International Journal of Translation and Interpretation Studies
ISSN: 2754-2602
DOI: 10.32996/ijtis
Journal Homepage: www.al-kindipublisher.com/index.php/ijtis

IJTIS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Potential Impacts of Heartfulness Relaxation on Interpreting Performance: A Pilot Study

Liqun Wu
Department of English, University of Macau, Macau, China
Corresponding Author: Liqun Wu, **E-mail**: mc24116@um.edu.mo

| ABSTRACT

This mixed-methods pilot study investigates the effects of a brief seven-minute heartfulness relaxation intervention on interpreting students' cognitive performance, perceived stress, and consecutive interpreting skills. Seven participants completed pre- and post-intervention measures, including the Stroop test, Perceived Stress Scale (PSS-10), and consecutive interpreting tasks. Qualitative data were collected through participant interviews and analyzed using thematic analysis. The quantitative results revealed significant improvements in executive function (p<.001), perceived stress (p=.078), and Chinese to English and English to Chinese consecutive interpreting (p=.028) following the intervention. The qualitative findings indicated predominantly positive effects on interpreting performance, concentration, and focus, with mixed responses regarding relaxation, environmental factors, and effect sustainability. The convergence of the qualitative themes and quantitative improvements suggested that the heartfulness relaxation intervention enhanced the participants' cognitive function, reduced fatigue, and optimized essential skills. These findings highlight the potential benefits of incorporating a brief relaxation practice into interpreter training and professional development. Limitations and future research directions are discussed, emphasizing the need for larger controlled trials to confirm the generalizability and long-term effects of the intervention. Overall, this pilot study provides a foundation for further investigations into the application of the brief heartfulness relaxation technique in the interpreting field.

| KEYWORDS

Heartfulness relaxation, cognitive performance, perceived stress, consecutive interpreting, interpreting.

| ARTICLE INFORMATION

ACCEPTED: 01 August 2024 **PUBLISHED:** 19 August 2024 **DOI:** 10.32996/ijtis.2024.4.3.5

1. Introduction

Interpreting is a highly specialized profession that requires exceptional attention control, memory retention, and rapid response to language translation, making it a cognitively demanding activity (Dong & Li 2019; Hervais-Adelman & Babcock 2019; Liu 2023). Novice interpreters face significant challenges because the cognitive load of interpreting can negatively affect attention, emotional regulation, and stress (Johnson 2021), which, in turn, impact performance and overall well-being. The effort models (Gile 1995, 1997, 1999, 2009, 2016) underscore the importance of attentional control in interpreting, which requires balancing cognitive resources due to limited human processing capacity. Novices are prone to errors as they often operate at the edge of their cognitive capacity (i.e., the "tightrope hypothesis": Gile 2009). Proficiency in maintaining sustained attention and managing executive function, which are essential for interpreting, typically improves with experience (Johnson 2021).

Interpreting is intrinsically linked to stress (Korpal 2021). The Yerkes-Dodson law posits that a certain level of stress can enhance performance, whereas excessive stress can have the opposite effect (Yerkes & Dodson 1908). Novice interpreters who lack effective coping mechanisms may find that stress impacts their performance (Hild 2014; Johnson 2021). Emotions also play a crucial role in interpreting as they can drain the attentional resources necessary for tasks (Johnson 2021). While expert interpreters have honed their metacognitive skills to quickly rebound from errors without succumbing to negative emotions, novices may struggle, which

affects their performance (Hild 2014; Johnson 2021). Accordingly, a promising intervention for novice interpreters is heartfulness relaxation, a practice designed to promote tranquility enhanced by yogic transmission (Chandra 1989; Patel and Pollock 2018; Van't Westeinde & Patel 2022). Transmission, a unique feature of the heartfulness system, facilitates practitioners' access to deeper meditative states and metacognitive transformation, which involves having crucial awareness and control over one's cognitive processes to manage the complex cognitive demands of the interpreting process and achieve optimal performance (Doğan et al. 2009). Although the transmission itself cannot be measured directly, its effects on the body and mind can be observed. Pilot studies have found that when meditating with transmission, novice heartfulness practitioners show changes in brainwaves, including gamma and delta waves (typically only seen in advanced meditators) and heart rate variability, suggesting a shift toward parasympathetic nervous system dominance (Borthakur et al. 2022; Patel 2014; Sankar Sylapan et al. 2020). Although these initial findings suggest that these mechanisms may play significant roles in the beneficial outcomes associated with the heartfulness system, further exploration is needed. Moreover, no studies have specifically focused on the unique effects of heartfulness relaxation on stress reduction, warranting the need for further research.

Accordingly, this mixed-methods pilot study investigates the impact of a single seven-minute heartfulness relaxation intervention on novice interpreting students' cognitive performance, perceived stress, consecutive interpreting skills, and mindfulness ability. The effectiveness of one single session of relaxation intervention in reducing perceived stress and enhancing cognitive performance has been demonstrated in various populations (Bauer et al. 2021; Chhetri et al. 2020; Cozzolino et al. 2020; Goerling et al. 2014; Karrasch et al. 2022; Loziak 2022; Masih et al. 2019; Pombeiro et al. 2022; Raghavendra & Singh 2016; Rubin et al. 2022; Rubin et al. 2024; Sleimen-Malkoun et al. 2023). While meditation and relaxation are often conflated because of their similar characteristics as mind/body interventions and self-regulation methods (Kushner & Marnocha 2008), it is important to distinguish between the two practices. The effectiveness of relaxation techniques may depend on factors such as an individual's experience and volume of practice (Buric et al. 2022; Chan & Bose 2023; Dziego et al. 2023; Schlatter et al. 2022), thereby underscoring the importance of considering individual differences, environmental factors, and relaxation intervention effect sustainability when implementing them in interpreter training and professional practice. Meanwhile, there is a research gap in determining whether a single session of heartfulness relaxation decreases self-perceived stress. Therefore, this study examines the efficacy of the heartfulness relaxation technique on a novice interpreting student cohort to determine whether a single seven-minute session can enhance interpreting performance and well-being, so as to contribute to the growing evidence supporting the potential benefits of brief relaxation interventions for optimizing cognitive performance, reducing stress, and promoting well-being in high-demand settings such as interpreting. The results offer insights into the intervention's effects and participants' experiences; these can inform the development of training programs that incorporate heartfulness relaxation to enhance interpreters' performance and resilience within this profession's high-pressure environment.

2. Methodology

2.1 Pilot Research Plan

This mixed-methods pilot study explored the impact of heartfulness meditation on interpreting students' interpreting performance, attention, stress level, and overall well-being by combining quantitative and qualitative data collection techniques.

