On the Source of U-Shape Learning in Interlanguage Processing: A Pilot Study on the L2 Acquisition of Number Agreement in French by Jordanian Arabic Learners

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Abstract—This paper investigates the L2 acquisition of the morphosyntax of number agreement of French by L1 learners. The study is based on a pilot study that investigates learners' knowledge of number agreement of two paradigms of subject-verb number agreement in French: the so-called matching paradigm in which agreement in number is expressed audibly via an alternation of the verb stem between a singular and plural forms and the mismatching paradigm in which the number agreement is not audible realized via singular vs. plural alternation. We discussed our sample's proficiency in (de-)normalizing number agreement and the implications it has for the theory of corrective feedback and linguistic input in L2 processing in Language acquisition.

Index Terms—Number agreement, input-providing va. output-pushing corrective feedback, U-shape processing

I. INTRODUCTION

Central to Second Language processing are the two notions of what McLaughlin (1990) called *automaticity* and *restructuring*. In automaticity, an L2 learner exercises control over their linguistic capacity by routinizing a number of cognitive, social or perceptual skills. For the learner to automatize a certain linguistic knowledge in second language acquisition (SLA), it is necessary to activate a kind of associative connection of an input-output pattern through fast and unconscious processing. Reconstructing, on the other hand, involves the process of incorporating additional information that facilitates organization and reconstruction (for more information on this concept with respect to the processing of L2, see for example Crookes, 1991, 1989; Bialystok, 1978; Ellis, 1987; Williams, 1990; Segalowitz, 2003).

Reconstructing refers to the qualitative change that the internal representation of L2 undergoes through learning. To move from one step to another in language learning is to re-construct and organize an existing system of knowledge. Such a move is not a mere accumulative addition of information, but it is a process of restructuring an existing system in order for the change on the internal representation of L2 to take place (Lightbown, 1985; McLaughlin & Heredia, 1996).

One well-studied form of reconstructing is the so-called *destabilization*. This form refers to the situation in which a learner begins with a single rule that is generalized over all cases in hand and when an additional rule becomes available in a subsequent stage, the learner either alternates between the rules or alters them until the correct patterning and distribution of the structure in question is established (Ard & Gass, 1987; Gass et al., 2013).

Destabilization as a form of restructuring in L2 acquisition is characterized by what is known to be *U-Shaped learning* which is a well-attested form of development by reconstructing in L1 acquisition and other domains of cognition (see Carlucci et al., 2005). U-shaped learning gives rise to the so-called U-Shaped patterns which represent the following stage-level development. Earlier in acquisition, the learner produces the target-like L2 form in an error-free manner. At a later stage, the learner starts to produce errors in the production of the target-like form in such a way that an apparently remarkable decline in the L2 acquisition becomes noticeable. Finally, the learner retains her error-free performance in producing the target-like normal form. The three stages which result into U-shaped pattern is visualized in the following figure (Gass et al., 2013).
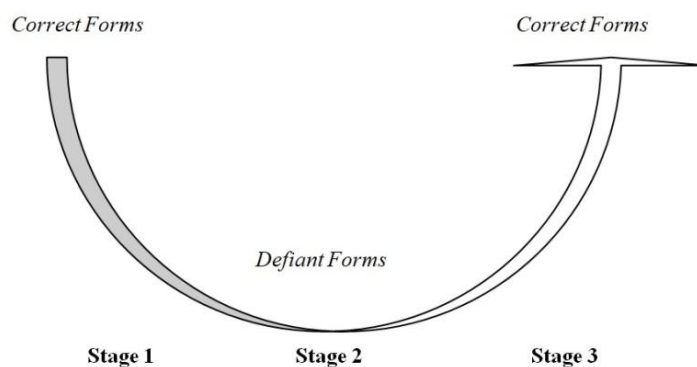
Figure 1 U-Shape Behavior in Language Acquisition

An example of the U-shaped pattern in SLA is the production of the progressive -ing pattern in L1 French acquirers of L2 English which was analyzed in Lightbown (1983). In this study, it was observed that at an early stage of L2 acquisition, French learners responded to describing pictures by using the correct form of the progressive -ing in English.

