Examining the Relationships between Foreign Language Anxiety and Attention during Conversation Tasks

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Abstract. This study explored the association between Foreign Language Anxiety and sustained attention during two conversation tasks. Participants were twenty-nine EFL (English as a Foreign Language) learners who completed a role play task in a classroom practice condition and a real-world situated condition. Attention levels were measured using Neurosky's EEG headset during the task. Self-perceived language anxiety was measured using questionnaire after the task. Correlation analyzes show there was a negative correlation between attention levels and states of language anxiety in the classroom practice condition but there was a positive correlation between attention levels and states of language anxiety in the real-world situated condition. Findings suggest that students who experience low anxiety tend to sustain better attention during the language task; however, their attention can be enhanced when they feel more anxiety resulting from a more challenging task. Implications for language instructors and system developers are discussed.

Keywords. Neurosky EEG headset ·Communicative task ·Attention ·Foriegn language anxiety ·Technology-enhanced language learning

1 Introduction

Communicative language teaching (CLT) has been widely used in classroom to promote communicative competence in English. In a CLT classroom, task-based learning activities are used to promote meaningful interaction, introduce authentic context and solve a problem. However, learners' performance can be affected by the interaction between the complexity of a learning task and individual differences. Learners' affective variables, such as language anxiety, can affect language comprehension and production [1].

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State of language anxiety refers to an anxiety that EFL learners experience during a language task [1]. Research indicates that low anxiety state has a positive impact on perceived communicative competence and willingness to communicate [2], which is associated with the amount of language output. Studies have found that lower measures of language anxiety can lead to more oral production and more modified utterances (see [5] for a review). On the other hand, high language anxiety tends to be negatively correlated with L2 achievement [3]. Some explanation has been proposed in terms of cognitive interference. When one's anxiety arousal is high, the attention can be divided between task-related cognition and self-related cognition such as excessive self-evaluation and worry over potential failure, which makes cognitive performance less efficient [4].

While some studies suggest that anxiety disrupts cognitive processing, several researchers believe that a certain degree of anxiety can have a positive effect because anxiety might lead to greater effort put by the learners. Eysenck (1979) argued that anxiety can reduce effectiveness, but it will not necessarily impair performance efficiency if sufficient effort is exerted. Similarly, other studies found that there is no relationship between language anxiety reported in the diary and learners' rate of improvement. Based on the brief overview, the results are mixed and most research has concentrated on its impact on language output, or performance rather than processing during a task [5].

Thus, of interest to the research team is how attention states correlate with language anxiety during a language task. Generally, attention can have different forms, including focused attention, shifting attention and selective attention and divided attention [6]. The attention inspected in this paper is sustained attention, which is a component of attention that reflects learners' readiness to respond to stimuli over a period of time [7].

With the advancement of biosensor technology, it is possible to monitor learners' mental states during a task. Using the EEG headset developed by Neurosky, physiological signals in the brain, such as attention, an indicator of the degree of the intensity of mental "focus" or "attention" a person feels, can be detected. The physiological signals can be turned into readable values, called eSense, ranging from 1 to 100 on a relative scale using Neurosky's algorithms. On this scale, values between 40 to 60 at any given moment in time are considered "neutral." Values from 80 to 100 are considered "elevated," indicating strongly heightened levels of that eSense. Similarly, on the other end of the scale, values between 20 to 40 are considered "reduced," while values between 1 to 20 indicate "strongly lowered" levels [8]. Studies using Neurosky's EEG headsets have been able to use it to track attention states across different learning tasks [6, 9, 10, 14]. Rebolledo-Mendez et al. created an assessment exercise in Second Life to examine the correlation between the attention measured by

eSense, or MindSet in their study, and self-reported attention levels measured by the Attention Deficit and Hyperactivity disorder test during the interaction in the assessment exercise [14]. A positive correlation was found, indicating that eSense provides accurate readings related to self-reported attention levels.

The present study attempted to examine how different levels of language anxiety induced by two language tasks would affect the attention states as measured by the EEG headset as well as examine the correlation between on-task attention states and language anxiety states during language tasks. Two types of common language tasks were designed: (1) classroom role play (2) real-world role play. The classroom task represents how language is normally practiced in the class while the real-world type of task simulates authentic situation where language is used. The former induces low level of language anxiety and the latter involves heightened level of language anxiety.