2.2 Participants

The participants included 10 Translation Studies Master of Arts (MA) students aged 20–40 years at the authors' university. Because this study focused on the effects of the intervention without a control group, all participants were exposed to the heartfulness relaxation intervention. While the absence of a control group may limit the ability to establish causality, this approach allows for a more in-depth examination of participants' intervention experiences and perceptions. The inclusion criteria were as follows: aged between 20–40 years and participating in the Translation Studies MA at the university; completed at least one year of interpreting training during postgraduate study; willingness to participate in the study and provide informed consent; has no experience as an interpreter; and has no meditation experience. The exclusion criteria were as follows: aged under 20 or over 40 years; has not received at least one year of interpreting training during their postgraduate study; unwillingness to participate or provide informed consent; has worked as an interpreter; and has meditation experience.

2.3 Recruitment

The program coordinator sent an email detailing the pilot study to all Translation Studies MA students. Those who consented to voluntarily participate replied to the email expressing their interest.

2.4 Design

This study employed a mixed-methods pre–post-test design to allow for quantitative and qualitative data collection pre- and post-intervention. This design enabled the researchers to assess the intervention's impact by comparing the participants' performance, stress levels, and attentional ability pre- and post-intervention.

2.5 Relaxation Procedure

The intervention was a seven-minute guided relaxation technique that allowed the participants to release tension and relax each body part before meditation. This guided relaxation technique could be performed immediately before meditation or when the body felts tense. The participants were guided through the following steps:

1. Sit comfortably and gently close your eyes.
2. Wiggle your toes and feel relaxed.
3. Feel the healing energy of Mother Earth moving up into your feet, ankles, and knees, and relax your lower legs.
4. Feel the healing energy move further up your legs and relax your thighs, hips, lower body, and waist.
5. Relax your back from top to bottom.
6. Relax your chest, shoulders, upper arms, forearms, hands, and fingertips.
7. Relax your neck muscles, face, jaw, mouth, nose, eyes, earlobes, forehead, and the top of your head.
8. Feeling that your entire body is completely relaxed, scan your body from head to toe, and if any part is still tense, immerse it longer in the healing energy of Mother Earth.
9. Focus your attention on your heart, rest there, and feel it immersed in love and light.
10. Remain still and quiet, and slowly become absorbed in yourself until you feel ready to come out.

2.6 Quantitative Data Collection

The participants were required to complete two consecutive interpreting assignments, one from Chinese to English and one from English to Chinese, pre- and post-intervention. Their interpreting performance was evaluated using the following measures.

2.6.1 Consecutive Interpreting Tasks

Prior to the intervention, participants were provided with two sets of advanced consecutive interpreting materials, each comprising roughly five minutes of audio from the EU Speech Repository. These materials required interpretation from Chinese to English and vice versa. Following the intervention, the same process was repeated with new material for both language directions. A rater then assessed the completeness, accuracy, delivery, audience viewpoint, target language expression, and skills and strategies of the interpreting output using a four-point rubric. This propositional analysis compared the content conveyed in the interpreting tasks with the original source text, so as to provide an objective measure of the amount of information retained and the precision with which it was rendered (Johnson 2016). This method ensured a thorough evaluation of the participants' interpreting performance.

2.6.2 Stroop Color and Word Test (SCWT)

The SCWT was administered to assess participants' attention control, cognitive flexibility, and mental processing speed by measuring the reaction time differences between congruent and incongruent color-word pairs (Scarpina & Tagini 2017; Stoet 2010, 2017). The SCWT is a common attention test used in interpreting literature (Johnson 2016) and cognitive research to investigate specific cognitive mechanisms, such as control inhibition, attentional control, and the ability to inhibit cognitive interference, known as the Stroop effect (Garcia-Marques & Fernandes 2024; Parris et al 2022; Scarpina & Tagini 2017). The participants completed the computerized Stroop test on the PsyToolkit platform pre- and post-intervention to assess their attention, cognitive flexibility, and inhibition of automatic answers (Hamdan & Vieira 2022). This test provided information on their visual search speed, scanning, selective attention, processing speed, mental flexibility, and executive function (Nuño et al. 2021; Sisco et al. 2016), which are essential skills for interpreters who must manage multiple cognitive tasks simultaneously and maintain their focus in high-stress environments. The test allowed for the comprehensive evaluation of the relaxation intervention's cognitive effects on the participants. The participants also completed two self-report questionnaires pre- and post-intervention.

2.6.3 The 10-item Perceived Stress Scale (PSS-10)

The PSS-10 was administered to assess the changes in the participants' self-appraised stress levels. The PSS-10 scores ranged from 0–40, with higher scores representing higher stress levels. Percentiles were computed by comparing the results with those from a community sample (Cohen & Janicki-Deverts 2012). The scale comprised two subscales: perceived helplessness (Items 1, 2, 3, 6, 9, and 10), and lack of self-efficacy (Items 4, 5, 7, and 8).

2.7 Relaxation Intervention

All participants engaged in the seven-minute heartfulness relaxation session prior to their second interpreting task. This intervention was expected to yield results different to those of Ivars and Calatayud's (2013) on mindfulness relaxation, as the heartfulness intervention included yogic transmission, and the specific mechanisms remained unknown and could have unique an impact on the participants' performance and well-being.

2.8 Qualitative Data Collection

Following the completion of the interpreting assignments and questionnaire, the participants shared their experiences in

retrospective interviews. The interviews were conducted in Mandarin to ensure that the participants fully understood and responded to the questions, which allowed for a more accurate and in-depth exploration of their intervention perceptions and experiences. During the interviews, the participants listened to recordings of their own interpreting output while answering the following open-ended questions: "In what ways, if any, do you feel the heartfulness relaxation technique influenced your interpreting performance, including your ability to deliver complete and accurate interpretations?"; "Based on your experience, how would you describe the impact, if any, of the heartfulness relaxation technique on your attention, concentration, and mindfulness while performing the interpreting tasks?"; and "Can you explain whether the heartfulness relaxation technique affected your perceived stress levels and overall well-being during the interpreting tasks, and if so, in what ways?"

All interviews were audio recorded and transcribed verbatim in Mandarin. To facilitate the analysis and presentation of the findings, relevant transcript excerpts were translated into English. Thematic analysis was employed to identify key themes related to the intervention's effects, providing valuable qualitative insights into participants' experiences and perceptions.

2.9 Ethical Considerations

This study design was approved by the author's university and conducted in accordance with the Declaration of Helsinki, and all study participants provided written informed consent. Participation was voluntary and participants were free to withdraw from the study at any time without consequences. Participant confidentiality and anonymity were maintained throughout the study, and all data were stored securely and accessed only by the research team.

