The Impact of Input Modality and Sensory Mode on Iranian Intermediate EFL Learners' Listening Comprehension

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Abstract

This study investigated the influence of different input modalities on the Iranian EFL learners' listening comprehension. After administering a paper-based TOEFL among an initial sample of 120 BA learners, majoring in English language translation, 86 students were selected to participate in this study and were randomly divided into three experimental groups, namely, the audio group (A), the video group (V), and the audio/video/caption (AVC) group. Group A received audio treatment, group two received video intervention, and group three was taught listening through AVC treatment. Also, a TOEFL listening test was used as pretest and posttest. Afterwards, oral interviews were administered to extract the attitudes of 30 % of the learners toward the influence of the received treatment on their listening performance. Two-way ANCOVA revealed that input modality had a significant effect on listening comprehension. Results showed that the audio group had the best performance and the AVC group had the least significant performance. Qualitative findings also confirmed that learners gave their positive support and attitude to audio input modality as the best. These findings have some pedagogical implications the most important of which is the match between input modality and the learners' perceptual modality to help them improve their L2 listening comprehension.

INTRODUCTION

Many SLA researchers are unanimous on the point that in the process of acquiring a language, listening is a prerequisite to other skills and should receive special attention and priority (Swain 1995, Hamouda 2013). Yıldırım and Yıldırım (2016) declared that without acquiring an efficient listening skill, one would not be able to communicate effectively in the language (Yıldırım and Yıldırım 2016). According to Walker (2014), the activity of listening consists of some main elements such as linguistic, cultural, and psychological which altogether make the instruction of this particular skill a demanding task (Walker 2014). Therefore, listening as the basis for the development of other language skills (Oxford 1990) should be accurately and thoroughly investigated.

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Due to this priority, listening research got more significance after the 1990s along with the advent of technology in teaching practices and the increasing emphasis on individual differences (IDs) in the language learning process. In reality, beside the increased importance attached to the listening skill, one aspect which got momentum was how to teach this skill in language learning. As Vandergrift (2007) states after the second half of 1990s, the increase in the use of technology as a pedagogical agent in education has led the focus of listening comprehension to shift towards listening in multimedia settings where the learners have the chance to be able to study with auditory, visual and text support (Vandergrift 2007). This new trend motivated and assisted teachers using media and instructional design procedures to enhance the quality of their instruction in listening (Gustafson and Bratton 1984, Brett 2000, Guichon and McLornan 2008, Winke, Gass et al. 2010). Mayer (2001) maintains that the use of multimedia instruction system in education has led to the development of all sorts of instructional materials in which verbal and non-verbal presentation modes are combined (Mayer 2002).

As Brinton (2001) maintains the use of multimedia instruction brings about two main advantages in teaching listening skill: first, is the possibility it provides in the selection of different input modalities and the other refers to its considering the learning styles or perceptual modalities of the learners (Brinton 2001). Input modality referred to as the method or way of presenting language input to the learners has been pointed out by many researchers to be very influential in the listening comprehension process e.g. (Rubin 1994, Goh 1999, Buck 2001, Dornyei 2006, Syodorenko 2010). Besides, learning style of the learners specifically their sensory mode or perceptual modality plays a key role in the comprehension process. Barbe and Milone (1980) define perceptual modalities as the ways we take in and extract information from the environment, and subdivide them into: visual, auditory, kinaesthetic, and tactile (Barbe and Milone Jr 1981).

An important body of research in the area of modalities has been devoted to investigating the effect of different input presentation modes provided by multimedia system on the students' listening skill. In this respect, two research lines are observable. On the one hand, there is an abundance of research that supports the effectiveness of multi-channel learning. In fact, the majority of multi-channel research has been conducted in the area of television and film and almost all such studies have found redundant audio and visual communication more effective for comprehension and problem solving than single channel presentations (Paivio 1991, Paivio 2007, Syodorenko 2010). For example, Frick (1984) found that if people were presented visually with a set of items followed by a series of auditory items, recall was better than it was if both sets of items were presented in either the auditory or the visual mode. Similarly, Levie and Lentz (1982), in their literature review of text and visual illustrations, contended that the attributes and information across the two channels reinforce each other and enhance both recall and comprehension (Levie and Lentz 1982).

On the other hand, there is a body of research that would seem to support the single channel theory (Hsia 1971, Muraida and Spector 1992, Mayer and Moreno 2003). For example, Flemming (1970) concluded that overloading the senses through multiple channels of information could result in less efficient learning and communication. Dwyer (1972), summarizing the results of nearly 50 studies on visual-verbal presentations, notes that the addition of cues in a second channel can be distracting and detrimental to learning. Muraida and Spector (1992) found no significant advantage for visually and aurally presented text. Furthermore, according to Mayer and Moreno (2003) in multimedia learning a potential problem is that the processing demands created by the learning task may exceed the processing capacity of the cognitive system and thus results in cognitive overload. The high amount of cognitive load can deteriorate the psychophysio-

logical status of the learner and at last can negatively decrease the learners' listening performance.

Taking the above points into account, the existence of contradictory findings in previous studies may be due to the fact that the individual characteristics of the learners especially their sensory mode or perceptual modality has not been considered. This listener's factor has been claimed by the meshing hypothesis (Pashler, McDaniel et al. 2008) to be related to input modality and thus has a determining role in the comprehension process. The meshing hypothesis emphasizes that "instruction should be provided in the mode that matches the learner's style" (Pashler, McDaniel et al. 2008). Although there have been few studies confirming the meshing hypothesis (Dekker, Lee et al. 2012, Rogowsky, Calhoun et al. 2015), there is a great need to examine its validity and practicality, specifically with regard to listening skill which is referred to as the most difficult and complicated language component. Coeffield et al. (2008), pointing out to such factors as conflicting research, complexity of interactions between other constructs, complexity of the learning construct, and the fact that the meshing hypothesis was pragmatically unrealistic, contend that this practice seems unhelpful and unrealistic, and lacks empirical evidence. The other group of scholars who criticized the meshing hypothesis was Pashler and his associates (2008). Their primary criticism referred to the fact that the conducted studies were not experimental and thus there was a lack of "methodologically sound studies" (Pashler, McDaniel et al. 2008) in favor of the hypothesis. They announced that specifically a "crossover interaction" (Pashler, McDaniel et al. 2008) research design was required to test this hypothesis. In their detailed literature review on learning styles, Pashler et al. (2008) pointed out to one study by Sternberg, Grigorenko, Ferrari and Clinkenbeard (1999) advocating the meshing hypothesis, and introduced three studies with a rather strong methodology (Constantinidou and Baker 2002)

that contradicted the meshing hypothesis. Later on, Wu (2014) added another study by Cook et al. (2007) that opposed the meshing hypothesis.

