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Research Paper

Promoting Grammatical Development in the Light of Positive Evidence: Introducing English Complex Wh-Questions to Persian L2 Learners

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Abstract

This study aimed to investigate whether the reported poor performance of adult second language (L2) learners on complex structures can be accounted for in terms of a "deficit" in acquiring abstract properties of the L2 that are absent in the first language (L1); or, a deficiency in the L2 input failing to trigger acquisition. To this end, the study focused on English complex wh-questions (a wh-movement language) which are generally unavailable in English as a Foreign Language materials and parametrically different from Persian (a wh-in-situ language). Forty-three intermediate Persian speakers were exposed to reading passages followed by English complex wh-questions. A comparison of the pretest and posttest results of a reading comprehension task indicated a strong positive effect for the input rather than the negative impact of the L1. Further analysis showed that learners with higher gain effects were more accurate in avoiding violations of wh-movement constraints, namely superiority and subjacency. These findings yield counter-evidence to the maturational view on the L2 syntactic development and suggest controlling the role of rich input in second language acquisition research.

***Keywords*:** Complex Wh-Question; L2 Input; Positive Evidence; Subjacency; Superiority; Wh-Movement.

1. Introduction

There has been a consensus in second language (L2) studies that second language learners differ from native speakers in linguistic behavior. Generally, L2 learners are a heterogeneous group as they achieve various divergent end-state grammars. At the same time, native speakers are assumed to form a more homogeneous group as they all converge on the ultimate end-state grammar of their native first language (Alibabaee & Youhanaee, 2013; Hawkins, 2001, 2019; Lardiere, 2009; Tsimpli & Mastropavlou, 2008; White, 2003, 2020 among many others). The differences between the two groups' linguistic knowledge/ performance have been explored in various studies. For instance, one area reported frequently in L2 research is forming wh-questions in English. Second language learners of English go through several stages of acquisition of wh-questions; however, many L2 learners stop at one or another transitional stage where their interlanguage gets fossilized. Forming correct wh-questions in English seems to appear only for L2 learners who achieve higher levels of language proficiency. Whether such advanced learners are able to perform as accurately as native speakers on complex wh-questions was an issue addressed by Hawkins and Hattori (2006) in a study of English bi-clausal multiple wh-questions in the interlanguage of Japanese advanced learners of English (2006). As they report, Japanese learners of English who could identify double interpretations of ambiguous wh-phrases and who had acquired complex wh-questions including long distance wh-movement, where a wh-phrase is extracted from within an embedded clause, did not avoid interpretations that implied ungrammatical constructions. Hawkins and Hattori conclude that L2 learners possess only those grammatical features they have acquired in their first language; therefore, they are unable to analyze L2 input to acquire new grammatical features and hence converge on non-target mental representations of L2 grammars. Similar studies (Al-Thubaiti, 2019; Hawkins & Chan, 1997; Hawkins, 2001; Khany & Bazyar, 2013; Tsimpli & Dimitrakopoulou, 2007) have concluded that any attempt to acquire new grammatical features in an L2 is doomed to failure after puberty.

This maturational view of second language acquisition has been formulated in hypotheses such as the Failed Functional Feature Hypotheses (Hawkins & Chan, 1997), the Representational Deficit Hypothesis (Hawkins & Hattori, 2006), and the Interpretability Hypothesis (Tsimpli & Dimitrakopoulou, 2007).

A crucial issue to mention here is the fact that while most of the L2 learners in these studies were apparently advanced learners, it is not clear whether they had received sufficient input for the constructions related to the target grammatical features under scrutiny. For instance**,** multiple wh-questions are instances of complex structures which have been reported to be less frequent than single wh-questions since they require highly specific contexts to be felicitous (New et al., 2024; Slavkov, 2009; White, 2003). To determine the certainty of this claim in the context of the present study, we explored most of the common English textbooks used in Iranian language institutes and universities, the result of which revealed that these structures were lacking in L2 English materials. We further conducted informal interviews with several English teachers who confirmed the fact that Persian learners of English never receive such input, nor do they practice these structures. Therefore, it seems dubious whether the L2 learners' performance on these constructions reflects a deficit in acquisition due to first language (L1) features or a scarcity of such tokens in the L2 input. To explore this issue, in this study, we try to find whether exposure to L2 input including complex wh-questions has any effect on the performance of Persian learners of English. In the following, we briefly review L1 as well as L2 studies which have emphasized the role of sufficient exposure in the performance of native and non-native speakers on complex structures. Next a description of the structure of multiple questions in Persian and English will appear followed by results of the previous studies on the acquisition of multiple wh-questions. Then, we explain an experimental study where Persian learners were exposed to English multiple wh-questions in their reading comprehension tasks. L2 learners were then tested whether their performance was affected by such exposure. More importantly, we sought to find whether the tasks had any effect on developing implicit knowledge of constraints on wh-movement in Persian English as a Foreign Language (EFL) learners. Thus, the study addressed the following research questions:

(I) Does input-based practice significantly affect learning English complex single and multiple wh-questions including long distant movement by Iranian intermediate EFL learners?

