Training with virtual reality simulations. Its effects on public speaking anxiety and public speaking performance in a secondary school setting

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ABSTRACT

Public speaking anxiety using virtual reality exposure (VRE) has mainly focused on distress arousal, especially with participants with social anxiety disorders (SAD). The present study has the goal of assessing the value of virtual reality training in the context of public speaking abilities with adolescents not only to assess its effects on anxiety but also on public speaking performance in front of a real audience. A total of 56 secondary-school students participated in a 3-session between-subject training experiment with a pre-test and post-test design. While the VR group produced three brief speeches within a virtual reality setting using three different virtual audience scenarios, the non-VR group performed those speeches using the traditional method of practicing alone in a room. An analysis of the public speaking anxiety and the listener-oriented public speaking performance at pre-test and post-test revealed that a 3-session virtual reality training reduces the participants’ perception of anxiety and encourages future longer pre-/post-test experiment designs to study its implications on the anxiety self-assessments and on the public speaking performance. Education implications are also discussed.

Keywords: public speaking, virtual reality, speech anxiety, training study, embodiment, gesture, between-subject training study, pre-test and post-test design.
Public speaking plays an important role in the social scene and is a skill required not only in many job positions nowadays but also for active and responsible social participation. As Bailey stated (2018: 11) “If we think of the rich civic history of the field of public speaking, however, of the skills it has given lay people to argue in court, to challenge unjust laws, to elect representatives, to argue for the abolition of slavery, to win votes for disenfranchised citizens, as well as to ace an interview and secure funding for a new organization, then we might see more of the vital, even revolutionary, possibilities in a course on public speaking”.

From a professional point of view, recent results show that 90% of businesses point out that the competence in oral communication is essential to develop tasks successfully. A professional has to be able to transmit oral information in a comprehensible way and needs to be able to communicate ideas and projects in a clear and persuasive way. It has such an important role in business that companies value this competence as one of the main requirements when interviewing new candidates. A study conducted by the consultor Millenial Branding (2012) concluded that the selection of professionals from companies is based 98% on communication competencies. However, the same study showed that 91% of professionals considered proficiency in oral communication to be the most difficult to achieve.

A set of studies have pointed out the need for more training in public speaking, as well as in oral abilities in general. A study from the Observatorio de Innovación en el Empleo, promoted by (Adecco, 2015) concluded that 19 multinationals (BMW, IKEA or Coca-Cola, among others) pointed out a lack of training in oral abilities in the graduates. Another report
of the Comission for the Employment of the UK Government (UK Commission, 2013) established that the ability that companies found it lacked the most amongst candidates was oral communication. Crosling and Ward (2002) resolved that to fully participate in the workplace and to achieve successful career results, those yet to enter the workforce needed education or training in all of the generic skills such as presentations, conflict resolution and negotiating with clients and employers, as well as skill in participating in informal conversations as well as in formal presentations and agenda-based meetings, rapport building and politeness, ability to approach issues critically and how to be assertive in presenting views.

Similarly, oral abilities have been shown to be important not only to find a job but also improve academic performance in general (see the report *The State of Speaking in Our Schools*, by Millard & Menzies 2016, done by the consultant Voice 21 and Cambridge University). It is thus important that education works on improving oral abilities in a decisive way. In the context of education, it has been shown that boosting oral abilities in secondary school settings contributes to strengthening not only students' school efficiency, but also their social abilities and satisfactory interpersonal relationships (Morreale, Osborn & Pearson, 2000). Finally, if we understand that education is pivotal for oral communication competence, it has also been proven to efficiently raise the safety and trust of citizens, which is important to communicate better and to know how to defend ideas in a context of citizenship participation.
Speech Anxiety or Glossophobia

Glossophobia, also known as “speech anxiety” is the feeling of fear while speaking in front of an audience, often known as fear of speaking publically or nervousness in communication. It is a feeling of panic related to different physiological changes like elevated heart and breathing rates, over-rapid reactions, trembling of muscles and shoulder and neck area stiffness among others (Tse, 2012). Public speaking fear is considered a type of societal dread that causes a serious desire to escape speaking in front of others because of fear of awkwardness or humiliation (Hancock, Stone, Brundage, & Zeigler, 2010). Glossophobia, along with performance nervousness, communication uneasiness, stage fright or fear of negative inference are categorized as a type of social anxiety or social phobia disorder which has a great social importance. (Anke, Marcia, Anne, & Westenberg, 2002).

Apart from the clinical cases, public speaking anxiety tends to be avoided by most of individuals. People with some degree of public speaking fear face difficulty in pursuing their educational and career goals, and this may cause frustration, depression and distress in their personality (Slater & Barker, 2002; Goberman, Hughes & Haydock, 2015). This is why in educational settings, when students are requested to speak in front of groups they display some degree of public speaking anxiety. Reducing public speaking anxiety could be an important step to make higher education more bearable and even prevent students from abandoning their studies prematurely (Boettcher, 2013).

Several studies have shown that public speaking courses at the university level can boost self-confidence and reduce anxiety (Hancock et al., 2010; Colbeck, 2011; Hunter, 2014). Hancock et al. (2010) assessed the effects of two different pedagogical approaches of a

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1 *Glossophobia* is a word of Greek origin, *glosso* means tongue, and *phobia* means threat or fear (Ali & Nagar, 2013).
Public Speaking Course (one named *Voice and Diction* and the other *Fundamental Speech*) on undergraduate students aged 18-24 of two North-American universities. They measured their self-assessments on apprehension, confidence and competence before and after completing the course and they concluded that self-perceptions were rated in a more positive way after having completed the course. Students saw themselves as more confident, less apprehensive and with more feelings of competency after the public speaking course. Both pedagogical approaches, *Voice and Diction*, which focused on how to use the speech mechanism to produce desired speech and voice quality, and *Fundamental Speech* that included lectures on how to organize, outline, and deliver a variety of speech types, besides their differences in addressing oral communication, obtained similar results in allowing students to gain public speaking experience and thus reduce fear and apprehension. Colbeck (2011) and Hunter (2014) obtained similar results in two studies in two different North American universities. They analyzed the impact of the *Fundamentals of Speech* course on public speaking anxiety and concluded that anxiety self-assessments (obtained through the PRPSA test; see section 2.2.4.1 below) differed significantly after taking the course. Once subjects completed the course, communication apprehension significantly decreased with special emphasis on women's self-assessments that showed lower apprehensive ratings than before starting the course and obtained similar ratings as men after having completed the course.

*Virtual Reality*

Cognitive Behavior Therapy (CBT) has been found to be the preferred treatment of choice for phobias. CBT has been shown to be superior to other psychotherapeutic approaches in the number of people improving, the degree of improvement, as well as the longevity of their effects. The exposure component in CBT can be employed in a natural setting *in-vivo* or in imagination *in-vitro* (Wallach et al. 2006).
Virtual Reality Cognitive Behavioral Tasks typically use virtual reality exposure (VR) (henceforth VR) in therapy for Public Speaking Anxiety (henceforth, PSA). VR enables a high degree of therapist control and requires much less time, thus overcoming difficulties that arise in *in-vivo* and in *in-vitro* exposures, such as patient’s inability to imagine, or a lack of confidentiality resulting from public exposure.