Taking the above points into consideration, either those in support of multi-modality or those in favor of unimodality in the presentation of language input, one cannot strongly accepts or rejects any one of these approaches. Although the above studies have been theoretically very promising, unfortunately, educational research has not yet identified how to design effective multimedia instructions. There is no proven standard for the development and implication of multimedia learning applications. In fact, there seems to be a big gap in the literature and it is the ignorance of perceptual modalities or sensory mode characteristics of the learners which may eventually lead to different cognitive structures and thus different performance.

Consequently, with regard to its purpose, this research was developed in an attempt to shed light on the influence of different types of input modality on listening comprehension. More specifically, it aimed to investigate both quantitatively and qualitatively the effect of unichannel mode of instruction through audio or video modality vs. multichannel presentation through audio/video/caption in multimedia system to see that which method results in better performance in listening comprehension skill of Iranian EFL learners. Furthermore, this research study intended to provide further evidence either in support of or contrary to the existing theories regarding unimodality or multimodality in input presentation during listening performance. In order to pursue these goals, the following research questions were proposed.

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Research Questions
The current study attempted to answer the following research questions:

1) Does input modality (A, V, AVC) have any significant effect on Iranian EFL learners' listening comprehension with

different sensory modes (auditory, visual, and haptic[1])?

2) What are the Iranian auditory vs. visual EFL learners' attitudes toward the effects of A, V, and AVC treatments on listening comprehension?

3) Do the findings obtained through the quantitative and qualitative results converge or diverge?

METHODS
Participants

The participants of this study were selected through convenience sampling from among four different classes, a total of 120 B.A. students majoring in English translation and literature at Islamic Azad University of Hamedan. In order to have a more homogeneous sample, 90 participants (both male and female with the age range of 19 to 35) possessing the same proficiency level were selected after administering a version of TOEFL test to comprise the ideal sample for this study. These 90 students were randomly assigned to three experimental groups each consisting of 30 students. In the posttest phase, the number reduced to 86 since 4 of the learners did not attend the whole semester and were absent for the posttest. The audio group (A) had 27 learners, the video group (V) included 30 learners without any dropouts, and the audio/video/caption (AVC) group involved 29 participants.

The three experimental groups were different from one another in the input modality, that is, the method used to instruct listening comprehension differed across the experimental groups. Therefore, group one was named A group in which the input modality was through audio materials, group two was referred to as V group in which the modality used to represent input was by video materials, and finally the third group, called AVC group, received the input through simultaneous using of audio materials and video or films which had captions as well.

Instrumentation

In order to gather the necessary data for this study , a number of questionnaires and tests were used which have been described in detail below:

O'Brien's (1990) Learning Channel Preference Checklist

The Learning Style Preference Checklist developed by O'Brien (1990) is the first learning style questionnaire widely known in the ESL/EFL field which is developed to help foreign language learners identify the ways they learn best (O'Brien 1990). This questionnaire consists of 30 statements and is divided into three perceptual modalities on a three-point scale including auditory, visual, and haptic styles which learners are asked to choose based on their learning preferences. The total score was calculated for each section by assigning 1 score to 'Never applies to me', 2 scores for 'Sometimes applies to me' and 3 scores for 'Often applies to me' on the basis of rubrics given by the questionnaire itself. Accordingly, the highest possible total score for each section would be 30 and the lowest will be 10. Then, the highest score for a section indicates the dominant sensory mode or learning perceptual tendency for the learners.

Test of TOEFL

In the first phase of the study a version of paper-based TOEFL test was used to achieve homogeneity among the subjects regarding their general English proficiency level. For the ease of administration and due to the shortage of appropriate audio facilities and the related environmental problems, the listening comprehension section was excluded from the whole test. Moreover, because of the difficulty of scoring procedures and the lack of able and certified TOEFL scorers, the TWE essay section was not included. Therefore, the administered TOEFL test included only structure and written expression section and the reading comprehension section. The TOEFL test,

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1.Haptic is a Greek-based word meaning "moving and doing". Haptic students learn best when they are involved, moving, experiencing, and experimenting; learn more from doing than from reading textbooks; and learn least from listening to lectures.(O'Brien,1989)

consisiting of 90 items, was given to the initial participants in order to have homogenized participants. The reliability of the test was calcuted using KR-21 formula and it came out to be .80.

Test of Listening

In order to measure the listening comprehension skill of the learners, a TOEFL listening comperihension test consisiting of 50 items was utilized. This test was used both as the pretest at the begining of the study and at the end after the completion of the treatment. The reliability of the test was calcuted using Cronbach alpha. It turde out to be .81.

Semi-Structured Oral Interview

At the qualitative phase of the study after the treatment and the posttest, semi-structured oral interviews were conducted with 10 participants in each of the experimental groups, a total of 30 students, to elicit their attitudes toward the usefulness, suitability and educational value of different types of input modality (A, V, AVC) and the effect they exerted upon the L2 listening comprehension. The content of these oral interviews was based on the latest conceptualizations and theories of input modality. These oral interviews were audio-taped by the researcher and were meticuously listened and transcribed for further analysis. In order to gauranttee the content validity or the inter-coder reliability, two scorers rated these oral interviews and the needed content analysis using the appropriate procedures was carried out. The collected data from the interviews were subject to transcribing, coding, and sorting by using MAXQDA, a software program that aids researchers in carrying out computer-assisted qualitative and mixed methods data.

Procedure

As to the first phase of the study, the participants were selected from among 4 different classes at the B.A. level from Islamic Azad University of Hamedan. After administering the test of TOEFL, those learners who scored in the range of ±1.5 standard deviations from the mean were selected as the intermediate learners for the purpose of the present research. The justification for using ±1.5 SD and not ±1 SD was that more participants were needed to comprise the three experimental groups. In other words, learners who greatly outperform other learners or had low extreme scores were excluded from the study. Also, the assignment of three experimental groups to A, V, and AVC was done randomly to add to the internal validity of the research.

All the groups had the pretest of listening, 8 sessions of treatment, and the posttest of listening. In the first session, before the treatment starts, the researcher explained the aim of the study to the participants. The first experimental group, the A group was taught the listening skill through the audio materials such as podcasts, radio programs, and listening from Voice of America. The V group was taught using the video materials such as the video lessons from the Four Corners series, TED Talks, and movies. The third group, the AVC, received podcasts and VOA English, videos from CNN, and movies with caption as well. They were given to the participants one after the other in each session. All the groups worked on the listening each session equally but with different modes of input. The researcher asked the participants of each group some comprehension questions about what they heard in the listening once it was broadcasted. The aim of these questions was to get the learners engaged in the comprehension as much as possible.

