Investigating the Effectiveness of a Signal-based Approach in Improving Learners' Decoding of Connected Speech
The Case Study of Second-year Students, University of M'sila

Abstract

This study examines the effectiveness of connected speech (CS) instruction in improving learners' decoding of spoken English. It follows the trend of a balanced listening session that focuses on both top-down and bottom-up modes. It attempts to integrate CS instruction into the listening comprehension lessons following a *diagnostic approach* that uncovers CS features which may cause comprehension breakdown. An experimental group (N= 19) received listening lessons with an extended post-listening phase to address the CS features diagnosed as problematic during listening. A control group (N= 19) received similar lessons without specific focus on CS. The pre-test results revealed that CS aspects pose serious obstacles in decoding and segmenting speech for the participants, with a possible negative interference from top-down processing. The experimental group has shown a statistically significant improvement after the treatment. A post-treatment interview revealed positive reactions to the instruction, and a reported relative improvement in listening comprehension.

Keywords: top-down ; bottom-up ; listening comprehension ; diagnostic approach ; connected speech decoding

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Résumé

Cette étude examine l'efficacité de l'enseignement du discours connecté (DC) dans l'amélioration du décodage des apprenants de l'anglais parlé. Il suit la tendance d'une séance d'écoute équilibrée qui se concentre sur les modes descendants et ascendants. Il tente d'intégrer l'enseignement du DC dans les leçons de compréhension orale à la suite d'une approche diagnostique. Un groupe expérimental (N = 19) a reçu des leçons d'écoute avec une phase après-écoute prolongée pour traiter les problèmes relié aux caractéristiques du DC sources des problèmes lors de l'écoute. Un groupe témoin (N= 19) a reçu des leçons similaires sans aucun apport théorique sur le DC. Les résultats ont révélé que les aspects du DC constituent un obstacle sérieux au décodage, avec une éventuelle interférence négative du traitement descendant. Le groupe expérimental a fait preuve d'une amélioration statistiquement significative après l'application de l'approche. Une interview post-traitement a révélé des réactions positives vis-à-vis l'approche.

Mots clés: traitement descendant ; traitement ascendant ; approche diagnostique ; décodage du discours connecté ; compréhension orale

ملخص

يلخص هذا البحث نتائج دراسة أجريت على عينة من طلبة الإنجليزية. تهدف الدراسة لمعرفة مدى تأثير المنهج التشخيصي للاستماع في تطوير مهارات المتعلمين في ادراك خصائص الكلام المتصل و تحسين مهاراتهم خلال الاستماع للغة الانجليزية, حيث تهدف الى إعطاء أهمية للمهارات المتعلقة بتقسيم الكلمات و ادراكها من خلال الاستماع من الأسفل إلى الأعلى لفك شفرة الكلام المتصل و تسهيل الفهم للمعنى المراد من طرف المتكلم. اشتملت الدراسة على عينة تجريبية تلقت دروسا في الاستماع باتباع المنهج التشخيصي لتحديد المشكلات المتعلقة بالكلام المتصل و علاجها, و أخرى ضابطة لم تتلق دروس محددة. أظهرت النتائج بأن خصائص الكلام المتصل تمثل عقبة في عملية الاستماع للطلبة في تقسيم و ادراك الكلمات، مع احتمال وجود تأثير سلبي لأسلوب الاستماع من الأعلى الى الأسفل على هذه العملية. كما تم تسجيل تحسن في مهارات المتعلمين في العينة التجريبية فقط بعد الدروس مع تثمينهم لها و ذكرهم لتحسن نسبي في عملية الفهم خلال الاستماع.

الكلمات المفتاحية: منهج تشخيصي ؛ استماع ؛ (الاستماع) من أسفل الى أعلى ؛ فك شفرة الكلام المتصل ؛ (الاستماع) من أعلى الى أسفل

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I- Introduction:

The ability to decode and segment words in CS (speech produced naturally in which words undergo a set of phonological modifications) is identified as a basic skill in L2[1] listening and complete or partial failure in coping with aspects of naturally spoken language during listening may indeed lead to comprehension breakdown (Celce-Murcia, M.Brinton, & Goodwin, 1996; Field, 2003; Wilson, 2003; Lynch, 2009; Vandergrift & Goh, 2012). Research studies, like Henrichsen (1984), Ito (2001; 2006) Brown and Hilferty (2006) and Matzuzawa (2006), have provided evidence for this, while others suggested that learners should be helped to develop the skill of decoding CS with automaticity (Hulstijn, 2001; Peterson, 2001). Within a process-view of listening, processing sounds in CS basically takes a bottom-up mode –one of the two main processing modes that dominated language pedagogy from the early 1980s on (Nunan, 2002), the other being top-down. In the first mode, understanding a message is the result of listening in a linear step-by-step way starting from sounds and moving up to the higher level of the syllable and then word level and so on until the highest level is reached and meaning is created. Top-down processing takes a reverse mechanism; listeners start from higher levels of meaning, schematic knowledge and background information to make expectations and hypotheses about what will be said. Hence, understanding is the result of narrowing down the scope of the hypotheses made and checking the expectations against what is actually said.

