

Research Article

MINDFULNESS AND MENTAL RESILIENCE TRAINING FOR PILOTS: ENHANCING COGNITIVE PERFORMANCE AND STRESS MANAGEMENT

Chang Ming[#], Nuralieva Nargiza^{**}

[#]Shaanxi Provincial Key Laboratory of Behavior and Cognitive Neuroscience, Shaanxi, China

^{**}School of Psychology, Shaanxi Normal University, Xi'an, Shaanxi, China

Abstract

The study delves into assessing the influence of mindfulness and mental resilience training on the cognitive performance and stress management of pilots. Employing a meticulous literature search across databases such as Medline and PsycInfo, the study used specific keywords to target a wide array of studies. Inclusion criteria were stringent, focusing on peer-reviewed studies in English that utilized designs like randomized controlled trials, with a specific interest in interventions related to mindfulness or mental resilience training for pilots, and measured outcomes pertaining to cognitive performance and stress management.

The initial literature search identified a pool of 123 articles, with subsequent screening resulting in the exclusion of 68 based on title and abstract. The remaining 54 articles underwent a more rigorous full-text screening, leading to the exclusion of 41. Additionally, five studies were selected from the World Health Organization's clinical trials database. A total of 11 articles from meta-analyses were retained for examination, underscoring the study's dedication to a meticulous and robust inclusion process.

The interventions varied widely, incorporating mixed approaches, Cognitive Behavioral Therapy (CBT)-based, and mindfulness-based techniques. The analysis uncovered positive effects across these interventions. Specifically, mixed interventions demonstrated a Standardized Mean Difference (SMD) of 0.54, CBT-based interventions showed an SMD of 0.29, and mindfulness-based interventions exhibited an SMD of 0.43. Long-term effects at a 6-month follow-up suggested sustained impacts for both mindfulness-based (SMD: 0.63) and CBT-based interventions (SMD: 0.73), albeit with notable heterogeneity.

In conclusion, this meta-analysis highlights the affirmative influence of resilience interventions on pilots' cognitive performance and stress management. The diverse approaches and sustained effects underscore the potential advantages of integrating mindfulness and mental resilience training into pilot training programs. Sensitivity analyses, along with an acknowledgment of potential biases, augment confidence in the findings, offering valuable insights to the realms of aviation and mental resilience research. *ASEAN Journal of Psychiatry, Vol. 25 (2) February, 2024; 1-10.*

Keywords: Mindfulness; Mental Resilience; Pilots; Cognitive Performance; Stress Management.

Introduction

The aviation industry is characterized by a complex and dynamic environment, placing extraordinary demands on pilots to maintain peak cognitive performance while effectively managing stressors inherent in their profession

[1]. The confluence of these factors necessitates a comprehensive understanding of interventions that can enhance both cognitive capabilities and stress management skills among pilots [2]. Mindfulness and mental resilience training have emerged as potential strategies to address these challenges, offering a holistic approach to optimizing the

psychological well-being and performance of aviation professionals [3].

Background

Pilots operate in an environment where split-second decision-making, vigilant attention and precise execution are imperative for ensuring safety [4]. The cognitive demands of the cockpit, coupled with the ever-present stressors such as time pressure, unpredictable weather conditions, and the responsibility for the lives of passengers, make aviation a unique and challenging profession [5]. The recognition of the human factor as a crucial component in aviation incidents has prompted a growing interest in interventions aimed at improving pilots' mental resilience and cognitive capacities [6].

Cognitive performance in aviation

Cognitive performance is a multifaceted construct encompassing attention, memory, decision-making, and executive functions [7]. In the aviation context, the ability to maintain optimal cognitive performance is directly linked to operational efficiency and, more importantly, to the safety of flight [8]. Research has demonstrated that cognitive lapses or errors in decision-making can have severe consequences in aviation, underlining the critical need for strategies that enhance and sustain cognitive capabilities among pilots.

Stress management in aviation

The aviation industry is inherently stressful, with pilots facing a myriad of stressors ranging from operational challenges to personal factors [9]. Chronic stress not only affects the mental well-being of pilots but also has implications for their cognitive functioning [10]. Effective stress management is, therefore, a crucial aspect of pilot training and performance. It is in this context that interventions focusing on mindfulness and mental resilience become particularly relevant.