(1) He is taking a cake.

At an advanced level, the use of the progressive -ing started to decrease by using forms such as (2). This indicated that there was a decline in the learners' knowledge of the *-ing* progressive form was declining.

(2) *He takes a cake

What explained this decline in the knowledge of the progressive -ing? Lightbown (1983) argued for a U-Shaped pattern in which the L2 learners normalized the use of the progressive -ing at an early stage since it was the only form available for the learners. Later on, the learners started to learn new forms of tense and aspect. With such new forms in hand, the learners started to deviate from the correct use of the progressive. Finally, with their knowledge of tense and aspect being appropriately restructured and re-established, they knew the limits of the use of the two forms and started to use them appropriately in context.

In this paper, we investigate the L2 acquisition of two paradigms of subject-verb number agreement in French by L1 Jordanian Arabic learners. In one paradigm, the agreement in number is expressed audibly via an alternation of the verb stem between a singular and plural form as exemplified in (3). We call this paradigm *'the mismatching paradigm'*.

(3) a. Le copain   /di/   bonjour
    The-SG friend-SG   say-SG   hello
  "The friend says hello"
  b. Les copains   /diz/   bonjour
    The-PL friend-PL   say-PL   hello
  "The friends say hello"   (Ågren et al., 2021, p. 4)

In the other paradigm, the number agreement is not audible realized via singular vs. plural alternation as represented mainly by verbs with the first conjugation -er verbs as in (4) (Ågren et al., 2021). We call this paradigm *'the matching paradigm'*.

(4) a. Le copain   /paʁl/   fran çais
    The-SG friend-SG   speak-SG   French
    "The friend speaks French"
  b. Les copains   /paʁl/   fran çais
    The-PL friend-PL   speak-PL   French
    "The friends speak French"

                    (Ågren et al., 2021, p. 4)

In non-natural school-based learning setting, the mismatching paradigm of number agreement can be taught through both *an input-providing corrective feedback* in the form of recasts which can be used to provide positive evidence to L2 learners (Nicholas et al., 2001; Leeman, 2007)[1] and an *output-pushing corrective feedback* which is only capable of providing negative evidence based on self-correction in the part of learners (Lyster, 2002).

The matching number agreement paradigm, on the other hand, can only be taught using an *output-pushing corrective feedback* which is only based on self-correction (Lyster, 2002). This is the case due to the absence of number agreement in spoken input through recasts so that the output-pushing corrective feedback remains the most effective method to teach this paradigm.

Assume that our learners show a U-shaped learning pattern of number agreement in one or both paradigms, two questions arise with respect to U-shaped learning. First, does the type of input play any role in normalizing the target-like error-free forms (e.g., recasts vs. written feedback) at an early stage of processing? Second, if input and input type

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[1] See also Egi (2007) and Ellis and Sheen (2006) for a discussion on the use of positive and negative evidence in recasts.

doesn't play any role in normalization, does L1 transfer take this role? The same two questions can be asked with respect to the learner's deviation from the normal form (let us call it denormalization), does input or input type play any role in such decline of knowledge or alternatively does negative transfer from L1 is the culprit?
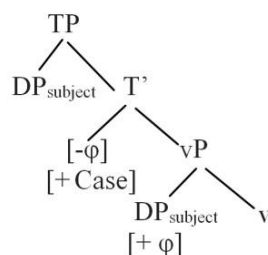
This paper is structured as follows. Section 2 describes the framework of language representation and learnability which we will assume in the subject-verb agreement in number of in French and Jordanian Arabic. Section 3 outlines the two modes of instruction; the so-called *Input-providing and output pushing corrective Feedback* in relation to L2 acquisition. Section 4 reformulates the null hypotheses based on our research questions which have to do with the relationship between input and L1 transfer on normalization and denormalization of emerging agreement patterns. Section 5 describes and discusses the results of an experimental pilot study and its procedures. The last section concludes the paper with further theoretical implications in language processing in SLA and recommendations for extending our pilot study into a full-scale project.