Importantly, VR has been shown to be effective in creating a credible scenario for public speaking which triggers comparable distress to participants. Slater et al. (2006) studied the reaction of two groups in public speaking virtual reality settings. One group was formed with people with PSA and the other group formed with confident speakers. All 20 participants had to give a unique 5-minute speech in front of a virtual audience. The settings differed in that one was filled with audience and the other one was empty. People with phobia indicated a significant increase in signs of anxiety in the room filled with virtual audience than in the empty virtual room, whereas those with no phobia registered no difference between the two conditions. The phobics who spoke to the audience exhibited heart rate trends significantly different from the confident speakers who spoke to the audience. Results showed that even when the virtual avatars had low representational quality, VR produced a strong sense of presence. This potency of presence was also stated in Šalkevicius' study (2019) with 30 participants. They had to give two speeches the same day: a first speech in front of the therapist and a second speech using VR. The VR scenes could create controllable anxiety during the treatment session, and this was assessed through psychophysiological features and the values from Subjective Units of Distress Scale. VR speaking scenarios generated a stimulus that was equivalent to or even stronger than a speech that was delivered in front of the therapist. In their study with 66 University students, Kothgassner et al (2016) divided participants in three different groups: a VR filled with a virtual audience, a real scenario with a real audience and an empty VR-scenario. They measured cardiovascular reactivity and
cortisol salivary reactions to a unique 5-minute public speaking task. They concluded that all participants showed a significant Heart Rate (HR) increase during the public speaking task and during the recovery period. There was a higher increase in HR in the two experimental groups than in the control group. Measures of cortisol showed no significant differences between the experimental groups during exposure to the stressor yet the control group presenting in an empty virtual lecture hall showed a significantly lower salivary cortisol stress increase than the groups presenting either in front of a real audience. Their major finding is that they prove that VR itself does not elicit a stress response and that the observed social stress is due to the social influence of virtual others.

Regarding the effectiveness of VR on the reduction of anxiety, clinical studies with VR trainings have obtained mixed results. North, North, and Coble (1998; cited in Wiederhold & Wiederhold, 2005) compared VR with 6 participants with a no-treatment group of 8 participants and found a significant reduction in fear measures in the treatment group; however, this study was composed of only a total 14 participants, and no comparison was made between the two groups. Anderson, Rothbaum, and Hodges (2003) used VR in two single-case studies and found it to be effective. Anderson, Zimand, Hodges, and Rothbaum (2005) used VR for 10 participants (open clinical trial) and found it also to be effective. However, their sample was small, and they did not use a control group. Klinger et al. (2005) treated 36 adults with social phobia, 18 in the CBT group and the other 18 in the VR group. They were exposed to 12 individual sessions and 4 different environments where they had to face their fear or anxiety towards the social scene. The results showed that both VR and CBT were effective to reduce the key symptoms of social phobia. Yet for all measures except for assertiveness, the difference between both treatments was small to very small. Wallach et al.
(2009) performed a clinical trial with a CBT group (30 participants), a VR group (28 participants) and a Waiting List\(^2\) (henceforth WL) group (30 participants), all suffering PSA. The two treatment groups followed the same procedure. All participants received 12 individual 1-hour treatments (7 sessions were devoted to VR exposure or in-vitro exposure depending on the group) and at the end there was a unique post-therapy 10-minute lecture for all groups in front of 4 or 5 members that rated their speech on 10 anxiety indicators. No difference was found between participants performing the CBT and participants performing the VR on the anxiety ratings assessed by the therapists and the self-assessments regarding the 10-minute lecture. VR doesn't appear superior than CBT for public speaking anxiety, yet both CBT and VR are effective treatment to fight glossophobia. Robillard (2010) compared 16 individual therapies in adults that suffered social phobia and divided participants in three groups: CBT, VR and WL. Both CBT and VR had individual exposure every week to public speaking and social situations. Results showed that both CBT and VR triggered a significant improvement in self-assessments and anxiety questionnaires compared to the WL group, but there was no difference between VR and traditional CBT. In sum, mixed active groups proved to be superior than WL group.

Mixed results were also found in different studies assessing the effects of VR trainings with non-clinical populations. Harris, Kemmerling, and North (2002) found that four sessions of VR were effective enough for reducing public speaking fear in a study with 14 university students. Although there were significant reductions in anxiety on some measures in the VR

\(^2\) A wait list control group, also called a wait list comparison, is a group of participants that is assigned to a waiting list and receives the intervention after the active treatment group. This control group serves as an untreated comparison group during the study, but eventually will receive treatment at a later date. Wait list control groups are often used when it would be unethical to deny participants access to treatment, provided the wait is still shorter than that for routine services (Elliott et al., 2002).
group, only one comparison between the treatment and Waiting List group proved to be significant. Harris et al. (2002) found that participants in the Virtual Reality (VR) condition showed greater improvement than WL participants in the self-assessment measures as well as on the physiological measures (heart rate measures during the speeches and during a brief relaxation exercise were taken using a pulse oximeter). The study claims that brief training with VR helps university students reduce both anxiety and the avoidance of public speaking. Heuett (2011) carried out a study with 80 University students with PSA in which one group used VR, another group a visualization treatment and the third, a control group. They all delivered two impromptu speeches and they were asked to fill some questionnaires related to PSA and Willingness to Communicate (WTC). All the questionnaires answered by the VR condition showed significance in the reduction of trait and state communicative apprehension (CA), in their self-perceived communication competence (SPCC) and an increase in their willingness to communicate. However, the visualization treatment indicated significance in regards to an individual’s SPCC more so than VR. Thus, by the collection of all these post-test questionnaires they proved the superiority of VR beyond visualization.

In a study of 19 non-clinical adults, Takac (2019) demonstrated in a within-subject task design that rapidly successive VR scenarios were capable of eliciting self-reported distress and significant physiological arousal was also observed in heart rate data. Distress was easier to initiate than habituation, with three successive speeches (within a 60-minute session) required to sustain distress reduction. Stupar-Rutenfrans (2017) carried out a study with non-diagnosed students and concluded that high-anxious participants significantly improved in self-assessed anxiety after all participants performed three speeches in a VR scenario with an increase of participants between Scenario 2 (small audience) and 3 (big audience). Scenario 1 was empty. Anxiety increased between scenario 1 and 2, but diminished before and after speech taken place in scenario 3. They suggested a future study with a pre
and post-test speech with a real audience in order to compare anxiety in virtual and real audiences. Due to the general lack of studies with a pre/post-test design that will allow us to assess the gains on stress reduction, and their mixed results, we decided to run a between-subject experiment that could assess the anxiety and performance differences between a first speech performed at pre-test and the same speech performed at post-test after a three-session VR training (experimental group) or after the same non-VR training.

A reasonable question to ask is whether training with virtual reality audiences can lead, not only to reduced anxiety and distress, but also to improved listener-oriented public speaking performances in terms of prosodic and gestural patterns. A recent study by Niebuhr & Michalsky (2018) showed that participants rehearsing within a VR environment performed their speech in a more listener-oriented, dialogue speaking style than the speakers of the control group that practiced their speech alone in a classroom. A total of 24 university students were asked to perform an elevator pitch in two between-subject conditions. A test group of 12 participants practiced speeches several times alone in a classroom and the other group rehearsed theirs in a VR scenario. The results showed that presentations of the VR test group were characterized by a slower speaking rate and performed at a higher intensity level. Overall, speeches in the VR group were longer compared to the test group. Thus, the authors claim that the results of performing a presentation using a virtual reality setting were very similar in terms of prosodic features to performing it with a real audience. In order to prove to what extent speaking in front of a VR scenario or to a real audience resemble also triggers gains at post-test, we conducted a training study in which we could assess and compare speech delivery with a real audience at both pre and post-test.

The present study aims at assessing the role of VR trainings not only on the reduction of public speaking anxiety (measured with 2 self-assessment measures and 2 electrophysiological measures at both pre-test and post-test) but also at the improvement of
public speaking performance (in terms of assessing adequate prosodic and gestural patterns in a 2-minute oral presentation, fluency and gesture both at pre and post-test speeches). A between-subject Virtual Reality training study with a pre-test and post-test design will compare the effects of training across two groups, namely the virtual reality (VR) group, which will perform a 3-session training within a Virtual Reality Exposure (VRE), and the non-virtual reality group (non-VR), which will perform the 3 sessions alone in a classroom. To our knowledge, it is the first study of this kind that is done with secondary school participants and that included both the ratings of performance together with a variety of anxiety measures.

