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Referential form, word order and emotional valence in Turkish pronoun resolution in physical contact events

Abstract: This study investigates the effect of information structure (revealed in SOV versus OSV orders), the type of anaphoric expression (zero versus overt pronouns), and the verb valence (positive valence versus negative valence) on the interpretation of ambiguous pronouns in Turkish physical contact action verbs. Turkish speaking adult participants were asked to determine the reference for a nonsense adjectival predicate in an utterance with an action verb and two clauses connected by a causal connector 'because'. We found that there was a greater subject preference when the subject was located preverbally in the focus position. Participants linked the null pronoun to the subject in the SOV order regardless of the verb valence. In the overt pronoun condition in the SOV order, they took the overt pronoun as coreferential with the object in the positive valence verbs while linking it to the subject in the negative valence verbs. We argued that the topic shifting mission of the overt pronoun may change according to the context such that the overt pronoun shifts the topic from the subject to the object in the positive valence events while keeping the topic constant in the negative valence events. There was also an increase in the subject reference in the OSV order, which revealed that the entity salience increases with the combined effect of subjecthood and focushood. Finally, there was a greater subject preference in the positive valence verbs than in negative valence verbs in the OSV order, which suggests that the information structure locating the object as the topic (i.e., given) entity might be decreasing the causality attribution to the subject in these contexts.

1 Introduction

Mary called Sally; Mary said hello and Mary stopped. One immediately realizes that something is wrong in this utterance. Repeating the proper name provides more information than necessary, creates a redundancy, and disrupts the flow of

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interpretation. We generally do not repeat overt lexical items unless we have a good reason to do so. Instead, we refer to entities already available in discourse using pronouns or null pronouns, as in *Mary called Sally; she said hello and stopped*. Despite being far more natural, the latter utterance involves an ambiguous pronoun *she* that could refer to the subject or the object equally possibly. Then, it is clear that finding the correct reference for an ambiguous referential expression may not be straightforward even within a coherent discourse. It requires complex task of determining who the speaker is, who/what the utterance is about, what kind of event structure is involved, who the participants are, what coherence relations exist among the events/utterances, what may happen next and what the language model structurally requires.

How we identify the antecedent of an ambiguous pronoun has been a topic of interest in discourse anaphora studies. Many of the theories assume that the most prominent or accessible entities in discourse are more actively represented in the mental model of the speaker and the hearer, so they are more likely to be re-mentioned in the upcoming utterance and more likely to be referred with shorter forms of referential expressions (e.g., overt pronouns, zero pronouns) whereas the less accessible ones are re-mentioned with longer referential expressions (e.g., overt lexical items, proper names, modified nouns) (Ariel 1990; Brennan 1993; Gundel, Hedberg, and Zacharski 1993). Similarly, more accessible referents are more likely to be picked as an antecedent for anaphors during interpretation. Different factors have been proposed to determine prominence such as topicality (Givon 1983), givenness (Gundel, Hedberg, and Zacharski 1993; Arnold 1998), parallel roles (Smyth 1994; Chambers and Smyth 1998), or recency (Arnold 1998), syntactic role (Crawley, Stevenson, and Kleinman 1990), thematic role (Stevenson, Crawley, and Kleinman 1994; Garvey and Caramazza 1974; Arnold 2001), verb type (Garvey and Caramazza 1974), coherence relations and world knowledge (Hobbs 1979; Kehler 2008; Rohde, Kehler, and Elman 2006), information structure (Grosz, Joshi, and Weinstein 1995), and referential form (Arnold 1998; Fedele and Kaiser 2015). One interpretation from these studies is that none of these factors can be a single determinant on its own but it is yet to be discovered how exactly these factors interact.

Referential interpretation does not occur in isolation as ambiguous referential expressions always appear in context that imposes multiple constraints on our interpretation of these expressions. Focusing on physical action events (e.g., kiss, kick, hit), the present study aims to understand how such factors as information structure, subjecthood, the type of referential expression, and the verb valence (i.e., whether the verb has positive or negative meaning/connotation) influence pronoun interpretation in Turkish, a language that is not experimentally well-studied with respect to anaphora resolution. In what follows, we will

first summarize the previous studies on pronouns in Turkish, review each factor we will address in this study, and we will present our experiments and findings.

1.1 Turkish overt and null pronouns and their resolution

Turkish is a variable word order language, where all six word order permutations are possible and the case marking on the noun phrases reveals the role of the referent. Constituent ordering conveys the information structural units such that the topic tends to appear in the sentence initial position whereas the focus appears preverbally (Erguvanlı-Taylan 1986; Erkü 1983; İşsever 2003 among others; for a summary, see Özge and Bozşahin 2010). It is possible to drop both subject and object arguments in Turkish and the pronoun can be overtly stated or dropped.

Previous theoretical studies on pronoun resolution mostly focused on identifying the contexts in which null and overt pronouns are used in Turkish. Enç (1986), for instance, suggests that overt pronouns act as a topic shifter or a contrast marker in Turkish. For instance, in a subject-initial utterance like (1), the overt pronoun in the second utterance may be taken as shifting the topic from the subject entity to the object entity. Similarly, in an utterance like (2), the overt pronoun is likely to create a contrast with the subject of the first utterance and the subject of the second utterance.[1]

(1) *Bahar* *Ceren'i* *ara-dı;*
Bahar-NOM Ceren-ACC call-PST.3SG
o *diğer-ler-in-e* *güzel* *haber-i* *ver-di.*
she other-PL-POSS.3SG-DAT good news-ACC give-PST.3SG
'Bahar called Ceren; she (Ceren) gave the good news to the others.'

(2) *Bahar* *Ceren'i* *ara-dı;*
Bahar-NOM Ceren-ACC call-PST.3SG
o *yanıt* *ver-me-di.*
she response give-NEG-PST.3SG
'Bahar called Ceren; she (Ceren) did not respond.'