(II) Does input-based practice significantly affect learning English ambiguous wh-questions by Iranian intermediate EFL learners?

(III) Does input-based practice facilitate Iranian EFL learners' implicit knowledge of syntactic constraints (superiority and subjacency) in English multiple wh-questions?

2. The Role of Input in the Performance of Native and Non-Native Speakers

The role of input and exposure in the acquisition of an L2 is undeniable. The sufficiency of exposure has been reported to be a main factor in the comprehension of complex structures even for native speakers. This phenomenon is reflected in the studies which have compared native speakers with different levels of education. For instance, Dabrowska (1997) tested five groups of native speakers with different levels of education on comprehension of a number of English complex structures. The results showed that university lecturers had outperformed university students, who, in turn, performed better than cleaners and porters. The rate of accuracy for native speakers seemed highly correlated with the amount of their education. Similar results were reported by Chipere (2000, 2001, 2003) who found that comprehension of complex constructions was significantly dependent on the level of academic achievement of English native speakers. Dabrowska and Street (2006) found that well-educated native speakers performed better than low-educated native speakers in the comprehension of plausible and implausible English passives. In fact, the low-educated native speakers' accuracy on implausible passives was only 36%. Moreover, Dabrowska (1997) and Chipere (2003) found that in processing complex syntax, low-educated native speakers who had little exposure to complex constructions were at a disadvantage compared to non-native speakers. On the whole, the crucial role of language input does not seem to stop in early years of life, when a child acquires his/her first language. Rather, it seems that it extends to later years when native speakers acquire complex structures only if they are exposed to such structures i.e., only if they receive further education usually in academic settings. In other words, being a native speaker does not necessarily result in accurate performance on complex structures (Dabrowska, 2014; Slavkov, et al., 2021; Vulchanova et al., 2022) and one can attribute the variation in native speakers' performance to an insufficient degree of prior exposure to such structures.

Similarly, the role of the L2 input in language acquisition has been emphatically maintained in L2 research. VanPatten et al. (2020) assert that the role of input as a fundamental ingredient in L2 acquisition has changed from a hypothesis to an accepted fact. Indeed, all current mainstream theories in L2 research accept that the acquisition process has to be strongly driven by the input. As the data for language acquisition, the L2 input with rich representations helps learners to gradually acquire and converge to the grammatical targets (Slavkov, 2009). Moreover, it has been suggested that acquisition might be more related to the length of residence rather than the onset of the first exposure to the L2 input (Higby & Obler, 2017); or, the amount of L2 education and language use (Flege et al., 1999). In other words, the amount of received input as a result of more exposure could be more effective than the age of first exposure (age effect based on the critical period hypothesis is suggested to be the main decisive factor in language acquisition but see e.g., Moradi & Farvardin (2016), Nezakat-Alhossaini et al. (2014) and Roohani et al. (2017) for counter-evidence). In general, the findings of both L1 and L2 research highlight the point that acquisition of complex structures is strongly dependent on certain types of linguistic input which seem to be available only in the context of higher education/academic settings rather than in the language use commonly found in daily communications. Therefore, we can tentatively assume that complex syntactic constructions are difficult for non-native speakers to acquire due to little exposure to input (apparently, just as is the case for native speakers). Specifically, in this study, we aim to find whether L2 learners' failure to perform accurately on complex structures might be due to poor exposure to the L2 input rather than an internal factor like a deficiency in the potentialities of language faculty.

3. Wh-questions in English and Persian

Following Chomsky (1995, 1998, 2001) and Radford (1997, 2004) we assume that English interrogative clauses are complementizer phrases (CPs) headed by a COMP (C) which contains the question affix [Q]. The Q affix needs an overt head to attach to. The shortest movement principle requires that this head be the auxiliary in Tense (T). That is, the auxiliary moves from the head T position in TP into the Head C position in CP. Q also carries uninterpretive [wh] and [EPP] features, which attract a wh-expression to move to spec-CP. The wh-expression and the tensed T element leave behind a null copy of themselves at their extraction sites. Extraction of wh-phrases can also take place from within embedded clauses. The example in (1) shows a simple wh-question while (2 and 3) indicate complex wh-questions (these are also called Long Distance questions as the wh-phrase is not generated in the main clause but in an embedded clause and has to move up to the initial position in the main clause (for the sake of simplicity only movement of the wh-phrases are indicated: wh ……<wh>).

1 **What** has John bought <what>?

2 **Who** will Mary discover <who> has bought a big car?

3 **What** will Mary discover John has bought **<**what**>**?

In multiple wh-questions, the [wh, EPP] features on C attract only one of the wh-elements and this must be the closest wh-expression to C. Consider (4) below:

4 **Who** did Mary say **<**who**>** had repaired **wha**t?

As shown in (4), in multiple wh-questions only the wh-phrase which is syntactically closer to the front position can move to the initial position of the sentence. This is referred to as the Superiority Constraint (short movement) in the literature, the violation of which results in ungrammaticality as indicated in (5).

5 ***What** did Mary say **who** had repaired **<**what**>** ?