It would seem logical to say that, because of the phonological nature of CS aspects and the assumed sound modifications that words undergo as a result of them, bottom-up processing appears to be the natural route of processing the resulting distorted word boundaries and reduced word forms. Suggested practical tasks and principles to cope with CS aspects in the L2 listening literature suggest this link (e.g. Peterson, 2001; Hewings, 2004). However, a noticeable over emphasis on top-down mode in theory and, consequently, in teaching has shifted interest from teaching the basic bottom-up decoding skills to focus on the use of higher sources of meaning (Field, 2003; Wilson, 2003; Lynch, 2006) . Learners are taught and expected to use their background knowledge not only to make useful expectations, but also to bypass the signal whenever problems in decoding are encountered. The result is a neglect of the basic decoding skills to deal with natural speech, especially CS aspects. Addressed this way, problems in dealing with CS aspects may be avoided to some extent through compensating from higher level sources. However, avoidance does not provide learners with the required automatic skill to decode speech and the problems may persist.

I.1. Literature Review:
I.1.1. Decoding CS in L2 Listening:

CS aspects represent a major obstacle in decoding speech for untrained L2 learners (Ito, 2006). This problem will be briefly discussed in the light of the related literature in theory and, then, some of the studies that dealt with L2 listeners' CS-related problems will be reviewed. In discussing how CS aspects affect English as foreign language (EFL) listeners' decoding process, a comparison is usually drawn between written and spoken language. Lynch (2009) and Vandergrift & Goh (2012) note that listeners, unlike readers, do not have the 'luxurious' spaces between words which are found in written texts, and help in defining word boundaries. They are presented with a stream of sounds that is tied together as a single unit where words and their borders are rather obscure (Brown G. , 1990). When words are pronounced together in natural fast speech, a principle of ease of pronunciation is called upon to resolve the difficulty of pronouncing each sound as accurately as it might be if

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[1] The controversial issue of second language (L2) and foreign language (FL) and the difference between them is out of the realm of this study. Throughout the paper, "L2" will be used, following Mitchell & Myles' definition, to refer to "any languages other than the learner's 'native language' or 'mother tongue' " (2004, p. 6). Hence, any possible use of "L2" or "FL", individually, will fall within this scope.

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articulated in isolation (Ladefoged, 2001; Bloomer, Griffiths, & Merrison, 2005; Toda, 2006). In many cases, the organs in the vocal tract cannot move smoothly and quickly from one articulatory position to another, especially under the constraint of fast delivery. What usually happens is a change, a reduction or an adjustment in the quality and or the quantity of sounds at word borders (Bloomer, Griffiths, & Merrison, 2005) so that the movement is rather smooth, fast and does not require much energy.

While these modification processes (also called *reductions/reduced forms/CS aspects* or *features*) make the speakers' task easy, a heavy burden is put upon the EFL listeners, especially (Brown G. , 1990; Field, 2005). Unless they are aware of these aspects, the task of matching these modified or reduced word shapes to the ideal word representations stored in their memories will be really difficult for them when they face natural language outside the classroom. L2 learners listening to natural speech may not recognise the words they already know, and which they would easily determine if they were written or spoken in isolation (Kenworthy, 1987; Vandergrift & Goh, 2012). They could also encounter problems in making lexical segmentation –defining word boundaries. Commonly discussed aspects include *assimilation*, *elision*, *linking* and *intrusion,* as well as phrases like 'gonna', 'dunno' 'watcha' (Brown G. , 1990; Dalton & Seidlhofer, 1994; Buck, 2001; Field, 2003; Brown & Kondo-Brown, 2006; Roach, 2009). Brown illustrated these modifications by analysing native speakers' speech and gave examples of what he called *regular patterns of simplification* (1990, p. 57). He maintained that while the modification patterns are produced unconsciously and effortlessly by native speakers, non-native speakers will suffer this variability in the input while listening. If L2 listeners are unfamiliar with naturally spoken language, the modifications will add to their listening problems (Brown G. , 1990).

Though usually treated separately, weak forms of function words are also considered as "another aspect of connected speech" (Dalton & Seidlhofer, 1994, p. 113). To maintain the regular rhythmic pattern of spoken English, function words are commonly reduced in connected speech (Dretzke, 1998). This is done through the dropping of consonant sounds and/ or the reduction or replacement of the central vowel with a weaker one, usually the schwa (Roach, 2009). Again, such reductions make weak forms unnoticeable and pose serious perception problems for untrained learners who are usually exposed to slow and fine-tuned language inside the classroom (Buck, 2001; Gilbert, 2005).