Erguvanlı-Taylan (1986) argues that while an object is more likely to be encoded in an overt pronoun rather than a null pronoun in a subordinate clause, it

1 List of abbreviations: 3SG: 3rd person singular; ACC: accusative; COP: copula; DAT: dative; NOM: nominative; POSS: possessive; PROG: progressive; PST: past.

could either be overt or null in a conjoined clause. Kerslake (1987), on the other hand, proposes that a null pronoun is more likely to refer to the subject but it can be encoded in an overt pronoun when it receives the contrastive stress, so Turkish null subject pronouns correspond to unstressed pronouns in English while overt subject pronouns correspond to English stressed pronouns. Interestingly, however, we should note this generalization seems to be influenced by the word order as well. For instance, when the subject appears sentence initially as in (3), the overt pronoun can be interpreted as coreferential with the subject and the object equally possibly but when the topic is the object and it appears sentence initially, the overt pronoun is more likely to be interpreted as a stressed referent coreferential with the subject rather than the object (4). This observation is based only on our intuitions but the present study will enable us to experimentally test whether word order variation may lead to such observations.

(3) *Bahar* *Ceren'i* *ara-dı;*
Bahar-NOM Ceren-ACC call-PST.3SG
sadece *o* *müsait-ti*
only she free-COP.PST.3SG
'Bahar called Ceren because only she was free.'

(4) *Ceren'i* *Bahar* *ara-dı;*
Ceren-ACC Bahar-NOM call-PST.3SG
sadece *o* *müsait-ti*
only she free-COP.PST.3SG
'As for Ceren, Bahar called her; only she was free.'

Turan (1998) frames her study within the domains of the Centering Theory (e.g., Grosz, Joshi, and Weinstein 1983) and investigates what kind of factors may influence the salience of a referent so that it is encoded in a shorter form of referential expressions such as null pronouns in Turkish. Analyzing natural utterances from written documents, she concluded that while the sentence-initial position does not facilitate the salience of entities in Turkish, subjecthood does. Thus, a referent is more likely to reappear in an upcoming discourse and with shorter forms of referential expressions like zero pronouns if it is the subject. She suggests that an object referent cannot be encoded in a null pronoun if it is not the center of attention in the first utterance it appears. She further suggests that this pattern does not hold for all thematic roles, so there is a thematic hierarchy ranking the agents higher than experiencers, which is ranked higher than themes. In other words, if a subject has the agent role at the same time, this argument will have a higher

status with respect to its discourse salience compared to object themes; similarly, if the subject has the theme role as in some psychological predicates, the object argument with the experiencer role would be ranked higher. Importantly, she states that word order is not as strong a determinant as the thematic role and the grammatical role, which is further supported by (Hoffman 1998). Therefore, Turan (1998) concludes that discourse saliency of the arguments are determined by the thematic role hierarchy which mostly tends to be reflected in the grammatical role hierarchy (except in certain verb types such as psychological state verbs)

1.2 Factors influencing pronoun resolution

1.2.1 The effect of surface-level factors on pronoun resolution

Surface-level factors such as first-mention bias (surface order) and subject-bias have been reported to influence the referential choices and the pronoun resolution. Speakers tend to talk about the referent that appears in sentence-initial position more than other discourse entities. Researchers suggest that this is observed because the first referent is generally the most prominent and accessible entity in discourse (McDonald and MacWhinney 1995; Gernsbacher and Hargreaves 1988; Gernsbacher 1990; Hudson-D'Zmura and Tanenhaus 1998; Arnold 1998; Grosz, Joshi, and Weinstein 1983).

Another bias which squares well with the first-mention bias for languages like English is the subject-bias. Speakers remention the subject referent in the subsequent discourse with shorter referential forms (Crawley, Stevenson, and Kleinman 1990). Both surface order and subjecthood have been independently linked to conceptual accessibility in other domains of sentence processing (Bock and Warren 1985; MacWhinney 1977). According to this, prominent referents are more likely to appear in sentence-initial positions and the subject referent is the most prominent entity because it constitutes the perspective of the discourse (i.e., speakers construct their utterances from the perspective of the subject) (MacWhinney 1977). The first-mentioned entity may not be the subject in all languages and research suggests that these factors have their independent effect on referential selection and the referential form (Järvikivi et al. 2005; Kaiser and Trueswell 2008).

1.2.2 The effect of information structure on pronoun resolution

Another constraint that has been reported to influence pronoun resolution is the information structure, which determines the information status of discourse

entities (i.e., whether or not the entity is previously introduced and familiar to the interlocutors). Topicality, for instance, has been proposed to influence whether and with which referential forms the referent would re-appear in the discourse. Topic can be roughly described as the referent that the utterance is about; it is the given entity that is familiar to both the speaker and the hearer (i.e., given) (Reinhart 1981; Lambrecht 1994). The topic entities have been observed to occupy higher and prominent syntactic position in an utterance, so they tend to appear sentence-initially sometimes corresponding to the sentence subject and re-appear in the subsequent discourse with shorter referential expressions. Thus, topichood has been considered as one of the markers of the cognitive status of referents and their accessibility (Ariel 1990; Gundel, Hedberg, and Zacharski 1993; Grosz, Joshi, and Weinstein 1995; Gernsbacher 1990; Sanford and Garrod 1981; Strube and Hahn 1996). In languages like Japanese, referents marked with a topic marker *–wa* have been shown to influence both the likelihood of remention of the entity and the type of the expression used more than subjecthood (Walker, Iida, and Cote 1994).

On the other hand, there is also evidence showing that the focus, which designates the newly introduced information that is unfamiliar to the hearer, becomes more accessible than non-focused argument in the discourse (Arnold 1998; Cowles, Walenski, and Kluender 2007; Kaiser 2011). Furthermore, some studies report that there is a processing penalty incurred when the anaphoric form of the focused referent is repeated compared to the cases where a different anaphoric form or a pronoun is used. For instance, Almor (1999) showed that it is more costly to establish a reference between the clefted antecedent and its anaphor when the anaphor is the repeated noun phrase compared to the cases when the anaphor is a different noun phrase (Almor 1999) or a pronoun (Gordon and Hendrick 1998; Foraker and McElree 2007; but see Colonna, Schimke, and Hemforth 2012; Järvikivi et al. 2014).