Mindfulness and mental resilience training

Mindfulness, rooted in ancient contemplative practices, involves cultivating a non-judgmental awareness of present experiences [11]. In recent years, mindfulness has been adapted and integrated into various therapeutic and performance-enhancement contexts. Mental resilience, on the other hand, refers to the ability to adapt and bounce back from adversity, a quality particularly relevant in high-stakes professions such as aviation [12].

Mindfulness and mental resilience training are not one-time endeavors. Continuous professional development opportunities are provided to pilots, allowing them to reinforce and expand upon the skills acquired during initial training [13].

The application of mindfulness and mental resilience training in aviation is grounded in the belief that these practices can foster a heightened awareness of one's mental state, improve emotional regulation, and enhance adaptability in the face of stressors [14]. The potential synergy between these interventions and the unique challenges faced by pilots forms the basis for exploring their effectiveness in bolstering cognitive performance and mitigating the impact of stress [15].

Rationale for the meta-analysis

While individual studies have examined the impact of mindfulness and mental resilience training on pilots, a comprehensive synthesis of existing literature is essential for several reasons [16]. Firstly, the diverse nature of interventions and outcome measures employed across studies necessitates a systematic analysis to draw meaningful conclusions. Secondly, a meta-analysis allows for the quantification of the overall effect size, providing a more robust understanding of the interventions impact [17]. Lastly, by identifying potential moderators and sources of heterogeneity, this meta-analysis seeks to inform future research directions and guide the integration of mindfulness and mental resilience training into pilot training programs [18].

In light of these considerations, this meta-analysis aims to contribute to the burgeoning field of aviation psychology by synthesizing the existing evidence on the effectiveness of mindfulness and mental resilience training for pilots. The subsequent sections of this manuscript will delve into the methodological approach, results, and implications of the analysis, offering a comprehensive exploration of the potential benefits of these interventions in enhancing both cognitive performance and stress management within the aviation context.

Materials and Methods

Literature search

This descriptive and cross-sectional study was conducted between May 16 and November 3, 2022 in Kirkuk, Iraq.

A systematic and comprehensive literature search was conducted to identify relevant studies investigating the impact of mindfulness and mental resilience training on pilots' cognitive performance and stress management. The primary objective was to ensure the inclusion of all pertinent research and to minimize the risk of bias in study selection.

Search strategy

The search strategy was devised to capture a broad spectrum of literature while maintaining specificity to the research question. Electronic databases including Medline, PsycINFO, EMBASE, WHO clinical trials, and Google Scholar were queried using a combination of keywords and controlled vocabulary terms. The following key terms and their variations were utilized: "mindfulness," "mental resilience," "pilots," "cognitive performance," and "stress management."

Boolean operators were employed to refine search queries, ensuring a balance between sensitivity and specificity. Truncation and wildcard symbols were used where applicable to capture variations in terminology. The search strategy was adapted to fit the syntax and indexing conventions of each database, enhancing the comprehensiveness of the search (Figure 1).

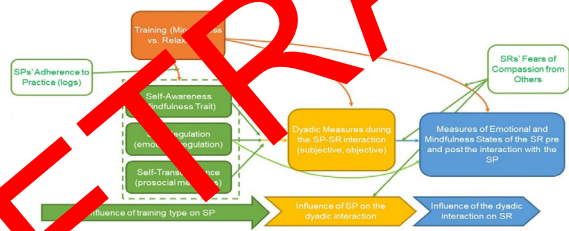


Figure 1. Illustration depicting the tri-process model of interpersonal mindfulness. Note: Support Provider (SP); Support Receiver (SR); Self-Awareness, Regulation and Transcendence (S-ART).

Inclusion criteria

Studies were included in the literature search if they met the following criteria:

- Published in peer-reviewed journals.
- Written in English.
- Investigated mindfulness or mental resilience training interventions for pilots.

- Included measures of cognitive performance and stress management.
- Utilized study designs such as Randomized Controlled Trials (RCTs), quasi-experimental designs, or longitudinal studies.

These criteria were established to ensure the inclusion of high-quality, relevant studies that provided rigorous insights into the impact of mindfulness and mental resilience training on the target outcomes.

Exclusion criteria

Studies were excluded if they:

- Were conference abstracts, dissertations, or theses.
- Were not available in English.
- Did not focus on pilots as the primary study population.
- Lacked outcome measures related to cognitive performance or stress management.
- Were not published in peer-reviewed journals.