2 Research question

The two following research questions guide this study:

RQ1: How do attention states vary by langauge tasks involving different levels of foreign language anxiety?

RQ2: What is the correlation between attention and self-perceived langueage anxiety during a language task?

3 Research design

3.1 Participants

Twenty-nine undergraduate and graduate students participated in the experiment. Their ages ranged between 19 to 25 with 36.7% female and 63.3% male. They were native speakers of Chinese learning English as a foreign language, who learned English for nine years on average. The majority of participants are from the college of Management (76.7%), and some are from the college of Technology (20%) and the college of Liberal Arts (3.3%). Their average percentile of English scores on the college entrance exam (range 0 to 15) were 12.46 (SD = 1.84), which is equivalent to intermediate high proficiency level.

3.2 Instruments

There are two dependent variables in this study, self-perceived language anxiety and brainwave. To measure the self-perceived language anxiety, the Foreign Language Classroom Anxiety Scale was adopted from Reinders and Wattana [11]. The Foreign Language Classroom Anxiety Scale was translated to Chinese and tailored to meet our language context. The questionnaire consisted of five items, which were rated on a five point Likert scale, ranging from 1 being "strongly disagree" to 5 being "strongly agree." The internal consistency coefficient was satisfactory for the classroom practice condition (cronbach's α = .80) and for the real-world situated condition (cronbach's α = .66). Another questionnaire, consisting of three items tapping into task complexity, time constraints and interlocutor pressure, was designed for the manipulation check. It was rated on a 5-point scale ranging from strongly disagree to strongly agree.

3.3 Language tasks

The goals of the language tasks are to induce low and heightened levels of language anxiety and design two conversation tasks that are meaningful and relevant to actual language use. Based on the consultation with university-level English instructor and factors related to speaking-in-class anxiety [12], two types of role-play tasks were designed to create two situations commonly encountered by language learners: (1) classroom type of role play (2) real-world type of role play. They differ in the following aspects (table 1).

Table 1. Types of role play tasks and their design principle

	Classroom situation	Real-world situation
Task difficulty	Simple ordering	Authentic ordering
Time limit	Sufficient time	Limited time
Interlocutor	Student partner	English speaking partner
Expected anxiety level	Low anxiety inducing	Heightened anxiety inducing

These factors are the ones that have been found to associate with different levels of language anxiety. The degree of task difficulty, time urgency, and talking to a student partner or English speaker in these tasks were also manipulated in a way that simulates communicative tasks.

The task begins with an ordering instruction with a setting in a coffee shop. The classroom task simulates the classroom practice situation that is less anxiety-inducing. In this situation, participants are asked to order specific coffee and manage to checkout. The content only prompts the use of fixed expressions to complete the tasks,

i.e., I'd like to have a hot Venti latte. To go. Sufficient time is given with 3 minutes maximum. The conversation is practiced with a low-stake partner at similar age and with similar English proficiency. The real-world task simulates a more authentic conversation, which prompts the participants to engage in a rather open-ended ordering situation, i.e., I'd like to add an extra shot of expresso. Top it with extra whipped cream. The task also limits the task time to two minutes but actually gives three minutes. The conversation was carried out with a Malaysia-born English speaker as a conversation partner. This task is relatively high anxiety-inducing.

3.4 System description

Tablets and Neurosky EEG headsets were the devises used in this experiment. A web-based system was developed for facilitating the language tasks where participants can use the tablet to connect to our web page. The Neurosky's EEG headsets were used to collect participants' brainwave throughout the language tasks. We use C# and Neurosky's EEG headset SDK to develop the program, connect the Neurosky's EEG headset through Bluetooth, and design a website with task content and countdown function by using HTML and JavaScript language.

3.5 Procedures

Since this is a within-subject design, we randomly assigned participants into two groups, A and B, to fulfill a counterbalance design (see figure 1).