RESEARCH QUESTIONS

RQ1: Does a 3-session public speaking training within a VR paradigm reduce self-assessed anxiety and physiological anxiety results in secondary school students?

RQ2: Does a 3-sesison public speaking training within a VR paradigm increases public speaking performance (measured as non-verbal and prosodic measures) in secondary school students?

2. METHODS

The experiment consisted of a between-subjects 3-session public speaking training study with a pre-/post-test design. The experiment consisted of four parts: The initiation session, the pre-test session, a brief training session and the post-test session. There were two different groups: the non-virtual reality group and the virtual reality group. The whole study lasted four weeks.
2.1 PARTICIPANTS

A total of 56 native Catalan-speaking high-school students (37 female and 19 male; mean age=16.87, SD=0.33) participated in the study. All participants were in the same high-school course, 1r de Batxillerat (11th grade), at four different public high-schools in two central districts of Barcelona (Gràcia and Sant Martí) with similar middle-income social composition and Catalan-Spanish language dominance. While in the district of Sant Martí, the population is largely Catalan-Spanish bilingual (96.3% understand Catalan, 73.6% speak Catalan), in the district of Gràcia 97.2% understand Catalan, 81.8% speak Catalan). The main language of instruction in the target schools is Catalan.

The study was supported by the four school boards³ and treated the proposed training as an extra-curricular activity which was carried out in the school premises. All participants voluntarily participated in the experiment. Prior to the experiment, the adolescents’ parents signed a participation consent form and completed a language questionnaire (Appendices A and B). All participants were typically developing adolescents and had no history of speech, language, or hearing difficulties.

2.2 MATERIALS

The pre-test and post-test materials consisted of giving the same brief speech in Catalan in front of an assessment board of three people. The training session between pre-test and post-test involved the delivery of three different brief speeches in two different

³ We deeply thank the teachers of 1r de Batxillerat and the high school board of the high schools for helping with schedules, organization and their kindness with the project.
conditions, e.g., the Virtual Reality Condition (henceforth VR; see section 2.3.4.1), and the non-Virtual Reality condition (henceforth Non-VR; see section 2.3.4.2 below).

Four 17-year-old students participated in a pilot session to test the materials, topics and procedure of the experiment.

2.2.1 Selection of topics

An initial choice of 10 topics was first made through a long list of suggested topics taken from a website maintained by instructors of public speaking and other communication courses (e.g., www.myspeechclass.com). This initial list of 10 topics was assessed through an online questionnaire which was distributed to lists of 17-year-old boys and girls. A total of 58 anonymous students participated in the poll. They were asked to vote their favorite topics from 1 (less liked) to 7 (most liked). Figure 1 shows the ratings received by the four most voted topics, e.g. "Do you think that adolescents should spend more time in nature?", "Is graffiti art?", "The house of my dreams", and "Can money buy happiness?".

![Graph showing the ratings of the four most voted topics](image-url)
Figure 1 Ratings (from 1 to 7) received by the four most voted topics, e.g. "Do you think that adolescents should spend more time in nature?", "Is graffiti art?", "The house of my dreams", and "Can money buy happiness?".
2.2.2 Pre-test and post-test public speaking tasks

The pre-test and post-test task consisted of giving a 2-minute speech in front of a 3-member assessment board. The topic of both pre-test and post-test was the same: “Adolescents need to spend more time in nature” and was the preferred topic by the 58 students who participated in the poll. Before giving their 2-minute speech, participants received the instructions presented in Figure 2. They had to imagine having to convince representatives of the Catalan government to increase funding to high-schools to organize trips to the countryside. Participants were given data about recent experiments conducted in nature and told to use the data they found more important and more necessary to convince the representatives that spending more time surrounded by nature is essential for their own development.

Before every speech students were given two minutes to read the instructions, prepare the speech and take notes if they wished.

Figure 2. Instructions given to students for the pre-test and post-test prior to the delivery of the 2-minute speech.
The training sessions consisted of three brief sessions which in total that lasted 8 minutes approximately per participant. The task consisted of giving a 2-minute speech about a different specific topic every time. The materials used in the Non-Virtual Reality group and the Virtual Reality group were exactly the same. In the first Training Session they talked about the topic “How would the house of my dreams be?” (see Figure 3 for the instructions distributed to students). In the second Training Session they talked about the topic “Is graffiti art?” And in the third Training Session the topic was “Can happiness be bought?” As in the pre-test and post-test, participants received a set of instructions where each topic was accompanied by a list of ideas that they could pick to use them as content of the speech (see Appendix C for a complete set of instructions for each speech). Again, before every speech, they were given two minutes to read the instructions, prepare the speech and take notes if they wished.

A set of instructions was carefully written down and validated with a pilot session with 4 17-year-old students. The instructions informed of the time each participant had to
prepare the speech and the time they had to deliver the speech. In each of the speeches they had a script of ideas related to the title that they could use to include in the speech.

2.2.4 Control measures

Since fear of public speaking and general social anxiety are very common in student populations, we aimed to control this factor. We used two standard self-assessment tools of social anxiety (the PRPSA and the SUDS scales; see below) and two physiological measures (heart rate and galvanic skin response using two different sensors; see below).

2.2.4.1 ANXIETY SELF-ASSESSMENT

In order to control for anxiety, each participant filled out two different questionnaires to self-assess their level of anxiety regarding public speaking.

a) Personal Report of Public Speaking Anxiety, PRPSA (McCroskey, 1970)

The PRPSA-18, the reduced version of the Personal Report of Public Speaking Anxiety (PRPSA;McCroskey 1970), is a reliable and valid measure for assessing fear of public speaking. As Mörtberg et al., (2018: 423) claim “It would potentially benefit research and clinical settings by providing a psychometrically sound instrument that may be used for diagnosing fear of public speaking as well as evaluating its treatment. It is concluded that the shorter and more easily administered PRPSA-18 is a credible option for assessing fear of public speaking among university students".

Participants were given the PRPSA-18 in the Initiation Session and assessed their own perception of anxiety. [see Appendix D].

b) Subjective Units of Distress Scale, SUDS (Wolpe, 1973)
Subjective anxiety was measured on the 100-point SUDS scale anchored by 0 (no fear), 25 (mild fear), 50 (moderate fear), 75 (severe fear), and 100 (very severe fear). Participants were given the SUDS before they entered the room to give every speech, both at pre-test and post-test and during the training. [see Appendix E].

### 2.2.4.2 ANXIETY PHYSIOLOGICAL ASSESSMENT MEASURES

In order to control for anxiety and complement the participants’ self-assessments, heart rate and galvanic skin responses were measured using two different sensors.

a) Heart Rate (HR)

HR will also be measured during pre-test and post-test using a monitoring device *Heart Rate & Pulse logger sensor and NUL-208 (Neulog©)*. The sensor has two modes of operation: measuring the BPM (Beats per Minute) of the heart rate or displaying the analog arbitrary value of the measured signal. The electrodes are both plethysmograph-based. The sensors consist of an infrared LED transmitter and a matched infrared phototransistor receiver. Mean HR during the speeches will be used as the physiological measure of anxiety. The participant inserts a finger into an adult articulated finger sensor that is very easy to place.

b) Galvanic Skin Response (GSR)

GSR will be measured during pre-test and post-test using a *GSR logger sensor NUL-217 (Neulog©)*. The logger sensor measures the conductivity of our skin, especially of our fingers. The conductivity of our skin changes according to unconscious emotion effects such as sudden noise, smell, touch, pain or view. This sensor has two ranges: conductivity in microsiemens and arbitrary numbers. The participant inserts a finger into an adult articulated finger sensor that is very easy to place.
2.3 PROCEDURE

The experiment followed a pretest-training-posttest procedure (see Figure 6 for the experimental procedure). The training consisted of a total of three training sessions. Immediately before giving every speech at pre-test and post-test each participant was asked to rate their own level of anxiety using the Subjective Units of Distress Scale, SUDS (Wolpe, 1973).