Thus, both topic and focus entities have been reported to be discourse prominent in the literature. In addition to the studies nominating one of these factors as a determinant of prominence, there are also studies suggesting that neither of these factors can be a single determinant but multiple factors interact to increase the salience of topics or foci (Kaiser 2006).

1.2.3 The effect of referential expression on pronoun resolution

It has been observed that speakers use shorter forms of referential expressions when referring to more accessible entities while they refer to less accessible entities with longer and more detailed expressions (Ariel 1990; Gundel,

Hedberg, and Zacharski 1993; Çokal, Sturt, and Ferrera 2016). In language comprehension, this means that the type of the anaphoric expression would influence with which entity an ambiguous referential expression is taken as co-referential. A similar observation was made for pro-drop languages. Null pronouns have been assumed to behave similarly to unaccented pronouns in English, so they are expected to refer to more accessible entities like the subject, and overt pronouns are expected to indicate a topic shift (Kameyama 1985; Turan 1995; Prince 1999). Carminati (2002) further showed that there is a processing cost incurred when a null pronoun referred to the object and when an overt pronoun referred to the subject in Italian. Alonso-Ovalle et al. (2002) and Filiaci, Sorace, and Carreiras (2014) showed that while null pronouns were taken to refer to the subject in Spanish, overt pronouns did not cause any processing cost when they refer to the subject. Thus, overt pronouns do not necessarily indicate a topic shift.

1.2.4 The effect of verb type, coherence relations, and verb valence on pronoun resolution

We know that both the event structure (e.g., Garvey and Caramazza 1974; Hartshorne and Snedeker 2013; Brown and Fish 1983) and coherence relations (e.g., Elman, Kehler, and Rohde 2006; Kehler et al. 2008) influence pronoun resolution biases. With respect to the verb type, we restricted our test items to action verbs involving physical contact and employed a causal structure only with respect to coherence relations. Following previous studies, we expect the agent entity in the action verb schemas to bear the causal relation rather than the patient entity for this configuration of the verb type and the coherence type (e.g., Brown and Fish 1983; Brown 1986; Au 1986). However, we know from studies on the implicit causality biases that the verb valence may influence how people determine the cause of events such that when the verb encodes a negative event, the likelihood of the subject as the cause increases (e.g., Fiedler and Semin 1988; Franco and Arcuri 1990; for a review, see Rudolph and Försterling 1997). However, this pattern was observed in verbs that involve a psychological event (e.g., *thank*, *encourage*, *help*). We employed utterances involving a real action or physical contact embedded in a causal structure. Therefore, it remains to be seen whether we would observe a similar pattern in the present study.

2 Present study

2.1 Aims and predictions

Although we have solid theoretical expectations as to how pronoun resolution in Turkish should be influenced by the word order, type of referential expression or the type of the event structure, these expectations have not been experimentally tested previously. Özge, Hartshorne, and Snedeker (2017) recently demonstrated stimulus-experiencer verbs (e.g., frighten, dazzle) led to a subject bias regardless of whether the pronoun was zero or overt while the form of referential expression affected the pattern in the experience-stimulus verbs (e.g., fear, desire) (i.e., leading to greater subject preference in the zero pronouns compared to overt pronouns). This is a solid demonstration that the zero pronouns may not always lead to a subject bias in Turkish and there is a dynamic interplay between the event semantics and the grammatical biases arising due to the form of referential expression.

In the present study, we aim to further this line of research to understand how different factors such as word order variation, subjecthood, the type of referential expression, and the verb valence influence the interpretation of zero and overt pronouns in Turkish utterances. More specifically, we ask the following research questions:

i. Do Turkish zero pronouns behave similarly to non-stressed English pronouns? If this were the case, we would predict the zero pronouns to be taken as co-referential with the subject argument while expecting the overt pronouns to be taken as co-referential with the object argument.
ii. How does the information structural factors encoded in word order variation influence the interpretation of overt and zero pronouns in Turkish? If topic arguments were taken as more salient, then we would predict greater tendency to pick the topic argument as the referent of an ambiguous pronoun (i.e., greater subject preference in the SOV order, greater object preference in the OSV order). Similarly, if it were the focus position that increased the discourse salience of arguments, then we would predict greater focus bias (i.e., greater object preference in SOV and greater subject preference in OSV order).
iii. How does verb valence influence the interpretation of overt and zero pronouns? If the results from previous implicit causality studies can be generalized to the causal contexts with physical action verbs, we would predict greater subject preference in the negative valence argument structures compared to positive valence ones.

2.2 Method

2.2.1 Participants

One-hundred-thirty-eight undergraduate university students with Turkish as their native language participated in this study.

2.2.2 Stimuli

We designed a comprehension study modeled after Hartshorne and Snedeker (2013), which presented participants with a sentence composed of a main clause and a reason clause, which is followed by an ambiguous pronoun and a nonsense adjectival predicate (e.g., *Sally frightens Mary because she is dax*.) and asked them to decide which referent was *dax*. This allowed them to test whether the participants resolved the pronoun *she* to the subject entity or the object entity without directly asking who the pronoun refers to but by asking them to decide who the referent for the nonsense word is.

We used physical contact action verbs (e.g., hit, kiss) that assign agent and patient role to their arguments and we held the type of coherence relation constant by employing reason clauses connected by 'because'. To test whether Turkish zero pronouns behave similarly to non-stressed English pronouns, we manipulated the form of the referential expression between zero and overt pronoun ('o'; 'she'). We also manipulated the word order between SOV and OSV orders, which resulted in subject-topic and object-focus utterances in SOV and object-topic and subject-focus utterances in OSV. This would allow us to test whether the discourse salience of the arguments is determined by the word order and information structural factors encoded with it. Finally, we manipulated the verb valence between positive (e.g., kiss) and negative (e.g., kick) to see whether/how the valence information may influence the interpretation of ambiguous pronouns. So we ended up with a 2X2X2 design, where we manipulated the type of referential expression (zero, overt), the word order (SOV, OSV), and the verb valence (positive, negative). While the first two factors were manipulated between-subjects, the last factor was manipulated within-subjects. A sample item for each condition is presented in (5) and (6).