Design

This study tried to investigate the impact of different types of input modality and sensory mode on Iranian EFL learners' listening comprehension through an explanatory mixed-method research design. The first phase of the study was a larger experimental quantitative study in which the effect of A, V, AVC input modalities on Iranian EFL learners' listening skill with different auditory, visual and haptic sensory modes, using 86

participants, was investigated. The second qualitative phase attempted to procure more insightful knowledge about the attitudes of 10 percent of the participatory students in experimental conditions using oral interviews.

Data Analysis

For analyzing the calculated data, the SPSS software version 21 was used. This software was also used to calculate the reliability of the used questionnaire and other descriptive statistics which were needed to describe the features of the sample including minimum and maximum scores, mean, standard deviation, and SEM. Also, normality tests of Kolmogrove and Shapiro were used to check the assumptions for using parametric tests. The related nromality distribution figures and P-P Plots were also provided using SPSS to help gain a better view of the descriptive statistics. The researcher used the parametric factorial or two-way ANCOVA to answer the first research question. The reason for using two-way ANCOVA was the existence of two independent variables: input modality with three levels (A, V, AVC) and sensory mode with three levels (auditory, visual, and haptic) and listening scores used as both pretest and posttest. The listening pretest scores were the covariate in running two-way factorial ANCOVA in answering question 1. Qualitative interpretations using

descriptive statistics and percentages were also utilized to find regularities in Iranian EFL learners' attitudes toward the input modality effect on listening. Hence, qualitative interpretations and descriptions were the main devices used for answering questions 2. The main purpose for the second qualitative phase was to delve more deeply into the learners' attitudes since their views plays a significant role in the use of a special type of input modality. According to the classification made by Creswell and Plano-Clark (2011), the qualitative phase of the current study had a complementary role in clarifying some deeper insights into the participants' views (Creswell and Clark 2017). The results of the quantitative and qualitative phases were compared to see if they diverged or converged.

RESULTS

The first research question sought to examine whether input modality (A, V, AVC) had any significant effect on Iranian auditory vs. visual EFL learners' listening comprehension. To answer this question, the data were gathered using the above-mentioned tests and questionnaires after an eight-session treatment using the related multimedia for improving Iranian upper intermediate EFL learners.

The descriptive statistics for the listening comprehension performances of three study participants have been provided in table 1.

Table 1.
Descriptive Statistics for Participants' Performances on LC1 and LC2

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
LC1=Listening Pretest	86	10	26	17.66	3.981	.217	-.657
LC2= Listening Posttest	86	16	32	24.74	3.549	.155	-.577

The minimum and maximum scores on this listening comprehension pretest (LC1) were 10 and 26 respectively; the mean score was 17.66 with a standard deviation of 3.98. The mean score for learners' performance on the listening comprehension posttest (LC2) was 24.74 with a standard deviation of 3.54. The minimum and

maximum scores on LC2 were sequentially 16, and 32. The ratio of Skewness statistic over its standard error is within the acceptable range of ±1.96 (as mentioned by (Gravetter and Wallnau 2016), which means that the two distributions of LC1 and LC2 did not show a significant deviation from normality. The normality of the distri-

butions was also checked through related figures and the application of Kolmogorov-Smirnov and Shapiro-Wilk's tests of normality [p>.05 for both tests, Sig. Values= .200, .087, respectively].

Table 2.

Kolmogrov- Smirnov and Shapiro-Wilk's Test of Normality for the Pretest Scores

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
LC1	.089	86	.087	.976	86	.114
LC2	.076	86	.200*	.983	86	.309

The next table shows the performances across groups and involved variables on the listening posttest:

Table 3.

Descriptive Statistics for Participants' Performances on LC Pre- and Posttests Across Various Group Combinations

Groups			Pretest (LC1)		Posttest (LC2)	
Input Modality	Sensory Mode	N	Mean	Std. Deviation	Mean	Std. Deviation
Audio	Auditory	14	18.29	2.730	28.57	1.505
	Visual	10	19.00	2.708	23.80	1.135
	Haptic	3	13.00	1.000	23.33	.577
	Total	27	17.96	3.107	26.22	2.792
Video	Auditory	14	18.86	3.718	22.00	2.386
	Visual	12	17.08	5.600	25.67	3.892
	Haptic	4	14.50	2.380	19.75	2.872
	Total	30	17.57	4.569	23.17	3.742
Audio/Video/Caption	Auditory	13	20.31	4.404	23.31	2.983
	Visual	12	15.50	2.276	21.00	2.089
	Haptic	4	14.25	1.258	21.00	1.633
	Total	29	17.48	4.172	22.03	2.679
Total	Auditory	41	19.12	3.669	24.66	3.699
	Visual	34	17.09	4.025	23.47	3.296
	Haptic	11	14.00	1.673	21.18	2.359
	Total	86	17.66	3.981	23.74	3.549

As seen in Table 3, two general patterns can be seen. First, all groups' listening scores have increased from pretest to protest, indicating that participants' listening comprehension mean scores witnesses a considerable rise. The mean score for the first input modality group, i.e., audio group has increased from 17.85 to 26.22. The mean score rise for the second input modality group, i.e., video group is from 17.57 to 23.17. The auditory/video/caption group's mean scores have also enhanced from 17.48 on the pretest to t to 22.03 on the posttest. Second, the increase in gain scores from pretest to posttest listening performances can also be expressly seen across the three subgroups, based on sensory mode variable in the three main modality groups.

Third, the mean scores for the three input modality groups are very close (M_{audio}=17.96, M_{video}=17.57, and M_{AVC}=17.48) on the pretest (Running a one-way ANOVA also indicated that there wasn't any significant difference among the pretest scores across the three modality groups). Fourth, there are considerable differences among the mean scores of three input modality groups

on the posttest. The best performance belongs to the audio group with a mean score of 26.22 and a standard deviation of 2.79. The video group has the second plane by scoring a mean of 23.17 and a standard deviation of 3.74. The AVC group's mean score and standard deviation were 22.03 and 2.67, respectively revealing the least scores among the three input modality groups. Fifth, the mean scores for auditory and visual learners on both pre- and posttests are more than learners with haptic perceptual style. The auditory learners have slightly outperformed visual learners in the three groups.

There were two categorical independent variables (input modality and sensory mode) each with three levels and because one listening comprehension test was used both as pretest and posttest, the two-way factorial analysis of covariance (ANCOVA) was run. Analysis of covariate allows us to statistically compare the listening comprehension performances of different combinations of groups on the posttest while

controlling the effect of pretest (the covariate).

