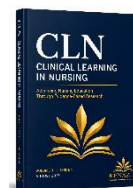


Contents lists available at [Kenazer](https://journal.kenazer.com/index.php/cln/index)

Clinical Learning in Nursing

Journal Homepage: <https://journal.kenazer.com/index.php/cln/index>

Changes in Anxiety Following a Brief School-Based Butterfly Hug Program Among Indonesian Ninth-Grade Students: A One-Group Pretest-Posttest Pilot Study

Wahyu Wulandari^{1*}, Arifal Aris¹, Abdul Rokhman¹

1. Department of Nursing, Faculty of Health Sciences, Universitas Muhammadiyah Lamongan, Lamongan, Indonesia

ARTICLE INFO

Article history:
Received 9 July 2026
Received in revised form
14 July 2026
Accepted 30 July 2026
Available online xxxx

Keywords:
Adolescents; anxiety;
Butterfly Hug; bilateral
stimulation; school
nursing.

ABSTRACT

Background: Adolescent anxiety can interfere with concentration, sleep, school participation, and academic functioning. Brief self-regulation strategies that can be delivered in schools without equipment may be useful. Still, evidence for the Butterfly Hug - a self-administered form of alternating tactile bilateral stimulation - remains limited, particularly among Indonesian junior-high-school students.

Objective: To examine within-group change in anxiety scores following a brief school-based Butterfly Hug program among ninth-grade students.

Methods: This one-group pretest-posttest pilot study included 91 ninth-grade students selected through purposive sampling at a public junior high school in Lamongan, Indonesia. Participants completed three weekly Butterfly Hug sessions over three weeks. Anxiety was assessed before the first session and after the final session using the 14-item Hamilton Anxiety Rating Scale (HARS). Because score distributions were non-normal, paired change was examined with the Wilcoxon signed-rank test. Effect size was calculated as $r = |Z|/\sqrt{N}$.

Results: Mean HARS scores were 27.55 (SD 5.75; 95% CI 26.35-28.75; median 26, IQR 8) at pretest and 11.98 (SD 3.95; 95% CI 11.15-12.80; median 12, IQR 5) at posttest. Ninety participants had lower posttest scores, one had a higher score, and none were tied. The Wilcoxon test indicated a statistically detectable within-group difference ($Z = -8.284$, $p < .001$), with a large rank-based effect size ($r = .87$).

Conclusion: Participation in the brief Butterfly Hug program was associated with lower immediate post-intervention anxiety scores. Because the study had no comparison group and used purposive sampling with no longer-term follow-up, the findings do not establish causal effectiveness. Controlled studies using adolescent-validated measures and longer follow-up are required.

* Corresponding author: * syahronianam641@gmail.com (w.dari)

© 2026 The Author(s). Published by Kenazer Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>)

Introduction

Adolescence is a formative period in which educational demands, peer relationships, family expectations, and developmental transitions can interact with vulnerability to emotional distress. The World Health Organization estimates that approximately one in seven people aged 10-19 years lives with a mental health condition, and anxiety and depressive disorders are among the leading contributors to illness and disability in this age group (World Health Organization, 2025). In school settings, anxiety may be expressed as excessive worry, physiological arousal, impaired concentration, disrupted sleep, avoidance, and reduced participation in learning activities.

Evidence-based psychological interventions for adolescent anxiety include cognitive-behavioural and brief structured therapies. Recent trials have shown that school-based or remotely delivered interventions can reduce anxiety symptoms, although these programs may require trained facilitators, multiple sessions, or digital access (Chen et al., 2023; De Silva et al., 2024). This creates a practical need for low-cost adjunctive strategies that students can learn quickly and use independently while remaining connected to appropriate professional support.

The Butterfly Hug is a self-soothing exercise in which a person crosses the arms over the chest and alternately taps the upper arms or shoulders while maintaining slow breathing and attending to present-moment sensations. It is conceptually related to the bilateral sensory stimulation used within eye movement desensitization and reprocessing (EMDR), but it should not be treated as equivalent to a complete EMDR protocol. The exercise was selected for the present school setting because it requires no equipment, can be demonstrated in a group, supports student autonomy, and can be stopped immediately if discomfort arises.

Several mechanisms may plausibly contribute to short-term calming. Alternating bilateral stimulation may influence the allocation and integration of perceptual and memory information. However, contemporary studies differ on whether the dominant mechanism is working-memory competition or facilitated information processing (Wang et al., 2024). Experimental work involving visual and tactile bilateral stimulation has also reported increased frontal electroencephalographic activity and reduced peripheral physiological activation. These findings may reflect greater top-down regulation and lower autonomic arousal (Stingl et al., 2025). Slow, controlled breathing may further increase vagally mediated heart-rate variability and parasympathetic activity (Laborde et al., 2022). These mechanisms remain hypotheses in relation to the Butterfly Hug because the present study did not measure neural or autonomic outcomes.

