The effect of virtual training on music performance anxiety

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This study investigated the effects of virtual reality training on music performance anxiety. Seventeen music students were randomly assigned to a control group (n=8) or a virtual training group (n=9). Participants were asked to play a musical piece by memory in two recitals at three weeks interval. The anxiety was then measured with the Personal Report of Confidence as a Performer (PRCP), the S-anxiety scale of the State-Trait Anxiety Inventory (STAI-Y), the Subjective Units of Distress scale (SUDS), and by pulse rate. The virtual training consisted of six one-hour long sessions of virtual exposure. Results indicate a significant decrease in performance anxiety (PRCP) for women in the treatment group and a significant decrease of State Anxiety (S-anxiety scale) for musicians with high levels of trait anxiety (T-anxiety scale) in the treatment group.

Keywords: performance anxiety; music; training; virtual reality; exposure

Forty percent of musicians are affected by music performance anxiety (MPA; Fishbein et al. 1988). In fact, MPA is recognized to be a significant problem among orchestra musicians, opera chorus artists, music students, and faculty members (Kenny et al. 2004, van Kemenade et al. 1995, Wesner et al. 1990). Fortunately, exposure turns out to be an effective intervention for the treatment of anxiety disorders (Olatunji et al. 2010). For the last 15 years, virtual reality has increased as a mode of delivery of exposure treatment and studies have consistently shown a large mean effect size for virtual reality exposure compared with control conditions (Powers and Emmelkamp 2008). The purpose of this study was to examine the effect of virtual training on music performance anxiety in piano and guitar music students. The hypothesis was that
the group who received virtual training would show greater reduction of music performance anxiety compared with the control group not receiving the intervention in a pre-test/post-test design.

**METHOD**

**Participants**

Seventeen guitarists and pianists participated in the study, but one pianist dropped-out after the pre-test assessment. Participants were pursuing their music studies either at a college, a conservatory, or a university in Quebec City, Canada. To be included in the study, participants who were taking anxiolytic medication had to be on a stable dose for at least three months prior to the beginning of the study and agree not to modify their medication or dose for the duration of the study. The sample consisted of 10 women and 7 men with a mean age of 21.8 years (SD=5.2).

**Materials**

The State-Trait Anxiety Inventory Form Y (STAI; Spielberger 1988), which is comprised of two separate scales, the S-anxiety and the T-anxiety scales, was used to evaluate state and trait anxiety of participants. The Personal Anxiety Inventory (PAI; Nagel et al. 1981), the Personal Report of Confidence as a Performance scale (PRCP; Appel 1974), the Subjective Units of Distress scale (SUDS; Wolpe 1990) and the Pulse Rate (PR) collected with pulse oximeter were used to assess anxiety during initial interview and/or during pre- and post-test evaluation.

**Procedure**

*Initial interview*

During the initial interview, participants completed a consent form. They then filled out a personal and musical history questionnaire, the Personal Anxiety Inventory (PAI; Nagel et al. 1981) form and the State Trait Anxiety Inventory Form Y (STAI; Spielberger 1988). In order to achieve equivalence between groups, participants were paired according to their instrument (piano or guitar) and their PAI results. They were then randomly assigned to the virtual training group (n=9) or to the control group not receiving the intervention (n=8).
Pre-test/post-test

To evaluate music performance anxiety, a public recital was scheduled for all participants before and after the virtual training. Subjects were asked to play a short musical piece in front of an audience comprised of parents, friends, teachers, and other guests. The specific time of the scheduled performance and the playing order were the same for pre-test and post-test assessments. Each participant’s pulse rate (PR) was monitored before and after their performance. Participants completed the S-anxiety scale and the Subjective Unit of Discomfort Scale (SUDS) before their performances and the Personal Report of Confidence as a Performer scale (PRCP) after their performances.