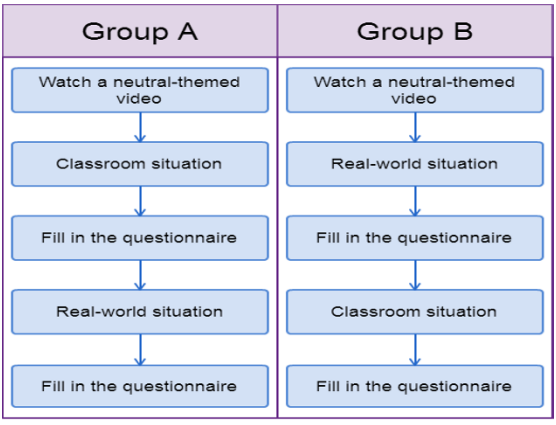

Fig. 1. Experimental procedure

Before participants began the language tasks, they were led to wear Neurosky's EEG headset. To neutralize participants' emotion, they were asked to watch a three-minute neutral-themed video. Then participants began the role play tasks with the designated partners while following task instruction on the tablet and referring to a print menu to complete the task (see figure 2). Depending on the group the participants were assigned to, they either went through the classroom practice task first and then the real-world simulated task or vice versa.

Fig. 2. A menu and a table for the conversation tasks

Fig. 3. Subject participating in the real-world situated condition

Participants in the classroom practice condition were assigned to converse with a college student and were told that they would use as much time as needed to complete the task. Those in the real-world situated condition were assigned to talk with a nearly native-like English speaker and were told that they were only given two minutes to complete the task while they were actually given sufficient time to finish the task (see figure 3). After they complete each of the tasks, they were required to fill in the Foreign Language Classroom Anxiety Scale. They were also given manipulation check questions regarding the anxiety inducing factors. Finally, they were debriefed and thanked for their participation with a gift card.

4 Results and discussion

4.1 Analysis of manipulated factors

To test if the three anxiety inducing factors were successfully manipulated during the tasks, three paired-t tests were conducted (table 2). The results showed that the three factors in the real-world situation all led to higher self-perceived task difficulty, $t(28) = -5.13$, $p < .001$, time constraints, $t(28) = -5.95$, $p < .001$, and interlocutor pressure, $t(28) = -3.77$, $p < .001$, suggesting that the three factors were successfully manipulated and are the major sources that led to the difference between tasks.

Table 2. Means of self-perceived ratings on the three anxiety factors

	Attention level	Self-perceived language anxiety state
Task difficulty	2.45 (0.95)	3.48 (1.15)**
Time constraints	1.76 (0.74)	3.00 (1.04)**
Interlocutor pressure	2.14 (0.83)	2.79 (1.01)**

** $p < .01$

4.2 Analysis of brainwave and self-perceived Language Anxiety

To examine if different types of tasks would lead to different attention level and language anxiety states, two paired t-tests were performed. As table 2 shows, there was no significant difference between the two conditions in attention levels, suggesting that both the classroom and real-world situated tasks lead to similar attention states. The means also showed that both groups obtained “neutral level” of

attention states according to the eSense scale. In terms of language anxiety states, the real-world task significantly led to higher self-perceived language anxiety, $t(28) = -5.17$, $p < .001$, $d = .97$, indicating the real-world type of task is more anxiety inducing as expected.

Table 2. Means and standard deviation of measures by condition

	Attention level	Self-perceived language anxiety state
Classroom situation	50.72 (2.27)	2.70 (0.80)**
Real-world situation	47.89 (2.09)	3.41 (0.66)

** $p < .01$

4.3 Correlation between brainwave and self-perceived Language Anxiety during language task

To examine the relationship between attention levels and language anxiety states in the two conditions, two Pearson Correlation analyses were performed. The results showed that, in the classroom practice condition (see figure 3), there was a negative correlation of -.36 between attention levels and language anxiety states, although the result reached marginal significance ($p = .051$). There was a positive correlation of .38 between the attention levels and language anxiety states ($p = .04$) in the real-world situated condition (see figure 4).

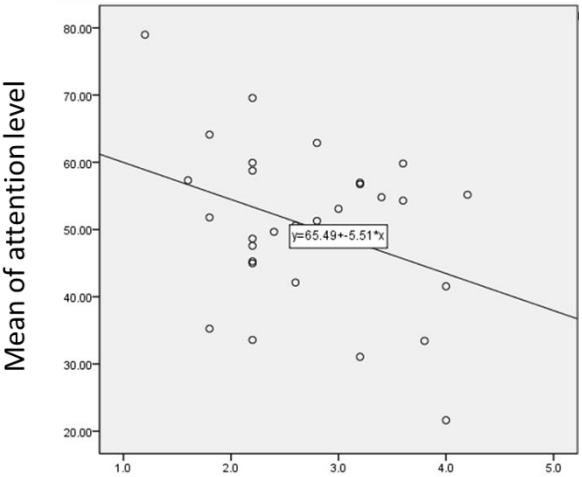

Fig. 3. Correlation between attention levels and language anxiety states in the classroom practice condition