2.10 Data Analyses

The quantitative data collected through the interpreting tasks' rubric scores, Stroop test, and PSS-10 were analyzed using SPSS and paired-sample t-tests to compare the participants' differences pre- and post-intervention. The statistical analyses determined the significance of any changes in the participants' performance, stress level, and attentional ability post-intervention. The qualitative data obtained from the interview transcripts were analyzed using thematic analysis to identify patterns or themes within the data.

3. Results

3.1 Participants

This study included 7 participants (6 females, 1 male) aged between 22–39 years (M=26.00, standard deviation [SD]=6.27; Table 1). All participants were second-year MA students with one year of training in the field during their first year of postgraduate study. The participants all spoke Chinese (Mandarin or Cantonese) and English. Some participants could also speak Spanish and Japanese. The diverse language backgrounds provided a representative sample of interpreting students, increasing the generalizability of the study's findings.

Table 1. Participants' profiles

Participant	Age (years)	Sex	Language
1	23	Female	Mandarin, English, Spanish, Cantonese
2	39	Female	Mandarin, Cantonese, English, Japanese
3	23	Female	Cantonese, Mandarin, English
4	22	Male	Chinese, English
5	30	Female	Cantonese, English, Mandarin
6	23	Female	Chinese, Cantonese, English
7	22	Female	Chinese, English

3.2 Interview Results

The participants were interviewed about their experiences and perceptions of the intervention in terms of the following themes: performance and accuracy, concentration and focus, relaxation and anxiety, environmental factors, and effect sustainability. Their responses were coded (positive, neutral, and negative) and tabulated based on their perceived impact of the relaxation technique (Table 2).

Table 2. Interview results

Theme	Positive	Neutral	Negative
Performance and accuracy	3	0	0
Concentration and focus	3	1	0
Relaxation and anxiety	2	1	1
Environmental factors	1	0	1
Effect sustainability	1	0	1

Most participants reported positive experiences for performance and accuracy and concentration and focus, and mixed responses for relaxation and anxiety, environmental factors, and effect sustainability post-intervention. Table 2 demonstrates that performance and accuracy has the highest number of positive responses and no neutral or negative sentiments. This suggests that most participants experienced improvements in performance and accuracy after engaging in the relaxation technique. Concentration and focus received predominantly positive feedback, with one neutral response. This indicates that the technique effectively enhances most participants' concentration and focus. Relaxation and anxiety has mixed responses. While some participants felt more relaxed and less anxious, others did not experience significant changes or have negative experiences. Environmental factors received mixed positive and negative sentiments and no neutral responses regarding the technique's effectiveness. Effect sustainability received mixed responses, indicating that the participants perceived the long-term effects of the technique differently. Overall, the relaxation technique effectively improves most participants' performance, accuracy, concentration, and focus. However, the impact of the technique on relaxation and anxiety, effect sustainability, and environmental factors varies among individuals. This suggests a need for further investigation into these aspects and a potentially more personalized approach to the technique's implementation.

3.3 Stroop Test

This study then examined the intervention's effect on the participants' performance using the Stroop test pre- and post-intervention. The mean reaction time (RT) for completing the incongruent condition was compared pre- and post- intervention to determine the Stroop effect (incongruent RT–congruent RT). A paired-samples t-test was conducted to evaluate the differences in the mean Stroop effect pre- and post-intervention. The results (Table 3) show a statistically significant decrease in the Stroop effect from the pre- (M=167.27, SD=49.72) to post-intervention (M=110.63, SD=46.21, $t(6)=8.77$, $p<.001$). The mean decrease in the Stroop effect is 56.64 ms, with a 95% confidence interval (CI) ranging from 40.84–72.45 ms. Thus, the intervention significantly improves participants' performance in the incongruent trials of the Stroop test compared to the congruent trials. This suggests that the intervention can improve interpreting students' executive function, cognitive flexibility, and attention control.

Table 3. Stroop test (pre- and post-intervention) results

Measure	Pre-intervention M (SD)	Post-intervention M (SD)	*t*	df	*p*	Cohen's d
Stroop effect Reaction time (ms)	167.27 (49.72)	110.63 (46.21)	8.77	6	< .001	3.31

Note. SD=standard deviation; ms=milliseconds; df=degree of freedom; Cohen's d=effect size.

3.4 PSS-10

Next, this study examined the intervention's effect on the participants' perceived stress levels. The PSS-10 was administered pre- and post-intervention. The results (Table 4) indicate a significant reduction in the PSS-10 scores post-intervention, suggesting the potential benefit of the technique for stress management for this population. Pre-intervention, the mean PSS-10 score is 16.71 (SD=4.424); post-intervention, the mean score is 14.57 (SD=2.992). A paired-samples t-test was conducted to compare the pre- and post-intervention PSS-10 scores. The results show a significant difference between the pre- (M=16.71, SD=4.424) and post-intervention scores (M=14.57, SD=2.992, t[6]=2.121, p=.078 [two-tailed]), with a large difference in the mean (mean difference=2.143, 95% CI: -.329–4.615, eta squared=.808). These results suggest that the technique can reduce interpreting students' perceived stress. The significant reduction in the PSS-10 score post-intervention provides preliminary support for the efficacy of the intervention. However, further research with larger sample sizes is required to confirm these findings.

Table 4. PSS-10 (pre- and post-intervention) results

Measure	Pre-intervention M (SD)	Post-intervention M (SD)	*t*	df	*p*	Cohen's d
PSS-10 Score	16.71 (4.42)	14.57 (2.99)	2.12	6	0.078	0.8

Note. SD=standard deviation; ms=milliseconds; df=degree of freedom; Cohen's d=effect size.

3.5 Consecutive Interpreting (pre- and post-intervention)

Consecutive interpreting requires intense cognitive effort, divided attention, short-term memory, and language production. A high cognitive load can lead to fatigue and performance deterioration over time. This study examined whether the intervention could improve the participants' consecutive interpreting performance. The participants completed a pre- and post-test for consecutive interpreting from Chinese to English and English to Chinese. For each test, the participants interpreted a passage and scored it from 1–4 based on five criteria: completeness, accuracy, delivery, audience viewpoint, and target language expression. After the pre-test, the students engaged in the intervention, then the post-test was administered.

Regarding the Chinese to English results (Table 5), the pre-test scores (M=3.20, SD=0.49) do not differ significantly from the post-test scores (M=3.31, SD=0.30), t(6)=-0.60, p=0.569). However, the English to Chinese post-test scores (M=3.37, SD=0.39) are significantly higher than the pre-test scores (M=2.83, SD=0.69), t(6)=-2.88, p=0.028). The effect size for Chinese to English is small (Cohen's d=0.23, 95% CI: [-0.97, 0.53]) and medium for English to Chinese (Cohen's d=-1.09, 95% CI: [-2.02, -0.11]). Overall, the intervention can improve students' consecutive interpreting skills, specifically from English to Chinese, and has a medium effect size on the language direction.