(5) a. SOV, Zero/Overt pronoun, Positive-valence verb

Bahar	*Ceren-i*	*öp-üyor*	*çünkü*	*(o)*	*dakmuk.*
Bahar-NOM	Ceren-ACC	kiss-PROG-3SG	because	(she)	dakmuk

'Bahar is kissing Ceren because she is dakmuk.'

Kim dakmuk? Bahar Ceren
'Who is dakmuk?

b. SOV, Zero/Overt pronoun, Negative-valence verb
Bahar Ceren-i tekmel-iyor çünkü (o) dakmuk.
Bahar-NOM Ceren-ACC kick-PROG-3SG because (she) dakmuk
'Bahar is kicking Ceren because she is dakmuk.'
Kim dakmuk? Ceren Bahar
'Who is dakmuk?

(6) a. OSV, Zero/Overt pronoun, Positive-valence verb
Bahar-ı Ceren öp-üyor çünkü (o) dakmuk.
Bahar-ACC Ceren-NOM kiss-PROG-3SG because (she) dakmuk
'Ceren is kissing Bahar because she is dakmuk.'
Kim dakmuk? Bahar Ceren
'Who is dakmuk?

b. OSV, Zero/Overt pronoun, Negative-valence verb
Bahar-i Ceren tekmel-iyor çünkü (o) dakmuk.
Bahar-ACC Ceren-NOM kick-PROG-3SG because (she) dakmuk
'Ceren is kicking Bahar because she is dakmuk.'
Kim dakmuk? Ceren Bahar
'Who is dakmuk?

Four counterbalanced different lists were created so that each included 24 critical (12 positive-valence 12 negative-valence verbs) and 24 filler items. Each list was pseudo-randomized so that two critical items from the same condition does not appear together. The order of the answers (*Bahar, Ceren*) for the question (*Who is dakmuk?*) was also counterbalanced so that each name (i.e., subject of the main clause) appeared half of the time as the first referent and half of the time as the second referent.

Out of 138 participants, 31 participants were randomly assigned by the Limesurvey program to the first set, 37 participants to the second set, 32 participants to the third set, and 38 participants to the final set. However, the participants who chose the same referent for all test items were excluded from the analysis as this was taken as a sign of not reading the utterances carefully or not understanding the instructions. Therefore, the responses of 4 participants from the first set and 2 participants from the final set were filtered out before the analysis.

2.2.3 Procedure

The experiment was presented to the participants through an online survey tool, LimeSurvey, and each item and the question for each item was shown one by one to prevent the participants from going back to the previous questions to change their answers. Participants read each test stimulus on the screen and selected their choice by selecting one of the referents clicking on the name. Participants were the students of the second author and they participated in the study as small groups in a classroom but each participant completed the task individually using their phones. We did not collect the reaction times but only the offline responses.

3 Results

Figure 1 shows the percentage of subject responses in each condition.

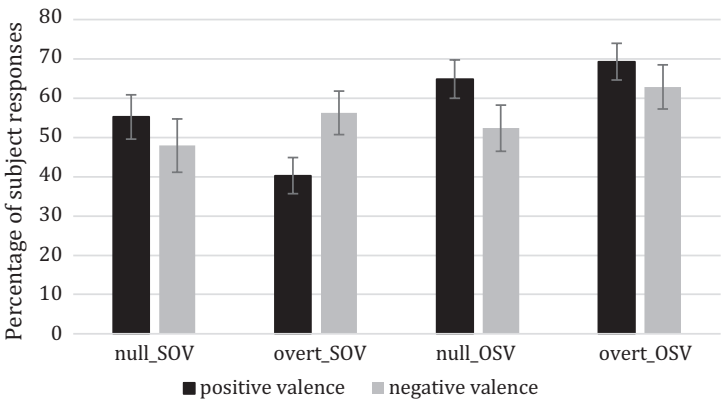

Figure 1: Subject preference in each word order, in each anaphoric type, and in each verb valence. Error bars show the standard error of the mean.

To understand the effect of word order, anaphoric type, and verb valence on the interpretation of pronouns in this study, we used as our dependent variable a binary variable as to whether participants selected the subject or the object as the referent of the ambiguous pronoun and we performed a mixed effects logistic regression analysis with the word order, anaphoric type, and verb valence as well as the interaction of these variables as our fixed effects, and the participant and item number as our random intercepts. All factors were included in the model step-wise. This analysis demonstrated that there was a significant effect of word

order (Table 1) such that participants showed greater subject preference for OSV order (M = 62,50; SE = 3,07) than for SOV order (M = 49,58; SE = 3,02) (Figure 2). The effect of anaphoric type or verb valence was not significant but there was a three-way interaction between anaphoric type, word order, and verb valence (Table 1). To understand the source of this interaction, we constructed below a separate model for each word order, each anaphoric type and for each verb valence type.

Table 1: Analysis with the word order, anaphoric type, and verb valence as well as the interaction of these variables.

Effect Added	Analysis
Word Order	$X^2(1) = 3.78$; $p = .051$
Anaphoric Type	$X^2(1) = .015$; $p = .90$
Verb Valence	$X^2(1) = .38$; $p = .53$
Word Order*Anaphoric Type*Verb Valence	$X^2(4) = 21.22$; $p = .0002$

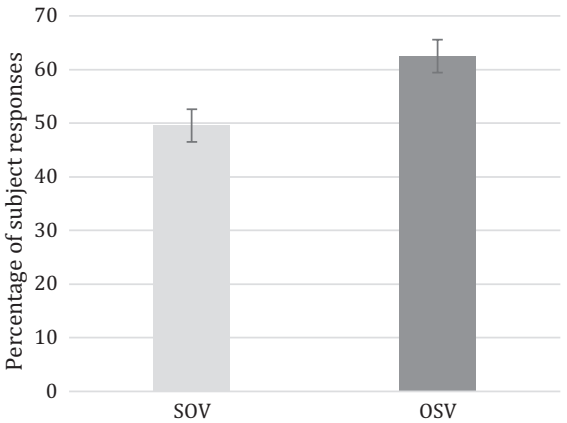

Figure 2: Percentage of subject responses in SOV versus OSV orders when all other conditions are collapsed. Error bars show the standard error of the mean.

