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The derivation of direct and indirect scalar implicatures in L1 and L2

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ABSTRACT

Pragmatic inference, which examines how words rise in a context, is a crucial aspect of human communication and has been widely studied. This paper aimed to address the gap by focusing on direct (DSIs) and indirect (ISIs) scalar implicatures, which are examples of pragmatic inferences that emerge based on scaled informativity. Although DSIs and ISIs share a common derivation mechanism, they exhibit superficial differences that may impact their processing. To investigate this, a covered box test was conducted on a group of thirty native Arabic speakers learning English at Mutah University in Jordan. Results showed that participants had no difficulty computing both types of scalar implicatures (SIs) and tended to provide more pragmatic interpretations than logical ones. DSIs and ISIs seem to share the exact mechanism of derivation, even though indirect scalar implicatures drew fewer generation rates compared to direct ones. Additionally, the use of 'partitive of' had no significant effect on the derivation rates of either type of SIs. The study offers recommendations for future research in this area.

Contribution/ Originality: This study investigated how adult Arabic speakers learning English computed scalar implicatures (SIs) using the covered box technique. The findings of this study could bridge the gap that currently exists and pave the way for future research on how Arabic speakers process SIs in their first and second languages.

1. INTRODUCTION

Human communication is a complex process that includes more than the direct encoding and decoding of messages. Recently, there has been increasing interest in those aspects of communicated meanings that are "inferred" rather than "understood" as a result of the growth of theoretically motivated empirical studies of the pragmatic and semantic facets of meanings (Gibbs Jr & Colston, 2020). Semantics and pragmatics can be thought of as two sides of the same general study. Both are interested in how effectively people use language. However, semantics and pragmatics have slight differences. While pragmatics addresses issues of use, semantics addresses issues of meaning. Many linguistic forms are interpreted pragmatically and semantically, producing multiple meanings from a single form. Interlocutors rely on pragmatics to determine the intended meaning of an utterance in cases where semantics cannot offer a plausible interpretation of what is being said or written. Therefore, this study focuses on a subtype of implicatures called scalar implicatures (henceforth SIs). because they offer an excellent testing ground for investigating the process of integrating semantic and pragmatic meanings (Bublitz &

Norrick, 2011). According to Grice's theory of inferential communication, communication is conducted based on principles and expectations called maxims: quality, quantity, relevance, and manner. If the speaker obeys the cooperative principle and associates conversational maxims that govern our communication, the reader or hearer may interpret what is said literally. On the other hand, if the speaker does not obey the cooperative principle and associated conversational maxims, the reader or hearer has to consider the utterance and infer the speaker's intention; what the speaker intends to communicate rather than what he says (Grice, 1989). The quantity maxim requires the speaker to provide precisely as much information as is necessary, but neither more nor less. However, the speaker might not choose to provide the required information or not use the more informative word to convey a non-literal meaning; therefore, what a speaker said is different from what a speaker implied or meant (Grice, 1989).

Conversational implicature is the inference that is drawn when the speaker's intent differs from the meaning of the sentence spoken by the speaker. An implicature can be understood semantically and pragmatically, suggesting several interpretations in a particular context and compelling the hearer or reader to reject the obvious interpretation and select the most suitable interpretation from the available options (Feng & Cho, 2019). In other words, an implicature is what is said (the logically or semantically encoded meaning of a sentence) as opposed to what is meant or implied (the pragmatic meaning that is inferred in a particular communicative context).

Implicatures are of two types: particularized/conversational and conventional. The conversational ones are derived from the compliance of the cooperative principle by the speaker, and they are context-dependent. Conventional implicatures, on the other hand, are not derived from the cooperative principle or the context but rather from the word's lexical meaning, which is part of the sentence meaning. SIs are a subtype of generalized implicatures. SIs refer to implicatures based on a scale, with one member having higher informational strength than the others (Snape & Hosoi, 2018). SIs include scales such as *always*, *sometimes* (frequency), *all*, *some* (quantity), and *must*, *might* (possibility) (Broersma, 1994). They are a group of alternatives in terms of more informative (i.e., stronger) and less informative (i.e., weaker) items (e.g., < some, most, all >). A scalar form such as *some* is stored in our memory associated with alternate forms such as *most* and *all*. Such association is due to the repeated production of *some* with *not all* in everyday communications (Levinson, 2000; Snape & Hosoi, 2018). For example, *some* in sentence (1) below has a lexical meaning (i.e., at least some or some and may be all students), which is also its semantic meaning, while its pragmatic meaning is 'only some or some but not all students'.