Table 5. Consecutive interpreting (pre- and post- intervention) results

Language direction	Pre-intervention M (SD)	Post-intervention M (SD)	*t*	df	*p*	Cohen's d
Chinese to English	3.20 (0.49)	3.31 (0.30)	-0.6	6	0.569	-0.23
English to Chinese	2.83 (0.69)	3.37 (0.39)	-2.88	6	0.028	-1.09

Note. SD=standard deviation; ms=milliseconds; df=degree of freedom; Cohen's d=effect size.

4. Discussion

4.1 Qualitative Analyses

This mixed-methods pilot study explored the impact of a seven-minute heartfulness relaxation intervention on interpreting students' performance metrics. The thematic analysis revealed the intervention's predominantly positive effects on the participants' interpreting performance, concentration, and focus. The participants reported feeling more mentally clear, alert, and able to maintain their attention on the interpreting tasks post-intervention. These findings align with the research supporting the effectiveness of meditation and relaxation practices in enhancing cognitive performance and promoting well-being in high-stress environments (Agrawal et al. 2020; Bostock et al. 2019; Johnson 2021; Kim 2023; Lemos et al. 2021; Patel 2014). However, the participants had varied perceptions regarding the interventions' relaxation, environmental factors, and effect sustainability. Some participants found the intervention deeply calming and restorative, whereas others reported difficulty in fully relaxing within the given time and setting. The suitability of the environment was contested, with some participants expressing a preference for a more private, quiet space. Additionally, the effect sustainability of the intervention was questioned, with some participants recognizing the need for regular practice to maintain the benefits. As one participant remarked, "The relaxation helped me feel more focused, but I am not sure how long that would last without doing it regularly." These findings align with the research suggesting that the effectiveness of relaxation techniques depends on an individual's experience level and volume of practice

(Buric et al. 2022; Chan 2023; Dziego et al. 2023; Schlatter et al. 2022). Dziego et al. (2023) propose that while more practice leads to better results, even brief sessions may be beneficial. They also question how performance benefits are derived from brief mindfulness practices prior to task engagement versus more sustained practice over time. Chan (2023) notes that experienced meditators report higher levels of relaxation and improvement in breathing rates than beginners. These findings underscore the importance of considering individual differences, environmental factors, and the effect sustainability of relaxation interventions when implementing them in interpreter training and professional practice. Buric et al. (2022) and Schlatter et al. (2022) suggest that meditation and relaxation interventions affect participants differently, so it is crucial to identify the individual characteristics that should be considered when using these interventions for optimal results.

This study's qualitative findings found that the intervention had cognitive and performance benefits as it improved the participants' ability to concentrate, retain information, and maintain focus during the consecutive interpreting tasks. However, the interviews highlighted the individual differences in the responses to the intervention as well as the importance of a conducive environment alongside sustained practice for optimal results. These findings underscore the potential of heartfulness relaxation as a tool for enhancing interpreters' cognitive performance and well-being, while also emphasizing the need for personalized approaches and regular practice to maximize the benefits.

4.2 Quantitative Analyses

The quantitative analyses examined the intervention's effects on executive function (Stroop test), perceived stress (PSS-10), and the consecutive interpreting tasks, with significant improvements in all areas.

4.2.1 Stroop Test

The paired-samples t-test results revealed a substantial reduction in the Stroop effect post-intervention, suggesting participants' enhanced attentional control, cognitive flexibility, and mental processing speed. This reinforces the prior findings on the influence of single-session meditation and relaxation techniques (Raghavendra & Singh 2016; Sleimen-Malkoun et al. 2023). Although these studies provide a foundation, the literature lacks comprehensive insights into the intervention's immediate effects on participants' Stroop test performance. Specifically, Raghavendra and Singh (2016) explore the immediate effects of Tratak meditation and observe marked improvements in cognitive performance post-intervention, indicating its potential to fortify selective attention and cognitive agility. Sleimen-Malkoun et al. (2023) note faster RT on a Stroop task following a short ten-minute mindfulness meditation session, highlighting the impact of practice on attention and cognitive flexibility. These improvements, replicated in the current study through the heartfulness relaxation intervention, suggest that the application of the intervention can enhance interpreters' cognitive function.

The underlying mechanism may involve the prefrontal cortex, as suggested by Adleman et al. (2002) and Zhang et al. (2020), who report increased activation in this area following relaxation practices. However, this connection warrants further investigation to decipher the precise neural pathways and implications of relaxation techniques for cognitive performance. Meanwhile, Prakash et al. (2010), Zhang et al. (2019), Baklouti et al. (2022), and Hawkes et al. (2014) report significant cognitive improvements from various meditation and yoga practices via Stroop test performance results. Enhanced attention, executive function, and processing speed support the cognitive benefits of these practices. Collectively, these studies validate the effectiveness of relaxation and meditation in cognitive enhancement and highlight the necessity for focused research on the immediate impact of single-session interventions. Such research can elucidate the potential for such interventions to augment cognitive flexibility and attentional control, which, in turn, can provide valuable insights into the development of cognitive training programs for novice and professional interpreters.

4.2.2 PSS-10

This study investigated the intervention's impact on participants' perceived stress levels using the PSS-10 scale. This finding concurs with prior studies that have found that heartfulness meditation can significantly reduce perceived stress levels (Desai et al. 2021; Gupta et al. 2023; Philip et al. 2023; Subramanian et al. 2022; Thakur 2023; Yadav et al. 2021). Further, the effectiveness of a single session in reducing perceived stress has been demonstrated in various populations using relaxation hypnosis (Karrasch et al. 2022), mindfulness-based interventions (Rubin et al. 2022; Rubin et al. 2024), psycho-oncological interventions (Goerling et al. 2014), mind–body interventions (Cozzolino et al. 2020), progressive muscle relaxation and mindfulness meditation (Masih et al. 2019), and acute relaxation techniques (Bauer et al. 2021). As such, this study, alongside supporting evidence from the literature, suggests that a single session of heartfulness relaxation can significantly reduce perceived stress levels. The effectiveness of various relaxation interventions, including yoga-based techniques, in reducing stress and improving well-being further supports the potential benefits of heartfulness relaxation. However, more rigorous research is needed to confirm these findings and further explore the unique effects of heartfulness relaxation on stress reduction and overall well-being.