3.1 Analysis by word order

For the model for each word order, our fixed effects were the anaphoric type and verb valence as well as their interaction while we used the participant and item number as our random effects. In the SOV order, anaphoric type did not signifi-

cantly influence the pattern whereas the effect of verb valence was significant as well as the interaction between anaphoric type and verb valence (Table 2).

Table 2: Analysis with anaphoric type, and verb valence as well as the interaction of these variables within SOV order.

Effect Added	Analysis
Anaphoric Type	$X^2(1) = 2.07$; $p = .14$
Verb Valence	$X^2(1) = 2.38$; $p = .12$
Anaphoric Type*Verb Valence	$X^2(1) = 7.53$; $p = .006$

To unpack this interaction, we analyzed the SOV data for each anaphoric type separately. For the zero pronoun condition, the effect of verb valence was not significant whereas it was significant for the overt pronoun condition (Table 3). Participants showed greater subject bias for the overt pronoun condition in negative valence verbs (M = 56,25; SE = 5,54) than in positive valence verbs (M = 40,27; SE = 4,60) (Figure 3).

Table 3: Analysis with verb valence within SOV order and within each anaphoric type.

Condition	Effect Added	Analysis
Zero pronoun	Verb Valence	$X^2(1) = 1.12$; $p = .28$
Overt pronoun	Verb Valence	$X^2(1) = 8.45$; $p = .003$

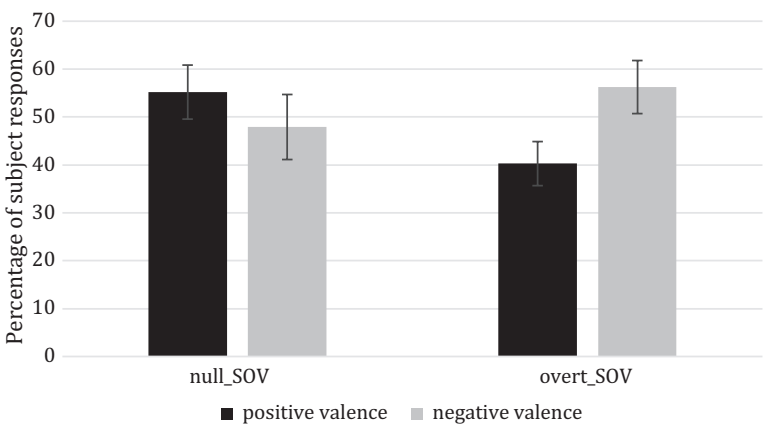

Figure 3: Percentage of subject responses in each anaphoric type and in each verb valence type within the SOV order. Error bars show the standard error of the mean.

In the OSV order, the effect of verb valence was significant. Participants showed a greater subject preference in positive valence verbs (M = 64,84; SE = 4,88) than in negative valence verbs (M = 52,34; SE = 5,88) (Figure 4). However, there was no effect of anaphoric type and no significant interaction between anaphoric type and verb valence (Table 4).

Table 4: Analysis with anaphoric type, and verb valence as well as the interaction of these variables within OSV order.

Effect Added	Analysis
Anaphoric Type	$X^2(1) = 2.78$; $p = .09$
Verb Valence	$X^2(1) = 5.97$; $p = .01$
Anaphoric Type*Verb Valence	$X^2(1) = .81$; $p = .36$

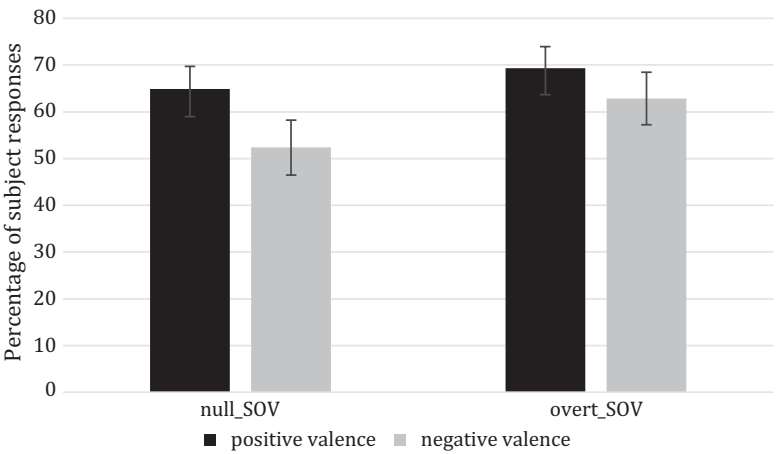

Figure 4: Percentage of subject responses in each anaphoric type and in each verb valence type within the OSV order. Error bars show standard error of the mean.

4 Discussion

We set out to investigate how factors like information structure encoded in word order variation (SOV versus OSV), the type of anaphoric expression (zero versus overt pronouns), and the verb valence (positive valence versus negative valence) influence the interpretation of ambiguous pronouns in Turkish action verbs involving physical contact. In our study, participants read an utterance involving

an action verb, two clauses connected by a causal connector 'because', and ending with an adjectival predicate 'dakmuk', which is a nonsense word created for this study. Given a binary choice between the two referents (Subject, Object) of each utterance, the participants were asked to determine the reference for this adjectival predicate.

Our analyses revealed the following patterns. First, there was a greater subject preference in the OSV order compared to the SOV order, which suggests that the subject was more likely to be picked as a referent for the ambiguous pronoun and the adjectival predicate when it is the focus entity located in the preverbal position. Considering the pattern reported in Hoffman (1998), where the most salient entity occurred in the sentence-initial topic position rather than the preverbal position regardless of the word order in Turkish (see also Hoffman and Turan 1993; Hoffman 1994), one would expect that the most salient entity would be repeated in the upcoming discourse. However, interestingly, Hoffman's analysis of the continuation of the discourse entities showed that this was the case only for the SOV order. In other words, there was a clear tendency to continue the discourse with the subject entity if the previous utterance was in the SOV order whereas it was not clear whether the object or the subject entity would be repeated in the upcoming discourse in the OSV orders (Hoffman 1998). Our study here reveals that it is the subject referent that is expected to reappear in the upcoming utterance in the OSV order, and in fact this pattern was more pronounced in the OSV order compared to the SOV order, which allows us to conclude that being in the focus position increases the likelihood of the subject entity to be rementioned. In other words, subjecthood increases the prominence of an entity more if it appears also in the focus position rather than in the topic position, this may be why the subject preference was greater in the OSV order compared to the SOV order. The fact that the object preference was not greater than the subject preference in SOV order also shows that being in the focus position is not enough for an entity to be more salient, so the effect we observe here seems to be the combined effect of subjecthood and focushood.