A number of studies investigated the effects of CS on EFL learners' listening and the results suggest a link between learners' difficulties in decoding CS aspects and their listening comprehension. For example, Henrichsen (1984) investigated the difference in L2 listeners' performance in a listening test in the presence or absence of reduced forms. Unlike the native speakers' performance in his study, both low and high level L2 learners obtained significantly lower scores in the test where reduced forms were present. Similarly, in the experiment he conducted, Matsuzawa (2006) reported "a serious lack of comprehension of reduced forms among participants," (Matsuzawa, 2006, p. 59) and described reductions as a barrier to listening comprehension. The 20 Japanese learners in this study obtained very low scores in the pre-test, and a significant improvement was noted in their post-test scores after the reduced forms instruction they received. Brown & Hilferty (2006) also investigated the effects of teaching reduced forms to EFL learners of English. The experimental group (N=16) received 30 lessons on reduced forms that lasted for about 10 minutes each, while the control group received pronunciation drills and sound discrimination exercises. The post-test results showed an improvement in the control group's scores and the "4 weeks of reduced forms lessons did seem to have an effect on performance" (Brown & Hilferty, 2006, p. 57). More recently, Chenjun and Li (2012) found that explicit instruction on some decoding skills contributed to better listening comprehension for Chinese EFL learners and proposed that "it would be more appropriate and practical for L2 teachers to adopt a triangle model (decoding skills instruction + top-down strategies instruction + automatization training) for L2 listening instruction" (2012, p. 253).

I.1.2. Top-down Overemphasis

While listening is considered as an interactive process between bottom-up and top-down modes (Morley, 2001; Peterson, 2001), some scholars have raised the issue of the overemphasis given to the latter (Skehan, 1998; Wilson, 2003; Lynch, 2006; Field, 2008a). Wilson (2003) notes that "current approaches to teaching listening have tended to emphasise listening for gist, top-down processing and listening strategies [...] Bottom-up approaches that focus on word recognition, on the other hand, have been comparatively undervalued" (p. 335). The possibility that top-down processes can be used to solve lower level problems, including those related to CS aspects, has led to the presumed idea that bottom-up skills are of a lower importance as failure in decoding the signal can be solved by using compensatory strategies (Wilson, 2003; Field, 2008a). However, the extent to which learners can successfully use background and linguistic knowledge has been questionable. It is not an easy task (Wilson, 2003) and learners may lack the necessary knowledge to activate in the target culture (Buck, 2001) or even fail to activate the relevant schema for the situation at hand (Carrelle & Eisterhold, 1983; Tomitch, 1988).

L2 learners' interpretations, as demonstrated in studies like Tsui & Fullilove (1998) and Wu (1998), may be negatively affected by top-down overuse. Participants in these studies were tested on the effect of using background information and familiarity/non familiarity with the topic on their interpretation of spoken language with or without a video support. The results revealed that L2 listeners can often be misled by overusing their background knowledge which can lead to wrong inferences. Without checking their initial hypotheses against what is actually said, or their failure in doing it, wrong interpretations usually prevail. Tsui and Fullilove concluded that, in their study, "bottom- up processing was more important than top-down processing in discriminating the listening performance of L2 learners in the test items" (1998, p. 432). Field (2008b) found that, whereas wrong hypothesis made by L1 listeners were quickly modified based on new perceptual evidence, L2 listeners had a *preservation effect* in the sense that they were more reluctant and very slow in making revisions (2008b). Using the gating technique (based on systematic pauses), he found that L2 learners were unable to activate all possible word candidates as they listened to the first syllable(s) of a multisyllabic word that embeds other words (e.g. *the waiter cut it / the way to cut* for /@weIt@kVtIt/, or even *assist her/ a sister* for /@sIst@/). Field is almost certain that learners could be unable to make an activation of all word candidates in real life listening situations given their failure to do so with the luxury of the pauses in the test (2008b).

The results from these studies present a reasonable argument against top-down overemphasis. If background information may distort comprehension (Lynch, 2009), there seems to be a need for a more balanced practice in EFL listening instruction to encompass both higher and lower level processes.

I.1.3. A Primary Objective for Bottom-up Practice

In his criticism of the top-down overemphasis, Wilson (2003) writes that "we need to respond with practical classroom activities that shift the balance towards 'bottom-up primacy' " (2003, p. 341). He suggested *discovery listening* as a technique through which learners can work together through text reconstruction to identify the listening problems they face, along with their causes, and assess their importance. Peterson (2001) proposes that bottom-up processing should be practised regardless of the proficiency level, and urges that phonological modifications should be presented to learners at the intermediate level after that they have sufficiently mastered the phonemic system. Similarly, Field (2008a) argues for more attention to decoding skills as a key for successful higher level interpretations. He suggested a *signal-based approach* (Field, 2003) and a similar *diagnostic approach* (Field, 2008a) which are based on the principle of identifying and anticipating problems related to decoding CS phenomena. Once identified, problems can be addressed in a post-listening phase

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through small scale/micro listening-tasks that raise learners' awareness to CS problems and allow for further practice (Field, 2003; 2008a). The next objective is to provide intensive practice to reach a high level of automaticity in decoding in the same way as an expert handles the acoustic signal; accurately, rapidly and effortlessly (Field, 2008a). For Hulstijn (2001) learners can develop automaticity in decoding by listening to "i-1 level" recordings with which they are familiar so as to allow for noticing the variations in speech. Accurate and automatic skills do not take much processing capacity (Ellis, 2003), and decoding skills are no exception. Little chance will be, however, for learners with controlled processes to pay attention to the content of the message (Ellis, 2003). In listening, they may stick in the perceptual phase of the process and do not go beyond parsing (Goh, 2000).