In (4 and 5) 'who' in the subject position is closer (superior) to the front position than 'what' in the object position, hence the grammaticality of (4) and ungrammaticality of (5).

Another aspect of wh-questions in English is the fact that the movement of a wh-phrase is subject to cyclicity and occurs stepwise in complex clauses. This means that if a wh-expression is generated in an embedded clause and is attracted by [wh, EPP] features on the C head of the main clause, it has to move to spec-CP of the lower clauses one by one, up to the spec-CP of the main clause.

6 **Who** did you say [<who> John thought [<who> that Peter had invited <who>]]?

In (6) the operator 'who' has moved in three steps: first to spec CP of the two lower clauses and then to spec position in the main clause. The cyclic movement has been referred to as wh-island constraint or Subjacency Constraint. Violation of Subjacency results in ungrammaticality. As an example, cyclic movement is not possible in (7) as the spec-

CP of the embedded clause is already filled by another wh-phrase: 'whether'; hence 'who' has crossed it (Subjacency Violation).

7 ***What** did you wonder **whether** John had bought <what>?

Finally, wh-questions can be ambiguous; i.e., have two interpretations, as shown in (8).

8 **When** did Mary say <**when**$_1$> John bought a car <**when**$_2$>?

In (8), the question might be asking about the time of 'saying' (when 1) in the main clause; or the time of buying (when 2) in the embedded clause. Thus, the answer to such a question might be something like: *Mary said it on Friday*; or, *John bought a car on Monday*.

It is important to mention that, depending on the context, one interpretation of an ambiguous question might be impossible if it implicates a violation of superiority and/or subjacency.

9 **When** did John say <when$_1$> **who** had found the key <*when$_2$>?

The wh-phrase 'when' in (9) must have moved from the main clause, not the embedded clause and hence has only one interpretation: asking about 'the time of saying' <when$_1$>. The interpretation asking about the 'the time of finding' <when$_2$> is not possible because it implicates a violation of superiority (the wh-phrase 'who' in the subject position is superior/closer to the initial position of the sentence and we cannot assume that 'when' has moved from within the embedded clause.

As another example, the wh-pronoun 'when' in (10) can have only one interpretation; i.e., the wh-phrase 'when' must be generated only in the main clause. If we assume that it is generated in the embedded clause, then its movement violates the subjacency constraint as it must cross a wh-island (what).

10 **When** did you say <when$_1$> **what** John bought <*when$_2$>?

Persian is a wh in situ language that lacks obligatory wh-movement triggered by an uninterpretive [wh] in CP. This means that wh-expressions do not get preposed, but appear in their base position (Bateni 1995; Karimi, 1999, 2005, Karimi & Taleghani 2007; Lazard, 1992; Mahootian 1997; Raghibdoost, 1994). The question particle 'aya' can optionally appear in the front position (Persian is a scrambling language and interrogative phrases might appear in front positions; however, this is irrelevant to the wh-movement parameter and its constraints. Details can be found, e.g., in Karimi, 2003, 2005).

11 (aya) æli ræft?
Q Ali went?
Did Ali go?'

12 (aya) æli ki-o entexab mikone?
Q Ali who-Acc choose does
'Who will Ali choose?

13 (aya) æli koja mire?
Q Ali where goes
(Where does Ali go?)

The fact that, in multiple wh-questions, all the wh-phrases appear in their base position after '*aya*' also indicates that wh-movement is not obligatory in Persian.

14 (aya) ki çi-o be ki dad?
Q who what-acc to who gave
'Who gave what to whom?'

15 (aya) ki çi-o koja xærid?
Q who what-acc where bought
(Who bought what when?)

Persian questions, then, are not subject to superiority and subjacency constraints, and due to scrambling, phrases might freely scramble over one another.

16 ki çi-o did
who what saw
(Who saw what?)

17 çi-o ki did
what who saw
(*what did who see?)

18 çi-o æli goft nima be ki dade bud
what Ali said Nima to who given was
(What did Ali say Nima had given to whom?)

19 be ki æli goft nima çi-o dade bud
to who Ali said Nima what given was
(*To whom did Ali say Nima had given what?)

The syntactic properties of wh-questions in different languages have been explained in terms of a parametric variation, namely the wh-movement parameter. A language like English with obligatory wh-movement is a [+] wh-movement language which is subject to superiority and subjacency constraints; and a language with no obligatory wh-movement is a [-] wh-movement language/ a wh-in-situ language and thus is irrelevant to constraints on wh-movement. Persian is an example of the [–] wh-movement setting of the parameter; i.e., all wh-phrases in this language appear in their base position (Bateni, 1995; Karimi, 1999; Lazard, 1992; Mahootian, 1997; Raghibdoost, 1994). The question particle '*aya*' is optionally used for both yes/no questions and wh-questions.

