

## Research Article

**Effect of Laughter Yoga on School Burnout and Hope Among Secondary School (Eighth Grade) Students: A Parallel Group Randomized Control Trial**Nilgün Kuru Alici<sup>1</sup>, Bilge Kalanlar<sup>2</sup>

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**Abstract**

**AIM:** This study aimed to evaluate the effect of laughter yoga on hope and school burnout among secondary school, (eighth grade) students.

**METHODS:** This study was a pretest, posttest, parallel-group, randomized control trial to evaluate the effect of laughter yoga on hope and school burnout in eighth-grade students. The population of the study consisted of 60 eighth-grade middle school students (intervention group  $n=30$  and control group  $n=30$ ). Laughter yoga was practiced face-to-face with the intervention group twice a week for 35–40 minutes and in six sessions in total. The protocol of the study was registered with the number NCT05742308 (ClinicalTrials.gov).

**RESULTS:** After laughter yoga, there was a statistically significant difference between the intervention ( $17.27 \pm 8.76$ ) and control ( $22.90 \pm 7.08$ ) groups in the mean scores of the school burnout scale ( $p < .05$ ) and a statistically significant difference between the intervention ( $29.28 \pm 5.66$ ) and control ( $22.28 \pm 5.65$ ) groups in the mean scores of the children's hope scale ( $p < .05$ ).

**CONCLUSION:** School health nursing practices have an important role in the process of acquiring positive health behaviors in school-age children. They are able to use evidence-based practices to reduce student burnout and improve hope. Based on the results of the study, school health nurses can use laughter yoga to increase hope levels and decrease burnout levels in eighth-grade students.

**Keywords:** Hope, laughter therapy, randomized controlled trials, school burnout, secondary education, yoga

**Introduction**

Adolescents spend most of their lives in school. Schools are important developmental environments that support the socioemotional and behavioral development of adolescents (Hoover & Bostic, 2021). The school environment affects adolescents' academic well-being, lifestyles, physical, mental, and social health, and even general well-being (Amholt et al., 2020; Jacob et al., 2021; Wang et al., 2020).

Existing longitudinal studies have shown that symptoms of school burnout in high school increase with the transition from elementary to middle school and predict school burnout in high school (Tang et al., 2021). School burnout can be defined as school-related fatigue, strain, tension, withdrawal from school, and loss of interest in the school, that is, a lack of interest in the meaning of school, inadequacy in school tasks, and a reduced sense of achievement (Salmela-Aro et al., 2009). School-related burnout can be seen as a result of increased school demands. If the perceived demands of school, such as homework and exam anxiety, exceed personal resources, this can lead to school burnout (Salmela-Aro & Upadaya, 2014). Many studies conducted in recent years reveal that adolescents have high levels of school burnout, which can lead to increased stress and depression,

sleep problems, decreased interest in school, decreased academic performance, increased absenteeism, and dropout (Liu et al., 2021; Tang et al., 2021). A recent systematic review study has found that female gender, lower socioeconomic status, academic track, grade point average, and psychopathology are risk factors, while autonomy-supportive parenting, relationships with peers, and academic buoyancy have protective effects for school burnout (Vansoeterstede et al., 2023). Preventing burnout can play an important role in supporting young people's well-being (Salmela-Aro & Upadaya, 2014).

Certain protective psychological factors have been recognized as potentially beneficial in the stress–burnout relationship. One of these factors is hope. Hope plays a significant role in reducing school burnout (Gungor, 2019). Being hopeful, referred to as a multidimensional positive motivational state, requires an adolescent to focus on achieving future goals (Callina et al., 2018). According to Snyder's theory of hope (2002), hope is defined as a type of goal-oriented thinking in which individuals can develop, implement, and maintain strategies in line with their goals. Hope theory consists of 3 elements: goals, pathways, and agency thought. The goals component pertains to the targets set by individuals for themselves, starting from the early stages of life, including infancy. Individuals develop a sense of