Figure 6. Experimental procedure.
Each participant was tested and trained individually in a small, quiet classroom at each participating school and videotaped using a Mac laptop in all phases of the experiment. The whole study lasted four weeks.

2.3.1 INITIATION SESSION

In the initiation session the author of the study (henceforth the experimenter) gathered all the participants in a given school and organized a meeting to explain the basic concepts participants would have to bear in mind when delivering a speech. It was done orally with the help of a visual aid that contained the main procedure of the experiment, the schedule for the entire study, and the rubric under which they would be assessed.

The session lasted half an hour and it also served the purpose of preparing the students for the pre-test session. They were shown the sensors that they would be wearing for pre and post-test speeches and the experimenter explained to them that sensors measured their heart rate and galvanic skin response. They were told that an assessment board of three people would assess their speech based on the rubric we commented, and they also knew that the pre-test speech would be persuasive, and it would consist of convincing three representatives of the Catalan Government to take specific action. The specific topic they would only know prior to giving that speech. At the end of the session, if there were any doubts, they were all solved. Students also answered the questionnaire PRPSA-18.

2.3.2 PRE-TEST AND POST-TEST

The pre-test and the post-test phases consisted of the exact same task. Students had to give a 2-minute speech in front of an assessment board formed by 3 raters. The role of the experimenter was to receive every participant, show them the place where they had to sit
down and read the instructions. The experimenter set the stopwatch at two minutes of preparation time. Prior to the speech, students had 2 minutes to read the topic they had to talk about and prepare the speech, using notes if they needed to. Once time ran out, the experimenter walked the participant to the adjacent room where the raters would be waiting for the next participant. The experimenter wished every participant good luck and left the room in order to receive the next participant. The assessment board consisted of three University students that had previously taken the Public Speaking Course with the experimenter and received the following instructions: they had to be kind and respectful towards the speaker, say good morning or good afternoon, set all the instruments and be very attentive, look at the speaker even if they had to write something down and once the speaker finished, say "thank you" and "goodbye" without any sort of feedback.

After this, one of the raters put the two sensors on the hand of the participant to make sure they were well placed. They had a stopwatch in front of them during their presentation.

The raters were sitting in the same row of chairs and tables. The distance from the raters, and the speaker was an average of two meters (depending on the room we were given in every high-school). They had the rubrics printed out (see Appendix F) so that they could write down notes and rate each item. One rater was in charge of setting the stopwatch on a tablet; another rater was in charge of placing the sensors to every participant, and the third rater was in charge of creating the sensors' file for every participant and setting the camera to videotape every presentation. The whole preparation lasted approximately one minute. Once everything was ready, participants delivered the speech standing up and they were videotaped (see Figure 7 for screenshots of speech delivery times at pre-test and post-test).
Once the participant finished delivering the speech, they left the room and the experimenter showed them her gratitude for having taken part in the experiment.

![Image](image.jpg)

*Figure 7. Captions of different participants speaking with the sensors both at pre and post-test.*

### 2.3.3 TRAINING SESSIONS

The between-subject groups were divided according to the different high-schools: two performed the virtual reality condition and the other two the non-virtual reality condition. The training sessions were taken individually at each school between the pre-test and the post-test phases. There were three different training sessions, each performed every two or three days, depending on the high-school schedules.

Each of the three trainings consisted of giving one speech alone in a classroom following the instructions that were written down. Upon arrival, every participant entered a small room with a table and the experimenter handed them the instructions and content of the
speech to deliver. They were given two minutes during which they sat to prepare their brief speech and structured the ideas writing them down if they needed it, but the script they wrote could not be used during the speech, to prevent them from reading it. After the two minutes they went to the adjacent room and gave a two-minute speech, in one of the following two conditions, VR and Non-VR.

2.3.3.1 NON-VIRTUAL REALITY TRAINING SESSIONS

In the Non-Virtual Reality condition, participants were told that they would be rehearsing their speech alone. A built-in computer camera videotaped the whole performance of each participant and they had a stopwatch in front of them during the entire delivery (see an example in Figure 8). Nobody else was in the room with them. The performance was very similar to the one they would do while rehearsing at home all alone.

![Figure 8. Picture of a participant in the Non-virtual reality condition](image)

2.3.3.2 VIRTUAL REALITY TRAINING SESSIONS

In the Virtual Reality condition, participants were told that they would be rehearsing their speech alone with the VR glasses on. The experimenter placed the VR glasses on each of the participants and made sure that glasses were well adjusted. The experimenter reminded the participants that they would see a stopwatch within the application and once the two minutes were over, they had to take the VR glasses off and leave the room. They used a pair of ClipSonic VR glasses (their price is 9,95 €) attached to a Xiaomi Mi Note 5A smartphone
device and the telephone application *Beyond VR*, a virtual reality interface. This app is a cardboard app that was designed in Canada by Jonah Perron and Eric Steinke. Currently, *Beyond VR* has three environments to choose from: a boardroom, a classroom and a conference call scenario. In each of the scenarios, the app displays a group of people that perform as the audience, facing the speaker. They behave in a naturalistic way because they look at the speaker and they move too.

Each of the trainings was performed using a different scenario and audience: one with 15 people, the second with 25 people and the last one with 40 people (see Figure 9).

Figure 9. Screenshots of the Beyond VR app displaying the three different virtual scenarios and their corresponding virtual audiences that participants saw when wearing the VR glasses in each of the training sessions.
In sum, the Virtual Reality training sessions followed the same structure as the Non-Virtual Reality ones, except for the fact that in the 3 speeches students used Virtual Reality. In both conditions, a built-in computer camera videotaped the whole performance of each participant.

![Figure 10. Picture of a participant in the Virtual reality training condition](image)

### 2.4 PUBLIC SPEAKING ASSESSMENT

The assessment of the pre-/post-test speeches was done with an adaptation of the Rubric The Competent Speaker Scoring Rubric (Hickerson, 2006) modified by Joe et al., (2015) with 10 items that assess performance, structure, non-verbal communication, relation with the audience and use of vocabulary. [See Table 1 and Appendix F]. Items 5, 6 and 7 refer specifically to the performance (non-verbal and prosodic) where we expected more changes between pre and post-test and between conditions.

**Items:**

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<tr>
<th>Item</th>
<th>Description</th>
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<tr>
<td>1.</td>
<td>Formulates an introduction that orients audience to topic and speaker</td>
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<td>2.</td>
<td>Uses an effective organizational pattern</td>
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<td>3.</td>
<td>Develops a conclusion that reinforces the thesis and provides psychological closure</td>
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<td>4.</td>
<td>Demonstrates a careful choice of words</td>
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<td>5.</td>
<td>Effectively uses vocal expression and paralanguage to engage the audience</td>
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<td>6.</td>
<td>Keeps good eye contact with the audience</td>
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<tr>
<td>7.</td>
<td>Demonstrates nonverbal behavior that supports the verbal message</td>
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<tr>
<td>8.</td>
<td>Successfully adapts the presentation to the audience</td>
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<tr>
<td>9.</td>
<td>Constructs an effectual persuasive message with credible evidence and sound reasoning</td>
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<tr>
<td>10.</td>
<td>Doesn't use filled pauses nor empty words</td>
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*Table 1. Items of the rubric The Competent Speaker Scoring Rubric (Hickerson, 2006) modified by Joe et al., (2015)*
The adaptation of the original rubric consisted of the following. The original item number 10 "Skillfully makes use of visual aids" was not included since it did not apply to our study and it was replaced by a new item regarding the use of filled pauses and empty words “Doesn't use filled pauses nor empty words”.