These results suggest that in the classroom practice condition, learners who feel less language anxiety tend to pay more attention to the language task. Interestingly, in the real-world situated condition, it is the learners who experienced more anxiety language tend to better concentrate on the language task. Note that what differs between the two tasks are the degree of task difficulty, time urgency, and talking to a student partner or an English-speaking partner. One possible explanation for such divergent trends observed in the two conditions is that learners with lower anxiety are more able to adapt their attention when the anxiety induced by the task is moderate. However, when such anxiety reaches a certain level (higher than 3, the median figure of the scale, in this study), learners experiencing a higher level of anxiety might put more effort in paying attention during the language task. These findings echo earlier studies, which found that anxiety may facilitate performance where increased effort can compensate for the reduced efficiency of cognitive processing [4].

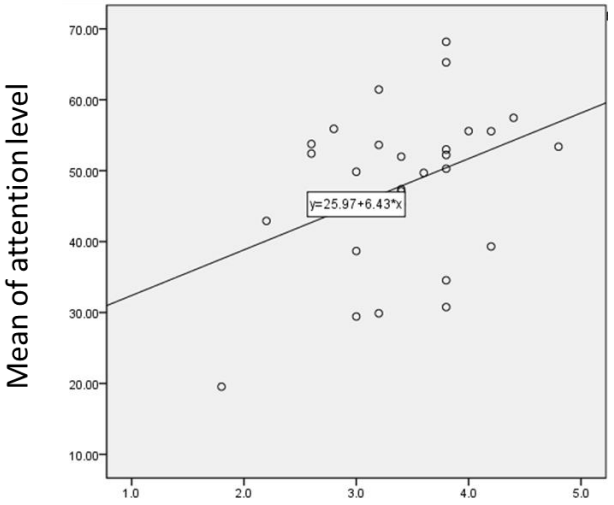

Fig. 4. Correlation between attention levels and language anxiety states in the real-world situated condition

4.4 Implications for educators and system developers

The results of this study can help language instructors better understand how different types of tasks can lead to varying level of anxiety and how such anxiety can correlate with sustained attention states. Specifically, when designing a language task, instructors should take into consideration how task elements, such as task complexity,

time urgency, and interlocutor, can affect students who experience different levels of language anxiety in a way that potentially limits or enhances how they attend to the language task. When conducting a typical type of classroom language task, instructors might consider scaffold or facilitate students who experience high language anxiety. However, providing a more authentic task, or a more challenging one, might increase their attention to the task. This finding implies that lowering language anxiety might not always be beneficial for language learning. Certain extend of anxiety can lead to better attention to the task. For system developers, EEG headset can enable attention recognition during a language task. In designing technology integration, real-time attention recognition can be used to adjust learning content or factors related to language anxiety while learners feel anxiety during a language task.

Also, as conventional measurement of language anxiety is through self-report or questionnaire, the results are not real time. Future studies can look into the possibility of using a smart watch to monitor anxiety states as it has the potential to record hear rate variability, which has been found to link with one's anxiety [13].

5 Conclusion

This study attempted to examine how sustained attention states are associated with the self-perceived Foreign Language Anxiety in two commonly adopted language tasks, namely classroom and real-world situated practice tasks. Attention levels were measured using Neurosky's biosensor during the tasks. States of language anxiety were measured using questionnaire after the task. Results showed that the two tasks did not lead to significant difference in the attention levels but the two tasks led to different levels of anxiety. Further analysis showed that on-task attention level was negatively correlated with self-perceived language anxiety in the classroom practice condition. In the real-world situated condition, on-task meditation level was positively correlated with self-perceived language anxiety. Findings suggest that while students with low anxiety tend to sustain better attention during the language task, their attention can be enhanced when they feel more anxiety resulting from a more challenging task. Note that the participants of the study are considered intermediate high language learners for their average percentiles of English scores are high, which makes the results only generalizable to those at similar proficiency level. Finally, we will continue to explore how attention level measured during a language task is related to actual learning outcomes as well as whether attention level can be used as an index for guiding real-time adaptive mechanism. It is hoped that this study can contribute to the field of technology-enhanced language by identifying potential learner variables involved in a language task.

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