their requirements or desires in their environment. The second element, pathways, involves the recognition and understanding of potential routes or strategies to reach the specified goals. In the context of children, this could include their perception of events and the temporal co-occurrences of actions in their surroundings. They gradually learn to distinguish between different needs and goals, focusing on developing skills and strategies to navigate the pathways leading to goal fulfillment. The third and final element, agency thought, encompasses the conviction in one's capacity to perform actions that will lead to the intended outcomes. This self-efficacy is a crucial motivation factor as people, including young ones, learn and trial different connections to their objectives. Snyder (2002) proposed that from birth, children start developing pathway and agentic thoughts. In the sphere of pathway thinking, infants form their perceptions of the environment by recognizing temporal co-occurrences of definite events. As they grow, infants distinguish their needs and focus on objectives to satisfy these necessities. Over time, they cultivate essential skills for pathway thinking by exploring and experimenting with various connections to their objectives. Individuals with high levels of hope believe that they can find many ways to achieve their desired goals (Hu & Jiang, 2022). Students with high levels of hope generally set higher academic goals and have higher achievement expectations than other students (Ciarrochi et al., 2007). While hope is important for goal-oriented behaviors such as school success, it is also an important predictor of certain behaviors such as inattention, aggression, and hyperactivity (Snyder, 2000). Hope has been found to be associated with academic achievement, subjective well-being, physical and mental health, psychological resilience, happiness, life satisfaction, and quality of life (Belen et al., 2020; Hu & Jiang, 2022; Marques et al., 2011).

Studies show that there is a need for interventions to increase students' level of hope and reduce school burnout (Walburg, 2014). A meta-analysis study revealed that the most commonly used interventions that reduce students' school burnout are exercise and group counseling, and the most effective ones are exercise practices (Tang et al., 2021). This study applied laughter yoga, also known as an exercise method, as an intervention. Laughter yoga is a nonpharmacological method consisting of breathing techniques, yoga warm-up movements, music, and laughter exercises (Kataria et al. 2023).

The literature contains limited studies showing that laughter yoga reduces feelings of hopelessness and loneliness in children (Sabari et al., 2019), reduces anxiety levels (Aghajani et al., 2021), and increases happiness levels (Ozturk & Acikgoz, 2022). There is no study in the existing literature evaluating the effect of laughter yoga on hopelessness and school burnout in eighth-grade students to the best of our knowledge. Twelve years of compulsory, gradual education are divided into 3 levels in the Turkish education system. Children aged 66 months and above are enrolled in the first tier in Turkey. The first tier is organized as a 4-year primary school (grades 1–4), the second tier as a 4-year middle school (grades 5–8), and the third tier as a 4-year high school (grades 9–12) (Caner & Bayhan, 2020). While the transition from primary school to secondary school does not depend on any academic achievement, the transition from secondary school to high school requires success in the higher education

institution exam (Atilgan, 2018). For this reason, eighth-grade students in Turkey, who constitute the sample group of the study, experience intense stress, test anxiety, school burnout, and hopelessness compared to other grades (Atik & Kemer, 2009; Gungor, 2019; Otis et al., 2016). This study aimed to evaluate the effect of laughter yoga on hope and school burnout among secondary school students.

## Hypotheses

1. The study hypothesized that laughter yoga would have an effect on hope and school burnout scores among secondary school students.