Considering the differences between Persian and English, Persian speakers' task is to acquire the Q feature with its specific properties in English. If second language learners receive input (positive evidence) for complex multiple wh-questions and they acquire and reset the parameter, they must be able: first, to interpret complex questions instantiating long distance movement of a wh-phrase like " *What did Mary say John had bought last week*?"; second, to identify the double interpretations of ambiguous wh-phrases like: "*Where did Mary say John bought the car*?"; and finally and more importantly, to identify violations of superiority and subjacency and reject interpretations which implicate such violations. Evidently, the rejection of these violations indicates acquired implicit knowledge of the wh-parameter in L2 learners, as it is also considered as the evidence for implicit knowledge of the wh-parameter for native speakers. The source of this knowledge can be traced back only to the input they received over the intervention period.

4. Literature Review

A number of studies have explored the acquisition of English wh-questions by native speakers of different languages. They generally show that L2 learners have difficulty acquiring different aspects of wh-questions. For instance, Bley-Vroman and Yoshinaga (2000) compared Japanese advanced learners of English with native English speakers in judging and rating six types of multiple wh-questions in English. Results revealed that the learners' performance was significantly different from native speakers. The researchers argue that Japanese learners' performance was generally compatible with patterns in their first language; however, for learners who had experienced such questions in the L2 input, performance was likely to be affected differently.

Moreover, Hawkins and Hattori (2006) examined whether Japanese learners of English acquire the uninterpretive [wh] feature in English questions. They selected advanced Japanese learners of English who apparently had the knowledge of long distant wh-questions and could identify double interpretations of ambiguous wh-phrases. The results of an interpretation task indicated that Japanese learners of English accepted interpretations of wh-questions which implicated violations of superiority and/or subjacency. This pattern of performance was significantly different from native speakers of English, indicating acquisition failure in the Japanese group. However, counter-evidence was reported by Çele and Gürel (2011) who compared two groups of adult L2 learners (L1 Turkish and L1 Spanish) L2 English with a group of adult native English speakers. All participants were very advanced L2 users, who had reached an end-state L2 acquisition. An Online Grammaticality Judgment Task (OGJT) was presented in two conditions: (1) the full-sentence

condition to measure reaction times spent on each sentence and (2) the self-paced word-by-word reading with a moving window display to identify specific loci of processing difficulty. In the full-sentence condition, participants read and judged full sentences displayed on the computer screen one at a time. In the word-by-word reading task, each sentence was presented one word at a time and as a new word appeared, the preceding word disappeared from the screen. Again, the participants first read and then judged the sentences. The results of the study generally revealed that except for a certain construction, the Turkish and Spanish speakers were as successful as the native speakers at correctly rejecting ungrammatical extractions. In addition, no difference was found between L2 learners coming from a [+*wh*-movement] L1 (i.e., Spanish) and [-*wh*-movement] L1 (i.e., Turkish).

In another study, Hasebe (2014) investigated whether Japanese learners of English observed the superiority constraint in mono-clausal multiple wh-questions. The task was a grammaticality Judgment test including sentences like '*Who bought what?'* and '*What did who buy?*'. Results showed that Japanese performance on multiple wh-questions was not as accurate as native speakers; yet, superiority effects were observed in the performance of the advanced Japanese EFL learners. The next study to mention is Hettiarachchi and Pires (2016) who explored the predictive and explanatory adequacy of the Interpretability Hypothesis/ RDH in a study of the acquisition of wh-questions and the related locality constraints (Subjacency and Superiority) by Sinhala Native Speakers acquiring L2 English. They used a slightly modified version of the Truth value judgment task developed by Hawkins and Hattori (2006). The task was given to a group of L2 learners and a group of English native speakers. The results revealed that their advanced L2 speakers' performance did not differ significantly from native speakers as they avoided interpretations of multiple wh-questions which implied violations of subjacency constraint. The results of their study indicated that L2 learners can acquire uninterpretive syntactic features like the [wh] feature, despite their absence in their L1 syntax.

Failure of L2 learners to perform similarly to native speakers has also been indicated by Samavarchi and Rezaie (2014) who studied how Persian advanced EFL learners processed wh-dependencies in English dislocated complex structures. They argued that the results of a cross-modal priming task indicated that, unlike native speakers who use structural cues during grammatical processing, their advanced L2 learners relied on nonstructural cues such as lexical and pragmatic resources. Finally, Vaez-Dalili, et al. (2021) compared the performance of 30 Persian advanced EFL learners and 30 native speakers of English on a variety of English mono-clausal multiple wh-questions. The task was a grammaticality judgment test including 30 items. Based on the results, they argued that exploring the acquisition of multiple wh-questions in single clauses requires understanding the role of processing and the working memory as cognitive determinants of linguistic behavior in addition to the detailed and complex analysis of the formal aspects of these structures.

It can be argued that in most of these studies, there was no evidence whether advanced L2 learners were exposed to a considerable number of complex wh-questions or not. Generally, being an advanced learner does not necessarily guarantee whether he/she has sufficiently experienced all complex structures of a language in the L2 input. This is a point that deserves critical scrutiny. It should be pointed out that the studies mentioned in the literature focused on advanced L2 learners to account for L2 end-state grammars irrespective of instruction. However, the present study aimed to find evidence for the effect of intervention on intermediate L2 learners in a reading comprehension course. Such instruction cannot be presented to advanced learners as they have already taken these courses. Besides, any evidence indicating that exposure to the L2 input triggers attainment of the related linguistic knowledge by intermediate learners would support the claim that the reported failure of advanced learners cannot be traced back to properties of L1 but to lack of exposure.