In addition to greater confidence during listening, the benefit for the learners from developing automaticity in decoding CS could be both a decrease in the burden they have in coping with fast speech and a spare attentional capacity to deal with higher levels of meaning and concentrate on the message content (Peterson, 2001; Ellis, 2003; Field, 2008a; 2013). This should be the role of bottom-up training in the language *practitiatory,* where learners are trained rather than tested (Labed, 2001), and learners as well as teachers should be made aware of the need for it. Strategy application which is a conscious mental operation (Peterson, 2001) could be presented as a secondary resort when the basic decoding skills have failed.

I.1.4. Contributions of the Study

There is a considerable body of research in support of the effectiveness of CS instruction. Previous studies focused on delivering short lessons ranging from 10 to 30 minutes which provided open lists of common reduced forms, practice tasks or direct explanation of rules (Brown & Hilferty, 2006; Matsuzawa, 2006; Chenjun & Li, 2012). In doing so, however, problems that learners really face during listening and the features which may cause comprehension breakdown more than others were not explored. In addition, some problematic features may be overlooked or given very little attention at the expense of providing practice on a whole range of CS features that may not all hinder listening. In other words, the way CS-related problems can be identified and addressed in a full-length listening comprehension lesson that balances and makes a link between higher and lower level skills was not examined. This study attempts to fill this gap. It examines this issue following the principles of Field's s*ignal based approach* (2003) and his *diagnostic approach to decoding* (2008a) which, to our knowledge, have not been investigated before. The approaches provide the instructor with tools in order to highlight features of speech that could hinder learners' comprehension, and suggest tasks to remedy them.

I.1.5. Questions and Hypotheses

The current study attempts to answer two main questions:
1) Do CS aspects really cause decoding and segmentation problems for participants in the study?
 2) Is CS instruction through the diagnostic/signal based approach effective in improving learners' decoding of naturally spoken English? Hence, we hypothesis that:
- If they are exposed to naturally spoken English, participants will have problems in decoding connected speech and making lexical segmentation.
- Participants who receive CS-instruction following a diagnostic/signal based approach will have significantly higher scores in decoding CS features and segmenting speech than those who do not.

II– Methods and Materials:
II.1. Subjects

Participants in the present study were 38 Algerian second year university students of English –LMD system. They were members of either a control group (CG) or an experimental one (EG). Randomness in assigning participants to groups was not

easy to achieve as group membership was either a result of a mere administrative procedure, or by the learner's own choice in some cases. It is noteworthy that no specific criterion based on academic achievement was considered by the administration in grouping learners. The choice of having volunteers from different groups as participants was avoided due to the likelihood problem entailed by the long period of the study and its likely effect on the participation and commitment of volunteers until the end of the instruction period. The one group choice, however, has guaranteed that the CS instruction would be insured throughout the whole period aimed at and easily integrated into the listening lessons the EG had in the Oral Expression module. In addition, all participants have expressed their consent and shown their commitment to attend all the sessions.

II.2. Materials and Instruments

A listening test composed of cloze and dictation tasks was administered to all participants (N=38) with a total score of 101. It served as a diagnostic tool for participants' ability to decode CS, and also as a pre-test for both the CG (N=19) and the EG (N=19). There were 34 sentences in the cloze test where function words were systematically blanked out in the answer sheet together with the word that comes before each one. The same function word occurred at least twice but in different phonological environments. Others occurred in clusters of two or three following each other. It should be noted that it is possible that learners might have used higher levels of meaning to compensate for the failure in decoding function words. To reduce the effects of compensation in determining the missing words, the sentences selected for the test were relatively short and did not have any topic relation. This may greatly insure that the skill assessed is decoding in the first place. The dictation test included 21 short sentences and was intended to assess the participants' skill in decoding other CS aspects: Assimilation, elision and linking in addition to weak forms. Each sentence contained one or two of these aspects which were the only criteria for scoring.

A post-test was designed in the same way as the pre-test and was administered only to the CG and the EG. To evaluate the participants' reactions to the instruction, a semi-structured interview was conducted with members of the EG after the post-test. It aimed at having an idea of the participants' views about the instruction and what they perceived as strengths or weaknesses. It also served to provide self-evaluation data of their own listening abilities before and after the lessons.