Before pre-test and post-test assessments, the experimenter organized a training session with the raters, which was devoted to analyzing three different videotaped speeches in order to guarantee a high degree of agreement and consistency amongst them. There was an explanation of the rubric and questions and doubts were resolved.

Overall delivery scores and performance scores resulted from calculating the mean of the ratings of each of the 10 items of the rubric by the three raters at pre-test and at post-test. Ratings ranged from 0 “deficient” to 4 “advanced”.

2.5. ANXIETY ASSESSMENT

To assess the anxiety level of each participant we divided the scores according to:

Self-assessed anxiety: It was measured through the SUDS questionnaire that ranges from 0 “no anxiety” to 100 “the highest anxiety you have ever experienced”.

Physiological assessment: First, the Heart Rate measures were obtained through the sensor measuring arbitrary analog units (wave function). The range comprehends from 0 to 1023 analog units “Arb”, an arbitrary unit to demonstrate waves, frequencies, and periods. The other measure was the Galvanic Skin Response which ranged from 0 to 10 μS “Micro Siemens”, a unit measuring electrical conductance.

For both physiological measures we split the total duration of the speech delivery (not all participants used the 2-minute maximum time) in three different periods: beginning of the speech, medium and end of the speech and we calculated the mean value of each of the three periods.
3. RESULTS

3.1. ANXIETY SCORES

In order to assess the results of the anxiety scores we run three different GLMMs with three separate dependent variables, namely, the overall self-perceived anxiety scores as a SUDS variable, the overall heart rate (HR) score, and the Galvanic Skin Response (GSR). The three models included Training Condition (two levels: VR and Non-VR) and Test (two levels: pre-test and post-test) and all their possible interactions as fixed factors. The second GLMM with the overall heart rate score as a PULSE variable, Training Condition (two levels: VR and Non-VR) and Test (two levels: pre-test and post-test) and all of their possible interactions as fixed factors. Pairwise comparisons and post hoc tests were carried out for the significant main effects and interactions for the three GLMMs.

RESULTS FOR SELF-PERCEIVED SUDS

The results of the GLMM analysis revealed a significant main effect of Test (F(1,92) = 18,228, p<.001), a main effect of Training condition (F(1,92)=4,881, p=.03). Post-hoc...
analyses revealed a significant difference between both groups at pre-test showing a higher SUDS for the VR condition and an interaction between Test and Condition (F(1,92) =5,081, p=.027). Also the differences between pre and post-test across groups is significant, Non-VR F(1,92)=5,600, p=.02 and a higher difference for the VR condition F(1,92)=15,427, p=<.001.

HEART RATE MEASURES

The GLMM results revealed a main effect of Test (F(1,102) =11,481; p=.001) and a significant interaction between Test and Condition (F(1,102)=10,939; p=.001). Post-hoc comparison revealed that the VR condition is the one that increases their heart rate significantly.

![Graph showing mean heart rate (HR) for Non-VR and VR conditions at pre-test and post-test. Error bars represent 95% CI.](figure10.png)

*Figure 10. Mean heart rate (HR), separated by training condition (i.e. Non-VR and VR), by test (i.e pre-test and post-test). Error bars represent confident intervals.*

GALVANIC SKIN RESPONSE SCORES

A main effect of Condition (F(1,99) =7,494; p=.007) was found. There is an interaction of test and condition that is significant T1 (F(1,99) =4,231, p=.042 and T2 (F(1,99) =7,242, p=.008, showing differences between groups at both pre and post-test. If we observe the graph at Figure 13 we can see a slight tendency for a decrease in GSR at post-test for the
VR condition and an increase in the case of the non-VR condition that does not show significance neither for non-VR (F(1,99) = .361, p = .549) nor for VR (F(1,99) = .086, p = .770).

Figure 11. Mean GSR (galvanic skin response), separated by training Condition (i.e. Non.VR and VR), by test (i.e pre-test and post-test). Error bars represent confident intervals.

3.2 GENERAL PERFORMANCE SCORES

To check for the results of the performance of the potential VR training condition, we run two GLMMs. The first with the Overall Delivery ratings (10 items of the rubric) as a dependent variable, the second with the Performance ratings (items 5, 6 and 7 for the rubric) as Performance variable. Three extra GLMM models were run for item 5 (“Effectively uses vocal expression and paralanguage to engage the audience”), item 6 (“Keeps good eye contact with the audience”) and item 7 (“Demonstrates nonverbal behavior that supports the verbal message”) of the rubric. All GLMMs included Training Condition (two levels: VR and Non-VR), and Test (two levels: pre-test and post-test), and all their possible interactions as fixed
factors together with PRPSA-18, SUDS Heart Rate and GSR. Pairwise comparisons post hoc tests were carried out for the significant main effects and interactions for all GLMMs.

OVERALL DELIVERY (ALL ITEMS)

Figure 14 shows the mean overall delivery scores for the 10 items of the rubric, separated by training Condition (i.e. VR and Non-VR) and by Test (i.e pre-test and post-test). The graph shows how the VR condition outperforms those in the Non-VR condition at pre-test, even though the model showed that this was not significant (F(1,103)=0.731, p=.395). However, the graph shows how at post-test those in the VR condition obtained lower ratings, although not significantly. The Non-VR condition improves significantly at post-test.

PERFORMANCE SCORES

Figure 15 shows the results for the 3 items that comprehend the Mean Performance, that is prosody (item 5), eye contact (item 6) and gesture (item 7) measured together. The results of the GLMM analysis showed an interaction between Test and Condition, being the two
conditions significantly different at pre-test (F(1,94) = 8.742; p=.004), different main effect of
test and condition for the Non-VR between pre-test and post-test was found significant
F(1,91) = 11.084; p=.001.

The results of the three extra GLMM for item 5 ("Effectively uses vocal expression and
paralanguage to engage the audience"), item 6 ("Keeps good eye contact with the audience"
and item 7 ("Demonstrates nonverbal behavior that supports the verbal message") of the
rubric revealed very similar results to the mean overall performance. Results show that the
VR condition scores higher than Non-VR at pre-test and tends to score lower at post-test in
the three items. The interaction between low and high-SUDS at scoring item 5 and 7 showed
that low-SUDS scored significantly higher than high-SUDS at the Non-VR condition
(F(1,103) = 5.196; p=.025) for the former item and scored F(1,103) = 4.573, p=.035 for the
latter. No significant differences were found between conditions in any of the tests for item 6.

Figure 13. Mean overall performance (items 5, 6, 7), separated by training condition (i.e. Non-VR and VR) and
by test (i.e pre-test and post-test). Error bars represent confident intervals
3.3 PERFORMANCE SCORES ACROSS ANXIETY GROUPS

Given the fact that the two between-subject groups were different at pre-test (both for self-perceived anxiety SUD measures, overall performance, and performance) our aim now is to assess the relationship between anxiety measures and performance across training groups. First, we split participants in two subgroups according to their level of SUDS: low-SUDS and high-SUDS. The division was made as follows: from 0 “total relief” up to 50 “moderate anxiety, uncomfortable but can continue to perform” were considered low-SUDS and from 60 “moderate to quite distressed” up to 100 “highest anxiety you have ever felt” were considered high-SUDS.