5. Methodology

5.1. Research Design

The logic of the study was based on the assumption that, in first language acquisition, exposure to input (including instances of simple, complex, and ambiguous wh-questions) leads to +wh-movement parameter setting in L1 English. Knowledge of constraints like superiority and subjacency arises and clusters from this setting. By analogy, we wondered whether exposure to such input including tokens of different types of complex wh-questions would possibly lead to the same effects in the course of second language acquisition. As English complex multiple wh-questions are generally unavailable in EFL materials, we hypothesized that the observed failure of L2 learners in accurately interpreting complex wh-questions is due to the deficiency of the input they receive. Therefore, in this study, we exposed Iranian

intermediate EFL learners to instances of complex and ambiguous multiple wh-questions. The general question was whether exposure and intervention in the form of input-based practice might have any gain effects on L2 learners and whether such learning would lead to implicit knowledge of superiority and subjacency constraints. The study employed a pre-test-treatment-post-test design involving two groups of intermediate L2 learners of English.

5.2. Participants

Participants were selected from a population of 90 senior students (aged 19 to 25) majoring in English at Ashrafi University. They were all native speakers of Persian and had all studied English in an instructed setting in Iran and had no experience of being in an English-speaking country before. Two criteria were used for the participant selection. First, they had scored at or lower than 40% on the pretest which measured their comprehension of English complex wh-questions and ambiguities. Second, they were placed at the intermediate level based on the results of their performance on the Oxford Quick Placement Test (OPT; Alan, 2004). They were randomly assigned to a control group and an experimental (the input group). At the end of the experiment, only 61 participants (32 in the control group and 29 in the input group) had fulfilled the requirements for being part of the final sample.

5.3. Instructional Material

Short reading passages were mainly adapted from the books "Read This! 1" (Mackey, 2010) and "Read This! 2" (Savage & Mackey, 2010) published by Cambridge University Press. The books contain enjoyable and fascinating texts and are designed to develop the reading skills of adult learners at low to intermediate levels. The texts were simple so that the students could focus on the challenging comprehension questions.

5.4. Instruments

The interpretive test developed by Hawkins and Hattori (2006) was adopted for this study. The target items of the test included 22 items, each in the format of a story followed by a question with three answers. For each item, L2 learners were required to read the story and select appropriate answers to the question. The test was divided into two sections. There were 15 items in the first section, including single wh-phrases which checked knowledge of long-distance wh-movement and syntactic ambiguity as well as multiple wh-questions, the first wh-phrase of which could be interpreted a) to have originated in the embedded clause only or b) to have originated both in the main and embedded clause. This section served for testing the first research question to check knowledge of long distance wh-movement and ambiguity in single and multiple wh-questions. To test the second research question, there were seven test items which checked knowledge of superiority and subjacency constraints. The answers provided for the multiple questions included interpretations of the wh-phrases to have originated in the main clause (grammatical) and the embedded clauses (ungrammatical due to superiority& /subjacency violations). There were five distracters in each section of the test. An example of the test items appears below.

> *When Louise was a little girl, she was always losing things. One day, she lost her favorite teddy bear when she and her mother Clare and father Henry were at the seaside. Years later, when Henry had forgotten about this incident, he was in Brighton one day on business and saw a shop full of teddy bears. This reminded him vividly of that day at the seaside when Louise lost her teddy bear.*
>
> *When did Henry remember Louise had lost what?*
> *a) He remembered that she had lost her favorite teddy bear when he was in Brighton on business.*
> *b) He remembered that she had lost her favorite teddy bear when he, Clare, and Louise were at the seaside.*
> *c) He remembered that she had lost lots of things when she was a child.*

The interpretation of the question 'when' can refer to the time of *remembering* and the time of *losing*. Therefore, both a and b can be an appropriate answer to the question. Choice c is an irrelevant option to check whether participants pay attention to the test item or not.

5.5. Treatment

Both groups read passages from their textbooks mentioned above and performed the reading comprehension tasks of the book. The participants in the input group additionally were required to answer different types of wh-questions

based on the passages adapted from the same books. The wh-questions consisted of a variety of structures, some of which were considered very odd to learners because as they expressed, they had never heard or read such questions. These included multiple wh-questions in simple and complex clauses. The questions also included ambiguous wh-phrases and students' attention was drawn to these double interpretations while performing the reading tasks.