II.3. Procedure

The pre-test data were digitalised into a pre-designed Windows Excel file so that the sentences of all participants (N=38) can be grouped and displayed under one another by sentence number. This has facilitated the analysis of the misperceptions of the same item from all participants' answers. Diagnostic analysis of participants' misperceptions was made for two main reasons: To depict the CS aspects for which misperceptions were prevalent among most participants and to consider the possible causes for each one. The results of the analysis were the basis of an informed remedial programme based on Field's *signal based approach* (Field, 2003) and his *diagnostic approach to decoding* (Field, 2008a) . The approaches have as their main objective the anticipation of the reductions that may cause an obstacle in decoding and addressing them before or after they occur. They also provide the instructor with tools to diagnose learners' listening breakdowns that may possibly originate in the features of the signal with specific reference to aspects of CS. A number of small-scale remedial exercises were suggested to address such problems (Field, 2003) and, for the current study, we tried to adopt and integrate them into the listening lessons. In a period of 8 weeks, the lessons were delivered to the EG in a well-equipped language *practitiatory* supported with high technology. The CG continued to receive similar listening lessons in the *practitiatory* without a specific focus on CS.

The framework of the lessons took the traditional pre – during – post format followed in the comprehension approach. In the pre-listening phase, the learners had one or two tasks to activate background information and schematic knowledge that are

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necessary for the listening phase. The tasks in the listening phase were focused on comprehension (listening for gist/specific information). It is in this phase that the diagnoses of decoding obstacles of the EG were mostly done. Answering some questions depended highly on the learners' perceptions of CS. Focus was on the problematic features noted in the pre-test for which comprehension could be hindered by failure in decoding them. The justifications the learners gave to their answers of comprehension questions, together with their discussions, provided important insights into why breakdowns occurred. When the problem seemed to be caused by failure in decoding CS, it was remedied by small-scale tasks in the post-listening phase. However, when a specific CS feature had been anticipated as problematic for understanding, or because of its reoccurrences in the listening text, specific tasks were designed mostly before the session to address it. For example, the weak forms of the function words *were, was, had, would* and *could* may pose a serious comprehension obstacle as they appear in a narrative text. The frequency of their occurrence may cause learners to stick in the perception phase of listening with few possibilities to concentrate on events or ideas. An audio software –*Audacity*- was used to extract the sentences with the CS aspects from the audio listening files of the lessons (Harmer & Elsworth, 1989; Harmer, 2004; Harmer & Lethaby, 2005). They served as a source of accurate examples for designing remedial tasks (see Table 1) as they were taken from the very listening text that the learners dealt with. Once problems have been identified and addressed, the next step was to focus on automaticity in processing the features. To provide more practice, or to supplement in some cases, some listening tasks were borrowed from Weinstein (2001), Bowler & Cunningham (2003), Cunningham & Bowler (2003), Hewings (2004), and Gilbert (2005).

Task	Instruction	Objectives/focus	Examples
Dictation	-Write the sentences using the full forms/citation forms	-To raise learners' awareness -To consolidate and proceduralize the perception of the aspects (automaticity)	*Do I* have a letter? (linking) He told me *that he had* been ill. (weak forms)
Dictation of ambiguous sentences	-Listen to the parts of the sentences dictated and write the correct words	-to provide practice in speech segmentation /raise awareness to the possibility of making more than one segmentation and revising it based on new evidence	*I scream* all day/ *Ice cream* is my favourite… (more than one candidate)
Cloze tasks	-Listen and fill in the blanks	-To draw learners' attention to specific pronunciations/forms -Automaticity in processing	-She *was* suffocating from lack of oxygen (weak form/assimilation) -*You taught yourself* French (assimilation)
Multiple-choice questions 1	-Listen and choose the transcription that corresponds to the way the underlined word is pronounced		
Multiple-choice questions 2	Listen to the questions and choose the right answer	-To enable learners to differentiate between homonymous function words -To encourage learners to use syntactic /grammatical information to decide between candidates	-It's been here (= yes, it has) It's a good idea (homonymous contracted forms) (= yes, it is) -*She is* scared / *She has* seen the letter.

Listen and Repeat	-Listen to the sentences/passage focusing on the pronunciation of X/Y -Listen and write the sentences. Then, read them as they were pronounced.	-Awareness raising -Practice & automaticity	*There are some* new ones *he's* brought
Noticing tasks	-Listen and notice how the words change /are reduced -Consider the examples and draw the rules	-To show different reductions of function words -To highlight systematic patterns of reduction (rules)	-I *have to* go/ I *have* a meeting (assimilation) They were /w@r/ absent / they were /w@/ here (weak forms)

Table 1: Remedial Tasks Designed to Address Connected Speech Aspects in the Post-listening Phase

III- Results and discussion:
III.1. The Pre-test

The descriptive statistics of the pre-test data presented in Table 2 indicate that the EG scored numerically higher, $M=27.3158$ (N=19, $SD=11.02045$), than the CG, $M=26.0000$ (N=19, $SD=11.22497$). The means of the two groups were very low in comparison to the test overall scale. Participants recognised less than half of the total reduced forms in both the listening cloze and the dictation tests. However, higher scores were obtained in the listening cloze test compared to the dictation test.