We then run another GLMM with Training Condition (two levels: VR and Non-VR), SUDS level (two levels: low and high) and Test (two levels: pre-test and post-test), and all their possible interactions as fixed factors together with PRPSA-18, SUDS Heart Rate and GSR. Pairwise comparisons post hoc tests were carried out for the significant main effects and interactions for all GLMMs.

Figure 16 shows the mean of the Performance for low and high-SUDS participants separated by training Condition (i.e. Non-VR and VR) and by Test (i.e pre-test and post-test). A significant interaction between Non-VR-VR group and Low- and High-SUDS was found (F(1,98)=5,727, p=.019), showing that there is a difference in participants that rated their anxiety with high levels between Non-VR and VR, being the VR condition the one with a higher mean Mean=65,119 than the Non-VR Mean=51,500. The difference of Low-SUDS and high-SUDS participants in both Non-VR and VR conditions was significant in both groups: Non-VR (F(1,98)=6,097, p=.015) and VR (F(1,98)=42,794, p<0.001).
Low-SUDS scored significantly higher than high-SUDS F(1,103) = 4.573, p=0.035.
The interaction between low and high-SUDS at scoring item 7 showed that low-SUDS scored significantly higher than high-SUDS at the VR condition F(1,103) = 6.005, p=0.016.

The low-SUDS group performs significantly higher than the high-SUDS (F(1,103)=5.149, p=.025).

Figure 14: Mean overall performance (items 5,6,7) from 0 to 4, separated by training condition (i.e. Non-VR and VR), by SUDS level (i.e low-SUDS and high-SUDS) and by test (i.e pre-test and post-test). Error bars represent confident intervals.
4. DISCUSSION AND CONCLUSION

The present study examined whether a 3-session public speaking training with virtual reality could reduce anxiety in participants and boost their oral communication skills. The findings of this study offer support to the hypothesis that with only 3 sessions the self-perception of anxiety that participants have diminishes significantly between pre-test and post-test, and even more in the VR condition. However, the other two electrophysiological measures of anxiety, heart rate and GSR, did not match the SUDS self-assessment, as we could see both in the GLMM analyses and graphs. Heart rate increased in both conditions at post-test showing significant for the VR condition and GSR decreased for the VR condition, although not significantly. However, GSR proved to increase at post-test for the Non-VR group with no significance. The lack of coincidence between both types of measures could be the result of not having chosen the right sensors because what the company recommends is “The student whose pulse is being measured should be still without moving as much as possible” (https://neulog.com/heart-rate-pulse/). The fact that all oral speeches (pre-/post-test and trainings) were delivered standing up and the fact that we were measuring gesture does not motivate quiet performances as these sensors counsel. According to Barlow, Nock & Hersen (2009) behavioral manifestations of anxiety are difficult to assess and physiological measures of anxiety are not easy to apply, that is why self-report measures of anxiety are considered necessary in such treatments to complement the former ones.

Whereas the first type of analyses assessed one of the first aims of this research, e.g., anxiety measures, the second aim of this research focused on the performance scores through the delivery of the same 2-minute speech at pre-test and at post-test. As far as we know, little research has been devoted to the effects of virtual reality on the improvement of students’ oral communication skills. Our goal was to examine whether a short training with virtual reality could favor learners’ public speaking abilities through a between-subject training study with a
pre-test and post-test design. We analyzed the delivery by taking into account two measures, e.g., the general ratings of the 10 items of the rubric by the 3 raters and a more specific analysis which focused on the performance, putting together prosody, eye contact with the audience and gestures that go together with the verbal content. These 3 items were grouped to form the performance variable. While the results of the general delivery showed an improvement that proved significant between pre-test and post-test in the Non-VR condition, this was not the case in the VR condition. In the performance analysis, taking the three items together, crucially the pre-test shows a significant difference between conditions, being the VR condition superior than the Non-VR condition. At post-test, while the VR condition decreased in performance (though not in a significant way), the performance of the Non-VR condition increased significantly. If we look at post-test for both conditions, we can see that both reach the same level. Perhaps, the fact that at pre-test the VR condition was significantly better rated than the Non-VR condition and obtained a high level did not allow this condition to keep improving encountering a ceiling effect. On the other hand, the Non-VR condition that began with a lower level at pre-test had more room for improvement and performed better at post-test.

Crucially, in order to analyze the potential effects of anxiety of public speaking performance across conditions, a further analysis was performed with participants divided in two groups (low-SUDS participants and high-SUDS participants), according to their anxiety self-assessments. There was a substantial difference across conditions in that in the Non-VR condition there were only 4 high-SUDS participants, whereas in the VR condition there were 21 high-SUDS. The results of this model found that low-SUDS participants scored higher than high-SUDS across time and condition. With this in mind we could argue that in the VR condition the presence of more high-SUDS participants could make the improvements slower than with a more balanced presence of both low and high-SUDS participants.
The integrated results of the three analysis (anxiety through the SUDS measure, performance, and SUDS and performance) show that given that fact that participants had a key difference between the SUDS levels at pre-test, this might have significantly affected performance gains. In fact, we could not apply homogenization of oral skills or anxiety levels between conditions at pre-test because each high-school represented only one condition and all participants were aware of the type of training that they were performing. Thus, two high-schools were presented with the non-virtual condition and the other two with the virtual reality condition. Indeed mixing conditions within the same school could have caused a demotivation effect in the non-virtual condition due to the clear difference that both conditions present. It is evident that although the four high-schools were very similar in terms of similar neighborhoods where they were located and teaching styles, none of the four high-schools had a specific subject devoted to public speaking. This is why potential differences among schools were not taken into account.

Overall, although we found that participants who were assigned to the virtual reality condition had significant and positive changes on the self-perception of anxiety and diminished its perception even more drastically than the non-VR group, we could not measure any substantial improvements in the public speaking performance. We think that this potentially due to three reasons. The first reason might be the effect of both performance and anxiety that were significantly different between conditions at pre-test. The second reason could be the ceiling effect of the VR condition that already had high ratings at pre-test and might encounter more difficulties in improving from the level they started at. A third reason is related to the virtual reality environment itself. The fact that virtual audiences don’t react to what the speaker says might demotivate the participant and could produce a counter-effect when facing a real audience at post-test.
An interesting question for future research is to investigate whether designing a longer training with VR could help to decrease anxiety in participants even more as well as it would help improving the oral communication abilities of both low anxious and high anxious participants by practicing different types of speech. Another key issue for future research is to group participants in order to have both conditions with homogeneous low and high-anxiety participants as well as with low and high-performance levels, so that comparisons between conditions can be made in a more precise way. Something to take into account would be to control for school differences as well.

In general, the results obtained in the current study are encouraging, in that a short between-subjects 3-session training with virtual reality may be able to show reliable gains on the perception of anxiety and on the performance of 2-minute oral speeches. This has education implications. Schools can use simple technology to help students reduce fear of public speaking and improve their performance.
REFERENCES


APPENDIX A

CONSENT FORM

NOM DEL /LA PARTICIPANT: ....................
EDAT: .......... anys
DATA DE NAIXEMENT: ..................

NOM DEL PARE/MARE/TUTOR: ............
TEL. DE CONTACTE: ......................
E-MAIL: .....................................