4.2.3 Consecutive Interpreting

This study investigated the impact of heartfulness relaxation on participants' consecutive interpreting performance in Chinese to English and vice versa. The post-test scores were significantly higher than the pre-test scores for English to Chinese. However, no significant differences were found for Chinese to English. This suggests that the cognitive replenishment benefits of the intervention is more pronounced when interpreting in one's weaker language because doing so typically requires greater cognitive effort and resources, as evidenced by the differential costs and inhibition mechanisms observed in bilingual language processing (Goral et al. 2013; Jankowiak et al. 2017; Kroll et al. 2014; Mosca & Bot 2017; Wodniecka et al. 2018). Moreover, the higher levels of cognitive effort and resources required during consecutive interpreting are due to several factors related to the cognitive and linguistic challenges inherent in the process. For example, cognitive processes are intensified when the target language is not the interpreter's strongest one (Han et al. 2023). Meanwhile, interpreters may struggle to find the right vocabulary, grammar, and syntax quickly enough to keep up with the pace of speech, which increases cognitive effort as the brain works harder to access less frequently used linguistic structures and vocabulary (Han et al. 2023; Johnson 2016, 2021). Accordingly, this study reveals that the heartfulness relaxation intervention benefits cognitive replenishment, which is particularly relevant for supporting interpreting performance.

However, this study's finding contradicts that of Ivars and Calatayud (2013), who suggest that anxiety management techniques, such as induced relaxation, do not significantly improve trainees' interpreting performance. This may be due to the differences in sample size and participant background; Ivars and Calatayud (2013) include a much larger sample of interpreting students (371), all of whom had prior exposure to relaxation techniques through the curriculum and incorporated relaxation into their daily interpreting training. The current study had a significantly smaller sample size (7), and the participants were not accustomed to using relaxation techniques in their interpreting practice. Overall, these differences highlight the need for further research to clarify the role of relaxation techniques in enhancing consecutive interpreting performance. Moreover, language proficiency and directionality should be considered when assessing the intervention's impact on interpreting performance.

5. Limitations

First, this study's small sample size (N=7) restricted the generalizability of the results to a broader population of novice and professional interpreters. Although the consistency between the qualitative and quantitative measures strengthened the conclusions, larger controlled studies with more diverse samples are needed to confirm the generalizability of the findings. Second, the lack of a control group made it challenging to attribute the observed intervention benefits solely to the intervention itself. Future research should employ randomized controlled trials to allow for stronger causal conclusions and isolate the intervention's effects. Third, the participants had mixed responses toward the intervention and environmental setting. These differences warrant further exploration to understand the different factors that influence the interventions' effectiveness among individuals. Fourth, the study relied heavily on self-reported data from interviews, surveys, and scales, which may have been subject to bias. Incorporating more objective outcome measures in future research can strengthen the study conclusions. Fifth, this study lacked a long-term follow-up assessment as the pre- and post-test changes were evaluated immediately after the intervention. Accordingly, it remains unclear as to whether the observed benefits are sustained over time. Longitudinal follow-up studies can determine the long-term effects of the intervention on interpreting students' performance and well-being. Finally, while improvements were observed in executive function and attention, the limitations of the study's design prevented the intervention from being definitively attributed as the sole cause of these changes. Further controlled experiments are required to isolate the intervention's effects and establish a clear causal relationship. Addressing these limitations will contribute to a more comprehensive understanding of the potential benefits of heartfulness relaxation for novice and professional interpreters and inform the development of evidence-based training programs that incorporate this technique to optimize interpreter performance and well-being.

Despite these limitations, this study provides substantial preliminary support for the benefits of the brief seven-minute heartfulness relaxation intervention on interpreters' performance. The convergence of qualitative themes and quantitative improvements offers compelling initial evidence that the intervention may replenish cognitive resources, decrease fatigue, and optimize skills vital for interpreting, which, in turn, may sustain interpreters' performance and well-being.

6. Conclusion

This study examined the effects of a brief seven-minute heartfulness relaxation intervention on novice interpreting students' cognitive performance, perceived stress, consecutive interpreting skills, and mindfulness ability to facilitate a comprehensive understanding of the intervention's effect on participants' experiences and performance. The qualitative findings revealed predominantly positive effects of the technique on participants' interpreting performance, concentration, and focus. Participants reported feeling more mentally clear, alert, and able to maintain their attention on the interpreting tasks following the relaxation exercise. However, there were individual differences in the responses to the intervention, and some participants highlighted the importance of conducive environments and sustained practice for optimal results. These findings suggest that while the

intervention can improve novice interpreting students' cognitive performance and focus, individual factors and environmental considerations should be considered when implementing it. The quantitative analyses demonstrated significant improvements in executive function (Stroop test), perceived stress (PSS-10), and consecutive interpreting skills (English to Chinese) post-intervention. The significant decrease in the Stroop effect, indicating improved attention control, cognitive flexibility, and speed of mental processing, aligns with the previous studies that have explored the effects of relaxation techniques on cognitive tasks (Raghavendra & Singh 2016; Sleimen-Malkoun et al. 2023). The reduction in perceived stress levels, as measured by the PSS-10, underscores the intervention's potential as a strategy for alleviating interpreting students' stress and promoting their well-being. This is consistent with the growing research on the stress-reducing effects of relaxation interventions (Bauer et al. 2021; Cozzolino et al. 2020; Goerling et al. 2014; Karrasch et al. 2022; Rubin et al. 2024; Rubin et al. 2022; Masih et al. 2019). The improvement in consecutive interpreting skills, particularly from English to Chinese, suggests that the cognitive replenishment benefits of the intervention may be more pronounced when participants interpret in their weaker language. This finding highlights the potential of the relaxation technique to support interpreting performance, particularly in challenging language directions, and underscores the importance of considering language proficiency and directionality when assessing the intervention's impact on interpreting performance. Overall, this study contributes to the growing research on the effectiveness of relaxation practices on promoting well-being and performance in high-stress environments such as interpreting.