In order to answer the first question, assumptions of two-way (factorial) ANCOVA were checked. Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate. The covariate which was the pre-test was measured prior to the treatment. Therefore, the scores on the covariate were not influenced by the treatment. The researchers checked the internal consistency, which was a form of reliability of the scale, by estimating Cronbach alpha (r=.81). Correlations among covariates were not checked because there was one covariate in this research and the researchers checked its reliability. The researchers also checked the linear relationship between the post-test and the pre-test for all the three groups. The covariate should be linearly related to the dependent variable at each level of the two independent variables based on linearity assumption.
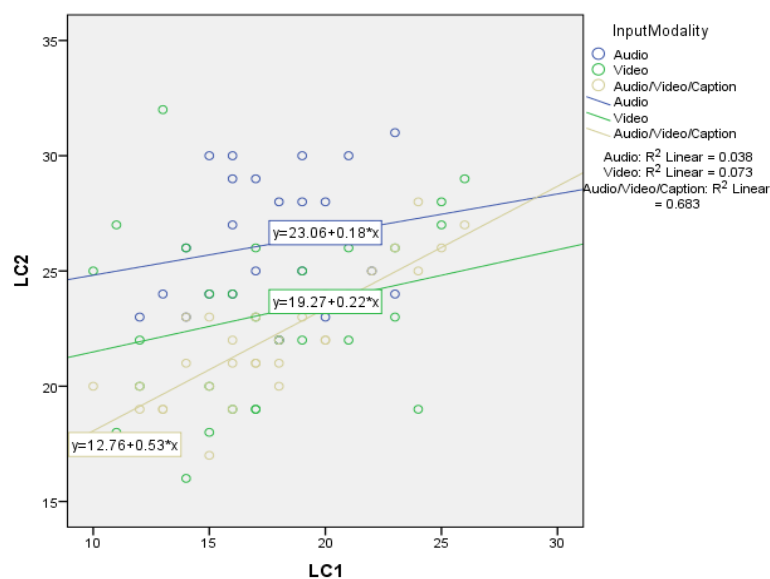

Figure 1. The fit line at input modality subgroups' performances on LC1 and LC2
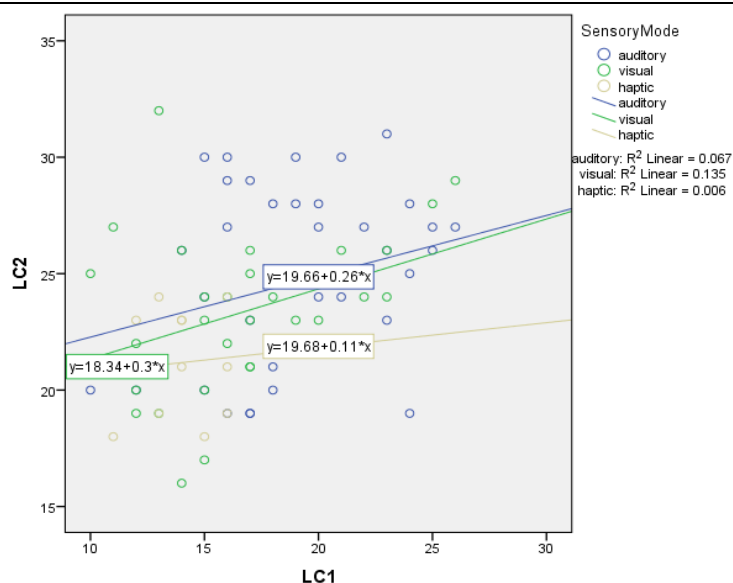
Figure 2. The fit line at sensory mode subgroups' performances on LC1 and LC2

As seen in figures 1 and 2 above, there appears to be a linear (straight-line) relationship for each group's pretest and posttest scores. These two figures do not show any indication of a curvilinear relationship between the different subgroups' scores on LC1 and LC2.

The final assumption for the application of two-way ANCOVA is the homogeneity of regression slopes. This prerequisite condition concerns the relationship between the covariate and the two dependent variables for different study groups. There should not be any interaction between the covariate and the levels of the independent variables. In order to assess this assumption, the Test of Between-Subjects Effects was applied using SPSS program. The results of this statistical procedure are deployed in Table 4.

Table 4.
Test of Between-Subjects Effects for Study Groups' Pretest and Posttest Listening Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	738.229[a]	17	43.425	8.890	.000
Intercept	161.612	1	161.612	33.087	.000
Input Modality * LC1	2.778	2	1.389	.284	.753
Sensory Mode * LC1	.223	2	.111	.023	.977
Input Modality * Sensory Mode	81.504	8	10.188	2.086	.049
Input Modality * Sensory Mode * LC1	1.643	4	.411	.084	.987
Error	332.143	68	4.884		
Total	49556.000	86			
Corrected Total	1070.372	85			
a. R Squared = .690 (Adjusted R Squared = .612)					

The P values for the interaction of the study groups and listening pretest scores are less than .05, indicating that the interactions between the covariate (LC1 scores) and the two independent variables (A, V, & AVC treatment and sensory modes) were not statistically significant, Therefore, it was concluded that that the homogeneity of regression slopes assumption was not violated.

Univariate analysis of variance was applied using factorial two-way ANCOVA. To utilize the analysis of covariance, variances of the scores gained by different subgroups should be equal to yield dependable statistical inferences. In reality, this statistical calculation (Levene's test of equality of error variances) explores the plausibility of the null hypothesis that the error variance of the dependent variable is equal across the involved groups and subgroups. The results of the applied Levene's test of equality of error variances are displayed in Table 5.