DECLARACIÓ DE CONSENTIMENT

Autoritzo a (nom de l’estudiant que realitza el TFM), amb DNI número______ i amb domicili _______, estudiant de l’assignatura Treball Final de Màster (TFM) del Màster en Lingüística Teòrica i Aplicada a la Universitat Pompeu Fabra (UPF) perquè faci ús de les dades de caràcter personal del menor al que represento que hagin estat comunicades en el marc d’aquest treball. El tractament d’aquestes dades es durà a terme segons el següent (vg. els punts 3 i 4 a sota):

1. RESPONSABLE DEL TRACTAMENT: (nom de l’estudiant que realitza el TFM)
FINALITAT: Dur a terme la realització del Treball de Final de Màster amb una finalitat exclusivament de recerca i sense ànim de lucre
LEGITIMACIÓ: Consentiment de l’interessat o el seu representant legal
DESTINATARIS: No es cedeixen dades a tercers
DRETS: En qualsevol moment podrà exercir els seus drets d’accés, rectificació, supressió, limitació, portabilitat, cancel·lació i oposició dirigint-se al correu electrònic _________________________ (email de l’estudiant).

2. Que manifesto que he estat informat/da sobre les característiques de la participació de l’estudi científic portat a terme per l’estudiant. També he estat informat/da sobre que les dades es tractaran d’acord amb el que disposa la Llei Orgànica 15/1999, de 13 de desembre, de Protecció de dades de caràcter personal, i d’acord amb el Reglament (UE) 2016/679 relatiu a la protecció de les persones físiques en relació al tractament de dades de caràcter personal “RGPD”.

3. Que en/na (nom de l’estudiant), es compromet a guardar secret sobre les informacions personals i les dades de caràcter personal, i a no fer ús públic de les dades de caràcter personal sota el complint la llei esmentada anteriorment. L’estudiant només podrà fer ús exclusivament de les dades obtingudes amb una finalitat docent i de recerca. L’estudiant es compromet a recollir les dades mínimes que siguin necessàries, seguint el principi de mínimització, i a destruir la informació de caràcter personal un cop s’hagi finalitzat el seu ús amb finalitat de recerca.

4. Autoritzo a la Universitat Pompeu Fabra, a través del Grup d’Estudis de Prosòdia (coordinat per la Dra. Pilar Prieto), a reproduir i publicar en qualsevol mitjà els enregistraments en els quals participi, amb finalitats exclusivament docents i de recerca i sense ànim de lucre. Autoritzo la cessió d’aquestes dades a altres institucions de recerca per a la realització de projectes d’investigació en ciències del llenguatge, sempre que la universitat i la institució receptora no realitzin activitats amb ànim de lucre amb aquestes dades.

A Barcelona, a ___ de _______ 201__
Qüestionari d’usos lingüístics

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Quan vas començar a parlar en català?………………………………………………………………………………

a) Llengua (castellà, català, altres) que fas servir per comunicar-te amb:
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b) Si amb els teus pares o germans solies parlar amb una llengua diferent de la que fas
servir ara quan parles amb ells, quan vas fer aquest canvi amb:
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c) Quines altres llengües saps (parles, legeixes o escrius)?
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<td>Català</td>
<td>perfecte</td>
<td>bé</td>
<td>no gaire bé</td>
<td>malament</td>
</tr>
<tr>
<td>Castellà</td>
<td>perfecte</td>
<td>bé</td>
<td>no gaire bé</td>
<td>malament</td>
</tr>
</tbody>
</table>

En quina llengua et sents més cómode?

| català | castellà | igual en català i castellà | altres |

Si tinguessis un animal de companyia, en quina llengua li parlaries?

| català | castellà | tant en català com en castellà | altres |

Més o menys, digues el percentatge d’ús que feies d’aquestes llengües quan eres petit:

<table>
<thead>
<tr>
<th>català</th>
<th>castellà</th>
</tr>
</thead>
<tbody>
<tr>
<td>.........%</td>
<td>.........%</td>
</tr>
<tr>
<td>I ara?</td>
<td></td>
</tr>
<tr>
<td>català</td>
<td>castellà</td>
</tr>
<tr>
<td>.........%</td>
<td>.........%</td>
</tr>
</tbody>
</table>
APPENDIX C

Instructions for the oral presentation at pre and post-test

VERSIO ORIGINAL

| Pre-test: Els adolescents necessiten passar més temps a la natura |
| TEMPS PREPARACIÓ: 2 MINUTS |
| TEMPS REALITZACIÓ PRESENTACIÓ: 2 MINUTS |

Situació: Tres representants del Departament d’Ensenyament han vingut a l’Institut a escoltar les propostes d’un seguit d’estudients. Estan valorant si destinar més pressupost a les sortides escolars.

La teva reclamació és que les i els adolescents necessiten passar més temps a la natura i no tantes hores tancats als instituts de les ciutats.

Per tal d’argumentar a favor de la teva proposta heu preparat un seguit de dades que et permetran convèncer les representants d’Ensenyament per destinar més pressupost a aquest àmbit.

Guia que et pot ajudar a preparar l’estructura i contingut del missatge:

Més del 50% de la població viu actualment en zones urbane. Es calcula que el 2050 la xifra augmentarà al 70% (Bratman, G; 2015).

Aqueles persones envoltades de menys arbres pateix més estrès i índexs de mortalitat més elevats.

Estar envoltat de naturalesa reduirà l’hormona de l’estrès, la tensió arterial i el sucre a la sang.

Estar envoltat de naturalesa augmenta la salut cardiovascular i metabòlica, la concentració i la memòria.

Passejar pel bosc augmenta la creativitat, la vitalitat i la relaxació (Finnish Forest Research Institute).

No és necessari que esmentis totes els punts, tria els que trobis més convencents.

MOLTA SORT!

ENGLISH VERSION

| Pre-test: Adolescents need to spend more time in nature |
| PREPARATION TIME: 2 MINUTES |
| SPEECH DURATION: 2 MINUTES |

Situation: Three representatives of the Education Department have come to your high-school to listen to the proposals of a group of students. They’re thinking of assigning more budget to school trips.

Your claim is that adolescents need to spend more time in nature and not so many hours inside the city schools.

In order to argue in favor of your proposal, you have prepared a list of studies with data that will allow you to convince the representatives to assign more budget to this field.

Script that can help you prepare the structure and content of the message:

More than 50% of the population lives nowadays in urban areas. It is estimated that in 2050 the number will increase up to a 70% (Bratman, G; 2015).

People surrounded of less trees suffer more stress and higher mortality rates.

Be surrounded of nature reduces the stress hormone, blood pressure and sugar in the blood.

Be surrounded of nature increases cardiovascular and metabolic health, concentration and memory.

Strolling in the forest increases creativity, vitality and relaxation (Finnish Forest Research Institute).

GOOD LUCK!

Instructions for the oral presentation at TRAINING 1

VERSIO ORIGINAL

| Training 1: La casa dels meus somnis seria… |
| TEMPS PREPARACIÓ: 2 MINUTS |
| TEMPS REALITZACIÓ PRESENTACIÓ: 2 MINUTS |

Guia que et pot ajudar a preparar l’estructura i contingut del missatge:

Descripció de la casa
Ubicació
Què no hi podrà faltar
Per què seria així?
Què et permetria fer una casa d’aquestes característiques?
Hi viuries sol/a o la voldries compartir?

MOLTA SORT!
Training 1: The house of my dreams
PREPARATION TIME: 2 MINUTES
SPEECH DURATION: 2 MINUTES

Script that can help you prepare the structure and content of the message:
Description of the house
Place
Why would it be like that?
What would be essential to be part of the house?
What would you do in such a house?
Would you live alone or would you like to share it with other people?
GOOD LUCK!

Instructions for the oral presentation at TRAINING 2

Training 2: El graffiti és art?
TEMPS PREPARACIÓ: 2 MINUTS
TEMPS REALITZACIÓ PRESENTACIÓ: 2 MINUTS

Guia que et pot ajudar a preparar l’estructura i contingut del missatge:
Descripció de què són els graffiti
On s’acostumen a trobar
Qui els realitza
Per què són importants / necessaris o el contrari
Què et fa afirmar que és o no és art i per què
Ajuda té d’exemples i/o situacions viscudes

MOLTA SORT!