Clinical and pilot studies of EMDR-related approaches have reported reductions in anxiety in children, adolescents, and adults, including a paediatric dental randomized pilot trial and a small adolescent social-anxiety case series (Kalra et al., 2023; Thunnissen et al., 2024). However, these findings cannot be directly generalized to a brief group-based Butterfly Hug exercise, and evidence from Indonesian school populations remains sparse. The novelty of the present pilot study lies in evaluating a short, equipment-free, school-delivered program among ninth-grade students in a public junior high school while reporting continuous HARS scores and a standardized rank-based effect size. The objective was therefore to examine whether anxiety scores changed from pretest to immediate posttest. Given the one-group design, the study was not intended to determine causal effectiveness.

Methods

Study Design

This study employed a pre-experimental one-group pretest-posttest pilot design to examine changes in anxiety levels following participation in a school-based Butterfly Hug program. All participants completed anxiety assessments before the first intervention session and

immediately after the final session. Because no comparison group was included, the findings should be interpreted as within-group changes rather than evidence of causal effectiveness.

Setting

The study was conducted during the 2025/2026 academic year at SMP Negeri 1 Sukodadi, Lamongan Regency, East Java, Indonesia. The Butterfly Hug program was implemented in the school environment over three weeks, with one intervention session conducted each week.

Participants

The target population consisted of 150 ninth-grade students. Participants were recruited using purposive sampling based on predefined eligibility criteria. Students were eligible if they were actively enrolled in Grade IX, screened as having anxiety, were willing to participate throughout the study, and obtained parental or guardian permission. Students who were unable to complete the intervention sessions or outcome assessments were excluded. A total of 91 students were included in the final analysis, comprising 39 males (42.9%) and 52 females (57.1%).

Instruments

Anxiety was measured using the Hamilton Anxiety Rating Scale (HARS), a clinician-rated instrument consisting of 14 items assessing both psychological and somatic symptoms of anxiety. Each item is scored from 0 (not present) to 4 (very severe), yielding a total score ranging from 0 to 56, with higher scores indicating greater anxiety severity. The HARS was administered before the first intervention session and again after completion of the three-session Butterfly Hug program.

Data Collection

Following approval from the school administration and the institutional ethics committee, eligible students and their parents or guardians received information regarding the study objectives, procedures, potential benefits, confidentiality, voluntary participation, and the right to withdraw at any time without consequences. Baseline anxiety assessment was conducted before the first Butterfly Hug session. Participants then attended three weekly Butterfly Hug sessions, each lasting approximately 30 minutes and consisting of explanation, guided practice, supervised implementation, and brief reflection. The posttest assessment was completed immediately after the final intervention session using the same HARS instrument.

Data Analysis

All collected data were entered, coded, and analyzed using IBM SPSS Statistics version 22. Descriptive statistics were used to summarize participant characteristics and anxiety scores. Continuous variables were presented as mean, standard deviation (SD), median, interquartile range (IQR), range, and 95% confidence intervals (CI), whereas categorical variables were reported as frequencies and percentages.

Ethical Approval

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Muhammadiyah Lamongan (Approval No. 129/EC/KEPK-S1/04/2026; April 20, 2026). Written informed consent was obtained from all participants and their parents or legal guardians before data collection. Participant confidentiality was maintained by replacing personal identifiers with study codes, and all collected data were used exclusively for research purposes.

Statistical Analysis

The normality of HARS scores was evaluated using the Shapiro-Wilk test. Because the data were not normally distributed, differences between pretest and posttest anxiety scores were analyzed using the Wilcoxon signed-rank test. Statistical significance was established at $p < .05$. Effect size was calculated using the rank-based formula ($r = |Z|/\sqrt{N}$), where values of approximately 0.10, 0.30, and 0.50 were interpreted as small, moderate, and large effects, respectively.

Results

Participant Characteristics

All 91 participants included in the reported analysis had paired pretest and posttest HARS scores. Females comprised 57.1% of the sample. The supplied output did not report attrition between baseline and posttest.

Table 1. Participant characteristics (N = 91)

Characteristic	N	%
Male	39	42.9
Female	52	57.1
Total	91	100.0

Anxiety Before and After the Intervention

The mean HARS score decreased descriptively by 15.57 points, from 27.55 at pretest to 11.98 at posttest. Because the score distributions were non-normal, inferential interpretation is based on the Wilcoxon signed-rank test rather than the difference between means.

Table 2. Table 2. Continuous HARS scores at pretest and posttest.