1. Some of the students passed the exam. *Semantic interpretation.*
2. All of the students passed the exam. *Logical interpretation.*
3. Not all of the students passed the exam. *Scalar implicature.*
4. Some but not all of the students passed the exam. *Strengthened meaning.*

In sentence (1), the speaker conveys certain information by choosing a word that expresses one value (*some*) from a scale of values (e.g., *all* and *most*). Since the speaker uses the weaker or less informative form *some* instead of the strong form *all*, the reader or hearer may assume that *all* (stronger form) does not hold or that the speaker is not in a position to use it. This promotes the hearer or reader to find an explanation for using the weaker form (*some*), generating a conversational implicature as in example 3. SIs only arise when the most informative form (e.g., *all*) is asserted in the context, but the speaker, following the Quantity maxim, chooses not to be cooperative by using it.

Accordingly, example (3) entails sentence (1), and when (3) is true, (1) is true too, but not vice versa. The combination of the scalar implicature in (3) and the literal meaning in (1) yields the strengthened meaning in (4) (Chemla & Singh, 2014). SIs can also be classified as direct or indirect. Like the direct ones (DSIs), indirect scalar implicatures (ISIs) are uniformly created, but they frequently contain some kind of negation. To put it another way, an indirect implicature occurs when the stronger term such as *all* is being negated and implies its weaker alternative which is *some* (e.g., Not all (some) balls are green), whereas a direct implicature occurs when a sentence containing a weaker form, such as *some*, implies the negation of *all*, its stronger alternative (e.g., Some (not all) of the balls are green) (Feng & Cho, 2019). SIs have been the subject of extensive research. Significant theoretical and applied

research has been sparked by their language characteristics and psycholinguistic mechanisms. Such research has raised questions about whether SIs are generated by pragmatic or semantic mechanisms. The Grecian perspective holds that SIs are the outcome of pragmatic reasoning. The strengthening function *f* that is responsible for producing the strengthened meaning in (4) above is placed in the pragmatic system. However, the grammatical theory contends that SIs are the outcome of a grammatical operation (e.g., (Chierchia, Fox, & Spector, 2012; Gajewski & Sharvit, 2012)). Under this approach, the strengthening function *f* that is responsible for producing the strengthened meaning in (4) above is identified by an invisible operator, called *O*, which could be equal to *only*. In both views, the derivation of sentence (3) is grammatical and pragmatic, while the decision to execute the strengthening function *f* (to choose or not the strengthened meaning in 4 above) is only pragmatic.

In addition, more questions have arisen regarding the factors that govern the reasoning of SIs. One of these questions is about the role of context in the derivation of SIs while the other is about the processing cost. The default-ness approach (e.g., (Horn, 1984; Levinson, 2000)) proposes that since such SIs could be derived by default, they are generated in neutral contexts. The pragmatic interpretation, which is realized automatically, requires little cognitive effort. Therefore, interpreting (1) with its strengthened meaning in (4) would be more rapid than interpreting it with its literal meaning. Because *some* is interpreted by default as 'some but not all students', the lexical meaning of *some* (i.e., some and maybe all students) can only be accessed if its pragmatic interpretation is contextually cancelled (Levinson, 2000). In contrast, the context-driven approach (Carston, 2004; Sperber & Wilson, 1995) states that the derivation of SIs is context-independent. The pragmatic interpretation is not derived rapidly by default, but rather an extra cognitive effort is required as it is constrained by context-specific inferences. Inferring the speaker's meaning is governed by the lexical meaning of the words in addition to the context. The computation of SIs occurs after the logical meaning is complete and the context is relevant. Hence, the logical interpretation of SIs is cognitively less costly than its pragmatic interpretation. A more recent view (i.e., the constraint-based account), on the other hand, urges that being context-driven does not necessarily mean that SIs are always derived at a processing cost (Degen & Tanenhaus, 2015; Degen & Tanenhaus, 2016). Their derivational process consists of several intermediate steps that might be slow, rapid, effortless, or costly.