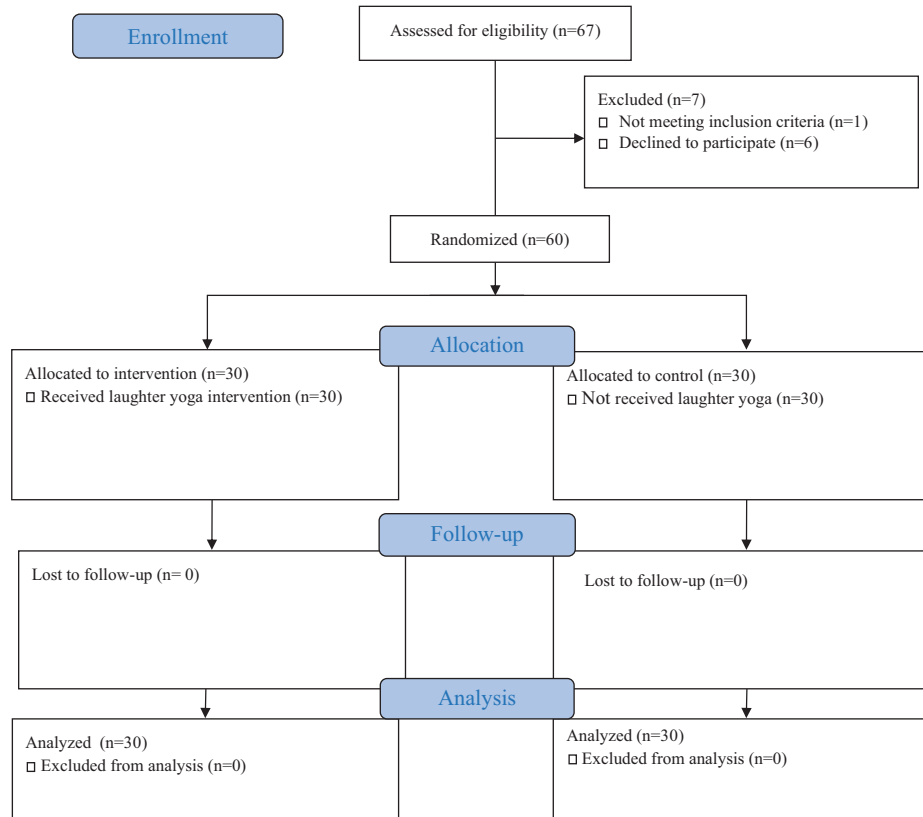
## Methods

### Study Design

This study was a pretest, posttest, parallel-group, randomized controlled trial to evaluate the effect of laughter yoga on hope and school burnout in eighth-grade students. The reporting of the study was written according to CONSORT extension 2017, which evaluates nonpharmacological interventions (Pandis et al., 2019). The study methodology was written according to the SPIRIT 2013 guidelines (Chan et al., 2013), and the TIDier checklist was used to define the intervention and create the template (Hoffmann et al., 2014). The protocol of the study was registered with the number NCT05742308 (ClinicalTrials.gov).

### Sample

The study was conducted in a public school affiliated with the Ministry of National Education. According to the records of the 2021–2022 academic year, the school has a total of 550 students studying in grades 5, 6, 7, and 8. The school has a multipurpose hall and a library. The population of the study consisted of eighth-grade middle school students ( $N=130$ ). The sample size of the study was calculated using the G.Power 3.1 program. A study with a similar scale and research design (Ozturk & Açıkgoz, 2022) was used to determine the sample size. Accordingly, it was determined that at least 50 people should be studied with  $d=0.5$  medium effect size, 0.05 alpha value, 95% CI ( $1-\alpha$ ), and 95% power. A total of 67 students were evaluated for eligibility. Seven students were not included in the study because they did not meet the inclusion criteria ( $n=1$ ) or were declined to participate ( $n=6$ ). After obtaining the consent of the remaining 60 students and completing their pretests, they were randomly assigned to 2 groups. Including a total of 60 students in the study, to avoid sample loss, fulfills the recommended 20% oversampling criterion. Since there were no intervention studies with both scales, post hoc power analysis was also performed. According to the posttest evaluations of the intervention and control groups of the study, 99% power was determined by taking a sample size of 30 students for both groups and by accepting the  $\alpha$ -type error estimate of 0.05. The inclusion criteria were determined as being an eighth-grade student and being able to fulfill daily life activities. The exclusion criteria of the study were determined as being a foreign national (due to the problem of speaking/understanding Turkish), having undergone a surgical operation in the last 3 months, and having uncontrolled blood pressure, diabetes, and asthma. There was no change in the sample size, and the study was completed with 60 participants at the end (Figure 1).