II. THE MORPHOSYNTAX OF NUMBER AGREEMENT IN FRENCH IN FEATURE ASSEMBLY

In this section, we describe a simplified standard minimalist procedure based on Chomsky (1995) that derives the subject-verb number agreement in the French sentences (3) and (4) and their Jordanian Arabic counterparts (See Jarrah, 2019) and the subsequent work on the syntax of agreement in Jordanian Arabic).[2] It is assumed that the nominal subjects (Le copain/Les copains) enter the derivation with the valued φ-features (number, gender, person) and the unvalued Case feature. The nominal subject 'Le copain' enters the derivation with the valued set of φ-features symbolized as $[+ \varphi]$, and with an unvalued feature of Case symbolized as [- Case]. The Tense phrase head T^0, on the other hand, comes with the Case feature as already valued (i.e., [+ Case]) and the φ-features as unvalued (i.e., $[- \varphi]$).

Given this featural set-up, the syntax operates on valuing the unvalued features through a set of computational procedures mainly characterized by Agree-Move operations.

(5)

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                        TP
                      /    \
              DP_subject    T'
                           /  \
                        [-φ]    vP
                     [+Case]   /  \
                         DP_subject   V
                           [+ φ]
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Following a standard practice which is due to Chomsky (1995), agreement in number proceeds as follows. The head T^0, by virtue of having the $[- \varphi]$ feature, probes into its c-command domain to locate as its goal the $DP_{subject}$ whose matching $[+ \varphi]$ feature is already valued. The $[- \varphi]$ feature on T^0 will get valued by Agree. At this point, the unvalued [- Case] on the $DP_{subject}$ will also get valued in the process since its agreeing probe T^0 carries the valued feature of Case [+ Case].[3][4]

How does Subject-Verb number agreement in number come to be acquired by L2 acquirers? In order to answer this question, we need to make available some working assumptions about Language architecture and the second language learnability.

First, we assume that the core syntax of Language assembles syntactic expressions out of relevant different morpho-lexical items specified for matrices of features by means of specialized syntactic mechanisms (such as Probe-Goal Agree). Such expressions are then sent to the relevant interface levels for the phonetic and semantic assignments. While the computational processes of the core syntax are universal, different languages may use different morpho-lexical elements with different featural realizations (See for example Ramchand & Svenonius, 2008; Chomsky, 2004).[5]

Let us illustrate this idea with subject-verb agreement in French and J.Arabic. The computation of the core syntax, being universal, assembles the TP structure in (5) using a T head with Case and phi-agreement features and the DP subject with corresponding Case and φ -agreement features using Probe-Goal Agree and the associate movement operations. If languages are different in the featural contents of the morpho-lexical items used and hence different

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[2] For more on Arabic, see Al-Gharaibeh (2019).

[3] Finally, two additional operations apply in the derivation: (i) the EPP feature on T^0 triggers the $DP_{subject}$ into the Specifier of TP and the T^0 undergoes head movement into v^0 resulting into an affix hopping

[4] Chomsky (1995) proposed that the valued vs. unvalued distinction of features associates with another distinction of interpretable vs. non-interpretable features. Interpretable features have semantic effects and non-interpretable ones need to get interpretable in the Agree-Move operation. See Pesetsky and Torrego (2000) for an argument against this correlation between valuation and interpretability.

[5] We take no position on the debate whether syntactic structures are assigned phonetic and semantic forms in independent interface components in connection to the intentional-conceptual and sensory-motor external systems or through the external systems directly (c.f., Ramchand & Svenonius, 2008).

agreement patterns resulted for different languages [6], a syntax-semantic mismatch arises in second language acquisition (See Cho & Slabakova, 2014).