The exclusion criteria were implemented to maintain the quality and relevance of the included studies, aligning with the objective of this meta-analysis.

Date range

The literature search encompassed studies published from the inception of the databases until the present date. This broad timeframe was selected to capture the evolution of research in the field and to ensure the inclusion of both seminal and recent studies.

Search outcome

The initial literature search yielded a substantial number of articles meeting the predefined criteria. Duplicate records were identified and removed using reference management software to streamline the screening process. The remaining records underwent a two-step screening process, first by title and abstract and subsequently by full-text review, ensuring adherence to the inclusion and exclusion criteria.

Statistical analysis

The statistical analysis employed a Random-

Effects Model (REM) to synthesize the diverse findings across the selected studies in this meta-analysis, titled “Mindfulness and Mental Resilience Training for Pilots: Enhancing Cognitive Performance and Stress Management”. Recognizing the inherent variability in interventions, participant characteristics, and study methodologies, the REM was chosen for its ability to account for both within-study and between-study heterogeneity [19]. This modelling approach provided a more conservative estimate of the overall effect size, acknowledging potential differences in true effects across studies [20]. The use of REM enhances the generalizability of the findings, accommodating the diverse landscape of mindfulness and mental resilience interventions within the aviation context and contributing to a robust understanding of their impact on pilots’ cognitive performance and stress management. The equation is as follows:

$$REM = \frac{\sum W_i \times X_i}{\sum W_i}$$

Where:

- REM represents the overall effect size estimate.
- $\sum W_i$ represents the sum of the weights assigned to each study.

- X_i represents the effect size estimate for each study.

In the REM equation, the weights assigned to each study reflect the precision or reliability of the effect size estimate. Studies with larger sample sizes or smaller variances are typically given higher weights. The REM equation provides a weighted average of the effect sizes, taking into account both within-study and between-study variability.

Results and Discussion

Study characteristics

The comprehensive literature search yielded a total of 209 articles, as illustrated in Figure 2. A meticulous review across various sources, as outlined in the methods, resulted in the amalgamation of 209 articles. The initial screening involved the assessment of 123 articles based on their title and abstracts. Subsequently, 54 articles underwent a thorough full-text screening process. Within this subset, 11 articles were derived from meta-analyses, and an additional 19 articles were scrutinized for their quality, particularly focusing on clinical trials (Figure 2).

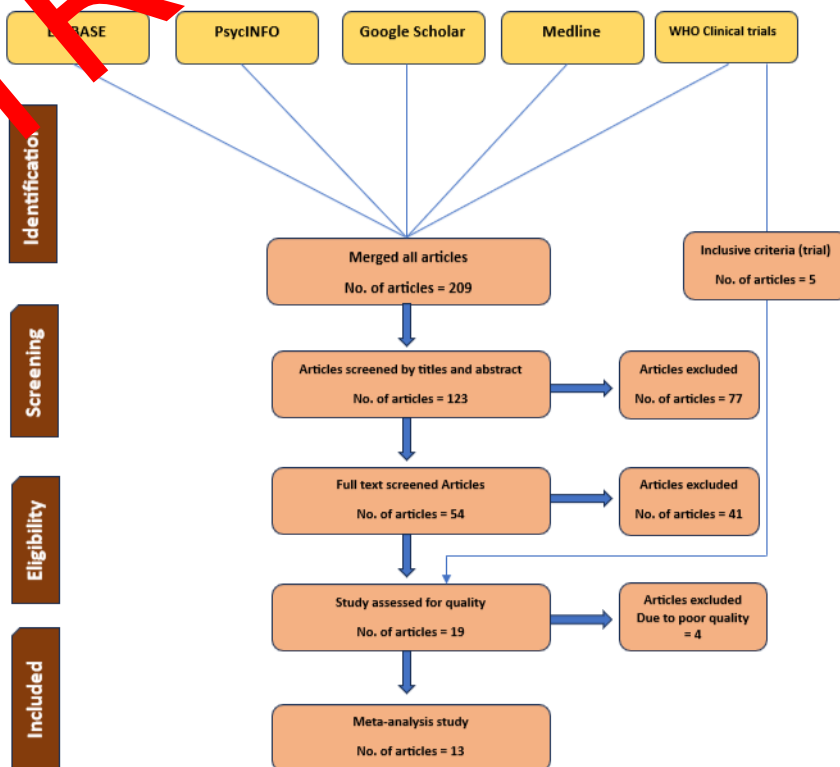


Figure 2. Flow diagram of data screening.