In Arabic, linguistic meaning falls into two types: *manṭūq* (the uttered or said) and *mafhūm* (the understood or implicated), which is part of generalized implicatures, specifically generalized Quantity implicatures (Abdulla, 2015). Although there has been a great deal of work on implicatures, including scalar ones across languages, there has been analogously very little work done in Arabic. The focus has been on the use of implicature in the Quran (Abdulla, 2015). For Arabic SIs (e.g. *kul*, *jamīʿ*, and *baʿḍ*), the existing literature is scarce, and they are often classified as nominal quantifiers, preceding an NP. *Kul* and *jamīʿ* literally mean *all* or *the totality of*, while *baʿḍ* expresses partial inclusion. *Kul and jamīʿ* are the Arabic equivalence of *all* (see Example 5 below), and *baʿḍ* is the equivalence of *some* (see Example 6 below). *Kul* and *baʿḍ* can be followed by the partitive particle *min* as illustrated in Example 7 (Saada, 2019).

5. Qaraʔ-a Ali –un jamīʿ-a/kul-a al-kutub-i.
   Ali read all the books
6. Baʿḍ-u alawlad-i thahab-u.
   Some children went.
7. Baʿḍ-un min alawlad-i thahab-u.
   Some of the children went.

Likewise, very few works have been done on Arabic SIs such as *sometimes* and *always*. Generally, they are classified as adverbs of time. *Ahyanan* is the Arabic equivalence of *sometimes*, and *dayimaan* is the equivalence of *always*. *Kull*, *jamīʿ*, and *dayimaan* are negated by adding a negative marker such as *laysa* as illustrated in Example 8 below.

8. Laysa jamīʿ -u/kul-u alwald-i fii albayt-i.

Not all children were at home.

[1]The above Arabic SIs have not been pragmatically analyzed in L1 or L2. Thus, this study is a preliminary attempt, aiming to explore the pragmatic aspects of L1and L2 SIs among native speakers of Arabic.

2. LITERATURE REVIEW

SIs constitute a phenomenon that stands at an interface between semantics and pragmatics. Understanding such a phenomenon provides us with insights into language and mind and their wider organization (Chemla & Singh, 2014). The processing of SIs involves creating alternatives, negating them, figuring out the speaker's epistemic state (Chemla & Singh, 2014), and making their processing very demanding for learners.

It has been contended that L2 learners face challenges acquiring linguistic properties that lie at the linguistic interfaces (i.e., the syntax-semantic interface and the syntax-pragmatic interface) (Slabakova, 2010). A number of studies, using a variety of psycholinguistic techniques, have provided conflicting evidence regarding questions such as which arise earlier: SIs or literal meanings, and whether SIs involve extra processing costs or not. Some of these studies have supported the default view by providing evidence of the autonomy of implicatures and the little cognitive effort required by SI generation (e.g., (Grodner, Klein, Carbary, & Tanenhaus, 2010; Lewis & Phillips, 2011)). In contrast, the results of several studies, such as Bott and Noveck (2004); Breheny, Katsos, and Williams (2006); Huang and Snedeker (2009); Huang and Snedeker (2011) and Bergen and Grodner (2012), among others, are in accordance with the context-driven assumptions. An extra cognitive effort is needed to derive SIs. They suggest a semantic or literal-first scalar implicature processing model (Huang & Snedeker, 2009), in which the semantic interpretation of SIs is assumed to precede their pragmatic interpretation.