In our example, all the JA acquirer needs to do in order to acquire subject verb number agreement in French is to make use of the relevant morphosyntactic elements such as T and the DP subject with its target-like featural specifications in assembling target like number agreement paradigms using the universal narrow syntactic mechanisms of Probe-Goal Agree and the relevant transformations.

Capitalizing on this assumption, Lardiere (2008) proposed the following approach of L2 acquisition based on features reassembly (i.e., the feature reassembly hypothesis). First of all, the L2 acquirer performs an initial mapping of the featural matrix of the L1 morpho-lexical element onto its counterpart in the L2 based on perceived similarity between the two forms. Second, once the initial mapping is achieved, the L2 acquirer adjusts the featural matrix by deleting or adding features based on the evidence they receive from the input. In looking at the task of L2 acquisition of number agreement in French by L2 acquirers, there is an obvious mapping between the two patterns of number agreement in the two languages based on meaning and function similarities.

III. Two Types of Corrective Feedback

Corrective Feedback (CF), be it oral or written, has been thoroughly investigated from two theoretically polarized second language acquisition (SLA) perspectives. [7] Under the behavioristic approach to SLA, CF plays the central role in language learning by eliminating errors through experience and instruction (See VanPatten & Williams, 2015 and the references therein). On the nativist view (mainly represented by generative SLA), CP in the form of negative evidence (NE) plays no crucial role, especially in first language acquisition. Its focus is placed on the internal factors of the mental processes of learning rather than on merely external behavioristic factors (Chomsky, 1959).

Under the generative approach, at least some aspect of language follows from mental properties which are embodied within a language-specific module in the cognitive system called 'Universal Grammar' (Chomsky, 1964 and the subsequent work).[8] The UG characterizes the linguistic competence that the speaker-hearer possesses. To what extent that input is involved in developing the linguistic competence of L2 learners (i.e., the interlanguage) remains a controversial topic. Many researchers argued that in CF is a necessarily inevitable condition in L2 acquisition (Gass, 1988; Schachter, 1988; Birdsong, 1989; Bley-Vroman, 1989; White, 1991). Others underestimate the role of CF as only capable of affecting linguistic performance rather than linguistic competence (Bley-Vroman, 1989; Schwartz, 1998). Schwartz (1998), for example, differentiated between two forms of interlanguage development: linguistic competence which arises through the interaction of UG and *primary linguistic data* of positive evidence as characterized by natural, contextual, and communicative paradigms of language use and a *learned linguistic knowledge* (LLK) which forms using negative evidence such as CF. Such knowledge only underlies the performance of the L2 learner (See for example Krashen, 1982; Truscott, 1998).

Recent investigations have studied the effect of two types of CF: Input-providing and output pushing CF (Lyster 2002, 2007; Lyster & Mori, 2006, 2008; Ranta & Lyster, 2007). While input-providing CP provides the correct reformulation through recasts and explicit correction. Output-pushing CF avoids the correct reformulation and instead encourages learners to self-correction through prompts such as clarification requests, repetition of learner error, metalinguistic clues, and elicitation (Yang, 2010, pp. 237-238).

The two types of CP differ in one major respect: while input-providing CP, in the form of recasts, can be used to provide positive evidence to L2 learners (Nicholas et al., 2001; Leeman, 2003), out-put pushing CP is only capable of providing negative evidence since it is based on self-correction in the part of learners (Lyster, 2002).

Previous research particularly highlighted the importance of recasts as promoting observed development in language acquisition in at least two ways. First, recasts provide both (implicit) negative and positive evidence (Grimshaw & Pinker, 1989; Long, 1996; Pinker, 1984, 1989). Second, recasts enhance the salience of target forms (Farrar, 1990; Long et al., 1998; Nelson, 1987; Saxton, 1997; Leeman, 2003).

