

The impact of health qigong practice on creative self-efficacy among primary school students

YIRAN TIAN¹, PUNG PIT WAN², CHEE-SENG TAN³

^{1,2}Faculty of Arts and Social Science, University Tunku Abdul Rahman, MALAYSIA

³School of Psychology, College of Liberal Arts, Wenzhou-Kean University, CHINA

Published online: March 31, 2024

(Accepted for publication March 15, 2024)

DOI:10.7752/jpes.2024.03087

Abstract:

As a traditional Chinese discipline, Health Qigong (HQ) emphasizes combining physical movement, breathing techniques, and mental balance, which significantly benefit overall well-being. Despite its recognized health advantages, there is a noticeable gap in research exploring its potential to enhance creativity. Creative self-efficacy, a critical factor in fostering creativity, particularly during the formative years of primary school students, is essential to unlocking their imaginative potential. This study aims to bridge this research gap by evaluating the influence of HQ on enhancing creative self-efficacy among primary school students. A randomized controlled trial was conducted involving 332 students from grades 2–4, selected from two primary schools. Participants were randomly assigned to either the intervention group (n = 166) or the control group (n = 166). The intervention group underwent a three-month HQ practice program consisting of 36 sessions, while the control group received no intervention. To ensure consistency in instruction, a teaching guideline based on HQ Baduanjin was provided to instructors in both schools. Participants completed pre-test, post-test, and follow-up (one month after the intervention) assessments of creative self-efficacy. A mixed analysis of covariance (ANCOVA) was employed to compare changes in creative self-efficacy between the two groups at three different time points. The results revealed significant group allocation, measurement time, and interaction effects. The three-month HQ intervention significantly increased the creative self-efficacy among participants in the intervention group. This study offers practical teaching guidance for primary school students and provides empirical evidence on the positive impact of physical education activities on creative self-efficacy. Further comprehensive research is warranted to corroborate the effects of HQ on creativity.

Key Words: Health Qigong, Creativity, Children, Physical Education

Introduction

As society progresses, physical activity (PA) has garnered increasing attention and emerged as a vital area of health-related research. PA encompasses any bodily movement facilitated by skeletal muscles, resulting in energy expenditure. PA is an essential health behavior owing to its correlation with numerous physical and mental health conditions. The 2018 Physical Activity Guidelines Advisory Committee Scientific Report recommends a minimum of 150 min of moderate to vigorous physical activity per week for individuals. Consistent engagement in PA protects against various diseases and mental health issues such as cancer and depression. Also, it enhances physical capabilities (Slovakova et al., 2022), self-efficacy (Cataldo et al., 2013), and creativity. The considerable health benefits of participating in physical activities have prompted the World Health Organization to adopt the theme "More active people for a healthier world" as part of the Global Action Plan on Physical Activity 2018–2030, encouraging and guiding individuals to embrace physical activity. Similarly, the Healthy China Action (2019–2030) policy in the Healthy China 2030 plan underscores the significance of physical activity engagement, particularly emphasizing traditional sports like Tai Chi and Health Qigong (HQ). In 2020, the General Administration of Sport of China launched the Dream Project, a sports summer camp initiative to provide physical education, including HQ instruction, to minority populations in rural areas. The primary school years represent a critical period in the physical and psychological growth of children, characterized by their increased sensitivity and adaptability. This period is crucial for nurturing psychological capital, including self-efficacy development. Despite introducing and promoting HQ in primary schools across China, there has been limited focus on its impact on primary school students, particularly from a psychological perspective. This study explores the influence of practicing HQ on the creative self-efficacy of primary school students.

Literature review

Health Qigong

Qigong, an ancient practice originating from China, helps to maintain vitality and foster a harmonious equilibrium between the body and mind. In China, Qigong is divided into two main categories: medical Qigong and HQ. Medical Qigong is a therapeutic approach primarily aimed at enhancing health and treating ailments

through self-practice, involving methods to clear meridians, regulate the mind, and balance Yin and Yang, which are integral to traditional Chinese medical practices. Activities related to medical Qigong must be conducted within medical institutions, with instructors holding medical practitioner qualifications and possessing a "Certificate of Qualification in Medical Qigong Skills." In contrast, HQ is a mind-body exercise that combines deliberate, gentle movements with controlled breathing and mental concentration. Characterized by its low intensity, straightforward movements, emphasis on mind-body harmony, and minimal equipment requirement, HQ is accessible to individuals across various age groups and health conditions. Consequently, HQ holds the potential for widespread promotion and adoption.