**Figure 1.**  
CONSORT Flow chart of the Study.

### Randomization and Blinding

The students were randomly assigned to two groups: group A (30 students) and group B (30 students), after consent and the data of the students meeting the inclusion criteria, and pretests were administered. Students were randomly assigned to the two groups by the second researcher, who did not implement the laughter yoga intervention and randomly assigned the students to the two groups using a computer-aided random-sequence generator (<https://www.random.org>). Random blocks were created as a combination of six (BAAB, AABB, ABAB, ABAB, ABBA, BBAA, and BABA). After determining that each set ( $60/6 = 10$ ), the students were assigned to their respective groups (group A and group B). To avoid bias, the data were collected by a co-researcher who did not know which students were in the intervention group and which were in the control group. The research data were coded as group 1 and group 2 while being collected by the co-researcher, and the data were processed by the first researcher. The statistical analyses were forwarded to an independent statistical expert who was unaware of the intervention and control groups. The statistical expert reported the analyses of the study. Blinding was applied in the randomization of the research sample, data collection and recording process, statistical analysis, and reporting stages.

### Data Procedure

Laughter yoga was practiced face-to-face with the intervention group twice a week for 35–40 minutes and in 6 sessions in total. The laughter yoga intervention was planned and conducted by

the first researcher, who has a PhD degree in public health nursing, a laughter yoga leadership certificate, and an instructor certificate. Laughter yoga was conducted in the classroom environment on the same day and at the same time (10.00–11.00) every week. Each laughter yoga session started with hand clapping and warm-up exercises, continued with yoga breathing techniques, childlike playfulness, laughter exercises, and ended with meditation. Each laughter yoga program was shaped by including different combinations of the following practices (Kataria et al., 2023). The pretests of the students in the intervention and control groups were administered 1 week before the intervention started, and the posttests were administered 1 week after the sixth session of laughter yoga was completed.

Laughter yoga started with hand clapping and warm-up exercises, which included hand clapping using 1-2, 1-2-3, Ho-Ho, Ha-Ha-Ha rhythms where hands are parallel to each other, fingertips, and palms touch each other. Diaphragmatic breathing was taught and practiced in deep breathing exercises. Dancing and singing along with music were practiced in the childlike playfulness part. There are more than 100 laughter exercises and, in this study, laughter exercises such as lion laughter, laugh with anger, bugi laughter, ant your pant, milkshake laughter were practiced. Each laughter yoga session ended with yoga nidra meditation.

Students in the control group did not receive any intervention other than the coping methods they apply in daily life.

Data collection tools were administered to the students in this group simultaneously with the intervention group. At the end of the study, the students in the control group were given face-to-face laughter yoga.

### Preapplication

Children's Hope Scale and School Burnout Scale was administered to 10 eighth-grade students before the research. In the preapplication, it was observed that there was no problem in terms of the comprehensibility of the scales and the application of the scales took 5 minutes in total.

### Data Collection Tools

The data of the research were collected with a personal information form, Children's Hope Scale, and School Burnout Scale.

The personal information form consists of descriptive questions including age, gender, and parents' educational status, prepared by the researchers by utilizing the literature (Jiang et al., 2021; Liu et al., 2021; Tang et al., 2021)

### Children's Hope Scale

It was developed by Snyder et al. (1997) to measure children's hope scale. The Children's Hope Scale can be used in children between the ages of 8–16. The scale consists of two subdimensions: ways of reaching the goal and motivation for the goal. Consisting of six items, the scale is replied to in accordance with Likert-type grading: never=1, rarely=2, sometimes=3, often=4, most of the time=5, and always=6. Scoring of the scale is done by summing the score obtained from each item; the highest score that can be obtained from the scale is 36, and the lowest score is 6. The odd-numbered items in the scale constitute the dimension of goal motivation, and the even-numbered items constitute the dimension of ways to reach the goal. The translation and adaptation studies of the scale into Turkish were conducted by Atik and Kemer (2009). Within the scope of the reliability studies of the scale, Cronbach's alpha internal consistency coefficient of the Children's Hope Scale for the whole study was found to be .74, while the test-retest correlation coefficient was .57. The Cronbach alpha internal consistency coefficient of the scale was .72 for the sample group in this research.