Training sessions

Between pre-test and post-test, the experimental group completed a total of six weekly 60-minutes virtual training sessions. In the first session, psycho-education was given on anxiety and exposure. Then, participants took part in virtual exposure sessions in which they played a musical piece. Each exposure situation represented a typical classical music audience that musicians are usually exposed to during their study and later on in their career. Virtual training sessions took place in the Laboratory of Museology and Engineering of Culture (LAMIC) at Laval University. The virtual stage was composed of four 10 x 10 feet screens on which virtual environments were projected, four speakers, and a stage spotlight that lit the musician while s/he was playing.

RESULTS

Repeated measures analyses of variance using SPSS mixed model procedure were conducted to compare changes in anxiety scores between pre- and post-test and between both groups. Homogeneity of variance between the groups was verified before conducting the analyses. Mean scores and standard deviations at pre-and post-test assessments (PRCP, S-anxiety, SUDS, PR) for the experimental group and the control group are shown in Table 1.

For both groups and all measures, lower means at post-test compared with pre-test were observed. No significant interactions were observed between Time and Group for each of these variables.

Sex and PRCP

Differences between genders in training efficacy were assessed using interaction analyses. Results indicate a significant interaction effect between Time, Group, and Sex for the PRCP: $F_{1,13}=5.10$, $p=0.043$. Post hoc analyses show a
Table 1. Adjusted pre- and post-test means (and standard errors) for PRCP, S-anxiety, SUDS, and PR by group.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th></th>
<th>Experimental group</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td>PRCP</td>
<td>13.13 (2.08)</td>
<td>8.80 (2.19)</td>
<td>17.33 (1.96)*</td>
<td>12.11 (1.96)*</td>
</tr>
<tr>
<td>S-anxiety</td>
<td>43.00 (4.77)</td>
<td>37.59 (3.24)</td>
<td>50.56 (4.49)</td>
<td>43.33 (2.90)</td>
</tr>
<tr>
<td>SUDS</td>
<td>5.75 (0.70)</td>
<td>4.46 (0.73)</td>
<td>6.00 (0.66)</td>
<td>5.28 (0.66)</td>
</tr>
<tr>
<td>PR</td>
<td>104.9 (5.96)</td>
<td>99.96 (6.12)</td>
<td>89.61 (5.61)</td>
<td>85.27 (5.61)</td>
</tr>
</tbody>
</table>

Note. * Mean difference is significant at p<0.05.

Figure 1. PRCP evolution according to sex.

Figure 2. S-anxiety evolution according to the level of T-anxiety at initial interview. (See full color version at www.performancescience.org.)
significant decrease of PRCP score between pre-test and post-test for women in the experimental group, $F_{1,12}=19.21, p=0.001$, and no significant difference for the three other groups.

**T-anxiety and S-anxiety**

Differences between high (range=45-59) and low levels (range=29-44) of T-anxiety in training efficacy were verified using interaction analyses. Results indicate a significant interaction effect between Time, Group, and T-anxiety for the S-anxiety variable: $F_{1,12}=9.29, p=0.01$. Post hoc analyses show a significant decrease of S-anxiety between pre-test and post-test for participants in the experimental group with high levels of T-anxiety, $F_{1,13}=13.98, p=0.002$, and no significant differences for the three other groups.

**DISCUSSION**

The hypothesis of this study was that virtual training would decrease anxiety for the experimental group receiving virtual training compared with the control group. This hypothesis was partially confirmed. We found a significant decrease in anxiety for two subgroups of participants in the virtual training condition: (1) women and (2) high trait anxiety participants. The efficacy of virtual training for the high trait anxiety group and not for the low trait anxiety group could be explained by a floor effect. Indeed, we observed that those who had a low score for trait anxiety had a low level of state anxiety at pre-test ($r=0.547, p=0.02$). It is therefore difficult to decrease their anxiety level as it is already low, although we should be careful in interpreting this result given the small sample size of the study.

Considering that the results of this pilot study indicate an improvement in anxiety levels in specific groups (i.e. women, high trait-anxiety), research on virtual reality should be pursued in larger randomized controlled trials. Virtual exposure seems to be a promising way to help musicians who suffer from music performance anxiety.

**Acknowledgments**

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References