Degen and Tanenhaus (2016) support the constraint-based account and emphasize the importance of contextual factors that can affect the speed and likelihood of computing implicatures, as well as how these factors interact. The more comprehensive and supportive the context, the faster and more probable the implicature is derived. The availability of sets of alternatives also affects the interpretation and processing speed of SIs. According to their findings, if *all* is paired with a set size of 2, there is a delay in processing, but a smaller delay if *some* is paired with a larger set size. They also argue that previous studies have not considered the effect of the *partitive of* on processing SIs (e.g., some of the students passed the exam vs. some students passed the exam). Studies using the *non-partitive of* have observed a delay in implicature processing, supporting the Literal-First hypothesis (e.g., (Bott, Bailey, & Grodner, 2012; Bott & Noveck, 2004; Noveck & Posada, 2003)). Therefore, they suggest that the absence of the partitive form may slow down the derivation of scalar implicatures. Assuming that L2 learners may have less processing competence in the second language (L2) than in the first language (L1), the default view claims that L2 learners will derive fewer logical readings of SIs out of context compared to native speakers. The context-driven view, on the other hand, assumes the opposite: L2 learners may lean towards pragmatic interpretations over logical ones more often than native speakers do. The findings of some studies (e.g., (Miller, Giancaspro, Iverson, Rothman, & Slabakova, 2016; Slabakova, 2010; Snape & Hosoi, 2018)) indicate the existence of a pragmatic bias in L2 learners relative to native speakers, while others (e.g., Dupuy et al. (2019)) show no pragmatic bias in adult L2 learners. Interestingly, in some cases, adult L2 learners are able to derive the same percentage of pragmatic interpretations in both their L2 and L1.

It has been contended that since the property of SIs is universal, there is no adverse L1 influence. The prime difference between L1 and L2 in terms of SIs readings may lie in the processing capacity, which is the common source of divergence at the syntax-semantic interface. Such limited processing capacity may get aggravated, particularly when L1 hinders computation. The computational and processing resources available to L2 learners are less compared to what they have in L1 (Slabakova, 2010). Hence, this may lead to comprehension and/or production

[1] The early research on scalar implicatures in Arabic has focused on their syntactic aspects, leaving aside pragmatic ones (e.g., Alzahrani (2019)).

difficulties in L2. Slabakova and Del Pilar García Mayo (2013) re-confirm the assumption that SIs involve universal computational mechanisms. L2 learners encounter no difficulty comprehending them. L2 learners, however; are more affected by the interference between processing difficulty and comprehension than native speakers. In general, generating SIs inference has been found to cause no difficulty for L2 learners, but suspending SIs inference may be challenging for L2 learners. The types of SIs in L2 have also been found to influence their derivation process. Some recent studies (e.g., Spector (2007) and Chierchia et al. (2012) have shown that DSIs and ISIs are not the same types of inference, in contrast to the traditional belief which assumes that they both share common derivation mechanisms and similar processing efforts. Lieberman (2009) found that the indirect implicatures (e.g., Joshua doesn't always go to the gym) cause more difficulty for L1 and L2 learners than the direct implicatures (e.g., Joshua sometimes goes to the gym) while L1 learners' performance overrode that of L2 learners with ISIs. The findings of a study by Cremers and Chemla (2014) indicate that ISIs computation is cognitively more demanding, but SIs are associated with a delay regardless of their type. Using the covered box paradigm developed by Huang, Spelke, and Snedeker (2013) and Bill, Romoli, Schwarz, and Crain (2016) found that the suspension of DSIs and ISIs seems to be done through different mechanisms or requires varying degrees of cognitive efforts, even though both DSIs and ISIs seem to be generated similarly. Feng and Cho (2019) investigated 26 L1-English and 24 L1-Chinese L2-English learners' processing of DSIs versus ISIs and observed that L2 learners showed symmetrical behaviors toward DSIs and ISIs. The findings have shown that L2 learners, unlike L1 speakers, differ in their generation and suspension of DSIs and ISIs. L2 learners computed DSIs more often than ISIs, but they suspended ISIs more frequently and significantly faster than DSIs. In contrast, native speakers showed no such symmetrical behavior toward DSIs and ISIs.

2.1. Objectives

The DSI and ISI phenomena share a common derivation mechanism but have slight differences that can affect how they are processed. understanding how these phenomena are computed is crucial in both linguistic theory and L2 acquisition theory. In addition, the fact that scholars have thoroughly examined SIs in L1 and L2, yet comparatively little has been done in the context of Arabic native speakers learning English, is another factor that inspired this study.

This study aims to:

1. Examine the derivation of SIs in L2 and to what degree their derivation in L1 is different or similar.
2. Investigate the derivation of DSIs vs. ISIs (e.g., *some, not all, sometimes, and not always*) by examining the variability between their derivation rates.
3. Shed light on the influence of the partitive *of* on DSIs vs. ISIs derivation.