Time point	n	Mean (SD)	95% CI for mean	Median	IQR	Range
Pretest	91	27.55 (5.75)	26.35-28.75	26	8	21-49
Posttest	91	11.98 (3.95)	11.15-12.80	12	5	5-22

In the signed-rank analysis, 90 participants had lower HARS scores after the program, one participant had a higher score, and there were no ties. The within-group difference was statistically detectable ($Z = -8.284$, $p < .001$). The corresponding effect size was $r = .87$, conventionally interpreted as large. This effect size describes the magnitude of paired rank change in this sample and should not be interpreted as proof that the program caused the observed change.

Table 3. Wilcoxon signed-rank test and effect size.

Negative ranks	Positive ranks	Ties	Z	p value	Effect size r
90	1	0	-8.284	< .001	.87

Discussion

This pilot study found that participation in three weekly school-based Butterfly Hug sessions was associated with substantially lower immediate post-intervention HARS scores. The paired rank effect size was large, and almost all participants had lower posttest scores. These findings provide a signal worthy of further study, but they must be interpreted within the limits of an uncontrolled pretest-posttest design. A large within-group effect can coexist with alternative

explanations such as repeated measurement, expectancy, spontaneous fluctuation, changes in school demands, and regression to the mean.

The direction of change is broadly consistent with studies reporting reduced anxiety after EMDR-related interventions. Kalra et al. (2023) observed lower procedure-related anxiety in children receiving EMDR during dental extraction, while Thunissen et al. (2024) reported preliminary reductions in social anxiety and distressing imagery after a brief EMDR intervention in a small adolescent case series. In adults with hypertension, a randomized trial found improvements in anxiety and heart-rate-variability indices following EMDR (Chen et al., 2025). These studies strengthen the plausibility of anxiety-related benefits from structured bilateral-stimulation protocols; nevertheless, the populations, treatment intensity, clinical supervision, and complete EMDR procedures differ from the simple Butterfly Hug exercise evaluated here. Direct equivalence should therefore be avoided.

Several interacting processes may explain short-term score changes. First, alternating tactile stimulation may provide a predictable attentional anchor that competes with repetitive worry or facilitates the integration of emotional and sensory information. EEG experiments suggest that bilateral eye movements can enhance concurrent perceptual and memory representations and increase information transfer toward frontoparietal regions (Wang et al., 2024). Second, both visual and tactile bilateral stimulation have been associated with increased frontal EEG power and reduced peripheral physiological activation, compatible with greater top-down regulation and lower autonomic arousal (Stingl et al., 2025). Third, the slow-breathing component may promote parasympathetic modulation; a large systematic review and meta-analysis found increased vagally mediated heart-rate variability during and after voluntary slow breathing (Laborde et al., 2022). Finally, the self-administered nature of the exercise may increase perceived control and self-efficacy during periods of tension. None of these mechanisms was measured in this study, so they should be considered explanatory hypotheses rather than demonstrated pathways.

The program may have practical value as a brief adjunct within school nursing, counselling, or emotional-literacy activities. It requires little space or equipment and can be discontinued immediately when a student feels uncomfortable. However, it should not replace clinical assessment or evidence-based treatment for students with persistent, severe, or functionally impairing anxiety. Schools considering the exercise should provide clear safeguarding procedures, referral pathways, facilitator training, and age-appropriate consent processes.

Limitations

Several limitations substantially restrict interpretation. First, there was no control or comparison group; therefore, the study cannot establish that the Butterfly Hug caused the observed reduction. History, maturation, concurrent school events, expectancy, social desirability, repeated testing, and regression to the mean are plausible alternative explanations. Second, purposive sampling from a single school may have introduced selection bias and limits generalizability. Students were selected partly because anxiety was present at screening, which can increase regression-to-the-mean effects.

Third, the posttest was conducted immediately after the short program and no medium- or long-term follow-up was reported, so persistence of the score change is unknown. Fourth, the HARS was the sole outcome measure. The source thesis did not document blinded assessment, adolescent-specific validation in this sample, inter-rater reliability, or checks for interviewer and response bias. Repeated administration of the same measure may also have influenced responses. Fifth, intervention fidelity, home practice, co-interventions, facilitator effects, acceptability, adverse experiences, and school attendance were not systematically quantified. Finally, the supplied statistical output did not include a confidence interval for the paired

median change, and this value could not be reconstructed reliably from summary statistics alone.

Conclusion

Among 91 ninth-grade students in one Indonesian public school, participation in a three-session Butterfly Hug program was associated with lower immediate post-intervention HARS scores and a large paired rank effect size. The findings support further evaluation of this low-resource self-regulation exercise, but they do not demonstrate causal effectiveness. Future studies should use randomized or controlled designs, validated adolescent anxiety measures, blinded or standardized assessment, fidelity monitoring, safety and acceptability outcomes, and longer follow-up across multiple schools.