No answers were provided for the questions, and learners were guided to find the answers and say them in their own words. Specifically, they were guided to notice that some wh-phrases had double interpretations. However, no instruction was given for ungrammaticality and constraints on wh-movement. A sample story and a target question are given below:

> Emily likes to play outdoors. One day she was at the playground. When she decided to climb a really tall tree. She got up pretty high, but suddenly one of the branches broke, so she fell off the tree and hurt herself! But Emily was a brave girl, so she got back up right away and didn't cry at all. Emily wanted to tell her friends how pleased she felt about not crying after hurting herself, so she went to find some of her friends at the library. She found a friend of hers there, but the librarian came out and told her that in the library they have to be very quiet! So, Emily went to the swimming pool to see another friend. When she got to the pool, she said to her friend, "I hurt myself falling out of the tree, but I didn't cry at all!" Emily was happy she could finally tell someone about her day, and her friend was impressed by how brave she was.
> Where did Emily tell someone that she hurt herself?

In this example the wh-phrase, 'where' is ambiguous in that it can be interpreted as to the place of 'telling' and place of 'hurting'. Thus:

> Emily told her friend <u>at the swimming pool</u> that she hurt herself.
> Emily told her friend that she hurt herself <u>at the playground.</u>

5.6. Procedure

The OPT and pretest were administered subsequently in the first two sessions. The first section of the interpretive test was used as the pretest to identify those learners who had no knowledge of complex wh-questions and syntactic ambiguities. Treatment started from the third session and continued for seven sessions. The participants received reading tasks with comprehension questions including long distant wh-movements, and ambiguities. The post-test was administered immediately after treatment in the 10th session. Students' choices for each answer whether grammatical or ungrammatical were counted, and all scores were entered into SPSS (2020) for a series of descriptive and inferential statistical analyses.

6. Results and Discussion

6.1. Knowledge of Long Distant Movement (LD)

The first research question asked whether input-based practice would significantly contribute to Persian intermediate EFL students' learning long distance movement of a wh-phrase in complex single and multiple wh-questions. The group's performance on complex <u>single</u> wh-questions 'e.g.: *Who did John wonder Mary had invited who?*' are presented in Table 1. In such questions, only one wh-phrase moves from within the embedded clause to the front position of the main clause (this is referred to as long distance Movement, LD). In this example, 'who' has moved from object position in the embedded clause. As shown, interpretation was accurate for both groups from the onset of the study (95.31 and 94.82 for the control and input groups respectively). This indicates that LD single wh-questions do not seem to pose any difficulty for Persian learners of English, as both groups were competent enough to interpret this type of questions in the pretest before receiving any instruction.

Table 1. *Descriptive Statistics for Interpretation of Single Wh-Questions*

Variables	Groups	N	Mean	SD	SEM
Pre Single wh LD	control	32	95.3125	9.91394	1.75255
	input	29	94.8276	10.30627	1.91383
Post Single wh LD	control	32	97.6562	7.40361	1.30879
	input	29	99.1379	4.64238	.86207

As Table 2. Shows, no significant difference was observed between the pretest and posttest (t.=1.791, p=.083 for the control group and t.=1.983, p=.057 for the input group). More importantly no significant difference was observed between the mean scores of the two groups in the post test (t.=.187; p=.852).

Similarly, Table 2 shows performance of the groups on interpretation of wh-phrases with the LD movement in multiple wh-questions 'e.g., *Who did John wonder ~~who~~ had written what?*'. As shown, the mean scores of both groups were more than 90% accurate in the pretest (90.53 and 91.79 for the control and input groups respectively). However, the paired t-tests performed on the mean scores of the groups in the pretest compared to the posttest showed that the accuracy rates increased significantly for the input group (t.= 2.985, p.= .006) but not for the control group (t.= 1.438, p.= .161). The results of the independent t-test performed on the mean scores of the groups in the posttest indicated a significant difference between the groups (t.=2.405, p.= .019). Considering the fact that the control group was not exposed to and did not receive any practice for complex multiple wh-questions, it can be argued that accurate interpretation of preposed wh-phrases in such questions derives from knowledge of simple wh-questions. In other words, once EFL students learn English simple wh-questions, they can considerably interpret wh-phrases in both simple and complex questions including LD movements. In addition, the significant gain effects observed for the input group indicate the positive role of input-based practice in developing such knowledge.

Table 2. *Descriptive Statistics for Interpretation of Multiple wh-Questions*

Variables	Groups	N	Mean	SD	SEM
Pre Multp wh LD	control	32	90.5312	21.30120	3.76555
	input	29	91.7931	14.80680	2.74955
Post Multp wh LD	control	32	92.5938	16.57215	2.92957
	input	29	1.0000	.00000	.00000

Generally then, it can be concluded that input-based practice improves Iranian EFL learners' performance on complex multiple questions instantiating LD movement of wh-phrases; nevertheless, these forms are not seriously difficult for Iranian EFL learners and even without exposure and/or instruction they can interpret them with considerable accuracy.

6.2. Knowledge of Ambiguity

The second research question concerned knowledge of ambiguous wh-questions in Iranian EFL learners. As explained above, the preposed wh-phrase in ambiguous sentences bears two interpretations. As an example, for an ambiguous single wh-question, '*when*' in "***When*** *did Mary say John bought a car*?" bears double interpretations. It could have originated from the main clause asking about the time of *saying* or from the embedded clause asking about the time of *buying*. Table 3 shows the extent that the learners in the two groups accurately interpreted ambiguous single wh-questions.