2.2. Significance of Study

Thus, the findings of this study would fill in the gap that existed, opening new avenues for future research on the derivation of SIs in L1 (Arabic). It also sheds light on the phenomenon of SIs in English as a second language for adult native Arabic speakers, using the covered box method. This study is unique as it explores both DSIs and ISIs for native Arabic speakers.

The majority of previous research on SIs in L2 has focused either on DSIs (most of the research in L2 acquisition is done on DSIs) or ISIs and few have investigated both, and these few have compared particular scales such as quantity scales (*some* versus *not all)* (e.g., (Bill et al., 2016; Cremers & Chemla, 2014)) or frequency scales (*sometimes* versus *not always)* (e.g., Feng and Cho (2019)).

In this research, the focus is on studying the derivation of *some* versus *not all* and *sometimes* versus *not always* in L1 and L2 and the effects of *partitive of* on their derivation. In general, such a study would contribute to our understanding of how SIs develop and operate in L1 and L2.

2.3. Research Questions

1. How do native speakers of Arabic derive SIs in L2 and L1?
2. How do ISIs and DSIs behave with respect to their generation and suspension rates?
3. To what extent does the presence of a partitive *of* affect the rates of SIs derivation?

3. METHODOLOGY

A sample of 30 males and females aged between 21 and 23 was conveniently selected at Mutah University in Jordan during the second semester of 2022. They were monolingual Arabic-speaking undergraduate students. The members of the sample were studying English in their final year, thus being categorized as having an upper-intermediate proficiency level. All of them have studied English as a second language in formal settings, but have never lived or studied in English-speaking countries.

This study adopted the covered box method developed by Huang et al. (2013). It encourages participants to take into account both inference and non-inference interpretations for the test sentence by explicitly providing the non-dominant NO-inference interpretation. It examines both inference computation and suspension. This distinguishes it from the truth-value judgment methodology. The test sentences describe only one of the two pictures, a visible or hidden picture under a black box. Therefore, the task required the participants to decide for each test sentence whether or not it described the visible or covered picture (Figures 1 and 2).

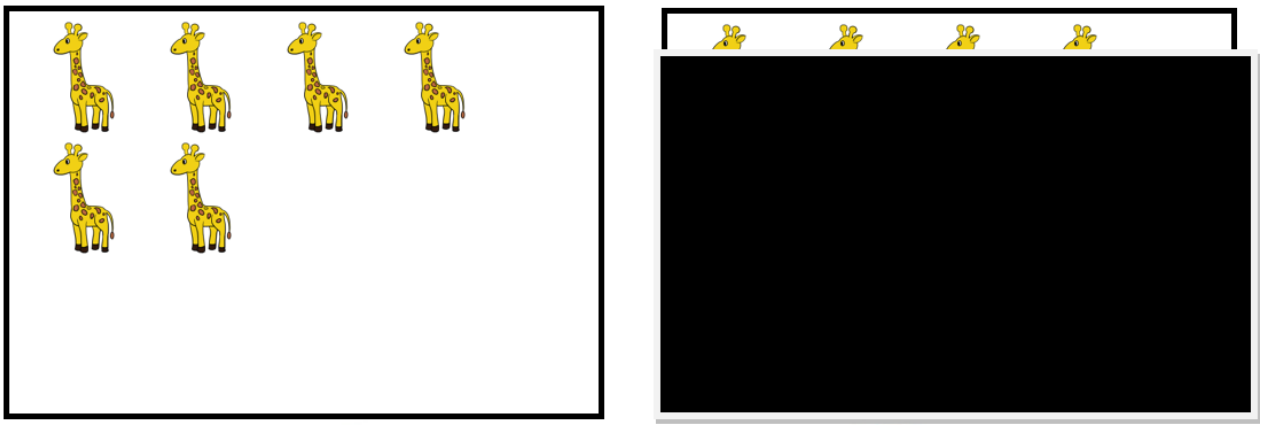

Figure 1. Example of ISI conditions not all of the giraffes wore scarves.

Figure 2. Example of DSI conditions Jack sometimes went to the hospital last week.