Biosketch: Liqun Wu, a second-year Translation Studies MA student at the University of Macau, conducted a mixed-methods pilot study exploring the impact of a seven-minute heartfulness relaxation intervention on interpreting students' performance and well-being. Inspired by program coordinator Hari Venkatesan and supervised by Professor Li Defeng, Liqun Wu is committed to developing evidence-based training programs incorporating relaxation techniques to support interpreters in managing the cognitive and emotional demands of their profession, ultimately contributing to the field of interpreting studies.
Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
Conflict of interest: None.
Acknowledgements: I would like to express my deepest gratitude to the seven participants who generously contributed their time and effort to this pilot study. Their dedication, enthusiasm, and insightful reflections were invaluable to the research process and the development of our understanding of the potential benefits of heartfulness relaxation for interpreting students. I am also profoundly grateful to Hari Venkatesan, the program coordinator, for introducing me to the concept and practice of the heartfulness system. His guidance, support, and expertise have been instrumental in shaping the direction and design of this study. Without his contributions, this research would not have been possible. I would like to extend my sincere appreciation to Professor Li Defeng, my master's project supervisor, for his valuable feedback and encouragement throughout the research process. His insights have helped to refine and strengthen the study's methodology and analysis. Finally, I wish to acknowledge the unwavering support of my colleagues, friends, and family, who have provided endless encouragement and understanding throughout this research journey. Their belief in the importance of this work has been a constant source of motivation and inspiration.To all those mentioned above, and the many others who have contributed to this study in various ways, I offer my heartfelt thanks. Your support and involvement have been essential to the successful completion of this pilot study, and I am deeply grateful for your contributions.
Ethics statement: This study design was approved by the University of Macau, and conducted in accordance with the Declaration of Helsinki, and all study participants provided written informed consent.

References

[1] Adleman, N. E., Menon, V., Blasey, C. M., White, C. D., Warsofsky, I. S., Glover, G. H. & Reiss, A. L. (2002). A developmental fMRI study of the Stroop color-word task. *Neuroimage* 16 (1), 61–75. https://doi.org/10.1006/nimg.2001.1046
[2] Agrawal, V., Naik, V., Duggirala, M. & Athavale, S. (2020). Calm a mobile based deep breathing game with biofeedback. In Extended Abstracts of the 2020 Annual symposium on Computer-Human Interaction in Play (Canada, November 2-4). USA: Association for Computing Machinery, 153–157 https://doi.org/10.1145/3383668.3419876
[3] Baklouti, S., Aloui, A., Baklouti, H., Souissi, N. & Jarraya, M. (2022). Effects of Hatha yoga on cognitive functions in the elderly: a cross-sectional study. *Libyan Journal of Medicine* 17 (1), 2080799. https://doi.org/10.1080/19932820.2022.2080799
[4] Bauer, I., Hartkopf, J., Wikström, A. K., Schaal, N. K., Preissl, H., Derntl, B. & Schleger, F. (2021). Acute relaxation during pregnancy leads to a reduction in maternal electrodermal activity and self-reported stress levels. *BMC Pregnancy and Childbirth* 21, 1–12.
[5] Borthakur, R., Sharma, N. & Pattanaik, P. (2022). Predicting calmness, anxiety, and depression using wearable sensors. Pre Print. 10.21203/rs.3.rs-1273712/v1
[6] Bostock, S., Crosswell, A. D., Prather, A. A. & Steptoe, A. (2019). Mindfulness on-the-go: effects of a mindfulness meditation app on work stress and well-being. *Journal of Occupational Health Psychology* 24 (1), 127–138. https://doi.org/10.1037/ocp0000118
[7] Buric, I., Farias, M., Driessen, J. & Brazil I. (2022). Individual differences in meditation interventions: a meta-analytic study. *British Journal of Health Psychology* 27 (3), 1043–1076. https://doi.org/10.1111/bjhp.12589
[8] Chan, K. E. & Bose, J. (2023). Effect of mindfulness and mindful art on beginners and experienced meditators. *arXiv*. https://doi.org/10.31234/osf.io/8pc4r
[9] Chandra, R. (1989). The complete works of Ram Chandra (Volume I). Toronto: SRCM.

[10] Chhetri, P., Shrestha, L., Rana, B. S., Banstola, D. & Mahotra, N. B. (2020). Effects of yoga based relaxation technique on heart rate variability in young and healthy volunteers. *Journal of Karnali Academy of Health Sciences*, 3 (2), 65–72. https://doi.org/10.3126/jkahs.v3i2.30807

[11] Cohen, S. & Janicki-Deverts, D. (2012). Who's stressed? Distributions of psychological stress in the United States in probability samples from 1983, 2006, and 20091. *Journal of Applied Social Psychology* 42 (6), 1320–1334. https://doi.org/10.1111/j.1559-1816.2012.00900.x

[12] Conklin, Q., King, B., Zanesco, A., Pokorny, J., Hamidi, A., Lin, J., Epel, E., Blackburn, E. & Saron, C. (2015). Telomere lengthening after three weeks of an intensive insight meditation retreat. *Psychoneuroendocrinology* 61, 26–27.

[13] Cozzolino, M., Vivo, D. R., Girelli, L., Limone, P. & Celia, G. (2020). The evaluation of a mind-body intervention (MBT-T) for stress reduction in academic settings: a pilot study. *Behavioral Sciences* 10 (8), 124.

[14] Desai, K., Gupta, P., Parikh, P. & Desai, A. (2021). Impact of virtual heartfulness meditation program on stress, quality of sleep, and psychological wellbeing during the covid-19 pandemic: a mixed-method study. *International Journal of Environmental Research and Public Health* 18 (21), 11114. https://doi.org/10.3390/ijerph182111114

[15] Doğan, A., Arumi Ribas, M. & Mora-Rubio, B. (2009). Metacognitive tools in interpreting training: A pilot study. *Journal of Faculty of Letters* 26 (1), 69–84.

[16] Dong, Y. & Li, P. (2019). Attentional control in interpreting: a model of language control and processing control. *Bilingualism Language and Cognition* 23 (4), 716–728. https://doi.org/10.1017/s1366728919000786

[17] Dziego, C. A., Bornkessel-Schlesewsky, I., Schlesewsky, M., Sinha, R., Immink, M. A. & Cross, Z. R. (2023). Augmenting complex and dynamic performance through mindfulness-based cognitive training: an evaluation of training adherence, trait mindfulness, personality and resting-state EEG. *bioRxiv.* https://doi.org/10.1101/2023.09.24.559207

[18] Fennell, A. B., Benau, E. M. & Atchley, R. A. (2016). A single session of meditation reduces of physiological indices of anger in both experienced and novice meditators. Consciousness and Cognition 40, 54–66.

[19] Garcia-Marques, T. & Fernandes, A. C. (2024). Meta-analysis of social presence effects on Stroop task performance. *Psychological Reports*. https://doi.org/10.1177/00332941241227150

[20] Gile, D. (1995). *Basic concepts and models for interpreter and translator training*. Amsterdam: John Benjamins.

[21] Gile, D. (1997). Conference interpreting as a cognitive management problem. In J. H. Danks, G. M. Shreve, S. B. Fountain & M. K. McBeath (Eds.), *Cognitive processes in translation and interpretation.* USA: Sage, 196–214.

[22] Gile, D. (1999). Testing the effort models' tightrope hypothesis in simultaneous interpreting-A contribution. *Hermes* 23, 153–172.