### School Burnout Scale

It was developed by Salmela-Aro et al. in 2009 to determine the school burnout levels of primary and secondary school students and adapted to Turkish culture by Seçer et al. (2013). The scale is a 5-point Likert-type self-report-based measurement tool consisting of 10 items and three subdimensions in its original form. In the scale adapted to Turkish culture, the School Burnout Scale consists of three subdimensions: emotional burnout, depersonalization, and a low sense of personal accomplishment. In addition to the subdimensions, the total score for the overall scale is also calculated. Considering the distribution of the items in the scale according to the factors, items 1, 4, 7, and 9 are in the emotional burnout dimension, items 2, 5, and 6 are in the depersonalization subdimension, and items 3 and 8 are in the low sense of personal accomplishment subdimension. Seçer et al. (2013) found the internal consistency coefficients as  $\alpha = .75$  for the emotional burnout subscale,  $\alpha = .74$  for

the depersonalization subscale, and  $\alpha = .76$  for the low personal accomplishment subscale in the validity and reliability study. The internal consistency coefficient for the whole scale was .75.

### Statistical Analysis

The data obtained through research were analyzed using The Statistical Package for the Social Sciences Statistics version 24.0 software (IBM Corp.; Armonk, NY, USA). The results obtained were tested at  $p < .05$  significance level and bidirectionally. Mean  $\pm$  SD, number and percentage representation, and median minimum–maximum values were used for descriptive statistics. For further analysis, the Kolmogorov–Smirnov normality test was applied to the scale and subscale scores. All scores were found to meet the normality assumptions, and parametric tests were used for comparison. Paired sample  $t$ -test was used to analyze the difference between 2 dependent groups, and an independent sample  $t$ -test was used to analyze the difference between 2 independent groups. Cohen's  $d$  was used to calculate effect sizes. Effect sizes of 0.20 and below were considered weak, 0.21–0.80 as moderate, and 0.81 and above as strong effect sizes (Cohen et al., 2007).

### Ethical Considerations

This research was evaluated in terms of ethical appropriateness, and ethical approval was received from Bitlis Eren University Rectorate Ethics Principles and Ethics Committee (Approval No: 2022:E54207, Date: March 15, 2022). Institutional consent was obtained from the institution where the study was conducted. The purpose of the research was explained to the students participating in the study. They were informed that participation in the study was completely voluntary and that they would not experience any disruption in their education and learning processes if they did not want to participate. A consent form including the purpose, importance, and expected results of the study was sent to the parents of the students who wanted to participate in the study, and their written informed consents were obtained.

### Results

Table 1 shows the descriptive characteristics of the students. Half of the intervention group was female, and the other half were male. The control group consisted of 56.30% females and 43.70% males. 71.90% of the intervention group and 68.50% of the control group was 14 years old. Half of the students' fathers were high school graduates in the intervention group (40.60%) and the control group (53.30%), while mothers in the intervention group (37.50%) and the control group (40.60%) were high school graduates; as revealed by the analysis of the educational status of the parents of the students. The descriptive characteristics of the groups did not show a statistically significant difference.

Table 2 shows the comparison of the hope scale and school burnout scale scores of the intervention and control groups. There was no statistically significant difference between the mean scores of hope and school burnout scales of the intervention and control groups before laughter yoga ( $p > .05$ ). Before laughter yoga, the scale scores of the intervention and control groups were similar.

**Table 1.**  
Descriptive Characteristics of the Study Population (N = 60)

	Control		Intervention		p
	n	%	n	%	
Gender					
Female	16	56.30	15	50.0	.902
Male	14	43.70	15	50.0	
Age					
13 year	10	31.50	9	28.10	.712
14 year	20	68.50	21	71.90	
Father education					
Primary school	0	0.00	1	3.12	.717
Secondary school	5	16.70	6	17.30	
High school	16	53.30	13	40.60	
University	9	30.00	10	39.00	
Mother education					
Primary school	2	6.20	3	9.40	.846
Secondary school	5	15.60	7	21.90	
High school	13	40.60	12	37.50	
University	10	37.60	8	31.20	
Total	30	100.0	30	100.0	