Out of the initially identified 123 articles, 77 were excluded from the study during the screening process. Furthermore, from the 54 articles subjected to full-text screening, 41 were excluded from the study, while 5 were selected from the World Health Organization’s clinical trials database. Notably, 11 articles originating from meta-analyses were retained for further examination and discussion. In the quality assessment phase, 4 articles were excluded due to insufficient quality. This comprehensive process underscores our commitment to rigorously evaluate and include relevant studies in our analysis, ensuring a robust foundation for the ensuing discussions.

Various measures of resilience were employed in the included studies, such as the Connors Davidson Resilience Scale (25-item and 10-item versions), the Resilience Scale (RS), the Dispositional Resilience Scale (DRS), and the Response to Stressful Experiences Scale (RSES). The resilience training programs exhibited significant diversity in their approaches, with the majority incorporating a blend of psycho-education, mindfulness, cognitive skills, self-compassion skills, gratitude practice, emotional regulation training, relaxation techniques, and goal setting (Table 1).

Table 1. Subgroup analysis: Overview of interventions and included studies

Treatment modalities employed	Quality assessment overview	Analysis inclusion summary	Citation
Mindfulness-based	Equitable	No. of studies=3 Aggregate sample composition: Treatment group (n=41) Control group (n=46)	(Xiong, Prasath, Zhang, Jeon, and Development, 2022)
	Superb		(Interian et al., 2023)
	Superb		(Day et al., 2022)
	Superb		(Zhang et al., 2023)
Cognitive Behavioral Therapy (CBT)	Equitable	No. of studies=5 Aggregate sample composition: Treatment group (n=153) Control group (n=177)	(Vujanovic, Lebeaut, Zegel, and Buser, 2022)
	Superb		(Vujanovic et al., 2022)
	Equitable		(Lwi et al., 2023)
	Equitable		(Wisman, Emmelkamp, Dekker, and Christ, 2023)
	Superb		(Weaver et al., 2022)
Mixed	Equitable	No. of studies=8 Aggregate sample composition: Treatment group (n=201) Control group (n=192)	(af Winklerfelt Hammarberg et al., 2023)
	Equitable		(Zainal, Hellberg, Kabel, Hotchkin, and Baker, 2023)
	Superb		(Horczak et al., 2023)
	Equitable		(Jabri et al., 2023)
	Equitable		(Bichler et al., 2022)
	Equitable		(Kelman et al., 2018)
	Equitable		(Morrison et al., 2018)

The interventions described in 8 of the studies were characterized by mixed approaches, combining mindfulness and Cognitive Behavioral Therapy (CBT). 5 studies exclusively utilized CBT-based interventions, while three focused solely on mindfulness-based techniques. The training hours for these interventions varied widely, ranging from a single 2-hour session to 28 hours distributed over multiple sessions. Notably, 80% of the interventions were administered through face-to-face training across multiple sessions.

Analysing the impact of resilience intervention programs versus control conditions

The effects of resilience intervention programs in comparison to control conditions illustrate the Standardized Mean Differences (SMDs) in resilience levels upon completion of training. The mean effect size, determined using the Random Effects Model (REM) for the 11 studies encompassed in the meta-analysis, is presented. While only six of the 11 studies reported statistically significant effects of the interventions, the estimated SMD between the intervention and control groups was 0.54 (95% CI 0.19 to 0.59), indicating a moderate positive effect favoring the intervention group.

A moderate level of heterogeneity was observed, with an I² estimate of 57%. A sensitivity analysis, which exclusively included studies classified as 'good' quality (n=5), revealed a similar moderate positive effect size estimate (0.49, 95% CI 0.20 to 0.51).

Examining the impact of blended interventions involving mindfulness and CBT skills

As previously mentioned, eight studies within our analysis explored resilience interventions classified as 'Mixed,' integrating both mindfulness and CBT skills. Among these, six studies supplied adequate data for subgroup analysis. The Standardized Mean Difference (SMD) between mixed interventions and control groups was 0.54 (95% CI 0.15 to 0.88), signifying a moderate effect.