Group Statistics

	Grouping	N	Mean	Std. Deviation	Std. Error Mean
PreTest	Exp. Group	19	27.3158	11.02045	2.52826
	Ctlr. Group	19	26.0000	11.22497	2.57519

Table 2: Descriptive Statistics of the Pre-test Results of the Experimental Group and the Control Group

Assimilated words were the least successfully segmented items in the test. Similarly, weak forms were also misperceived, especially when they occurred in clusters. Further analysis revealed that, in filling in some items, almost all participants provided a wrong answer that fits the co-text rather than what was actually said in the recording. For the sentence, "are you into golf?" the majority of the participants wrote "are you win to golf," instead. Table 3 summarises and gives examples of common problems of this kind.

Description of the problem	Example test item	Informant's answer
First wrong answers affecting the decoding of subsequent items	**1-** If *he* stopped smoking *it* would get better	If *you* stopped smoking *you* get better
Not revising initial hypotheses despite being incongruent with subsequent co-text (*cloze task*)	**2-** There *are some* new **books**	There *is a* new **books**

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Making guesses(**based on the text**) that do not match the sound or the space given	3- **When** are you taking **him to see her**	**When** are you taking **in this year**
Misperceptions/ lexical segmentation	4- …sho**t be**ars 5- A co**mma a**fter that 6- It **has seen** depression **7-They are for**… 8- …be**at yo**u at…	-Sho**p p**ears -A cam**era af**ter that -It **is seen** depression **-therefore** -bea**ch at** …

Table 3: Description of Common Decoding Problems in the Pre-test

To test whether there was a statistically significant difference between the pre-test scores of the two groups, an independent samples *t*-test was performed. To test the data for normality, the Shapiro-Wilk (1965) normality test results suggested that the pre-test data were normally distributed for the purpose of conducting a *t*-test ($p = .212 > .05$). In addition, the homogeneity of variance assumption was testified through Levene's *F* test, $F(36) = .049$, $p = .825$. The results of the *t*-test (Table 4) show that there was no statistically significant difference between the means of the EG and the CG in the pre-test, $t(36) = .365$, $p = .718$. Thus, it could be stated that, at the outset of the experiment, the participants in the two groups had similar performance regarding the decoding of CS aspects in general.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre-Test	Equal variances assumed	.049	.825	.365	36	.718	1.31579	3.60884	6.00327-	8.63485
	Equal variances not assumed			.365	35.988	.718	1.31579	3.60884	6.00336-	8.63493

Table 4: Independent Samples t-test between the Pre-test Results of the Control Group and the Experimental Group

III.2. The Post-test

The analysis of the post-test descriptive statistics (Table 5) shows that both the EG and the CG obtained numerically higher mean scores compared to the pre-test. However, the mean of the EG, $M=49.2632$ (N=19, $SD=8.75495$) was numerically higher than that of the CG, $M=29.0000$ (N=19, $SD=10.44031$). Similar to the pre-test results, participants in both groups scored higher in the listening cloze test than in the dictation test.

Group Statistics

	Grouping	N	Mean	Std. Deviation	Std. Error Mean
PostTest	Exp. Group	19	49.2632	8.75495	2.00852
	Ctlr. Group	19	29.0000	10.44031	2.39517

Table 5: Descriptive Statistics of the Post-test Results of the Experimental Group and the Control Group

To test whether the means of the pre-test and the post-test for each group were equal, paired samples *t*-tests were performed. The Shapiro-Wilk (1965) test of normality of distribution showed that the EG and the CG data were normally distributed, $p=0.470 >.05$, and $p=0.343 >.05$ respectively. The CG's paired samples *t*-test results (Table 6) revealed that the null hypothesis of equal pre-test and post-test means was accepted, $t(18)=1.547$, $p=.139$. This suggests that the CG's numerically higher post-test mean was not statistically significantly different from that of the pre-test, and no significant improvement was found among participants in this group. However, for the paired samples *t*-test of the EG's pre and post results, the null hypothesis of equal means was rejected, $t(18)=12.210$, $p=.000$. The effect size was estimated at $d=2.8$, which is a very large effect based on Cohen's guidelines (Cohen, 1992). As expected, there was a significant improvement in the performance of the EG in decoding after the CS instruction.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Exp. Post –Exp. Pre	21.94737	7.83492	1.79745	18.17106	25.72368	12.210	18	.000
Pair 2	Ctlr. Post –Ctlr. Pre	3.00000	8.45248	1.93913	-1.07397-	7.07397	1.547	18	.139

Table 6: Paired Samples t-test between Pre-test and Post-test Results of the Experimental Group and the Control Group

To test the hypothesis that the performance of the EG after the treatment differed significantly from that of the CG, an independent samples *t*-test was run between the post-test means of the two groups. The post-test data were normally distributed for the purpose of conducting an independent samples *t*-test according to the results of the Shapiro-Wilk's (1965) test of normality, $p = 0.539 >.05$. Additionally, the assumption of equal variances was tested and satisfied through Levene's *F* test, $F(36) =578$, $p = 0.452$. The results of the *t*-test (Table 7) revealed that the null hypothesis of equal post-test means was rejected, $t(36) =6.482$, $p = 0.00$, with a large effect size, $d = 2.11$ according to Cohen's guidelines (Cohen, 1992). Thus, the mean of the EG was statistically significantly higher than that of the CG after the treatment.

