's the rabbit.
		ʔettˤalaʕ, ʃa:yef mi:n fi: ho:n? ha:da kama:n ʔarnab.
		Look, do you see who's here? It's another rabbit
		ʃu:f, mi:n ha:d? ha:da ʔel-xaru:f.
		Look, do you see? It's the sheep.
		ʃu:f, mi:n ha:d? had:a ħsˤa:n.
		Look, do you see who's here? It's a horse
		ʃu:f, mi:n fi: ho:n? ha:da kama:n ħsˤa:n.
		Look, who's here? It's another horse.
		ʃu:f, mi:n fi: ho:n? ha:da dub.
		Look, who's here? It's a bear.
		ʃu:f, mi:n fi: ho:n? ha:da kama:n dub
		Look, do you see who's here ? It's another bear.
		ʔettˤalaʕ, ʃa:yef mi:n fi: ho:n? ha:da ʔel-kalb.
		Look, do you see who's here? It's the dog.
	Simultaneous presentation	Wa:w, ʔettˤalaʕ, ɣe:r ʕan baʕadˤ, ha:d ʔel-ʔarnab ɣe:r ʕan ha:d ʔel-ʔarnab

Wow, look! They're different! this rabbit is different than this rabbit
Wa:w, ʔettˤalaˤ, meʃzay baˤadˤ, ha:d leħsˤa:n ɣe:r ˤan ha:d leħsˤa:n
Wow, look! They're not the same! this horse is different than this horse.
Wa:w, ʔettˤalaˤ, ɣe:r ˤan baˤadˤ, ha:d ʔed-dub ɣe:r ˤan ha:d ʔed-dub
Wow, look! They're different! this bear is different than this bear
ʔettˤalaˤ, ʃa:yef ʔel-kab? we:n ʔel-kalb?
Look do you see the dog? Where is the dog?
ʔettˤalaˤ, ʃa:yef leħsˤa:n? we:n leħsˤa:n?
Look do you see the horse? Where is the horse?
ʔettˤalaˤ, ʃa:yef ʔed-dub? we:n ʔed-dub?
Look do you see the bear? Where is the bear?
ʔettˤalaˤ, ʃa:yef ʔel-ʔarnab? we:n ʔel-ʔarnab?
Look do you see the rabbit? Where is the rabbit?
ʔettˤalaˤ, ʃa:yef ʔel-xaru:f? we:n ʔel-xaru:f?
Look do you see the sheep? Where is the sheep?
ʔettˤalaˤ, ʃa:yef leħsˤa:n? we:n leħsˤa:n?
Look do you see the horse? Where is the horse?
ʔettˤalaˤ, ʃa:yef ʔed-dub? we:n ʔed-dub?
Look do you see the bear? Where is the bear?
ʔettˤalaˤ, ʃa:yef ʔel-ʔarnab? we:n ʔel-ʔarnab?
Look do you see the rabbit? Where is the rabbit?

	The novel actions	ʔettˤalaˤ, ʃu: bisˤi:r? ʃa:yef ʔe:ʃbisˤi:r?
		Look, what is happening? Can you see what is happening?
Test phase	Subject *wh*-questions	ʔay ʔarnab besayyeˤleħsˤa:n?
		Which rabbit is PSEUDO the horse?
		ʔay dub besayyeˤʔel-xaru:f?
		Which bear is PSEUDO the sheep?
		ʔay ħsˤa:n besayyeˤʔel-kalb?
		Which horse is PSEUDO the dog?
	Object *wh*-questions	ʔay dub leħsˤa:n bemraʃ-(u)?
		Which bear the horse is PSEUDO-him?
		ʔay ħsˤa:n ʔel-xaru:f bemraʃ-(u)?
		Which horse the sheep is PSEUDO-him?
		ʔay ʔarnab ʔel-kalb bemraʃ-(u)?
		Which rabbit is the dog is PSEUDO-him?