Table 5.
Levene's Test of Equality of Error Variances for Question One

F	df1	df2	Sig.
1.103	8	77	.371

Design: Intercept + LC1 + Input Modality + Sensory Mode + Input Modality * Sensory Mode

As displayed in Table 5 above, the Sig. value for the Levene's test of equality of error variances is .371 which is far greater than the .05 level value, demonstrating that that the assumption of the equality of variances was not violated in the current study. The results of ANCOVA are shown in Table 6 below:

Table 6.
Tests of Between-Subjects Effects for the Study Groups' Scores on the Listening Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	701.080[a]	9	77.89	16.03	.000	.655	144.281	1.000
Intercept	1073.635	1	1073.63	220.95	.000	.744	220.953	1.000
LC1	100.589	1	100.58	20.70	.000	.214	20.701	.994
Input Modality	127.557	2	63.77	13.12	.000	.257	26.251	.997
Sensory Mode	18.222	2	9.11	1.87	.160	.047	3.750	.379
Input Modality * Sensory Mode	272.933	4	68.23	14.04	.000	.425	56.169	1.000
Error	369.292	76	4.85					
Total	49556.000	86						
Corrected Total	1070.372	85						
a. R Squared = .655 (Adjusted R Squared = .614)								
b. Computed using alpha = .05								

Results of the ANCOVA indicated that there was a significant interaction effect because of the $F_{(4, 76)} = 14.04$, $p < .05$, with a strong effect size (partial eta squared = .425). However, the one of the main effects of the study was statistically significant. Input Modality had a statistically significant effect on Iranian EFL learners' listening comprehension on the posttest with $F_{(2, 76)} = 13.12$, $p = .000$ and the large partial eta squared of .275. Sensory mode was not a significant factor in learners' listening scores on the

posttest: $F_{(2, 76)} = 1.87$, $p = .160$, partial eta squared = .047.

The partial Eta square value for the input modality groups' performances on the posttest was .425 which is a large effect size (as mentioned by (Gravetter and Wallnau 2016), demonstrating that 42.5 percent of the variance in the posttest scores (dependent variable) can be explained on the basis of study groups (A, V, and AVC input modality groups) and the treatment they have received during the current study. The

partial Eta for the influence of the pretest scores (covariate) was .214 which is a large one. This value is significant at p<.000, indicating that there was a strong and significant relationship between the pretest scores and posttest scores on the used listening comprehension test. In fact, the covariate explained 21.4 percent of the variance in the posttest listening scores.

Table 7 presents the adjusted means on the posttest listening scores for the different input modality groups (the significant effect of the study). These adjusted means are calculated when the effect of the listening pretest scores (covariate) has been statistically removed.

Table 7.
Estimated Marginal Means for the Input Modality Groups' Scores on the Posttest

Input Modality	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Audio	25.520[a]	.526	24.473	26.568
Video	22.741[a]	.471	21.803	23.680
Audio/Video/Caption	22.079[a]	.476	21.132	23.026

a. Covariates appearing in the model are evaluated at the following values: LC1 = 17.66.

As presented in this table, the adjusted mean for the Audio, Video, and Audio/Video/Caption groups were 25.52, 21.74, and 22.07, respectively. Data analysis using ANCOVA indicated input modality was a significant factor in Iranian EFL

learners' listening comprehension scores on the posttest; however, in order to see where these differences exactly are, post hoc test results should be referred to. Pairwise comparisons have been displayed in the next table.

Table 8.
Estimated Marginal Means for the Input Modality Groups' Scores on the Posttest

(I) Input Modality	(J) Input Modality	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Audio	Video	2.779[*]	.701	.000	1.064	4.495
	Audio/Video/Caption	3.442[*]	.703	.000	1.721	5.162
Video	Audio	-2.779[*]	.701	.000	-4.495	-1.064
	Audio/Video/Caption	.663	.663	.963	-.962	2.287
Audio/Video/Caption	Audio	-3.442[*]	.703	.000	-5.162	-1.721
	Video	-.663	.663	.963	-2.287	.962

Based on estimated marginal means
*. The mean difference is significant at the .05 level.
a. Adjustment for multiple comparisons: Bonferroni.

These results suggest that learners who received three types of multimedia interventions performed differently on the posttest. Learners in Audio group showed a more substantial listening performance than learners in the other two input modality groups (p=.000). However, there was not any statistically significant difference be

tween the learners in the video group and those in the Audio/Video/Caption group in the posttest listening scores. The sensory mode did not have any significant effect on listening scores; however, its interaction effect with input modality was effective as seen in the following table and its related figure:

Table 9.

Estimated Marginal Means for the Interaction of Input Modality and Sensory Mode in Study Groups' Scores on the Posttest

Input Modality	Sensory Mode	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Audio	Auditory	28.374[a]	.591	27.197	29.551
	Visual	23.376[a]	.703	21.975	24.777
	Haptic	24.811[a]	1.313	22.195	27.427
Video	Auditory	21.621[a]	.595	20.436	22.806
	Visual	25.850[a]	.638	24.580	27.120
	Haptic	20.753[a]	1.124	18.514	22.991
Audio/Video/Caption	Auditory	22.469[a]	.639	21.197	23.741
	Visual	21.686[a]	.654	20.383	22.988
	Haptic	22.082[a]	1.128	19.836	24.328

a. Covariates appearing in the model are evaluated at the following values: LC1 = 17.66.

As depicted in Table 9, there are some differences among posttest scores among the learners with different sensory mode tendencies (auditory, visual, and haptic) in each of the three different input modality groups. In audio input modality group, auditory learners have the highest mean (M=28.37), visual and haptic learners have the second best mean scores (23.37 and 24.81, respectively). In the video modality group, the best performance was for visual learners estimated marginal mean score of 25.85. The mean values of the auditory and haptic learners' posttest listening scores were 21.62 and 20.75, sequentially. In the AVC group, leaners with different sensory mode tendencies showed similar scores (M $_{auditory}$=22.46, M $_{visual}$=21.68, and M $_{haptic}$=22.08). Such estimated mean score differences can be vividly seen in the following figure:
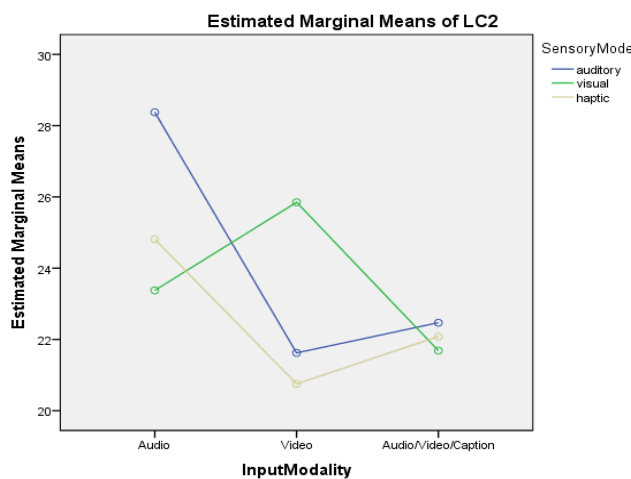
Covariates appearing in the model are evaluated at the following values: LC1 = 17.66

Figure 3 The fit line at subgroups' performances on LC2 for the interaction of input modality   and sensory mode

There are many ways and post hoc tests to check for the exact location of the differences in a 3 by 3 factorial two-way ANCOVA based on statistics experts; however, one of the easiest and more effective ones is to run three separate one-way NAOVAs (e.g. Larson-Hall, 2010; Lowie & Bregtje, 2013; Richards, Ross, & Seedhouse, 2011); each to scrutinize the differences among levels of t sensory mode variable in each modality group intervention condition.