Training 2: Is graffiti art?
PREPARATION TIME: 2 MINUTES
SPEECH DURATION: 2 MINUTES

Script that can help you prepare the structure and content of the message:
Description of what is a graffiti
Where do we usually find them
Who makes them
Why are they important / necessary or the opposite
What makes you state that it is art or not and why
Use examples and personal experience

GOOD LUCK!
Instructions for the oral presentation at TRAINING 3

**VERSIO ORIGINAL**

<table>
<thead>
<tr>
<th>Training 3: Els diners no poden comprar la felicitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMPS PREPARACIÓ: 2 MINUTS</td>
</tr>
<tr>
<td>TEMPS REALITZACIÓ PRESENTACIÓ: 2 MINUTS</td>
</tr>
<tr>
<td>Guia que et pot ajudar a preparar l'estructura i contingut del missatge:</td>
</tr>
<tr>
<td>Com descriuries la felicitat?</td>
</tr>
<tr>
<td>Què compren els diners i què no?</td>
</tr>
<tr>
<td>Riquesa / Pobresa</td>
</tr>
<tr>
<td>Què et fa afirmar o negar la frase del tema</td>
</tr>
<tr>
<td>Ajuda’t d'exemples i/o situacions viscudes que puguin il·lustrar sensacions de felicitat</td>
</tr>
<tr>
<td>MOLTA SORT!</td>
</tr>
</tbody>
</table>

**ENGLISH VERSION**

<table>
<thead>
<tr>
<th>Training 3: Money can not buy happiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREPARATION TIME: 2 MINUTES</td>
</tr>
<tr>
<td>SPEECH DURATION: 2 MINUTES</td>
</tr>
<tr>
<td>Script that can help you prepare the structure and content of the message:</td>
</tr>
<tr>
<td>How would you describe happiness?</td>
</tr>
<tr>
<td>What does money buy and what doesn’t?</td>
</tr>
<tr>
<td>Richness / Poverty</td>
</tr>
<tr>
<td>What makes you state or negate the topic sentence</td>
</tr>
<tr>
<td>Use examples or experience that can illustrate feelings of happiness</td>
</tr>
<tr>
<td>GOOD LUCK!</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
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<tr>
<td>10</td>
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<td>11</td>
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<tr>
<td>12</td>
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<tr>
<td>13</td>
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<td>14</td>
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<tr>
<td>17</td>
</tr>
<tr>
<td>19</td>
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<tr>
<td>24</td>
</tr>
<tr>
<td>26</td>
</tr>
<tr>
<td>29</td>
</tr>
<tr>
<td>31</td>
</tr>
<tr>
<td>34</td>
</tr>
</tbody>
</table>
APPENDIX E

Subjective Units of Distress Scale (SUDS)
El termòmetre de l’ansietat - Fear thermometer

Tracta d’acostumar-te a valorar el teu grau d’ansietat, angoixa, por o incomoditat en una escala del 0-100. Imagina que tens un termòmetre de l’angoixa per mesurar els teus sentiments segons aquesta escala.

ENGLISH VERSION
Try to get used to rating your anxiety or discomfort on a scale of 0 – 100. Imagine you have a "fear thermometer" to measure your anxiety according to the following scale.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>L’ansietat/por/incomoditat que mai hagis sentit. / Highest anxiety/distress that you have ever felt.</td>
</tr>
<tr>
<td>90</td>
<td>Extremadament ansiós/a, angoixat/da. / Extremely anxious/distressed.</td>
</tr>
<tr>
<td>80</td>
<td>Molt ansiós/a, angoixat/da. No em puc concentrat. / Very anxious/distressed, unable to concentrate.</td>
</tr>
<tr>
<td>70</td>
<td>Bastant ansiós/a, angoixat/da, que interfereix en l’actuació. / Quite anxious/distressed, interfering with performance.</td>
</tr>
<tr>
<td>60</td>
<td>Ansietat / angoixa de moderada a bastant. / Moderate to quite anxious/distressed.</td>
</tr>
<tr>
<td>50</td>
<td>Ansíos/a, angoixat/da amb moderació. Incomoditat, però pot continuar amb l’actuació. / Moderate anxiety/distress, uncomfortable but can continue to perform.</td>
</tr>
<tr>
<td>40</td>
<td>Ansietat / Anoixa de suau a moderada. / Mild to moderate anxiety/distress.</td>
</tr>
<tr>
<td>30</td>
<td>Ansíos/a, angoixat/da lleument. No interfereix en l’actuació. / Mild anxiety/distress, no interference on performance.</td>
</tr>
<tr>
<td>20</td>
<td>Ansietat / Anoixa mínima. / Minimal anxiety/distress.</td>
</tr>
<tr>
<td>10</td>
<td>Despert/a i en alerta. Bona concentració. / Alert and awake, concentrating well.</td>
</tr>
<tr>
<td>0</td>
<td>Totalment relaxat/da. / Peace, serenity, total relief.</td>
</tr>
</tbody>
</table>
APPENDIX F

RUBRIC The Competent Speaker, Scoring Rubric for Oral Communication Behavior Assessment (Hickerson, 2006)
modified version by (Joe, J. et al., 2015)

CODI PARTICIPANT: ………… AVALUADOR/A: …………………

VALORA DEL 0 AL 4; 0= DEFICIENT  1= MÍNIM  2= BÀSIC  3= EXPERT  4= AVANÇAT

| 1. Formula una introducció que es vincula amb l’orador i que orienta el públic cap al tema. | 0 | 1 | 2 | 3 | 4 |
| 2. Utilitza una estructura ben organizada i efectiva. | 0 | 1 | 2 | 3 | 4 |
| 3. Desenvolupa una conclusió que reforça la tesi i que tanca el discurs. | 0 | 1 | 2 | 3 | 4 |
| 4. Demostre una tria acurada del vocabulari. | 0 | 1 | 2 | 3 | 4 |
| 5. Bon ús de l’expressió vocal, pausas i èmfasis per mantenir l’atenció del públic. | 0 | 1 | 2 | 3 | 4 |
| 6. Manté un bon contacte visual amb el públic. | 0 | 1 | 2 | 3 | 4 |
| 7. Ús de la gestualitat que acompanya i dona suport al missatge. | 0 | 1 | 2 | 3 | 4 |
| 8. Adapta amb èxit la presentació al públic. | 0 | 1 | 2 | 3 | 4 |
| 9. Construeix un missatge persuasiu, efectiu, amb evidències i raonament crèdibles. | 0 | 1 | 2 | 3 | 4 |
| 10. NO fa ús de pauses farcides ni paraules buides. | 0 | 1 | 2 | 3 | 4 |
| 11. Opinió personal | | | | | |

*+++*
<table>
<thead>
<tr>
<th>Code Participant</th>
<th>Rate</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSESSMENT CRITERIA:</strong> 0= DEFICIENT 1= MINIMAL 2= BASIC 3= PROFICIENT 4= ADVANCED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Formulates an introduction that orients audience to topic and speaker.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. Uses an effective organizational pattern.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3. Develops a conclusion that reinforces the thesis and provides psychological closure.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4. Demonstrates a careful choice of words.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5. Effectively uses vocal expression and paralanguage to engage the audience.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6. Keeps good eye contact with the audience.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7. Demonstrates nonverbal behavior that supports the verbal message.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8. Successfully adapts the presentation to the audience.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9. Constructs an effectual persuasive message with credible evidence and sound reasoning.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>10. Doesn't use filled pauses nor empty words.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>11. Personal opinion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>