It has been suggested that a recast can be juxtaposed with a slightly different preceding utterance making the reformulated information included in the recast more perceptually salient (Farrar, 1990; Long, 1996; Long et al., 1998; Nelson, 1987; Saxton, 1997). By using recasts, juxtaposing utterances in L2 acquisition may increase the salience of the target form, which then has the effect of promoting noticing and learners' attending of that form with a consequence of incorporating the form in the grammar (Leeman, 2003).

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[6] Notice that languages vary w.r.t the featural content of the heads their functional category, e.g., C or v. One class of languages have agreement in φ -features such as French, English and Arabic. Another class lacks φ -agreement and they have instead agreement based on discourse features such as Japanese and Korean. One more class makes use of both phi- and discourse agreement such as Greek and Arabic (For more information on this typology, the interested reader is referred to comparative syntax studies such as Miyagawa, 2010; Jimenez- Fernandez & Spyropoulos, 2013; Abu Helal, 2022, 2019).

[7] From the perspective of second language writing, the question under investigation is whether CP helps L2 learners develop and/or improve their writing productive skill (e.g., Sheen, 2010; Ashwell, 2000; Chandler, 2003; Fathman & Whalley, 1990; among many others).

[8] The UG view explains two important facts about first language acquisition: first, humans tend to have propensity for acquiring a first language. Second, children acquire their first language in a uniformly effortless and perfect way. When it comes to SLA, the question of whether UG is operative in acquisition is a controversial one (See for example Eubank, 1991; Schwartz, 1986; Thomas, 2003; White, 2015).

IV. THE NULL HYPOTHESIS

Based on our research questions which were presented in the introduction, we formulate our null hypothesis as follows.

Given a U-shaped learning procedure, does input-providing corrective feedback in the form of recasts play any role in normalizing/ denormalizing the correct form of target-like form in the L2 acquisition of number agreement by J. Arabic learners of L2 learners?

V. THE EXPERIMENT (PILOT STUDY)

A. Participants

This study included two groups of participants: the first is a control group comprising native speakers of French (n= 13). The second group is a group of J. Arabic learners of L2 French (n=20) which were further divided into an advanced and an intermediate group (10 students each). The experimental group were university students who specialize on French Language and Literature in a number of Jordanian Universities. The participants provided demographic information such as gender, age and length of French study (for the learners). We strictly controlled these variables in such a way that only a uniform and well controlled group were tested.

TABLE 1
PARTICIPANTS DEMOGRAPHIC INFORMATION AND LEVEL OF PROFICIENCY

	Gender	Age	Years of Study	Proficiency
Native Control	8 male 5 female	19-30 M=23	N/A	N/A
L1 J. Arabic (n=20)	7 male 13 female	19-25 M=21	3-5 M= 3.5	Intermediate (n=10) Advanced (n=10)

B. Test Procedures and Instruments

Two offline tests were used in this study: a grammaticality judgement test and a proficiency test. The proficiency test consists of 20 items and it is based on DELF (Diplôme d'Études en Langue Française) which is an official test designed by the French Ministry of Education to confirm the French language proficiency of candidates from outside France. We only used a subset of the exam that tests grammar and vocabulary with varying levels of difficulty.

The grammaticality judgment task (GJT, K= 61, including fillers) asked students to correct verbs based on the paradigm of number agreement it has. Two paradigms of number agreement were tested. The first one we call '*matching verbs*' in which the singular and plural forms, which have different forms in writing, are indistinguishable in pronunciation as exemplified in (1).

(6) **(Matching paradigm)**

Les bus et les trains réguliers _____(cesser) de fonctionner aux alentours de minuit.

In the example in (6), the correct agreement form of the verb 'cesser' is the plural form 'cessent'. Notice that the plural form is pronounced in the same way as its singular counterpart 'cesse'; the two forms are pronounced as \sɛs\. This form cannot be taught using input-providing means of CF such as recasts so that the only effect means to teach this is output-providing CF which involves self-correction through writing.

Consider, now, the following sentence which exemplifies a mismatching form of number agreement in French where the plural and singular forms have distinguishable pronunciations.