Table 10.

One-Way ANOVAs for the Impact of Different Sensory Modes on the LC Posttest Scores in Three Input Modality Groups

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	160.971	2	80.486	46.328	.000
Audio Group	Within Groups	41.695	24	1.737		
	Total	202.667	26			
	Between Groups	140.750	2	70.375	7.159	.003
Video Group	Within Groups	265.417	27	9.830		
	Total	406.167	29			
	Between Groups	38.196	2	19.098	3.051	.065
AVC Group	Within Groups	162.769	26	6.260		
	Total	200.966	28			

As seen in the above Table, there are significant differences among learners with different sensory modes in audio and video group but not in the AVC group. The Scheffe post hoc test results for the audio and video groups regarding their different auditory, visual, and haptic learners' posters LC scores are given in the following Table:

Table 11.

Multiple Comparisons for the Impact of Different Sensory Modes on the LC Posttest Scores in Audio and Video Modality Groups

Group	(I) Sensory Mode	(J) Sensory Mode	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Audio Group	auditory	Visual	4.771*	.546	.000	3.35	6.20
		Haptic	5.238*	.839	.000	3.05	7.43
	visual	Auditory	-4.771*	.546	.000	-6.20	-3.35
		Haptic	.467	.868	.866	-1.80	2.73
	haptic	Auditory	-5.238*	.839	.000	-7.43	-3.05
		Visual	-.467	.868	.866	-2.73	1.80
Video Group	auditory	Visual	-3.667*	1.233	.022	-6.86	-.47
		Haptic	2.250	1.778	.459	-2.35	6.85
	visual	Auditory	3.667*	1.233	.022	.47	6.86
		Haptic	5.917*	1.810	.011	1.23	10.61
	haptic	Auditory	-2.250	1.778	.459	-6.85	2.35
		Visual	-5.917*	1.810	.011	-10.61	-1.23

As displayed in Table 11, in the audio input modality group, auditory learners significantly did better than the visual and haptic learners, indicating a direct relation between audio input modality and auditory perceptual style. However, in the video group, visual learners significantly outperformed auditory and haptic learners, signifying the direct relation between video input modality and visual perceptual learning style.

The ten learners who took part in oral interviews from audio group asserted that they were satisfied with the use of audio tracks during the educational semester for improving their L2 listening comprehension. Nine of them strongly

claimed that audio input modality is suitable for promoting L2 listening, commenting that audio input enjoys a high educational value in foreign language teaching. The participants' attitudes about advantages of audio input modality are presented in the following table:

Table 12.

Advantages of Audio Input Modality on L2 Listening Comprehension

Advantage	N(P)
The nature of audio tracks makes them suitable for listening	10(100%)
Audio tracks provide auditory content among the learners	8(80%)
Audio intervention helps the learner get familiar with phonological features of the target language	7(70%)
Audio input helps learners get used to native speakers' pronunciation which is a requirement for listening	7(70%)
Audio input will also enhance learners' knowledge of suprasegmental prosodic features which play a very important role in L2 listening development.	6(60%)

Learners also expressed some demerits or perhaps shortcomings in the implementation of audio input modality in L2 listening class. Majority of participants uttered that just 6 sessions were not adequately enough and that audio input intervention can be effective when it is used for longer periods of time. One of the participants, for example, told that "*the use of audio materials is the best and perhaps the best shortcut for enhancing L2 listening if it is followed for one year depending on the language proficiency level of the learner*". Yet, another learner expressed that " *…audio materials are effective even if they are used for a number of sessions; but, if want to achieve permanent positive changes, more training sessions and longer courses should be designed*". This was the most serious demerit of audio treatment based on what interviews in this group reported.

Another frequent disadvantage was the linguistic, cognitive, and sociocultural difficulty of the content of some audio tracks as pointed out by one of the learners this way: "*...I think a problem with audio material is that they should be within our vocabulary, grammar and cultural knowledge, i.e., we should be able to understand the content before the form*".

Participants in the video group also claimed that using video materials that includes both voice and picture and has an extra sensory dimension compared only audio files were very useful, suitable, and valuable for enhancing listening skill. They mentioned the following merits for using video files in L2 listening class as shown in Table 13.

Table 13.

Advantages of Video Input Modality on L2 Listening Comprehension

Advantage	N(P)
They support the comprehension through senses or input channels	9(90%)
They will help to understand words and meaning by observing their referents or concepts which is highly crucial for successful L2 listening comprehension.	7(70%)
They are motivating and appealing for all learners especially lower level ones.	7(70%)
The presence of visual help makes the listening less threatening.	6(60%)

As seen in the above table, the most significant advantage presented for the use of video in L2 listening class was the combination of audio clues and visual clues that make the input richer, easier, and more appropriate for comprehension. A participant, for instance, cited that "*I can listen better when I see a video of the conversation or the setting of the listening and feel more secure.*

If video of an event is accompanied by its video, it has double effect". Kiana, one of the participants reported that "……*having only audio files gives me the feeling of being blind, whereas videos aid us to boost our listening through two input gates for the same comprehension phenomenon*".

Regarding the disadvantages, again the necessity of longer exposure for achieving more stable and permanent growth was mentioned by nearly all participants. However, a conspicuous disadvantage was argued by four of the participants. These four learners said that although videos are generally useful; however, sometimes they can distract our attention from one of the channels. Kusha, a participant, mentioned that "*having videos for improving listening comprehension is very good, but sometimes my mind is involved with the pictures and visual movement of the video and I lose the track of the audio component. I think visual input can sometimes handicap our auditory concentration*". A final considerable disadvantage was remarked by two participants. They argued that videos can sometimes lead to mind exhaustion if the video is long. Mehdi, for example, uttered that "*videos are effective if they are short…for longer videos I lose my concentration and do not listen any more, I just watch*".

Participants in the AVC group provided the most controversial attitudes. Nearly half of the learners talked about the supremacy of AVC material for strengthening L2 listening skills while the other half claiming that captions are not effective. Those who has positive attitudes contend that captions can add another input source for deeper listening development. Nasim, a participant, for instance, told that "*captions are really useful. They connect the audio and video components and make the learner sure of the meaning in L2 listening comprehension*". Another participant gave his support to the effectiveness and substantial value of AVC material for enhancing L2 listening skill both in short and long time periods by asserting: "*captions are the best form of help that complete our audiovisual understanding by giving us a transcription of what was actually*

said while listening". However, the other were exponents and though that using caption distracts our attention and puts a lot of burden on our brain to analyze three types of input and weaken our mental faculty during listening. An interviewee criticized AVC by saying that "*when I watch a video track with captions, I am confused to attend to which aspect. And I think my mind wanders from one type of input to the other. I think captions are detrimental for both concentration and comprehension*".