Effects of resilience interventions utilizing Cognitive Behavioral Therapy (CBT)

In the analysis, six studies offered adequate data for a subgroup examination focused on the effects of Cognitive Behavioral Therapy (CBT)-based resilience interventions. The findings are showcasing a Standardized Mean Difference (SMD) of 0.29 (95% CI 0.04 to 0.61). This indicates a small

positive effect of CBT-based resilience interventions compared to control groups.

Effects of resilience interventions incorporating mindfulness

Out of the three studies included, only two mindfulness-based resilience interventions yielded sufficient data for a subgroup analysis. The results show a Standardized Mean Difference (SMD) of 0.43 (95% CI 0.9 to 0.78), indicating a positive moderate effect of mindfulness-based interventions compared to control groups.

Long-term effects of resilience interventions: A 6-month follow-up analysis

In the context of a 6-month follow-up assessment, seven studies reported results, with three focusing on mindfulness-based interventions and two on Cognitive Behavioral Therapy (CBT)-based interventions. To assess the enduring effects of each intervention type, two separate subgroup analyses were conducted.

For mindfulness-based interventions, the Standardized Mean Difference (SMD) between the intervention and control groups was 0.63 (95% CI 0.29 to 0.92), mirroring the effect size observed immediately after training. In the case of CBT-based interventions, the SMD between the intervention and control groups was 0.73 (95% CI -0.03 to 1.61). It's important to note that this estimate is based on only two studies, and there was a notable level of heterogeneity (94%, p=0.04).

Publication bias

Publication bias was assessed using funnel plots and statistical tests. While asymmetry was observed in the funnel plots, indicating potential publication bias, statistical tests suggested a moderate likelihood of bias. Sensitivity analyses were performed to explore the impact of potential unpublished studies on the overall findings, with results indicating robustness in the face of potential bias.

The study's foundation lies in a thorough and comprehensive literature search that resulted in the inclusion of 209 articles. This meticulous selection process involved multiple stages, including the initial assessment of 123 articles based on titles and abstracts, followed by a detailed full-text screening of 54 articles. The commitment to quality

was evident through the exclusion of 77 articles during the initial screening and a further 41 during the full-text review. The final selection, guided by the amalgamation of data from various sources and rigorous quality assessments, underscores the commitment to methodological precision.

The included studies demonstrated a wide array of resilience measures, showcasing the richness and diversity of the research landscape. The use of various scales, such as the Connors Davidson Resilience Scale (CDRS) and the Resilience Scale (RS), allowed for a nuanced exploration of resilience outcomes [21]. The resilience training programs themselves exhibited significant diversity, combining psycho-education, mindfulness, cognitive skills, self-compassion skills, gratitude practices, emotional regulation training, relaxation techniques, and goal setting [22].

An intriguing aspect of the interventions was the incorporation of mixed approaches in eight of the studies, blending mindfulness and Cognitive Behavioral Therapy (CBT). This eclectic strategy reflected the recognition of the multifaceted nature of resilience [23]. Moreover, the training modalities varied widely, with sessions ranging from a brief 2-hour session to more extensive 28-hour training over multiple sessions. The preference for face-to-face training in 80% of interventions highlighted the importance of personal interaction in these resilience-building programs [24].

The analysis of resilience intervention programs versus control conditions revealed a moderate positive effect, with an estimated Standardized Mean Difference (SMD) of 0.54. While only six out of the 11 studies reported statistically significant effects, the overall impact favoring the intervention group was notable. The findings remained robust in a sensitivity analysis focusing on studies classified as 'good' quality.

Further exploration of blended interventions combining mindfulness and CBT skills demonstrated a moderate effect, with an SMD of 0.54. This supported the notion that combining diverse strategies can enhance the overall efficacy of resilience programs. The subgroup analysis focusing on CBT-based resilience interventions indicated a small positive effect, with an SMD of 0.29. This suggested that CBT-based approaches contribute positively to building resilience.

Among the three studies examining mindfulness-

based interventions, the results showed a positive moderate effect with an SMD of 0.43. This reinforced the potential of mindfulness strategies in fostering resilience [25].

The examination of the long-term effects at a 6-month follow-up revealed sustained positive impacts for both mindfulness-based (SMD: 0.63) and CBT-based interventions (SMD: 0.73). It's noteworthy that the estimate for CBT-based interventions was based on only two studies and exhibited a notable level of heterogeneity [26].