(7) **(Mismatching paradigm)**

Plus on s'éloigne de notre étoile, plus elle _____ (faiblir).

The correct form here is the singular form 'faiblit' pronounced as \fe.bli \. Notice that the plural form of this verb is 'faiblissent' which is pronounced as \fe.blis\. The difference in pronunciation between the two forms is salient in conversation making an input-providing CF based on recasts a practicable means of teaching this form.

### C. Results and Discussion

A repeated measures ANOVA were performed to compare the effect of learners' proficiency on the L2 acquisition of the two paradigms of number agreement of French. There was no statistically significant difference in performance between the advanced and intermediate groups ($F_{1,1} = 0.931$, $p = 0.341$).

For the intermediate group of L1 Arabic L2 French, we performed a paired t-test to compare their performance in using matching and mismatching paradigms of agreement of number in both intermediate and advanced groups. For the intermediate group, there was no statistically significant difference in performance between the matching paradigm of number agreement (Mean = 72.1, Standard Deviation = 7.078057) and the mismatching paradigm (Mean = 82.5, Standard Deviation = 3.045032); $t(18) = -1.3497$, $p = 0.1938$.
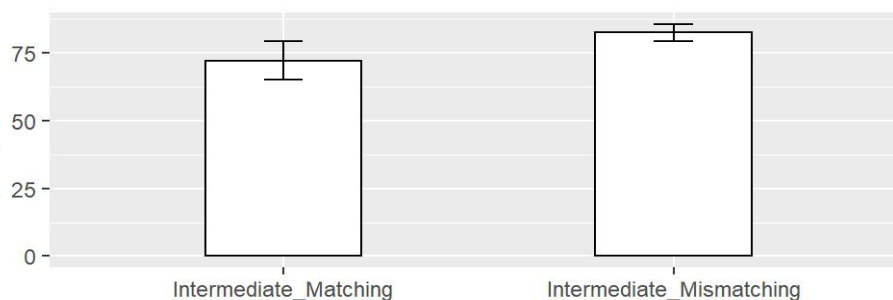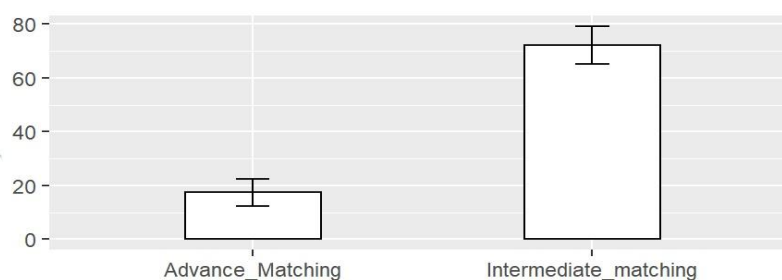
We also found no statistically significant difference in advanced groups between the matching paradigm of number agreement (Mean = 17.4, Standard Deviation = 17.4) and the mismatching paradigm (Mean = 17.7, Standard Deviation = 7.1); t(18) = -0.03761, p = 0.9704.
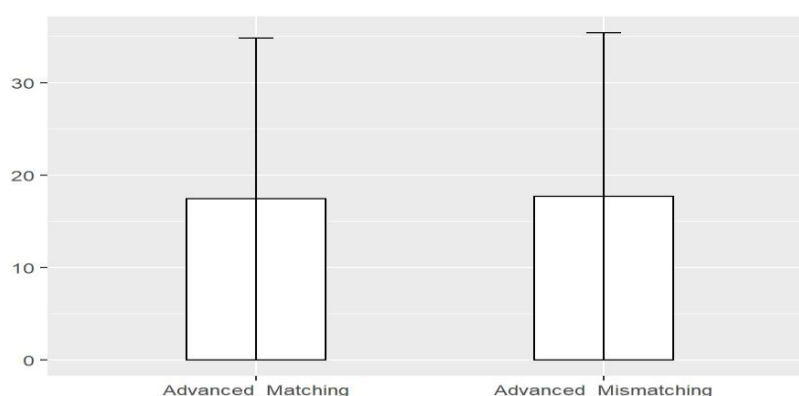

As we can see, the two groups of learners show no sensitivity to the type of paradigm of number agreement (matching vs. mismatching paradigms).