Table 3. *Descriptive Statistics for Interpretation of Ambiguous Single wh-Questions*

Variables	Groups	N	Mean	SD	SEM
Pre Main	control	32	96.0938	9.22255	1.63033
	input	29	95.6897	9.61065	1.78465
Post Main	control	32	96.0938	14.35351	2.53737
	input	29	1.0000	.00000	.00000
Pre Embedded	control	32	27.3438	31.97742	5.65286
	input	29	28.4483	11.02784	2.04782
Post Embedded	control	32	28.1250	10.53029	1.86151
	input	29	66.3793	19.22129	3.56930

As shown, both groups ignored the ambiguity of the wh-questions in the pretest and mostly accepted only the main clause interpretation. However, while the posttest scores indicated no development in the performance of the control group, paired comparison of the mean scores of the input group for the embedded interpretation showed significant development (t = 8.968, p = 0.00 respectively). Comparison of the two groups' posttest scores for the embedded interpretation was also significant (t = 9.762, p = 0.00).

As for ambiguous multiple wh-questions such as "***When*** *did Henry remember Louise had lost* ***what***?", the preposed '*when*' ambiguously refers to either the 'time of remembering' in the main clause or 'time of losing' in the embedded clause. Table 4. Represents groups' performance on these questions.

Table 4. *Descriptive Statistics for Interpretation of Ambiguous Multiple wh-Questions*

Variables	Groups	N	Mean	SD	SEM
Pre Main	control	32	92.9688	11.42009	2.01880
	input	29	91.3793	12.09313	2.24564
Post Main	control	32	93.4688	15.97979	2.82486
	input	29	1.0000	.00000	.00000
Pre Embedded	control	32	17.9688	29.26132	5.17272
	input	29	18.1034	25.78807	4.78872
Post Embedded	control	32	18.7500	15.55428	2.74963
	input	29	63.7931	17.14722	3.18416

The results indicated that both groups interpreted the preposed wh-phrases only in the main clause but not in the embedded clause. After treatment, the input groups' scores for the embedded interpretation raised significantly; i.e., paired comparison of the input groups' pretest and posttest mean scores showed a significant difference ($t = 8.023$, $p = 0.00$). Furthermore, an independent t-test performed on the mean scores of the two groups in the posttest showed significant outperformance of the input group ($t = 10.759$, $p = 0.00$). In other words, input practice developed knowledge of possible double interpretation of multiple wh-questions.

These results indicated that Iranian EFL learners consider only main clause interpretation for ambiguous single/multiple wh-questions and most of the time ignore the embedded interpretation. Yet, the input group's performance in the posttest displayed a strong positive effect for input-based practice in terms of embedded inclusion in their interpretations.

6.3. Knowledge of Constraints on Wh-Movement in Complex Wh-Questions

The third research question concerns the possibility of knowledge of complex and ambiguous wh-question to cluster with knowledge of superiority and subjacency constraints. For instance, if the learners can select only the main clause interpretation of '*when*' in "*When did John say* <~~*when*~~$_1$> *who had found the key* <*~~*when*~~$_2$>?", and avoid the embedded interpretation which violates the superiority constraint, then it can be concluded that the leaners do not have intuitions compatible with English native speakers who can distinguish between correct and incorrect wh-movements.

As only the input group showed development in readings compatible with embedded interpretations for ambiguous wh-questions, their performance on main and embedded interpretations of multiple wh-questions was analyzed. The logic of the analysis here was to find whether they would avoid illicit embedded interpretations. Table 5. Shows the input group's performance on wh-questions whose main clause interpretation is possible but embedded interpretations instantiates a violation.

Table 5. *Correct Main Clause Interpretations and Incorrect Embedded Clause Interpretations of Multiple wh-Questions*

	N	Minimum	Maximum	Mean	Std. Deviation
Main	29	66.00	100.00	95.3103	11.93166
*Embedded: Superiority violation	29	33.00	100.00	66.2759	25.32488
Main	29	66.00	100.00	96.4828	10.53776
*Embedded: Subjacency violation	29	.00	33.00	22.7586	15.53718
Main	29	66.00	100.00	98.8276	6.31364
*Embedded: Superiority & Subjacency violation	29	.00	100.00	13.7931	35.09312

As shown, the input group who had developed knowledge of embedded interpretations in English multiple wh-questions mainly avoided such interpretations for questions which instantiated subjacency violations (Mean=22.75).

Moreover, they avoided embedded interpretations for cases which violated both superiority and subjacency constraints (Mean=13.79). However, their performance on superiority violations shows a strong tendency to accept them (Mean=66.27). These results indicate that Persian learners of English are more accurate for subjacency violations than for superiority ones. Given the fact that the learners were not instructed for constraints on complex wh-questions, it can be concluded that exposure to ambiguous multiple questions leads to not only acquisition of movement of wh-phrases from the main as well as embedded clauses but also acquisition of ungrammaticality of movement from embedded clauses due to subjacency and superiority violations.