Second, the amount of subject preference did not significantly differ with respect to the verb valency in the SOV order when the pronoun was null and participants took the ambiguous null pronoun as coreferential with the subject regardless of the verb valence (each around 50% of the time). This is in line with the previous literature predicting coreference of the subject with the null pronouns in Turkish (Erguvanlı-Taylan 1986; Enç 1986; Turan 1996). Thus, in these cases, it can be said that the null pronouns are taken as the comment on the previous topic [i.e., the subject] (a la Enç 1986) so the topic of the previous clause is maintained in this reason clause as well. However, the valence did influence the pattern in the overt pronoun condition in the SOV order. In these conditions,

there was a greater subject preference in the negative valence verbs than in the positive valence verbs. It is important to note that the subject preference in the positive valence verbs is around 40%, so it is clear that participants interpret overt pronouns as the object in the positive valence verbs. This is in line with the expectation that the overt pronouns in Turkish indicate a topic shift to the object entity (Enç 1986). However, when the verb encoded a negative event such as 'kick' or 'hit' (e.g., *Bahar Ceren'i tekmeliyor çünkü o dakmuk. / Bahar is kicking Ceren because she is dakmuk.*), the participants interpreted the overt pronoun as the subject. We do not have a clear answer for this pattern. Yet, we speculate that the negative context might have increased the contrastive interpretation of the overt pronoun (e.g., *Bahar is kicking Ceren because SHE is dakmuk*), and the overt pronouns that are focused are more likely to be taken as coreferential with the subject in Turkish (Kerslake 1987).

Finally, the positive valence verbs created a more subject preference within the OSV order regardless of the type of the referential expression. This may be an effect of cue strength where the subjecthood and the focushood have led to a combined effect on the entity salience, so the pattern here enables us to conclude that the entity salience increases when it is the subject that is in the focus position. Considering the effect of the verb valence, this pattern is different from the pattern in the SOV order condition, where we observed greater subject preference for the negative valence verbs in the overt condition. While the pattern observed in the SOV condition is in line with previous studies showing an increase in the likelihood of interpreting the subject as the cause of the event in the negative valence verbs, the pattern in the OSV condition does not conform to it (e.g., Fiedler and Semin 1988; Franco and Arcuri 1990; for a review, see Rudolph and Fösterling 1997). Coming from English, a language with no word order variation and argument drop, these studies did not test how the verb valence interacted with the information structure and the type of the referential expression. The pattern coming from the SOV order with overt pronoun condition here reflects the pattern reported for English but when the pronoun is dropped or when the information structure changed, the pattern also changed. This clearly shows that the verb valence does not have a solid effect, but it interacts with other factors, such as information structure and the type of the referential expression. Although we do not have a clear explanation about the exact nature of this interaction, our conjecture is as follows: OSV order locates the subject in the focus position while locating the object in the topic position (e.g., *Bahar'ı Ceren tekmeliyor çünkü (o) dakmuk. / Ceren is kicking Bahar because she is dax.*), this may have resulted in two different interpretations: (i) an interpretation with a focus on the verb; e.g., *'Ceren is kicking Bahar because…' (Ceren is harming Bahar as a volitional and sentient*

being) or (ii) an interpretation taking not only the object but also the action as given information; e.g., '*It is Ceren who is kicking Bahar because….* In the former, the cause of the action may be the subject entity *(e.g., 'Ceren is kicking Bahar because Bahar is somebody who harms people')*, in which case this entity has full volition and sentience, or the cause may equally be the object entity (*'Ceren is kicking Bahar because Ceren kicked Bahar first/did something wrong*), in which case the subject entity is performing the action not as a planned or willful action but as a reaction to the patient's behavior. However, in the latter case, when the sentence initial object and the event are both taken as given information, it is our intuition that the subject entity cannot be attributed much responsibility because the information structure dictates that the object entity would have undergone the same event even if the subject entity had been somebody else *(i.e., somebody would have kicked/harmed Bahar anyway and it happened to be Ceren in this case);* hence the subject is not as agentive or as volitional as it is in the SOV ordering.

To sum up, our study has demonstrated that the overall subject preference increased when the subject is located preverbally in the focus position. Verb valence did not influence the pattern in the null pronoun, where we observed the expected pattern linking the null pronoun to the subject. In the overt pronoun condition in the SOV order, while the overt pronoun was taken as coreferential with the object in the positive valence verbs it was taken as coreferential with the subject in the negative valence verbs. This led us to conclude that the topic shifting mission of the overt pronoun is not constant in all contexts: it shifts the topic from the subject to the object in the positive valence events but it keeps the topic constant in the negative valence events. In the OSV order, we saw an overall increase in the subject reference, so it seems the salience of the referent increases when it is the subject and the focussed entity at the same time. Finally, subject preference was greater in the positive valence verbs than in negative valence verbs in the OSV order, which led us to argue that the information structure locating the object as the topic decreases the causality attribution to the subject in the negative events.

To conclude, the findings of this study highlight that the general expectation to link the null pronoun to the subject (topic) referent while linking the overt pronoun to the object (nontopic) referent is not an across-the-board situation but it is modulated by multiple factors such as word order, the type of anaphoric expression and the verb valence among others. In this study, we only focused on a single verb type (physical action verbs) and a single coherence relation (causality); therefore, we call on further studies to disentangle the intricate interaction of these further factors in anaphora resolution in Turkish.

References

Almor, Amit. 1999. Noun-phrase anaphora and focus: the informational load hypothesis. Psychological Review 106 (4). 748–765.