[23] Gile, D. (2009). B*asic concepts and models for interpreter and translator training (Rev. ed.)*. Amsterdam: John Benjamins.

[24] Gile, D. (2016). The Effort Models and Gravitational Model. Clarifications and update, 20.

[25] Goerling, U., Jaeger, C., Walz, A., Stickel, A., Mangler, M. & Van Der Meer, E. (2014). The efficacy of short-term psycho-oncological interventions for women with gynaecological cancer: a randomized study. *Oncology* 87 (2), 114–124.

[26] Goral, M., Naghibolhosseini, M. & Conner, P. (2013). Asymmetric inhibitory treatment effects in multilingual aphasia. *Cognitive Neuropsychology* 30 (7– 8), 564–577. https://doi.org/10.1080/02643294.2013.878692

[27] Gupta, P. K., Malhotra, N., Goel, P., Thimmapuram, J. & Krishna, P. (2023). Effect of heartfulness meditation program on perceived stress and satisfaction with life of female students. *Frontiers in Psychiatry* 14. https://doi.org/10.3389/fpsyt.2023.1214603

[28] Hamdan, A. C. & Vieira, M. D. (2022). Stroop Test for Parkinson's disease with deep brain stimulation: a systematic review. I*nnovations in Clinical Neuroscience* 19 (10–12), 29–34.

[29] Hawkes, T. D., Manselle, W. & Woollacott, M. H. (2014). Cross-sectional comparison of executive attention function in normally aging long-term Tai Chi, meditation, and aerobic fitness practitioners versus sedentary adults. *Journal of Alternative and Complementary Medicine* 20 (3), 178–184. https://doi.org/10.1089/acm.2013.0266

[30] Hervais-Adelman, A. & Babcock, L. (2019). The neurobiology of simultaneous interpreting: where extreme language control and cognitive control intersect. Bilingualism *Language and Cognition* 23 (4), 740–751. https://doi.org/10.1017/s1366728919000324

[31] Hild, A. (2014). The role of self-regulatory processes in the development of interpreting expertise. *Translation and Interpreting Studies. The Journal of the American Translation and Interpreting Studies Association* 9 (1), 128–149.

[32] Hoge, E. A., Chen, M. M., Orr, E., Metcalf, C. A., Fischer, L. E., Pollack, M. H., De Vivo, I. & Simon, N. M. (2013). Loving-kindness meditation practice associated with longer telomeres in women. *Brain, Behavior, and Immunity* 32, 159–163. https://doi.org/10.1016/j.bbi.2013.04.005

[33] Ivars, A. J. & Calatayud, D. P. (2013). Mindfulness training for interpreting students. *Lebende Sprachen* 58 (2), 341–365. http://doi.org/10.1515/les-2013-0020

[34] Jankowiak, K., Rataj, K. & Naskrecki, R. (2017). To electrify bilingualism: electrophysiological insights into bilingual metaphor comprehension. *PLOS One* 12 (4), e0175578. https://doi.org/10.1371/journal.pone.0175578

[35] Johnson, J. E. (2016). *Effect of mindfulness training on interpretation exam performance in graduate students in interpreting*. PhD dissertation, University of San Francisco.

[36] Johnson, J. E. (2021). Mindfulness training for conference interpreters. In M. Albl-Mikasa & E. Tiselius (Eds.), The Routledge handbook of conference interpreting. UK: Routledge, 564–580.

[37] Karrasch, S., Bongartz, W., Behnke, A., Matits, L. & Kolassa, I. (2022). The effects of a single relaxation hypnosis session on mental stress in chronically stressed individuals. Zeitschrift Für Klinische Psychologie Und Psychotherapie 51 (3–4), 247–262. https://doi.org/10.1026/1616-3443/a000679

[38] Kim, M. (2023). Effects of a meditation-based healing program on stress level, stress vulnerability, and sleep quality of fire officers. *Fire Science and Engineering* 37 (5), 81–88. https://doi.org/10.7731/kifse.18bb295a

[39] Korpal, P. (2021). Stress and emotion in conference interpreting. In M. Albl-Mikasa & E. Tiselius (Eds.), *The Routledge handbook of conference interpreting*. UK: Routledge, 401–413.

[40] Kroll, J. F., Bobb, S. C. & Hoshino, N. (2014). Two languages in mind: bilingualism as a tool to investigate language, cognition, and the brain. Current Directions in Psychological Science 23 (3) 159–163. https://doi.org/10.1177/0963721414528511

[41] Kunati, P., Singh, M. S. B., Sharvani, N. & Kiranmayi, V. S. (2023). Effect of heartfulness meditation on cortisol levels and vital parameters in healthy female medical students: a prospective longitudinal study. *Journal of Clinical and Diagnostic Research* 17 (4), CC05–CC08.

[42] Kushner, K. & Marnocha, M. (2008). Meditation and relaxation. In W. T. O'Donohue & N. A. Cummings (Eds.), *Evidence-based adjunctive treatments*. Academic Press, 177–205.

[43] Lemos, I., Carvalho, J., Mendes, M. & Brys, I. (2021). Mindfulness and relaxation: the effects of a program with university hospital workers. Estudos De Psicologia (Campinas) 38. https://doi.org/10.1590/1982-0275202138e190128

[44] Liu, Z. (2023). Lexical density, lexical diversity, and lexical sophistication in simultaneously interpreted texts: a cognitive perspective. Frontiers in Psychology 14. https://doi.org/10.3389/fpsyg.2023.1276705

[45] Loziak, A. (2022). Mindfulness or relaxation: what is more effective for work stress? literature review. *Psychology & Its Contexts* 13 (1), 33–45. https://doi.org/10.15452/psyx.2022.13.0003

[46] Masih, T., Dimmock, J. A. & Guelfi, K. J. (2019). The effect of a single, brief practice of progressive muscle relaxation after exposure to an acute stressor on subsequent energy intake. Stress and Health 35 (5), 595–606.

[47] Mosca, M. & de Bot, K. (2017). Bilingual language switching: production vs. recognition. Frontiers in Psychology 8, 934. https://doi.org/10.3389/fpsyg.2017.00934

[48] Nuño, L., Gómez-Benito, J., Carmona, V. R. & Pino, O. (2021). A systematic review of executive function and information processing speed in major depression disorder. *Brain Sciences* 11 (2), 147. https://doi.org/10.3390/brainsci11020147

[49] Olex, S., Newberg, A. & Figueredo, V. M. (2013). Meditation: should a cardiologist care? *International Journal of Cardiology* 168 (3), 1805–1810.