After laughter yoga, there was a statistically remarkable difference between the intervention ( $17.27 \pm 8.76$ ) and control ( $22.90 \pm 7.08$ ) groups in the mean scores of the school burnout scale ( $p < .05$ ). The subgroups of the school burnout scale showed no statistically significant difference in the emotional burnout subdimension after laughter yoga, while a statistically

significant difference was found in the indifference and low individual success subdimensions ( $p < .05$ ). After laughter yoga, the mean indifference scores of the intervention group ( $5.06 \pm 3.13$ ) were statistically lower than the control group ( $9.62 \pm 3.89$ ), and the mean low individual success scale scores of the intervention group ( $4.15 \pm 2.17$ ) were statistically lower than the control group ( $6.78 \pm 4.61$ ) ( $p < .05$ ). However, the effect size ( $d=0.129$ ) was found to be low when the change in the total score of the burnout scale according to time was analyzed. After laughter yoga, there was a statistically significant difference between the intervention ( $29.28 \pm 5.66$ ) and control ( $22.28 \pm 5.65$ ) groups in the mean scores of the children's hope scale ( $p < .05$ ). Cohen's  $d$  was found to be 0.556.

### Discussion

This study hypothesized that laughter yoga would have an effect on hope and school burnout scores among secondary school students. To the best of our knowledge, no study has been conducted in the world or in Turkey on the effect of laughter yoga on hope and burnout levels in secondary school students. Therefore, the discussion of our research findings is limited. This study found that laughter yoga decreased the burnout level and increased the level of hope in middle school students.

After laughter yoga, the school burnout levels of the students in the intervention group decreased. While there is no study evaluating the effect of laughter yoga on school burnout, previous studies have found that laughter yoga reduces anxiety and stress levels in different age groups (Memarian et al., 2017; Ozturk & Tezel, 2021). A meta-analysis study concluded that laughter yoga has positive effects on depression, sleep quality, and anxiety (Zhao et al., 2019). Laughter and humor therapy is a psychosocial intervention increasingly used in the management of behavioral and psychological disorders (Leow et al., 2016). Laughter

**Table 2.**  
Comparison of the Intervention and Control Groups According to Their Total and Subscale Scores of the Children's Hope Scale and School Burnout Inventory (N = 60)

	Group	Before Intervention			After Intervention			Group Time Interaction
		n	X ± SD	t; p	n	X ± SD	t; p	
Children's Hope Scale	Control	30	23.28 ± 5.65	-1.363; .183	30	23.28 ± 5.65	4.611; .000*	t = -2.345 p = .026 Cohen's d = 0.556
	Intervention	30	25.5 ± 7.77		30	29.28 ± 5.66		
School Burnout Inventory								
Emotional burnout	Control	30	6.50 ± 2.41	-0.028; .879	30	6.50 ± 2.40	-2.837; .008	t = 0.541 p = .592 Cohen's d = 0.129
	Intervention	30	9.96 ± 3.17		30	8.06 ± 3.93		
Indifference	Control	30	9.63 ± 3.90	-0.173; .343	30	9.62 ± 3.89	-3.876; .001*	t = 0.505 p = .617 Cohen's d = 0.129
	Intervention	30	6.43 ± 2.66		30	5.06 ± 3.13		
Feeling of low individual success	Control	30	7.78 ± 4.61	-0.070; .703	30	6.78 ± 4.61	-4.171; .000*	t = 0.291 p = .773 Cohen's d = 0.073
	Intervention	30	4.31 ± 2.10		30	4.15 ± 2.17		
School Burnout Inventory	Control	30	23.91 ± 7.11	0.506; .616	30	22.90 ± 7.08	3.820; .001*	t = 0.506 p = .616 Cohen's d = 0.129
	Intervention	30	20.70 ± 9.83		30	17.27 ± 8.76		

Note: \* $p < .05$ .