Alonso-Ovalle, Fernandes-Solera Luis, Lyn Frazier & Charles Clifton. 2002. Null vs. overt pronouns and the topic-focus articulation in Spanish. *Rivista di Linguistica* 14 (2). 1–19.

Ariel, Mira. 1990. *Accessing noun phrase antecedents*. London: Routledge, Croom Helm.

Arnold, Jennifer E. 1998. *Reference form and discourse patterns*. Stanford, CA: Stanford University dissertation.

Arnold, Jennifer E. 2001. The effect of thematic roles on pronoun use and frequency of reference continuation. *Discourse Processes* 31 (2). 137–162.

Au, Terry Kit-Fong. 1986. A verb is worth a thousand words: The causes and consequences of interpersonal events implicit in language. *Journal of Memory and Language* 25. 104–122.

Bock, J. Kathryn & Richard K. Warren. 1985. Conceptual accessibility and syntactic structure in sentence formulation. *Cognition* 21 (1). 47–67.

Brennan, Susan E. 1993. Centering attention in discourse. *Language and Cognitive Processes* 10 (2). 137–167.

Brown, Roger. 1986. Linguistic relativity. In Stewart Hulse & Bert Green (eds.), *One hundred years of psychological research in America: G. Stanley Hall and the Johns Hopkins tradition*. 241–276. Baltimore: Johns Hopkins University Press.

Brown, Roger & Deborah Fish. 1983. The psychological causality implicit in language. *Cognition* 14 (3). 237–273.

Carminati, Maria Nella. 2002. *The processing of Italian subject pronouns*. University of Massachusetts dissertation.

Chambers, Craig G. & Ron Smyth. 1998. Structural parallelism and discourse coherence: A test of centering theory. *Journal of Memory and Language* 39. 593–608.

Colonna, Saveria, Sarah Schimke & Barbara Hemforth. 2012. Information structure effects on anaphora resolution in German and French: A cross-linguistic study of pronoun resolution. *Linguistics* 50 (5). 991–1013.

Cowles, H. Wind, Matthew Walenski & Robert Kluender. 2007. Linguistic and cognitive prominence in anaphora resolution: Topic, contrastive focus and pronouns. *Topoi* 26 (1). 3–18.

Crawley, Rosalind A., Rosemary J. Stevenson & David Kleinman. 1990. The use of heuristic strategies in the interpretation of pronouns. *Journal of Psycholinguistic Research* 19 (4). 245–264.

Çokal, Derya, Patrick Sturt & Fernanda Ferreira. 2018. Processing of *it* and *this* in written narrative discourse. *Discourse Processes* 55 (3). 272–289.

Enç, Mürvet. 1986. Topic switching and pronominal subjects in Turkish. In Dan Isaac Slobin & Karl Zimmer (eds.), *Studies in Turkish Linguistics*, 195–209. Amsterdam: John Benjamins.

Erguvanlı-Taylan, Eser. 1986. Pronominal vs. zero representation of anaphora in Turkish. In Dan Isaac Slobin & Karl Zimmer (eds.), *Studies in Turkish Linguistics*, 206–233. Amsterdam: John Benjamins.

Erkü, Feride. 1983. *Discourse pragmatics and word order in Turkish*. Minneapolis, MN: University of Minnesota dissertation.

Fedele, Emily & Elsi Kaiser. 2015. Resolving null and overt pronouns in Italian. In Christopher Brown, Qianping Gu, Cornelia Loos, Jason Mielens & Grace Neveu (eds.), *Proceedings of the 15th Texas Linguistic Society Meeting*, 55–72.

Fiedler, Klaus & Gün Refik Semin. 1988. On the causal information conveyed by different interpersonal verbs: The role of implicit sentence context. *Social Cognition* 6 (1). 21–39.

Filiaci, Francesca, Antonella Sorace & Manuel Carreiras. 2014. Anaphoric biases of null and overt subjects in Italian and Spanish: A cross-linguistic comparison. *Language, Cognition and Neuroscience* 29 (7). 825–843.

Foraker, Stephani & Brian McElree. 2007. The role of prominence in pronoun resolution: Availability versus accessibility. *Journal of Memory and Language* 56 (3). 357–383.

Franco, Fabia & Luciano Arcuri. 1990. Effect of semantic valence on implicit causality of verbs. *The British Journal of Social Psychology* 29. 161–170.

Garvey, Catherine & Alfonso Caramazza. 1974. Implicit causality in verbs. *Linguistic Inquiry* 5 (4). 459–464.

Gernsbacher, Morton Ann. 1990. *Language comprehension as structure building*. Hillsdale, NJ: Lawrance Erlbaum Associates.

Gernsbacher, Morton Ann & David J. Hargreaves. 1988. Accessing sentence participants: The advantage of first mention. *Journal of Memory and Language* 27 (6). 699–717.

Givon, Talmy. 1983. *Topic continuity in discourse: A quantitative cross-language study.* Amsterdam: John Benjamins.

Gordon, Peter C. & Randall Hendrick. 1998. The representation and processing of coreference in discourse. *Cognitive Science* 22. 389–424.

Grosz, Barbara. J., Aravind Joshi & Scott Weinstein. 1983. Providing a unified account of definite noun phrases in discourse. In *Proceedings of the 21st Annual Meeting of the Association for Computational Linguistics*. 44–50. Cambridge, MA: Association for Computational Linguistics.

Grosz, Barbara, Aravind K. Joshi & Scott Weinstein. 1995. Centering: A framework for modeling the local coherence of discourse. *Computational Linguistics* 21 (2). 203–225.

Gundel, Jeanette, Nancy Hedberg & Ron Zacharski. 1993. Cognitive status and the form of referring expressions in discourse. *Language* 69 (2). 274–305.

Hartshorne, Joshua K. & Jesse Snedeker. 2013. Verb argument structure predicts implicit causality: The advantages of finer-grained semantics. *Language and Cognitive Processes* 28 (10). 1474–1508.

Hobbs, Jerry R. 1979. Coherence and coreference. *Cognitive Science* 3 (1). 67–90.

Hoffman, Beryl. 1994. Marking set-membership in Turkish. *The Penn Review of Linguistics* 18. 61–86.