In consideration of all these qualitative data, it can be concluded that learners had the best attitudes towards the video materials (including audio and video together) for enhancing listening comprehension. Their next choice was the only audio materials and their last preferences were the audio/video/caption material. This finding somehow deviates from what was shown in the quantitative phase of the study. Accordingly, the results of the large quantitative phase and the smaller qualitative phase converge and confirm each other.

DISCUSSION

The first and the most important finding of the current study was that input modality had a statistically significant effect on Iranian EFL learners' listening comprehension. The results of this study are generally in line with the findings of some other significant studies conducted on the effectiveness of using different types of input modality in enhancing L2 listening comprehension e.g. (Rubin 1994, Goh 1999, Sueyoshi and Hardison 2005). One of the main and the most comprehensive studies on the effective factors in the listening comprehension process has been done by Goh (1999). In his investigation, twenty factors were recognized and determined by the students to influence their listening comprehension skill. Based on their common features, Goh (1999) further arranged these factors into five categories including text, speaker, listener, task and environment. In this respect, Goh (1999) remarked that type of input as a feature of any listening

comprehension text beside such factors as anxiety, fatigue, nervousness and impatience directly exerts a crucial influence on the learners' listening comprehension performance. The positive effect of using different types of input on listening comprehension has been shown by several researchers as Brinton and Gaskill (1978) suggested using TV and radio news to help improve EFL learners' listening comprehension (Brinton and Gaskill 1978). Moreover, Poon (1992) and Rubin (1994) showed the significant impact of using TV news to improve listening comprehension.

The second outstanding finding is also pertinent to research question one. Audio input modality intervention had the largest significant effect on Iranian EFL learners' listening comprehension. Audio input modality group significantly outperformed both video and audio/video/caption groups. Although the video group had a higher mean score than the audio/video/caption group; however, there wasn't any statistically significant difference between the listening scores of the two groups. Put it another way, the group who received input through one sensory channel did better than those participants who had received input from two channels (video group) or three channels (AVC group).

Taking a glance at the existing literature reveals that there are controversial debates over this finding. In fact, some studies have supported the superiority of multi-channel presentation of input (for example, (Secules, Herron et al. 1992, Rubin 1994, Goh 1999). In his study concerning the effect of type of input, Mueller (1980) found that a lot of students when presented with spoken English over TV had a better understanding than when they were merely exposed to radio broadcasts. Another study in favor of audio-video input presentation has been carried out by Seo (2002). He asserted that audio-video materials provide L2 learners with richer input that facilitate listening comprehension (Seo, 2002). Seo (2002) argued that the visual aspects of such audio-video materials act as advance organizers and make the

comprehension easier for the L2 learners. The attribution of advance organizer label to the visual aspect in audio-video materials have also been pointed out by other researchers (e.g., Hanely et al., 1995; Herran et al., 1998; Kubota, 1999; Larsen-Freeman, 1983). Larsen-Freeman (1983) believes that watching TV is a good way to assist acquisition with easier access and entertainment and help alleviate pressure on learning.

Although many studies have confirmed the superiority of multi-channel presentation including the use of video materials in listening instruction, the related finding in this research is different in that it supports the positive role of single-channel presentation, that is, the use of audio-input modality in teaching listening comprehension. In fact, contrary to the above studies which supported visual presentation including Mueller's (1980) finding, there are some other studies which opt for just audio-input modality e.g. (Baddeley and Hitch 1974).

In this respect, McWilliam (1986), based on a review of a number of research findings from educational broadcasting and communication studies, reported that adults learning a second language lost auditory information when the television program presented visual information which entailed increased visual movements. Similarly, other researchers including Gunter (1987) and Robinson and Levy (1986) have discovered that learners lost more information in television news stories accompanied by pictures than in news stories presented by the news reader alone. Moreover, some researchers like Mayer (1997) and Najjar (1996) have shown that learners who possessed a high level of prior knowledge, did not learn much through multimedia presentation.

Furthermore, Neuman and Koskinen (1992), in the same line with the current finding and in contrary to multiple-channel presentation, count on the disadvantages of video-caption presentation. According to them, first of all, there is no variance among information received. The ongoing process doesn't give the opportunity for necessary review. Secondly, during TV watching too

much vocabulary information is provided, making it possibly too difficult for learners to acquire the knowledge. Finally, a large quantity of information is presented to the learner via different modes (visual, written, etc.) within short time interval, thus it can go beyond the limited capacity of human attention (Neuman & Koskinen, 1992). In fact, Seo (2002) mentions that the large number of studies on multimedia learning does not necessarily mean that multi-channel presentation leads to effective learning. What stands for the acceptability of the present research findings in supporting the single-channel input modality has to with such factors as the learners' working memory capacity as well as their sensory mode or perceptual modalities. These factors have not been taken into account in previous studies on listening comprehension which may be the cause of their existing contradictory results.

Taking the above-mentioned factors into account, in advocating the single-channel input presentation, Baddeley and Hitch (1974) also questioned the efficiency of using audio/video input for improving L2 learners' listening comprehension. Their study indicated that too much obsessions with audio-visual input exhausts the working memory and interferes with the controlling role of central executive and thus cannot aid learners comprehend effectively. In fact, Baddeley and Hitch 's (1974) study has supported the superiority of single-input modality, i.e., using only audio materials and has disconfirmed the simultaneous use of audio-visual materials in enhancing L2 comprehension. They argue that providing learners with the two modalities together will increase the load on working memory and meddles with its functions in the storage and processing of information (Baddeley and Hitch 1974).

The third study finding showed that auditory learners did better than visual and haptic learners on the listening posttest and there was a direct match between input modality type and learners' sensory mode in the audio and video groups, but not in AVC group. Accordingly, sensory mode

(including auditory, visual, and haptic perceptual learning styles) did play a significant role in L2 learners' listening comprehension. Auditory learners in the audio-input modality group significantly outperformed visual and haptic learners on the listening posttest and in the same vain, visual learners' listening performance was greater than auditory and haptic learners in the video-input modality group, suggesting that there is a direct correspondence between the input modality and learners' perceptual learning style modality. However, there was not any significant difference between auditory, visual, and haptic learners' listening comprehension in the AVC group.