in children is a protective and important resource in children's development and in stressful and unusual situations (Bergen, 2021). In laughter yoga, students laughed together as the simulated laughter turned into real laughter. Listening to the sound of laughter improves the recovery process of the autonomic nervous system after a stress load and reduces the level of psychological stress (Fujiwara & Okamura, 2018). Laughing causes the body to release endorphins, which are naturally occurring substances that improve mood. Students can lower their stress levels and achieve a more calm and hopeful state of mind by engaging in laughter yoga. Laughter yoga was also performed as a group activity, which may have affected the social interactions of the students. This can be particularly beneficial for those experiencing burnout, as it fosters a sense of community and social connection among students. As a result, the positive effects of the interventions on school burnout may have emerged.

There is no study evaluating the effect of laughter yoga on the level of hope in middle school students. Laughter yoga is an interactive program based on group interaction and performed as a group (Kataria, 2019). Studies evaluating the effect of laughter yoga on psychological factors related to the level of hope found that laughter yoga increased the level of happiness in fifth grade students in a quasi-experimental study with a pretest-posttest control group (Öztürk & Açıkgöz, 2022). In a randomized controlled study evaluating the effects of a laughter program on the psychological, immunological, and physiological systems of the body in seventh-grade students, mood states and humor of seventh-grade students in the intervention group improved, and cortisol level, one of the immunological markers of stress, decreased (Lopez et al. 2009). Studies indicate that group-based approaches in the school environment increase hopeful thinking in students (Marques et al., 2011). Positive social interactions and social ties are associated with a greater sense of belonging and support. This, in turn, increases a student's sense of hope. In addition, laughter yoga is a joyful activity. It increases positive feelings and promotes a more optimistic and hopeful attitude.

The study has a few strengths. The study group was chosen randomly from eighth-grade students and assigned randomly to the intervention and control groups. The study was completed without dropout, so the chance of making a type II error decreased. The laughter yoga program was structured and led by a trained researcher who has an International Laughter Yoga Teacher Certificate. The study also has several limitations. The data were collected from a single public school, and only eighth-grade students participated in the study, so the results of the study have limited generalization. Since the study was conducted during the education process, the duration of the program was limited to 6 weeks. Since the participants knew that they were in the intervention group and the intervention was carried out by the researcher, participant blinding could not be performed. However, the data analysts were blinded to the study groups. There may be a possibility of response bias since the data of the study were collected with self-reported measures.

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### Conclusion and Recommendations

Laughter yoga was applied to eighth-grade students twice a week and six times in total. The hope levels of students in the intervention group increased, and their burnout levels decreased compared to the students in the control group. Based on the results of the study, laughter yoga can be used to increase hope levels and decrease burnout levels of eighth-grade students. Laughter yoga can be integrated into physical education classes in schools. School health nurses and teachers can plan regular laughter yoga programs to increase students' well-being. School health nurses have an important role in the uninterrupted provision of comprehensive school health services to students. Moreover, nurses have a crucial role in promoting mental health and well-being. School health nursing practices have an important role in the process of acquiring positive health behaviors in school-age children. They are able to use evidence-based practices to reduce student burnout and improve hope. This randomized control trial study suggests that school nurses can use laughter yoga as an intervention. Laughter yoga is a nonpharmacological and cost-effective method that improves mood by encouraging deep breathing, warm-up exercise, childlike playfulness, laughter exercises, and yoga nidra.

**Ethics Committee Approval:** Ethics committee approval was received for this study from Bitlis Eren University Rectorate Ethics Principles and Ethics Committee (Approval No: 2022:E54207, Date: March 15, 2022).

**Informed Consent:** A consent form including the purpose, importance, and expected results of the study was sent to the parents of the students who wanted to participate in the study, and their written informed consents were obtained.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – N.K.A.; Design – N.K.A.; Supervision – B.K.; Resources – N.K.A., B.K.; Materials – N.K.A., B.K.; Data Collection and/or Processing – N.K.A.; Analysis and/or Interpretation – B.K.A.; Literature Search – N.K.A.; BK Writing Manuscript – N.K.A., B.K.; Critical Review – N.K.A.; Other – B.K.

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