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Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post-test	Equal variances assumed	.578	.452	6.482	36	.000	20.26316	3.12586	13.92362	26.60270
	Equal variances not assumed			6.482	34.939	.000	20.26316	3.12586	13.91693	26.60939

**Table 7: Independent Samples t-test between the Post-test Results of the
Experimental Group and the Control Group**

III.3. Results of Qualitative Analysis of the Interviews

The interviews were conducted 2 days after the post-test. They were intended to gather qualitative data from participants about the instruction and whether it had an effect on their listening skill. All of the recordings were transcribed and then coded for the purpose of analyses. As expected, the results of the interviews came in line with the teacher's classroom observations during the training sessions as participants seemed, most of the time, engaged and motivated, especially in the post-listening phase.

All participants reported their appreciation of the lessons they had been given during the training period. They noted a change in the lesson structure before and after the training, especially the post-listening phase. This was because, one of them explained, they only used to listen to the text again for a number of times after having dealt with comprehension questions, but without a specific task. Listening to native speakers was considered as a big challenge for all of them but one. When asked about the problems they faced when they listen to native speakers, speech rate and aspects of CS (especially assimilation and linking) were thought to be the main obstacles for almost all of the interviewees. Such problems, according to 11 interviewees, caused speech segmentation problems. "I didn't know how to separate words. Sometimes, I thought it is one single word that I didn't know. So, I said it is a new word," one of the interviewees noted. Concerning the post-training period, all of the informants felt a difference in their listening skill but with varying degrees; while some noted only a little difference that they considered positive, others said there was a big improvement in their ability to understand naturally spoken English. However, all of them evaluated the training as beneficial or very interesting for them. Two of them spoke about more confidence during listening after the training.

Despite that the lessons' main concern was the development of listening and decoding skills, some of the learners did not hesitate to speak about a positive effect of the lessons on their speaking skill and pronunciation. "I think I have 'new English' now," noted a participant referring to his speaking skill. They also expressed their willingness to continue working on CS through practice to develop both skills. Here also, they classified assimilation as the most important aspect to focus on for better listening, together with weak forms and linking in the second and third places, respectively.

Interestingly, all participants asserted that CS should not only be taught, but also given a priority in teaching listening and speaking. The reason for this, according to most of the informants, is that learners should be given a chance to know about these aspects, practise their skills and avoid the problems they may encounter. One of the

interviewees said "… if I become a teacher, I would not let my students suffer from what I suffered from [before the training]." "It only takes a short time," justified another one. The following are some additional insights that the analysis of the interviews revealed:

- The informants were taught about CS only in the module of Phonetics. The focus of the lessons in the Phonetics module was on speaking.
- Before the training, they only had some information about CS aspects. According to them, this knowledge was superficial (most of them said they only knew definitions and rules).
- Learners did not know about the significance of CS, mainly in listening.
- Their views about CS aspects in terms of significance in both listening and speaking have changed after the training.
- CS aspects were not the only obstacle for them in listening to native speakers.
- Nearly all of them have the impression that native speakers speak fast.

III.4. Discussion

The results of the pre-test support the hypothesis that the participants in both groups have difficulties in decoding speech and recognising reduced forms. They do have problems in decoding naturally spoken English in the presence of CS aspects. These results match the ones reported by Henrichsen (1984) and Matsuzawa (2006). In addition to assimilation which was identified by the interviewees as problematic, weak forms also presented a major obstacle in decoding. However, it is difficult to affirm that one aspect was more difficult than another. One reason is that the scores obtained in decoding weak forms in the cloze test compared to those obtained in decoding the other aspects in the dictation test were probably higher due to the test format. That is, participants might have found the task easier in the cloze test as they had to concentrate on the missing words only.

The low scores obtained imply that participants had poor decoding skills. Despite this, there is at least some evidence for the influence of top-down processing on the decoding of CS aspects in the test which could have resulted in weak performances. The problems described in Table 3 appear to suggest, in addition to the inability to decode CS aspects (examples 4–8), both a possible over reliance on top-down processing (example 3) and probably also a preservation effect with a poor use of decoding skills (examples 1, 2).