The visible pictures were divided between the No-inference condition, indicating the SIs suspension (see Examples 11 and 12), and the Inference condition, suggesting the SIs computation (see Examples 9 and 10). In addition, half of the stimuli (those that included *some* and *not all*) included the partitive *of* (see Examples 11 and 12) while the other half of them were without the partitive *of*. For *sometimes* and *did not always*- conditions (see

Examples 9 and 10), the pictures depicted individuals with a 5-day calendar strip containing icons illustrating various activities and destinations representing what the individuals did and went to during the last week (Figure 2). An uninterrupted appearance or occurrence of a location or an activity indicates that this action has been repeated every day. On the other hand, a combination of activities or locations implies that the first action has been stopped at some point, and a new action has started (Feng & Cho, 2019).

9. Jack sometimes went to the train station last week. (The visible picture is compatible with the inference that he did not always go to the hospital last week.)
10. He did not always go to school last week. (The visible picture is compatible with the inference that he sometimes went to school last week.)
11. Not all of the giraffes wore scarves. (The visible picture is compatible with the No-inference that none of the giraffes wore scarves.)
12. Some of the lions got balloons. (The visible picture is compatible with the No-inference that some and possibly all of the lions got balloons.)

There were 4 items that targeted each scalar item (e.g., *some*). For half of these 4 items, the target picture matched the linguistic description, while the other half required the selection of the covered box. In total, there were 16 items adapted and adopted from previous studies such as Bill et al. (2016), and Feng and Cho (2019). The Arabic version of the test included the same 16 items with variants of all conditions described above. Similarly, they split in half with respect to whether or not the target picture matched the stimulus. They were translated by the researcher and validated by two professors of Arabic linguistics.

Participants were presented with instructions and shown some example sentences and pictures (none of them were included in the experimental conditions). They were told that if they find that the given stimulus matches the visible picture, they should choose it. If they find that the visible picture does not correspond to the stimulus, they should choose the hidden picture under the black box. Using simple instructions and common words, the participants found no difficulty performing the task or understanding the test items. The length of the task was about 30 minutes. For purposes of analysis, responses were coded with respect to whether participants selected the target picture or the covered box. The rates (percentages) of the total answers were calculated.

4. RESULTS AND DISCUSSION

Sentences with DSIs such as 13 and its Arabic equivalent,13a attract high percentages of computation or generation in both languages. The learners showed a tendency to select the No-inference reading over the Inference one across almost all DSI-given conditions. However, for one sentence (out of the eight sentences included in the test), given in 14 below, the learners tended to choose the Inference reading more often in English (53.33%). They selected the visible picture, which indicates that 'Jack' went to the hospital every day last week. In contrast, 83.33% of the learners read *sometimes* as *not always* in its Arabic equivalent sentence(14a), choosing the covered box.

13. Some of the lions got balloons.

13 a. Baʿḍ-un min alisood-i yamlokon balloonat.

14. Jack sometimes went to the hospital last week.

14a. thahab-a jack ahyanan illa almost ashf-a alisboa elmadi.

Based on the results of ISIs, it was found that pragmatic inference reading is dominant in four out of eight test sentences that involved ISIs. This applies to both English and Arabic. However, for the remaining three test sentences, learners tend to swing between suspension and computation. In the Arabic sentence (15a), the ISI is suspended 53.33% of the time by selecting the visible picture, which portrays a No-inference reading of not all (none of the giraffes). In its equivalent English sentence (15), the ISI is equally suspended and computed. For sentences 16 and 16a, learners in Arabic tend to prefer semantic reading over pragmatic reading. They selected the visible picture that depicts the No-inference (Lily never went to the beach last week). Conversely, in English, the covered

box that depicts Inference (Lily sometimes went to the beach last week) is frequently selected at a rate of 63.33%. In addition, the ISI in sentence 17 is suspended at a rate of 53.33%, but it tends to be equally suspended and computed in its equivalent Arabic sentence (17a). Only for one of the given ISI conditions, do the learners behave similarly in Arabic and English. They show a preference for suspension over computation by choosing the visible picture that shows a No-inference reading of *not always*. In general, the total responses for ISI conditions in both languages are 16. The No-inference reading is the dominant response, with higher rates than the Inference one in 7 out of these 16.