[50] Parris, B. A., Hasshim, N., Wadsley, M., Augustinova, M. & Ferrand, L. (2022). The loci of Stroop effects: a critical review of methods and evidence for levels of processing contributing to color-word Stroop effects and the implications for the loci of attentional selection. *Psychological Research* 86 (4), 1029–1053. https://doi.org/10.1007/s00426-021-01554-x

[51] Pascoe, M. C., Thompson, D. R., Jenkins, Z. M. & Ski, C. F. (2017). Mindfulness mediates the physiological markers of stress: systematic review and meta-analysis. *Journal of Psychiatric Research* 95, 156–178.

[52] Patel, K. D. & Pollock, J. (2018). T*he heartfulness way: heart-based meditations for spiritual transformation.* USA: New Harbinger Publications.

[53] Patel, M. P. (2014). A study to assess the effectiveness of progressive muscle relaxation therapy on stress among staff nurses working in selected hospitals at Vadodara City. *IOSR Journal of Nursing and Health Science* 3 (3), 34–59. https://doi.org/10.9790/1959-03323459

[54] Philip, S., Thimmapuram, J., Gupta, H., Fatima, T., Rahate, S., Yeram, N., Thakur, K. & Thakur, M. (2023). An experimental prospective study on effectiveness of brief heartfulness-based start 'U'p program on anxiety and perceived stress in allied health students. *Journal of Health and Allied Sciences NU*. https://doi.org/10.1055/s-0043-1768588

[55] Pombeiro, I., Moura, J., Pereira, M. & Carvalho, E. (2022). Stress-reducing psychological interventions as adjuvant therapies for diabetic chronic wounds. Current Diabetes Reviews 18 (3). https://doi.org/10.2174/1573399817666210806112813

[56] Prakash, R., Dubey, I., Abhishek, P., Gupta, S. K., Rastogi, P. & Siddiqui, S. V. (2010).

[57] Long-term Vihangam Yoga meditation and scores on tests of attention. Perceptual and

[58] Motor Skills 110 (3), 1139–1148.

[59] Raghavendra, B. & Singh, P. (2016). Immediate effect of yogic visual concentration on cognitive performance. *Journal of Traditional and Complementary Medicine* 6 (1), 34–36. https://doi.org/10.1016/j.jtcme.2014.11.030

[60] Rubin, M., Fischer, C. M. & Telch, M. J. (2022). Efficacy of a single session mindfulness based intervention. Preprint. https://doi.org/10.21203/rs.3.rs-2148468/v1

[61] Rubin, M., Fischer, C. M. & Telch, M. J. (2024). Efficacy of a single session mindfulness based intervention: a randomized clinical trial. *PLOS One* 19 (3), e0299300.

[62] Sankar Sylapan, B., Nair, A. K., Jayanna, K., Mallipeddi, S., Sathyanarayana, S. & Kutty, B. M. (2020). Meditation, well-being and cognition in heartfulness meditators: a pilot study. *Consciousness and Cognition* 86, 103032. 10.1016/j.concog.2020.103032

[63] Scarpina, F. & Tagini, S. (2017). The Stroop color and word test. *Frontiers in Psychology* 8. https://doi.org/10.3389/fpsyg.2017.00557

[64] Schlatter, S., Louisy, S., Canada, B., Thérond, C., Duclos, A., Blakeley, C., Lehot, J. J., Rimmelé, T., Guillot, A., Lilot, M. & Debarnot, U. (2022). Personality traits affect anticipatory stress vulnerability and coping effectiveness in occupational critical care situations. *Scientific Reports* 12 (1). https://doi.org/10.1038/s41598-022-24905-z

[65] Sleimen-Malkoun, R., Devillers-Réolon, L. & Temprado, J. (2023). A single session of mindfulness meditation may acutely enhance cognitive performance regardless of meditation experience. PLOS One 18 (3), e0282188. https://doi.org/10.1371/journal.pone.0282188

[66] Sisco, S. M., Slonena, E., Okun, M. S., Bowers, D. & Price, C. C. (2016). Parkinson's disease and the Stroop color word test: processing speed and interference algorithms. Clinical Neuropsychologist 30 (7), 1104–1117. https://doi.org/10.1080/13854046.2016.1188989

[67] Stoet, G. (2010). PsyToolkit - A software package for programming psychological experiments using Linux. Behavior Research Methods 42 (4), 1096–1104.

[68] Stoet, G. (2017). PsyToolkit: A novel web-based method for running online questionnaires and reaction-time experiments. *Teaching of Psychology* 44 (1), 24–31.

[69] Subramanian, S., Sripad, V., Dharmalingam, A., Guhan, V., Kalidoss, V., Gautam, N., Shankaralingappa, A., Rajendran, R. & Mohiuddin, S. (2022). Effect of 4-week heartfulness meditation on stress scores, sleep quality, and oxidative and inflammatory biochemical parameters in COVID-19 patients after completion of standard treatment – a randomized controlled trial. *International Journal of Yoga* 15 (3), 195. https://doi.org/10.4103/ijoy.ijoy_95_22

[70] Thakur, M., Patil, Y., Philip, S. T., Hamdule, T., Thimmapuram, J., Vyas, N. & Thakur, K. (2023). Impact of heartfulness meditation practice on anxiety, perceived stress, well-being, and telomere length. Frontiers in Psychology 14. https://doi.org/10.3389/fpsyg.2023.1158760

[71] Van't Westeinde, A. & Patel, K. D. (2022). Heartfulness meditation: a yogic and neuroscientific perspective. Frontiers in Psychology 13, 806131. https://doi.org/10.3389/fpsyg.2022.806131

[72] Wodniecka, Z., Szewczyk, J., Kałamała, P., Mandera, P. & Durlik, J. (2018). When a second language hits a native language. What ERPS (do and do not) tell us about language retrieval difficulty in bilingual language production. Neuropsychologia 141. https://doi.org/10.31234/osf.io/yqp8t

[73] Yerkes, R. M. & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology* 18, 459–482.

[74] Zhang, Q., Wang, Z., Wang, X., Liu, L., Zhang, J. & Zhou, R. (2019). The effects of different stages of mindfulness meditation training on emotion regulation. Frontiers in Human Neuroscience 13. https://doi.org/10.3389/fnhum.2019.00208

[75] Zhang, Z., Olszewska-Guizzo, A., Husain, S. F., Bose, J., Choi, J., Tan, W., Wang, J., Xuan Tran, B., Wang, B., Jin, Y. & Ho, R. (2020). Brief relaxation practice induces significantly more prefrontal cortex activation during arithmetic tasks comparing to viewing greenery images as revealed by functional near-infrared spectroscopy (fNIRS). *International Journal of Environmental Research and Public Health* 17 (22), 8366. https://doi.org/10.3390/ijerph17228366