Article

Virtual Reality Nature Exposure and Test Anxiety

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Supplementary File 2

2.1. Positive and Negative Affect Schedule (PANAS) (Watson et al.,1988)

Participants answered each of the 20 PANAS items using a 5-point Likert scale (1 = very slightly or not at all, 2 = a little, 3 = moderately, 4 = quite a bit, 5 = extremely). Scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17 and 19 were added to obtain participants’ total PA score whereas scores on items 2, 4, 6, 8, 11, 13, 15, 18 and 20 were added to give participants’ total NA score. Scores ranged from 10-50 with greater PA scores representing greater levels of PA and lower NA scores representing lower levels of NA.

2.2. Non-Verbal Reasoning Test

The relevant instructions regarding how to complete the test were listed on the sheet before initiating this task. Each section contained a series of questions that became progressively difficult however, the total level of difficulty of each section is equal. Session 1 of the test comprised ten questions whereas Session 1 of the test comprised eight questions. The questions were administered in fixed order across participants. To compare scores pre and post-intervention, two questions were semi-randomly omitted from participants’ total test score for Session 1 (i.e., items 9 and 10 were omitted provided that the participant did not get either of these correct if they did, then another item that was answered incorrectly was removed). This was done to be conservative in terms of benefits to the test when taken the second time.

2.3. Test Anxiety Questionnaire (Nist and Diehl, 1990)

The test anxiety questionnaire was chosen specifically because it can capture test anxiety with only few items, while focusing both on arousal and on cognitive aspects of the experience of test anxiety; there are other questionnaires available, such as the revised text anxiety questionnaire and further versions [Benson, J and El-Zahhar, N. (2009). Further refinement and validation of the revised test anxiety scale. Structural Equation Modeling: A Multidisciplinary Journal, 203–221] which are lengthy and therefore deemed not suitable in our experimental context.

In this questionnaire, participants were asked to ‘read through each statement and reflect upon past testing experiences.’ Participants responded to each item by using a 5-point Likert scale to indicate the degree of relevance held by each statement concerning their testing experiences (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). Individual test anxiety scores were calculated by adding up the scores for each statement. According to Nist and Diehl, individuals who achieve a score between 35–50 points are classified as having a “high and unhealthy” level of test anxiety; individuals who achieve a score between 20–35 points are classified as having “healthy levels” of exam anxiety and those who score between 10–19 points do not suffer from any test anxiety. For this research, those who scored in the upper quartile (35 or above) were categorized into the high anxiety group and those who scored in the lower quartile (24 and below) were categorized into the low anxiety group. The data from individuals who completed surveys (demographics, test anxiety questionnaire) in the initial phase of recruitment but did not achieve a score within the high or low anxiety bracket was not included in the research. These individuals were also not contacted to take part in the experimental study.

2.4. IVR Screenshots



**Figure S1.** Nature Environment.



**Figure S2.** Urban Environment.

2.5. Demographics Questionnaire

The demographics questionnaire consisted of five questions which were presented as follows:

1. What is your sex?
2. What age are you?
3. How many years have you been in third level education?
4. Have you ever used virtual reality equipment before?
5. Do you currently live in a mostly urban or mostly rural environment?

2.6. Nature Connection Index (Richardson et al., 2019).

The nature connection index (NCI) was chosen as it has been validated with large samples and it captures with only few items how individuals experience nature, which is distinct, and more appropriate to our aims, than other scales such as the Meyer and Frantz (2005) [Mayer, FS, and Frantz, CM (2004). The connectedness to nature scale: a measure of individuals’ feeling in community with nature. *J. Environ. Psychol*. 24, 503–515. doi: 10.1016/j.jenvp.2004.10.001] which is more reflective of kinship with nature.

The nature connection index comprises six statements in which participants indicate the degree to which they agree or disagree with them by using a 7-point Likert scale (1 = completely disagree, 2 = strongly disagree, 3 = disagree, 4 = neither agree nor disagree, 5 = agree, 6 = strongly agree, 7 = completely agree). Participants’ total nature connection index scores are calculated by adding up the weighted points for each statement response. Scores can range from 0–100, with a score of 50 indicating that the participants exhibit a satisfactory level of connectedness to nature. The weighted points are indicated in Table 3 below.

**Table S3.** Weighted Points Scoring System.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Response Scale Rating** | | | | | | |
|  | **Statement** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 1 | I always find beauty in nature | 0 | 1 | 2 | 3 | 5 | 9 | 15 |
| 2 | I always treat nature with respect | 0 | 0 | 1 | 2 | 4 | 6 | 10 |
| 3 | Being in nature makes me very happy | 0 | 1 | 2 | 3 | 6 | 10 | 16 |
| 4 | Spending time in nature is very important to me | 0 | 1 | 2 | 3 | 6 | 11 | 19 |
| 5 | I find being in nature really amazing | 0 | 1 | 2 | 3 | 6 | 10 | 17 |
| 6 | I feel part of nature | 0 | 1 | 2 | 4 | 7 | 13 | 23 |

2.7. Motion Sickness Assessment Questionnaire (MSAQ, Gianaros et al.,2001)

This self-reported questionnaire comprised 16 statements to which participants were asked to rate how relevant each statement was to their virtual reality experience. Participants responded by assigning a number from 1–9 beside each statement (1 = not at all, 6 = severely, 9 = extremely). Overall motion sickness scores were calculated by obtaining the percentage for the total points scored. Scoring system: the overall motion sickness score is obtained by calculating the percentage of total points scored: (sum of points from all items/144) x100. The motion sickness questionnaire was utilized in previous studies from our lab and it was chosen for convenience.

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