Alternatively, participants' poor decoding skills could have made top-down processing the dominant mode of handling the acoustic signal in the test. In all cases, it is very likely that top-down processing has contributed to the failure in decoding CS aspects in the pre-test. Research suggests that learners can be negatively influenced by overusing top-down processing in listening (Tsui & Fullilove, 1998; Field, 2008b). The current study, however, cannot depict the extent to which this processing mode has affected the decoding of CS. A quantitative qualitative investigation with a larger sample size may be more informative in identifying the extent to which top-down processing influences the decoding of CS features, and the likely effects of this influence on EFL learners' listening comprehension in general.

As it was revealed by the interview results, lack of training in decoding CS can also explain the participants' inability to decode them in the test. They had only known about some features through the module of Phonetics where the focus was primarily on speaking, according to them. Though this is a learners' perspective in describing the lessons and their direction, it still suggests their lack of awareness about CS aspects' significance in listening, and this was explicitly reported by them in the interview. This lack of awareness can also explain the reason why they described their knowledge about CS as superficial or "not so deep". Research is needed to explore both teachers' and learners' perspectives towards a listening-oriented teaching of decoding skills in the Department of English, and to depict the possible obstacles that would make such an instruction difficult.

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Concerning the second hypothesis that a diagnostic approach is effective in improving learners' decoding of natural speech and recognition of reduced forms, the results of the statistical *t*-tests appear to support it. The results come in line with the findings of previous research (e.g. Matsuzawa, 2006; Chenjun & Li, 2012), and give further support to the effectiveness of CS instruction although the treatment in the current study took a different approach. Rather than blindly dealing with all CS aspects with the same degree of focus, the diagnostic approach was possibly more effective in providing data for an informed remedial work that prioritises and addresses the aspects which learners really suffer from in decoding. The significant difference between the pre and the post-test means suggests that the treatment that the EG received in decoding CS aspects has led to a better performance compared to the CG. The awareness raising tasks, the noticing tasks and the extended practice provided in the lessons have possibly reduced the problems they used to have in decoding. What the interviewees reported in terms of confidence and improvement in their listening skills after the treatment support this claim. Moreover, their willingness to continue working on CS and practising their listening skill may be the result of an awareness about their significance. That is to say, once they discovered their importance, they developed a desire to work on them and even to integrate them into their own language production.

The absence of a significant difference between the mean scores obtained by the CG reveals that they did not make an improvement and CS aspect remained an obstacle for them in decoding naturally spoken English. With this in mind, the improvement noted in the performance of the EG cannot be linked to chance factors as the post-test mean score was significantly higher than that of the CG.

It is believed that skill in decoding CS is important in listening comprehension, and previous research supports this claim (e.g. Brown & Hilferty, 2006; Chenjun & Li, 2012). In this study, however, it is not clear to what extent the instruction had an effect on the participants' listening skill although the interviewees reported an improvement after the treatment and expressed their appreciation of the lessons. Further research could focus on examining the effects of the diagnostic/signal based approach to decoding CS aspects on EFL learners' overall listening comprehension skill.

IV- Conclusion:

One of the objectives of this study was to call for more attention to bottom-up skills in the listening comprehension classroom to help learners with CS aspects and decoding in general. If it is true that both bottom-up and top-down processing modes are important in listening, one should look at ways to adopt practical classroom applications that provide training in both of them. The results of the study give further support to the effectiveness of CS instruction (Brown & Hilferty, 2006; Matsuzawa, 2006; Chenjun & Li, 2012), especially that learners would benefit from having their decoding problems anticipated, diagnosed and addressed in the listening comprehension session (Field, 2003; 2008a). In this study, CS aspects exerted obstacles for learners in decoding and segmenting natural speech. Weakness in using the bottom-up mode was the main reason for poor performances in the pre-test, and top-down mode's overuse was perhaps a logical result of this. For the post-treatment results, the significantly higher performance of the EG is indicative of a positive effect of the diagnostic approach followed to overcome their decoding-related listening problems. This was also traceable in the participants' self reports about the training which revealed their appreciation of it, and suggested an improvement in their listening skills. However, one should be cautious about generalising the results obtained in the present study. One reason is that randomness was not easy to achieve in sampling. This is likely to bring about unwanted variables that might interfere in the interpretation of the results. Concerning the reported improvement in the listening skills, it was not clear from the interviewees' answers how it improved and what has exactly improved. In other words, although they spoke about an improvement in their listening skills, we cannot depict what they were exactly evaluating. Further research should focus on this; the effects of a diagnostic - signal based approach on learners' Listening

Comprehension skill can be examined by adding a listening comprehension test to the design.

The paper suggests some techniques teachers can use in designing their own materials and tasks to address CS decoding in the practitiatory (Labed, 2001). Audio software is widely available nowadays and gives instructors useful options to cut, merge, modify and amplify the audio tracks of the listening text. These can be useful in creating tasks that are particularly based on the lessons/texts the teacher selects for the listening session. By addressing listening problems this way, learners may find the logic behind dealing with decoding obstacles along with CS features, as the examples provided are taken from the very parts of the text they found difficult to decode.

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