The results of this study generally challenge the findings of Hawkins and Hattori (2006). The following table summarizes results found for the Japanese learners (Hawkins & Hattori, 2006, p.291) and the Persian learners in this study.

Table 6. *Descriptive Statistics for Main and Embedded Interpretations by the Native Speakers and Persian & Japanese Learners of English*

L 1	Mean & SD	Embedded only	Complex multiple wh-questions							
			Ambiguous		Superiority		Subjacency		Superiority and Subjacency	
			main	embedded	main	*embedded	main	*embedded	main	*embedded
English	Mean	97	91	75	85	33	100	21	91	0
	SD	10	17	19	27	30	0	31	30	0
Japanese	Mean	96	92	78	88	75	93	58	95	58
	SD	11	12	26	17	29	14	37	23	51
Persian	Mean	100	100	63.79	95.31	66.27	96.48	22.75	98.82	13.79
	SD	0	0	17.14	11.93	25.32	10.53	15.53	6.31	35.09

As shown, Persian and Japanese learners' performanceS on interpretations which indicated violations are considerably different. In fact, Persian learners performed very similar to English native speakers for subjacency and both superiority and subjacency violations. The rate of acceptance of embedded interpretations which implicate subjacency violation was 21% for English native speakers, 22.75% for Persian speakers but 58% for Japanese speakers. This means that Japanese learners of English have not yet acquired this constraint. Similarly, while Japanese learners accepted ungrammatical embedded interpretations for superiority and subjacency violations 58% of the time and were significantly different from English native speakers (0%), Persian speakers accepted such violations only for 13.79 percent and patterned most with English natives rather than the Japanese learners of English. As both Japanese and Persian are wh-in-situ languages, the similar performance of Persian and English speakers suggests the effect of intervention on Persian speakers. We speculate that the poor performance of Japanese learners in Hawkins and Hattori (2006) might be related to other variables which might be illuminated in further research. As for the superiority violation, Persian speakers' performance (66.27%) was similar to Japanese speakers (75%) and significantly different from English natives (33%). Yet, it should be noted that superiority violations were accepted more than subjacecny violations by English native speakers, too (33% versus 21%). This might indicate that native speakers of English to some extent do accept such constructions as grammatical. Moreover, the rate of acceptance of this violation by Persian learners of English was considerably lower than Japanese learners (75% versus 66.27%). Considering the fact that the Japanese participants in Hawkins and Hattroi's study were very advanced English learners while Persian EFL learners in this study were intermediate learners, it can be concluded that the superiority constraint might be acquired either at a higher level or with more exposure to complex multiple wh-questions. In sum, the Persian learners of English at the onset of the study did not accept embedded interpretations in ambiguous complex questions but further to considerable exposure not only accepted them but also showed partial implicit knowledge of ungrammaticality when such interpretations indicated violations of superiority and/or subjacency constraints. As they had not received any explicit instruction, we suggest that the observed development in their performance is derived solely from the L2 input they were exposed to.

Generally, then, the results of this study are compatible with VanPatten (2002, 2004 & 2009) in that learners were guided to process input for meaning before they processed it for form. According to VanPatten, input-based activities help L2 learners promote learning and establish connections between meaning and form. Moreover, the findings of this study suggest a number of pedagogical implications. First, it was confirmed that input exposure and practice can be a

successful intervention to help EFL learners develop their linguistic knowledge and accuracy. In addition, language teaching methods such as communicative language teaching usually emphasize fluency at the cost of accuracy (Larsen-Freeman & Anderson, 2011). Therefore, in order to compensate for this shortcoming, language instructors should focus on providing opportunities for L2 learners to experience instances of language which are extremely limited in the usual input they receive. Finally, when teaching complex L2 grammatical aspects, exploiting reading comprehension tasks might facilitate acquisition of implicit knowledge of L2 forms without explicit instruction. Therefore, we suggest that these types of tasks be used for complex structures before using any other time consuming tasks. Further research might focus on issues such as the impact of incremental exposure to complex structures and the retention of such an impact.

7. Conclusion

Many researchers have proposed that language acquisition ability declines with increasing maturation leading to a sharp divergence between native and non-native end-state grammars. The evidence supporting this proposal is mainly derived from adult L2 learners' performance on morphological or syntactic properties which bear very complex and abstract subtleties. However, divergent grammars have also been reported for individual native speakers of the same language. This divergence is claimed to originate from 'low education', 'poor schooling', 'less linguistic experience of written academic input' and the like. Similarly, the findings of this study emphasize that insufficient linguistic experience might be the source of failure in the performance of L2 learners, a point which could be concealed when level or length of exposure is the sole criterion for determining learners at the final state of language acquisition. If input is the main external driving force for language acquisition, it is simply impossible to expect L2 learners' success and native like performance in the absence of rich and varied input specifically for complex structures which are less frequent in everyday language. These findings do not necessarily contradict nativist approaches to language acquisition. Rather, they emphasize the significant role of the L2 input which cannot be ignored. Further research on the acquisition of complex structures is required to dissociate the roles of the L2 input versus maturation in the course of adult second language acquisition.

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Conflict of Interest

The authors declare no conflict of interests.

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