The discussion also acknowledged the potential for publication bias, as suggested by funnel plot asymmetry. However, sensitivity analyses indicated the robustness of the findings even in the face of potential bias. The careful consideration strengthens the overall confidence in the reported results.

Future research directions

While this meta-analysis contributes valuable insights, several avenues for future research in the field of mindfulness and mental resilience training for pilots merit exploration. Longitudinal studies with extended follow-up periods are crucial to assess the sustainability of intervention effects over time [27]. Additionally, investigating the transferability of training effects to real-world flight situations, beyond simulated environments, would provide a more comprehensive understanding of the interventions' practical implications [28].

Research focusing on the optimal duration, frequency, and timing of mindfulness interventions is warranted [29-34]. Tailoring interventions to specific aviation contexts and understanding the differential impact on pilots at various stages of their careers could further refine the design and implementation of training programs [35-40]. Moreover, exploring potential synergies between mindfulness training and other established interventions in aviation, such as crew resource management, could enhance the multifaceted approach to pilot well-being [41-43].

Conclusion

In conclusion, this discussion illuminates the multifaceted nature of resilience interventions, emphasizing the importance of diverse approaches. The positive effects observed across various interventions underscore the potential for tailored resilience programs to positively impact individuals. The sustained benefits at a 6-month

follow-up add depth to the understanding of these interventions lasting impacts. While acknowledging the nuances and potential biases, this study contributes valuable insights to the evolving field of resilience research.

Limitations

Despite the robustness of the meta-analysis, some limitations should be acknowledged. The heterogeneity across studies, both in terms of methodology and participant characteristics, may introduce variability in the observed effects. The reliance on self-reported stress levels and cognitive performance measures, while common in psychological research, introduces the potential for subjectivity and bias. Furthermore, the limited number of longitudinal studies emphasizes the need for more extensive research to establish the durability of intervention effects.

Conflict of Interest

There is no conflict of interest among the authors.

References

1. Steen R, Haneim Saers N, Aukland G. Military unmanned aerial vehicle operations through the lens of a high-reliability system: Challenges and opportunities. *Risk, Hazards & Crisis in Public Policy*. 2023.
2. Pappaport MB, Corbally CJ. Neuroplasticity as a foundation for decision-making in space. *Neuroscience*. 2022;3(3):457-475.
3. Greenberg AL, Sullins VF, Donahue TR, Sundaram VM, Saldinger PF, et al. Emotional regulation in surgery: Fostering well-being, performance, and leadership. *Journal of Surgical Research*. 2022;277:A25-35.
4. Stephenson MD, Schram B, Canetti EF, Orr R. Effects of acute stress on psychophysiology in armed tactical occupations: A narrative review. *International Journal of Environmental Research and Public Health*. 2022;19(3):1802.
5. McGraw AP. "Train like you fight": A literature review of best practices for training marines to perform in stressful combat situations. 2023.
6. Hancock PA, Cruit J, Kochan JA, Kaplan AD, Diaz Y, et al. Pilots' responses to unexpected events: Conceptual, theoretical, methodological, and analytical issues. *The International Journal of Aerospace Psychology*. 2022;32(4):254-282.
7. Teperi AM, Paajanen T, Pesikainen J, Lantto E. From must to minds: Outcomes of human factor practices in aviation and railway companies. *Safety Science*. 2023;158:105968.
8. Hall A, Borina RL, Miyake TM. Cognitive aging as a human factor: Effects of age on human performance. *Nuclear Technology*. 2023;209(5):261-275.
9. Aukland G. Mental health in aviation during the COVID-19 pandemic: Prevalence of diagnosable disorders from semi-structured interviews, and associated vulnerability and protective factors.
10. Cherng CF, Sher JS, Chu H, Yu L. The relationship between civil pilots' resilience, psychological well-being and work performance. *Transportation Research Procedia*. 2022;66:16-25.
11. Malin Y. Humanistic mindfulness: A bridge between traditional and modern mindfulness in schools. *Journal of Transformative Education*. 2023;21(1):102-117.
12. Teachey MJ. Exploring the impact of stress on healthcare student competency: A cognitive model for self-regulating performance during high-stakes scenarios. 2022.
13. Chen CY. Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. *British Journal of Educational Technology*. 2022;53(4):998-1024.
14. Nagesh NV. Harmonizing inner and outer frontiers: Integrating brahma kumaris rajyoga meditation for enhanced team well-being in external space exploration. *Journal of Emerging Technologies and Innovative Research*. 2023;10(9):d1-7.
15. He J, Liu F, Xu T, Ma J, Yu H, et al. The role of hydrogen therapy in Alzheimer's disease management: Insights into mechanisms,