Hoffman, Beryl. 1998. Word order, information structure, and centering in Turkish. In Marilyn Walker, Ellen Prince & Aravind Joshi (eds.), *Centering theory in discourse*, 251–272. Oxford: Clarendon Press.

Hoffman, Beryl & Ümit Deniz Turan. 1993. Zero and overt pronouns in Turkish. In *Workshop on Centering Theory in Naturally-Occurring Discourse*. Institute for Research in Cognitive Science, University of Pennsylvania, Philadelphia, PA.

Hudson-D'Zmura, Susan & Michael Tanenhaus. 1998. Assigning antecedents to ambiguous pronouns: The role of the center of attention as the default assignment. In Marilyn Walker, Ellen Prince & Aravind Joshi (eds.), *Centering theory in discourse,* 199–226. Oxford: Clarendon Press.

İşsever, Selçuk. 2003. Information structure in Turkish: The word order-prosody interface. *Lingua* 113 (11). 1025–1053.

Järvikivi, Juhani, Roger P.G. van Gompel, Jukka Hyöna & Raymond Bertram. 2005. Ambiguous pronoun resolution contrasting the first-mention and subject-preference accounts. *Psychological Science* 16 (4). 260–264.

Järvikivi, Juhani, Pirita Pyykkönen-Klauck, Sarah Schimke, Saveria Colonna & Barbara Hemforth. 2014. Information structure cues for 4-year-olds and adults: Tracking eye movements to visually presented anaphoric referents. *Language, Cognition and Neuroscience* 29 (7). 877–892.

Kaiser, Elsi. 2006. Negation and the left periphery in Finnish. *Lingua* 116 (3). 314–350.

Kaiser, Elsi. 2011. Focusing on pronouns: Consequences of subjecthood, pronominalisation, and contrastive focus. *Language and Cognitive Processes* 26 (10). 1625–1666.

Kaiser, Elsi & John C. Trueswell. 2008. Interpreting pronouns and demonstratives in Finnish: Evidence for a form-specific approach to reference resolution. *Language and Cognitive Processes* 23 (5). 709–748.

Kameyama, Megumi. 1985. *Zero anaphora: The case of Japanese.* Stanford, CA: Stanford University dissertation.

Kehler, Andrew. 2008. Rethinking the SMASH approach to pronoun interpretation. In Jeanette K. Gundel & Nancy Hedberg (eds.), *Interdisciplinary perspectives on reference processing*, 95–122. Oxford: Oxford University Press.

Kehler, Andrew, Laura Kertz, Hannah Rohde & Jeffrey L. Elman. 2008. Coherence and coreference revisited. *Journal of Semantics* 25 (1). 1–44.

Kerslake, Celia. 1987. Noun phrase deletion and pronominalization in Turkish. In Hendrik E. Boeschoten & Ludo T. Verhoeven (eds.), *Studies on Modern Turkish,* 91–104. Tilburg: Tilburg University Press.

Lambrecht, Knud. 1994. *Information structure and sentence form: Topic, focus, and mental representations of discourse referents*. Cambridge: Cambridge University Press.

MacWhinney, Brian. 1977. Starting points. *Language* 53 (1). 152–168.

McDonald, Janet L. & Brian MacWhinney. 1995. The time course of anaphor resolution: Effects of implicit verb causality and gender. *Journal of Memory and Language* 34. 543–566.

Özge, Duygu, Joshua Hartshorne & Jesse Snedeker. 2017. Salience of experiencer versus stimulus in Turkish psych verbs: A pronoun resolution study. Poster presented at the 30th Annual Meeting of the CUNY Conference on Human Sentence Processing, Cambridge, MA.

Özge, Umut & Cem Bozsahin. 2010. Intonation in the grammar of Turkish. *Lingua* 120 (1). 132–175.

Prince, Ellen. 1999. Subject pro-drop in Yiddish. In Peter Bosch & Rob van der Sandt (eds.), *Focus: Linguistic, cognitive, and computational perspectives*, 82–104. Cambridge: Cambridge University Press.

Reinhart, Tanya. 1981. Pragmatics and linguistics: An analysis of sentence topics. *Philosophica* 27 (1). 53–94.

Rohde, Hannah, Andrew Kehler & Jeffrey Elman. 2006. Event structure and discourse coherence biases in pronoun interpretation. In Ron Sun & Naomi Miyake (eds.), *Proceedings of the 28th Annual Conference of the Cognitive Science Society,* 697–702. Mahwah, NJ: Lawrence Erlbaum Associates.

Rudolph, Udo & Friedrich Försterling. 1997. The psychological causality implicit in verbs: A review. *Psychological Bulletin* 121 (2). 192–218.

Sanford, Anthony J. & Simon C. Garrod. 1981. *Understanding written language: Explorations of comprehension beyond the sentence*. Chester, UK: John Wiley and Sons.

Smyth, Ron. 1994. Grammatical determinants of ambiguous pronoun resolution. *Journal of Psycholinguistic Research* 23. 197–229.

Stevenson, Rosemary J., Rosalind Crawley & David Kleinman. 1994. Thematic roles, focus and the representation of events. *Language and Cognitive Processes* 15. 225–262.

Strube, Michael & Udo Hahn. 1996. Functional centering. In *Proceedings of the 34th Annual Meeting of the Association for Computational Linguistics,* 270–277. Santa Cruz, CA: Association for Computational Linguistics.

Turan, Ümit Deniz. 1995. Subject and object in Turkish discourse: a centering analysis. Philadelphia, PA: University of Pennsylvania dissertation.

Turan, Ümit Deniz. 1996. Null vs. overt subjects in Turkish discourse: A centering analysis. *IRCS Technical Report Series* 95.

Turan, Ümit Deniz. 1998. Ranking forward-looking centers in Turkish: Universal and language-specific properties. In Marilyn Walker, Ellen Prince & Aravind Joshi (eds.), *Centering theory in discourse*, 139–160. Oxford: Clarendon Press.

Walker, Marilyn, Masayo Iida, & Sharon Cote. 1994. Japanese discourse and the process of centering. *Computational Linguistics* 20 (2). 193–232.