15. Not all of the giraffes wore scarves.
    15a. Laysat kul-u alzarafat tartadi al'awshiha.
16. Lily did not always go to the beach last week.
    16a. Lam tathab Lily dayiman ila alshaali alisboa elmadi.
17. Not all of the rabbits brought balls.
    17a. Laysat kul-u al'aranibi ahtharat balunat.

For the influence of partitive *of*, the conditions for *some* and *not all* are equally divided (4 for each). Four of these eight conditions include partitive *of* while the other four are non-partitive. Moreover, the four conditions with the partitive *of* are equally divided between DSIs and ISIs. The same applies to the four conditions without partitive *of*. The results show that Inference interpretation is generated in the majority (6 out of 8) of DSIs and ISIs with or without partitive *of*. Yet, in one condition (15 above) suspension and computation are selected about 50% of the time. Conversely, learners are more likely to choose Inference interpretation less often (46.66%) than No-inference interpretation in condition 17 above. In other words, the percentages of suspension and computation are comparable in these two conditions (15 and 17 above).

The findings show that L2 learners acted more pragmatically across all types of conditions (DSIs and ISIs) in both languages. They exhibit no difficulty in computing both types of SIs. SIs computation or generation appears to be the preferred tendency. The participants tended to drive scalar inferences more often than no-inferences in their L1 and L2, regardless of the limited cases in which they suspended inference interpretations when dealing with some ISI conditions. It has been argued that since DSIs and ISIs show reversed processing signatures, they do not share the same derivation mechanisms (Chemla & Bott, 2012). Spector (2007) and Chierchia et al. (2012) proposed that ISIs are obligatory implicatures, but DSIs are non-obligatory. Thus, deriving DSIs is more costly than deriving ISIs, while suspending obligatory ISIs should be harder than suspending non-obligatory DSIs.

Accordingly, interpretations with ISIs, since they are obligatory, are easier to process (e.g., *not always ~ sometimes*) than interpretations without ISIs (e.g., *not always ~never)*. In contrast, others, such as Romoli (2015), claim that both DSIs and ISIs are uniformly derived, but the potential effect of negation induces superficial differences despite the uniform derivation profiles. The findings indicate that cases of suspension occur more often with ISIs than with DSIs. In such cases, the L2 learners tended to select the visible picture, where the visible picture depicts the No-inference reading. The L2 learners may opt for the reading that is visibly depicted and offered at hand (the visible No-inference picture); however, this occurs infrequently and does not reflect a response bias, as all participants showed that they could appropriately choose or not the visible picture (Feng & Cho, 2019). It is important to mention that such cases of suspension are not systemically produced. For example, the same ISI is suspended in one condition while it is generated in another. This holds true for both the conditions in English and Arabic. Hence, SI suspension is not a lexical word-dependent phenomenon.

The findings do not support the proposals of Spector (2007) and Chierchia et al. (2012) mentioned above in claiming that the suspension of ISIs is harder than that of DSIs. DSI generation is easier than suspension, while ISIs generation requires learners to choose among more than one alternative. For example, learners need to compute three meanings in processing a sentence such as 18 above: the non-negated meaning, the literal meaning of the negated sentence, and the pragmatic meaning of the negated sentence. Negation may increase the semantic

complexity of the ISIs conditions and the cognitive effort needed to process them, causing an asymmetric performance in insubstantial cases. Nevertheless, DSIs and ISIs attract more cases of generation than suspension, which indicates that they are both scalar implicatures of the very same kind. We argue that the derivation of ISIs is more similar to that of DSIs than the opposite.

For the effect of the partitive *of*, it is claimed that its presence may provide stronger support for the implicature than its absence, which may delay the derivation of SIs according to the Constraint-Based account. Findings of some research (e.g., (Degen & Tanenhaus, 2011; Grodner et al., 2010; Politzer-Ahles, 2013)) suggest that using partitive constructions tends to generate robustly pragmatic interpretations. Our results imply that it has an insignificant effect on inducing stronger or even higher rates of Inferences than No- inferences and vice versa. However, when L2 learners were presented with conditions where *not all* with *partitive of* was used instead of *some* with *partitive of*, they exhibited incoherent performance, fluctuating between suspension and generation. It can be hypothesized that the interaction between the potential effect of negation and that of partitive *of* may magnify the complexity of conditions with *not all of* compared with those with *some of*, non-*partitive not all*, and *not always*, leading to fluctuation between computation and suspension.