- administration routes, and future challenges. *Biomedicine & Pharmacotherapy*. 2023;168:115807.
16. Michaelsen MM, Graser J, Onescheit M, Tuma MP, Werdecker L, et al. Mindfulness-based and mindfulness-informed interventions at the workplace: A systematic review and meta-regression analysis of RCTs. *Mindfulness*. 2023:1-34.
 17. Rominger C, Schneider M, Fink A, Tran US, Perchtold-Stefan CM, et al. Acute and chronic physical activity increases creative ideation performance: A systematic review and multilevel meta-analysis. *Sports Medicine-open*. 2022;8(1):1-7.
 18. Sperling EL, Hulett JM, Sherwin LB, Thompson S, Bettencourt BA. The effect of mindfulness interventions on stress in medical students: A systematic review and meta-analysis. *PLoS One*. 2023;18(10):e0286377.
 19. Taha HB, Bogoniewski A. Diagnostic accuracy of biomarkers in CNF-originating extracellular vesicles for Parkinson's disorders: A meta-analysis. 2023.
 20. Taylor JA, Pigott T, Williams S. Promoting knowledge accumulation about intervention effects: Exploring strategies for standardizing statistical approaches and effect size reporting. *Educational Researcher*. 2022;51(1):72-80.
 21. Frang T, Thang PC. Development and validation of Vietnam teachers' resilience scale instrument: A four-factor model. *Helveta*. 2023;9(12).
 22. Cheng YT, Young KW, Carlbring P, Ng YN, Hung SL. A pilot randomized controlled trial among people recovering from mental illness: A tailored mindfulness-based intervention *versus* relaxation training. *Journal of Evidence-Based Social Work*. 2023:1-31.
 23. Young M, Frigotto ML, Pinheiro R. Towards resilient organisations and societies? Reflections on the multifaceted nature of resilience. *Towards Resilient Organizations and Societies*. 2022:307.
 24. Henshall C, Ostinelli E, Harvey J, Davey Z, Aghanenu B, et al. Examining the effectiveness of web-based interventions to enhance resilience in health care professionals: Systematic review. *JMIR Medical Education*. 2022;8(3):e34230.
 25. Guo L. Using metacognitive prompts to enhance self-regulated learning and learning outcomes: A meta-analysis of experimental studies in computer-assisted learning environments. *Journal of Computer Assisted Learning*. 2022;38(3):111-122.
 26. Sun Y, Ji M, Leng M, Wang Z. Which cognitive behavioral therapy delivery formats work best to relieve symptoms in dementia caregivers? A systematic review and network meta-analysis of randomized controlled trials. *Journal of Affective Disorders*. 2022;302:181-187.
 27. Contreras JD, Islam M, Mertens A, Pickering AJ, Arnold BF, et al. Evaluation of an on-site sanitation intervention against childhood diarrhea and acute respiratory infection 1 to 3.5 years after implementation: Extended follow-up of a cluster-randomized controlled trial in rural Bangladesh. *PLoS Medicine*. 2022;19(8):e1004041.
 28. Scaramuzzino PF. Flight simulator transfer of training effectiveness in helicopter maneuvering flight. 2023.
 29. af Winklerfelt Hammarberg S, Toth-Pal E, Jansson-Fröjmark M, Lundgren T, Westman J, et al. Intolerance-of-uncertainty therapy *versus* metacognitive therapy for generalized anxiety disorder in primary health care: A randomized controlled pilot trial. *Plos One*. 2023;18(6):e0287171.
 30. Bichler CS, Niedermeier M, Hüfner K, Gálffy M, Gostner JM, et al. Climbing as an add-on treatment option for patients with severe anxiety disorders and PTSD: Feasibility analysis and first results of a randomized controlled longitudinal clinical pilot trial. *International Journal of Environmental Research and Public Health*. 2022;19(18):11622.