Declarations

Ethics approval and consent to participate. This study received ethical clearance from the Health Research Ethics Committee of Universitas Muhammadiyah Lamongan (No. 129/EC/KEPK-S1/04/2026; 20 April 2026). All participants received an explanation of the study and provided consent through an informed consent form. Students who did not obtain parental or guardian permission were not included. Participation was voluntary, and participant identities were kept confidential.

Consent for publication. Not applicable, as no identifiable participant material is included. Availability of data and materials. The anonymized research data supporting the findings of this article are available from the corresponding author upon reasonable request. Access will be provided subject to ethical approval requirements, confidentiality safeguards, and the protection of the privacy of school-aged participants.

Competing interests. The authors declare that they have no financial or non-financial competing interests that could have influenced the conduct, analysis, or reporting of this study.

Funding. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. All research expenses were self-funded by the researcher.

Author contributions. Wahyu Wulandari contributed to conceptualization, methodology development, study implementation, data collection and curation, formal analysis, and preparation of the original draft. Arifal Aris and Abdul Rokhman contributed to supervision, validation, methodological refinement, and review and editing of the manuscript. All authors read and approved the final manuscript and accept responsibility for the integrity of the work.

Acknowledgements. The authors thank the participating students, the school administration and staff, and the academic supervisors for their support during the study.

References

- Chen, M.-Y., Chen, T.-Y., Wang, Y.-J., Cheng, S.-M., Lin, W.-S., Wan, F.-J., Liu, C.-Y., & Kao, C.-W. (2025). Eye movement desensitization and reprocessing (EMDR) improves symptoms of anxiety and depression, blood pressure, and heart rate variability in patients with hypertension: A randomized controlled trial. *Psychology, Health & Medicine*, 30(7), 1353-1372. <https://doi.org/10.1080/13548506.2025.2482962>
- Chen, S., Zhang, Y., Qu, D., He, J., Yuan, Q., Wang, Y., Bi, W., Chen, P., Wu, F., & Chen, R. (2023). An online solution-focused brief therapy for adolescent anxiety: A randomized controlled trial. *Asian Journal of Psychiatry*, 86, 103660. <https://doi.org/10.1016/j.ajp.2023.103660>
- De Silva, S., Peris, R., Senaviratne, S., & Samaranayake, D. (2024). Effectiveness of a cognitive behavioural therapy (CBT)-based intervention for reducing anxiety among adolescents in

- the Colombo District, Sri Lanka: Cluster randomized controlled trial. *Child and Adolescent Psychiatry and Mental Health*, 18, 108. <https://doi.org/10.1186/s13034-024-00799-9>
- Hamilton, M. (1959). The assessment of anxiety states by rating. *British Journal of Medical Psychology*, 32(1), 50-55. <https://doi.org/10.1111/j.2044-8341.1959.tb00467.x>
- Kalra, N., Rathore, A., Tyagi, R., Khatri, A., Khandelwal, D., & Yangdol, P. (2023). Management of anxiety using eye movement desensitization and reprocessing therapy in children undergoing extraction: A randomized controlled pilot study. *Journal of Dental Anesthesia and Pain Medicine*, 23(6), 347-355. <https://doi.org/10.17245/jdapm.2023.23.6.347>
- Laborde, S., Allen, M. S., Borges, U., Dosseville, F., Hosang, T. J., Iskra, M., Mosley, E., Salvotti, C., Spolverato, L., Zammit, N., & Javelle, F. (2022). Effects of voluntary slow breathing on heart rate and heart rate variability: A systematic review and a meta-analysis. *Neuroscience & Biobehavioral Reviews*, 138, 104711. <https://doi.org/10.1016/j.neubiorev.2022.104711>
- Stingl, M., Schäfflein, E., Spieler, D., Henn, M., Hanewald, B., & Sack, M. (2025). Bilateral stimulation: Differential effects in EEG and peripheral physiology. *BJPsych Open*, 11(6), e278. <https://doi.org/10.1192/bjo.2025.10887>
- Thunnissen, M. R., de Jong, P. J., Weijermans, J., Vet, L. J. J., Rijkeboer, M. M., & Nauta, M. H. (2024). Negative flashforward imagery in adolescent social anxiety disorder: A pilot study of imagery reports and a short EMDR intervention. *Clinical Psychology & Psychotherapy*, 31(5), e3063. <https://doi.org/10.1002/cpp.3063>
- Wang, S., He, Y., Hu, J., Xia, J., Fang, K., Yu, J., & Wang, Y. (2024). Eye movement intervention facilitates concurrent perception and memory processing. *Cerebral Cortex*, 34(5), bhae190. <https://doi.org/10.1093/cercor/bhae190>
- World Health Organization. (2025, September 1). Mental health of adolescents. World Health Organization.