The literature consistently highlights the beneficial effects of practicing HQ on physical health. For instance, studies have demonstrated improvements in lung function among practitioners. Specifically, individuals who engaged in HQ for two to six years exhibited reduced respiration rates and increased air volume changes per breath compared to non-practitioners. Additionally, research indicates that HQ can enhance various physiological functions, including immune system functioning. Positive outcomes of HQ practice have been observed in knee arthritis patients and those with chronic obstructive pulmonary disease, further underscoring its therapeutic potential. Furthermore, the positive impact of HQ extends to psychological well-being, such as enhancing happiness. In a study by Ma et al. (2016), researchers investigated the effects of HQ practice on tension, depression, and self-esteem in middle-aged women. Eighty participants were randomly assigned to either an intervention group, which engaged in 60-min HQ sessions three times a week for five months, or a control group without health-related activities. Analysis of participants' emotional states pre- and post-exercise revealed significantly lower levels of tension and depression and higher self-esteem among the intervention group compared to the control group.

Likewise, research has demonstrated a favorable impact of HQ practice on creativity. As outlined by Vilar (2018), engaging in Qigong induces a state of temporary rest in the brain, allowing for uninterrupted cognitive processes thus fostering creativity. Furthermore, Si Hongyu (2012) utilized interview and questionnaire methodologies to explore the correlation between HQ practice and aesthetic creativity. The study identified three key stages in enhancing aesthetic creativity through HQ: initial aesthetic enjoyment, characterized by intuitive and emotional experiences; subsequent aesthetic empathy, involving humanizing and contextualizing HQ practices; and finally, the integration of metaphors, which incorporates insights from various disciplines to enrich creative expression.

However, it is important to acknowledge that the direct causal relationship between HQ and creativity remains ambiguous. For example, in an experimental study examining parental perceptions of changes in both primary and high school students' creativity following Qigong practice, the findings did not indicate significant differences in creativity (Witt et al., 2005). This inconsistency suggests the potential for practicing HQ to influence creativity indirectly through another factor, such as creative self-efficacy.

Moreover, several studies corroborate the positive influence of HQ on self-efficacy. For instance, Tsang et al. (2013) conducted a randomized controlled trial involving individuals aged 65 and older suffering from chronic illnesses and severe depression. Following a 12-week intervention, participants in the HQ exercise program exhibited greater self-efficacy enhancements than those engaged in a newspaper reading program. Similarly, Lee et al. (2004) enlisted 36 adult volunteers with primary hypertension for an 8-week Qigong practice, revealing controlled blood pressure and improved self-efficacy compared to the control group. Furthermore, Qigong extends its influence beyond general self-efficacy to specific domains such as emotion regulation self-efficacy and balance self-efficacy. However, contradicting perspectives exist, with Gouw et al. (2019) presenting findings from a meta-analysis suggesting that Qigong has no discernible impact on self-efficacy.

Creative self-efficacy

Self-efficacy, defined as an individual's belief in their ability to execute specific actions, plays a pivotal role in shaping motivation and behavior. Individuals with high self-efficacy are inclined to invest effort and persist in tasks they perceive as being within their capabilities, demonstrating resilience in overcoming environmental obstacles. Notably, self-efficacy contributes significantly to students' academic performance. Consequently, researchers have dedicated considerable effort to identifying strategies to enhance students' self-efficacy. Cataldo et al. (2013) conducted a systematic review and meta-analysis investigating the impact of physical activity intervention programs on the self-efficacy of children and adolescents. Their findings suggest that engagement in physical activities can improve self-efficacy. Similarly, a survey involving 1923 participants revealed that participating in positive physical activities can enhance college students' self-efficacy and overall psychological well-being (Han et al., 2022). This aligns with the findings of other researchers utilizing similar survey methodologies.