Accordingly, these findings suggest that L2 learners, who are native speakers of Arabic, are pragmatic with respect to SIs processing in their L1 and L2. The L2 learners' performance can be explained in terms of: first, the conventional meaning associated with SIs in the mental representation of L1 Arabic scalar quantifiers is compatible with the pragmatic interpretation of such SIs in English. For example, *some* triggers *some and not all* implicature rather than *some* and *possibly all* and *not all* triggers *not all but some* implicature rather than *none*. Therefore, it can be postulated that the learners preferred pragmatic reading by generating SIs as it is cognitively less demanding due to L1 transfer. Second, the teaching of SIs in the majority of schools in Jordan focuses on their pragmatic interpretations rather than their semantic ones. For instance, *some* is presented and taught to mean *only some or some but not all*, while its semantic meaning, *at least some or some, and maybe all*, is completely overlooked. Likewise, the pragmatic meaning of *not always*, which is *sometimes*, is the only meaning presented to the L2 learners of English in these schools. The repeated production and association of such SIs with their pragmatic meanings in everyday communication in informal and formal settings may explain the findings. The Default account (Levinson, 2000) proposed that the presence of a weaker scalar item triggers SI automatically, independently from context.

Meanwhile, the Relevance theory (Carston, 1998; Sperber & Wilson, 1995; Wilson & Sperber, 2004) and the traditional Gricean accounts view SIs as products of context-driven inference.

They arise only when the context is sufficiently appropriate for their derivation. In this study, it can be assumed that the learners integrated their pre-existing knowledge from their L1 along with their knowledge about the linguistic expressions themselves and context (offered through the sentence and the visible picture) to assist them in inference calculation. Put differently, the pragmatic reading is enforced as it is consistent with their pre-existing assumptions from L1 and L2. Third, the mechanisms of scalar implicature generation, regardless of their type, are claimed to be universal. Therefore, adult L2 learners have access to what is called a universal implicature computation mechanism (Slabakova, 2010). The findings show that the participants performed similarly in L2 and L1.

Our findings align with previous research on SIs which shows that adults act pragmatically when dealing with SIs (e.g., (Lin, 2016; Slabakova, 2010; Snape & Hosoi, 2018)). They support the notion of general uniformity for the mechanism that gives rise to both DSIs and ISIs as proposed by Cremers and Chemla (2014), but suggest asymmetries between DSI and ISI suspension, as found in Bill et al. (2016) and Feng and Cho (2019). Furthermore, our findings contradict the results of a number of studies that employed online tasks and imposed time pressure on the informants. The informants were less sensitive to pragmatic readings, which seem to be late-arriving and cause cognitive costs (e.g., (Khorsheed et al., 2022; Mazzaggio, Panizza, & Surian, 2021)).

5. CONCLUSION

The present study aimed to investigate the derivation of SIs in L1 and L2, specifically looking at whether there are differences or similarities in the rates of derivation of DSIs and ISIs, and if the presence or absence of *partitive of* affects their derivation. The participants' responses in L1 and L2 were similar, showing a greater tendency towards pragmatic responses rather than logical responses in both DSI and ISI conditions. The derivation mechanisms for both DSIs and ISIs were found to be the same. Participants exhibit a uniform pattern of performance regardless of the presence or absence of the *partitive of*. The findings confirm the general pattern found in previous literature, suggesting that pragmatic inference presents no challenges to L2 learners.

Our study provides insights into the process of SI derivation in both L1 and L2, but due to limited resources, further future research in the domain of Arabic SIs and interpretation of English SIs by native speakers of Arabic with a larger number of participants is required, using online tasks such as eye-tracking techniques to measure the time taken to compute both pragmatic and semantic readings and to gain a better understanding of how SIs work in L1 and L2. However, online tasks such as eye-tracking are not available in universities and research institutions in Jordan. In addition, future research on SIs in Arabic and English should address the acquisition of SIs versus that of other pragmatic inferences, such as presuppositions, since it is lacking and can therefore add a valuable piece of evidence to this line of research. Furthermore, teachers need to emphasize the semantic versus pragmatic interpretations of both English and Arabic SIs to help students improve their pragmatic competence.

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