Let us compare the groups with respect to their performance in each paradigm of number agreement. Let us begin with the advanced vs. intermediate group with respect to the matching paradigm. Again, we run a paired t-test to compare the performance of the two groups. In fact, we found a statistically significant difference between the advanced group performance on the matching paradigm (Mean= 17.4, Standard Deviation= 4.995998) and the intermediate group performance on the matching paradigm (Mean= 72.1, Standard Deviation=7.07), t (18) = -6.3137, p = 5.966e-06 ≈ 0.00005966**.**

The same result applies to the learner's performance on the mismatching paradigm of number agreement. We found a statistically significant difference between the intermediate group performance on the mismatching paradigm (Mean= 17.7, Standard Deviation= 6.218342) and the advanced group performance on the mismatching paradigm (Mean= 82.5, Standard Deviation=3.045032), t (18) = -9.3589, p = 2.451e-08 ≈ 0.00000002451**.**
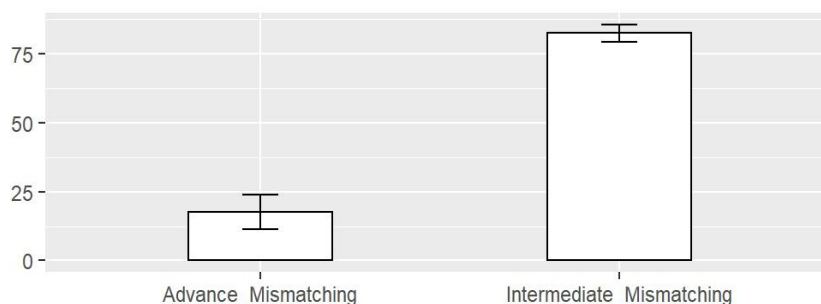
The experimental results of this pilot study indicate that the sampled J. Arabic learners of L2 French displayed a U-shape learning situation; the intermediate group performed better than the advanced group on both matching and mismatching paradigms of number agreement. It is possible that the learners started to normalize a generalized paradigm of number agreement at an earlier stage as a consequence of L1 transfer (i.e., since J. Arabic makes use of number agreement) or through the universal mechanism of feature valuation in the syntax using featural (re-)assembly based on positive input, which can only be provided through the input-providing CF through recasts in our non-naturalistic L2 teaching setting.

Since, as the results showed, there is no statistical difference in performance between the matching and mismatching agreement paradigms in the two groups of learners, it follows that the role of input-providing CF through recasts may not be crucial. If recasts were to be shown effective in the L2 acquisition of number agreement, we expected that our participants would perform better in mismatching paradigm than in the matching one. Contrary to this expectation, the results showed no significant difference between the two paradigms in the two groups of learners.

VI. CONCLUSION

In conducting this pilot study, we hoped to bring attention to an interesting question in L2 processing through restructuring via U-Shape Learning: given a U-shaped learning situation, which is well-attested in the acquisition of inflectional morphology, is input/ input responsible for normalization/denormalization of the target-like form in language development in interlanguage? Our pilot study preliminarily showed that the input type, be it input-providing or output-pushing, has no effect in both normalizing or denormalizing the number agreement form of L2 French. It is possible that such a situation of U-shaped learning follows from positive L1 transfer or from universal mechanism of the syntax based on successful featural assembly. Since it is just a pilot study that aimed at giving a rough idea of a full-fledged study on the question of the source triggering U-shaped learning, there is no claim that our finding is conclusive. It is our hope to motivate feature full-scaled research to look at the U-shape learning of number agreement paradigms of L2 French by L1 learners from different L1 backgrounds.

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