The results obtained here concerning the consistency between different modalities in listening input presentation and the perceptual modalities of the learners are truly in support of the meshing hypothesis proposed by Pashler and his colleagues in 2008. Of course, reviewing the literature, we will come across with some studies which have partially rejected the existence of complete matching between teachers' style and learners' sensory modes (Constantinidou and Baker 2002, Cook, Gelula et al. 2007) while there are other studies which totally confirm this hypothesis e.g. (Peacock 2001, Pashler, McDaniel et al. 2008, Naimie, Siraj et al. 2010, Tuan 2011, Dekker, Lee et al. 2012, Rogowsky, Calhoun et al. 2015). Based on the meshing hypothesis, also known as matching hypothesis, teachers' instruction should be geared to the learning styles of the learners, that is, to reach optimal learning outcomes there should be an agreement between teachers' input presentation modality and perceptual modality of the students. In support of this hypothesis, Rogowsky et al. (2015) referred to the American education system and the general public saying that they have come to believe that optimal learning occurs if individuals are presented instruction in the modality that capitalizes on their learning style preference. Pashler et al. (2008) carried out an exhaustive review of the existing literature on learning styles and came to this conclusion that there is a widespread belief

both among the scholars and the general public that the meshing hypothesis truly exists, that is, individuals with a visual learning style learn better when the information is presented to them visually through videos or written format, and conversely those with an auditory sensory mode will learn more if information is presented to them through audio files and materials (Pashler, McDaniel et al. 2008).

In line with the present result, Dekker et al. (2012) conducted a comprehensive survey within 242 primary and secondary school teachers from the United Kingdom and the Netherlands. The results revealed that 93% of teachers from the United Kingdom and 96% of teachers from the Netherlands confirmed that "Individuals learn better when they receive information in their preferred learning style (e.g., auditory, visual, kinesthetic)". Furthermore, another evidence in support of the meshing hypothesis comes from Peacock's (2001) study. He conducted a study in an attempt to test the Reid's (1987) hypothesis that the mismatch between teachers' and learners' styles results in learning failure, demotivation, and frustration. Using Reid's questionnaire, tests and interviews, Peacock (2001) collected data from 46 EFL teachers and 206 EFL students at a university in Hong Kong (Reid 1987, Peacock 2001). Teachers were found to prefer auditory, kinesthetic and group styles and hate individual and tactile styles while it was discovered that students preferred auditory and kinesthetic styles and disliked group and individual styles. Getting to recognize the incongruence with regard to auditory and group styles, the interview results revealed that 70% of the learners were discouraged by this mismatch, 76% stated that it had a negative impact on their learning; and 81% of the teachers were content with Reid's' hypothesis. Therefore, as seen, the findings show that teachers and students have, to a great extent, tendency to observe a balance in their teaching and learning styles respectively. One other study advocating the meshing hypothesis which has been done in Iranian EFL context is by Naimie et al. (2010).

The findings from this research also demonstrated that when students' learning preferences and needs are accommodated by their lecturers, they will show a positive response and have higher achievement.

However, one important study in opposition to the meshing hypothesis has been reported by Coeffield and his colleagues (2004). They studied on the implications of this hypothesis for teachers' practices and showed that given the complexity of interactions between other constructs, complexity of the learning construct, and the fact that the meshing hypothesis was pragmatically unrealistic, this practice seems unhelpful and unrealistic, and lacks enough empirical evidence.

CONCLUSION

The main conclusions of the present study are presented here and briefly touched upon by convincing thoughts and final arguments. The first conclusion is that input modality can directly exert an influence on EFL learners' listening comprehension. This study revealed that learners who receive audio input modality can improve their L2 listening better than learners who have received video intervention. Therefore, it is clear that learners who receive listening intervention through one input channel can improve their listening compared with learners who receive input from two (video) or three channels (AVC).

The second main conclusion is the impact of perceptual learning style or sensory mode on the L2 listening improvement. It was concluded that learners with auditory perceptual style can develop better listening skills. Of course, visual learners can also improve their listening; however, due to the nature of L2 listening comprehension, auditory sensory mode fits better with listening in comparison with learners with other dominant perceptual tendencies.

The findings of current study have some important pedagogical implications for those who are involved in learning and teaching English as a foreign or second language including EFL learners, teachers, and syllabus designers. The com-

munity of Iranian EFL learners can employ the findings of the current study to improve their L2 listening comprehension. Learners should be familiar with their sensory modes for L2 learning or their perceptual learning styles. Knowing their auditory, visual or other styles can help them to choose the most effective multimedia for their own listening comprehension improvement. If they possess auditory perceptual (sensory mode) styles, they should choose more audio-oriented material and if they have a dominant visual style in their learning perception, they are recommended to follow more video materials. By choosing the most appropriate type of input modality based on their perceptual learning style (sensory mode) they can lower their fatigue and let their mental abilities to listen better.

Teachers can use the findings of this study in their EFL listening classes and their teaching practices. Then, they should tailor their teaching materials and tasks based on these learning perceptual inclinations and choose the best type of input modality and listening materials. They should recognize that auditory learners can learn better from audio input and visual learners can improve their listening by watching video materials. Teachers should also try to assign listening materials without captions because based on the findings of this study, receiving input from many channels can only bring about fatigue, negative attitude and exhaustion.

Syllabus designers and those who are involved in curriculum planning and material development should also arrange and write their listening materials on the basis of effectiveness of different types of input modality according to learners' sensory modes. They should provide some surveys or checklists that aid EFL learners discern their dominant perceptual styles by the help of their instructors and then choose those instructional materials and related multimedia. Definitely, syllabus designers should provide rich audiovisual files to give learners the option to choose these files based on their best channel of listening comprehension development.

In every study there are certain conditions affecting the generalizability of the research findings, in one way or another. In fact, this study suffered from some limitations that were out of the researcher's control. First, gender of participants was not controlled for and it could have had some unwanted influences on the results of the study. Therefore, one interesting suggestion for further research would be a study taking into account the gender of participants in order to see that whether there is a difference between the listening performance of male vs. female learners with respect to their perceptual modalities. Second, the participants were limited to intermediate and upper intermediate learners and learners with other proficiency levels were excluded. Accordingly, another area for future research would focus on learners from a different proficiency level including Iranian advanced EFL learners. The third limitation referred to the duration of the study. The time duration allocated to execute the treatment sessions was 8 sessions. Time is considered an important factor in experimental studies. Therefore, the reduction and increase in the number of instructional sessions would produce different findings. In order to obtain more valid and reliable findings, interested researchers can replicate this study within a larger duration time. Furthermore, future studies can deal with different input modalities as well as different perceptual modalities and even investigate their interaction effect on other language skills and components.

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