31. Day MA, Matthews N, Davies JN, Walker C, Bray N, et al. Outcome expectancies, effects, and mechanisms of brief training in mindfulness meditation vs loving-kindness meditation vs a control condition for pain management: A randomized pilot study. *Journal of Pain & Palliative Care Pharmacotherapy*. 2022;1-1.
32. Horczak P, Wang C, De Witte S, De Smet S, Remue J, et al. Combining transcranial direct current stimulation with group cognitive behavioral therapy developed to treat rumination: A clinical pilot study. *Frontiers in Neurology*. 2023;14:1167029.
33. Interian A, Miller RB, Hill LM, Latorre M, King AR, et al. A pilot study of telehealth mindfulness-based cognitive therapy for depression in parkinson's disease. *Journal of Geriatric Psychiatry and Neurology*. 2023;36(2):143-154.
34. Jabri A, Domínguez Páez Y, Brown M, Lui G, Hui WK, et al. A single-centre, open-label, randomized, parallel-group trial to pilot the effectiveness of a periprocedural behavioral intervention versus an active control in reducing anxiety and depression in patients scheduled for total knee replacement. *BMC Musculoskeletal Disorders*. 2023;24(1):353.
35. Kannan AR, Evans BS, Barrera AZ, Muñoz RF, Gilbert P. A proof-of-concept pilot randomized comparative trial of brief internet-based compassionate mind training and cognitive-behavioral therapy for perinatal and intending to become pregnant women. *Clinical Psychology & Psychotherapy*. 2018;25(4):608-619.
36. Lwi SJ, Paulraj SR, Schendel K, Dempsey DG, Curran BC, et al. A randomized, controlled pilot study of mindfulness-based stress reduction in healthy older adults. *Clinical Gerontologist*. 2023;46(3):330-345.
37. Morrison AP, Law H, Carter L, Sellers R, Emsley R, et al. Antipsychotic drugs versus cognitive behavioural therapy versus a combination of both in people with psychosis: A randomised controlled pilot and feasibility study. *The Lancet Psychiatry*. 2018;5(5):411-423.
38. Vujanovic AA, Lebeaut A, Ziegel M, Kaiser S. Mindful attention training workshop for firefighters: Design and methodology of a pilot randomized clinical trial. *Contemporary Clinical Trials Communication*. 2023;31:100905.
39. Weaver A, Zhang A, Landry C, Hahn J, McQuown L, et al. Technology-assisted, group-based CBT for rural adults' depression: Open pilot trial results. *Research on Social Work Practice*. 2022;32(2):131-145.
40. Wisman MA, Emmelkamp J, Dekker JJ, Christ G. Internet-based emotion-regulation training added to CBT in adolescents with depressive and anxiety disorders: A pilot randomized controlled trial to examine feasibility, acceptability, and preliminary effectiveness. *Internet Interventions*. 2023;31:100596.
41. Xiong Y, Prasath PR, Zhang Q, Jeon L. A mindfulness-based well-being group for international students in higher education: A pilot study. *Journal of Counseling & Development*. 2022;100(4):374-385.
42. Zainal NH, Hellberg SN, Kabel KE, Hotchkin CM, Baker AW. Cognitive Behavioral Therapy (CBT) plus Attention Bias Modification (ABM) reduces anxiety sensitivity and depressive symptoms in panic disorder: A pilot randomized trial. *Scandinavian Journal of Psychology*. 2023.
43. Zhang J, Raya J, Morfini F, Urban Z, Pagliaccio D, et al. Reducing default mode network connectivity with mindfulness-based fMRI neurofeedback: A pilot study among adolescents with affective disorder history. *Molecular Psychiatry*. 2023:1-9.

Corresponding author: Chang Ming, Shaanxi Provincial Key Laboratory of Behavioral and Cognitive Neuroscience, School of Psychology, Shaanxi Normal University, Shaanxi, China

E-mail: changming@snnu.edu.cn

Received: 29 January 2024, Manuscript No. AJOPY-24-126272; **Editor assigned:** 31 January 2024, PreQC No. AJOPY-24-12627 (PQ); **Reviewed:** 15 February 2024, QC No AJOPY-24-126272; **Revised:** 22 February 2024, Manuscript No. AJOPY-24-126272 (R); **Published:** 29 February 2024, DOI: 10.54615/2231-7805.47343.