Creative self-efficacy is a specific type of self-efficacy in the context of creativity. Locke (1997) underscores the significance of creative self-efficacy and innovation processes as motivational drivers that enhance individuals' creative performance. According to Karwowski and Barbot (2016), creative self-efficacy is an individual's belief in their capacity in the creative domain. They propose that creative self-efficacy plays a pivotal role in individuals' self-perception of their creative abilities, influencing creativity during the creative process. Moreover, creative self-efficacy influences individuals' tendency to engage in creative activities or

tackle creative challenges, thus positively impacting creativity. Indeed, research conducted across diverse cultural contexts consistently underscores the pivotal role of creative self-efficacy as a precursor to creativity.

Research on creative self-efficacy frequently targets primary school students to assess their creative abilities across various subjects, including science. For instance, Beghetto (2009) conducted a survey involving 585 students from grades 3–6 across seven schools, revealing that creative self-efficacy positively correlates with the development of intellectual risk-taking. Students exhibiting confidence in their capacity to generate inventive solutions, devise science experiments, and propose novel approaches to scientific challenges are more inclined to engage in intellectual risk-taking. Similarly, Beghetto and Baxter (2012) surveyed 276 students from grades 3–5 across 12 primary schools, uncovering the pivotal role of positive creativity self-efficacy in fostering students' comprehension of science. This confidence in their creative abilities improves their scientific thinking and empowers them to embrace intellectual risks, ultimately shaping their perceptions of the certainty of scientific knowledge. In mathematics, an experimental study investigated the correlation between primary school students' mathematical innovation abilities and their mathematical innovation self-efficacy, encompassing 205 participants from grades 3–5 (Bicer et al., 2020). The findings revealed a strong association between high mathematical innovation self-efficacy and proficient mathematical innovation abilities among students.

The Present Study

Research consistently demonstrates the positive correlation between physical activity and creativity (Cataldo et al., 2013). Optimal engagement in physical activities during childhood is crucial for nurturing cognitive processes and fostering creativity. As a traditional Chinese physical activity, Qigong has been linked to beneficial effects on physical health and psychological well-being, including self-efficacy. Given the pivotal role of creative self-efficacy in influencing creative performance, it is reasonable to hypothesize that practicing HQ could enhance one's creative self-efficacy.

This assumption aligns with the broaden-and-build theory, which states that positive emotions can expand and enrich individuals' psychological, social, and cognitive resources. Specifically, engaging in HQ practice may stimulate dopamine release, thereby inducing positive emotions that enhance creativity and self-efficacy. Moreover, empirical studies support the notion that positive emotions, such as enjoyment and relaxation, are positively associated with creative self-efficacy among high school students. For instance, research investigating the influence of music-induced emotions revealed that positive emotions significantly promote creative self-efficacy (He & Wong, 2022).

Building upon the broaden-and-build theory and existing empirical evidence, this study hypothesized that engaging in HQ practice positively influences the creative self-efficacy of primary school students. Specifically, our focus was on HQ Ba Duan Jin, which stands out among various HQ forms owing to its effectiveness and ease of learning. Ba Duan Jin has garnered attention for its beneficial effects on intestinal flora, hypertension, and other health conditions. Notably, it has been shown to enhance cognitive function in older adults with mild cognitive impairment. Furthermore, research indicates that college students practicing Ba Duan Jin report reduced fatigue and anxiety levels and increased attention and psychological well-being (K. Li et al., 2022). Additionally, Ba Duan Jin practice has been linked to improved sleep quality among healthy adults, the elderly, and women who have experienced intimate partner violence.

The findings of our study not only contribute to filling the gap in understanding the relationship between positive emotions and creative self-efficacy but also provide the initial empirical evidence of the advantages of HQ practice for primary school students. This empirical evidence is a vital reference for government agencies evaluating the program's efficacy in promoting HQ among primary school students.

Material and methods

Participants

The study utilized a randomized controlled trial methodology to evaluate the influence of HQ practice on primary school students' creative self-efficacy. Before participant recruitment, careful selection of instructors was prioritized to ensure consistent and effective instruction across different schools. Instructors meeting specific criteria, such as being recipients of first prizes in provincial HQ competitions and possessing over one year of primary school teaching experience, were chosen. Considering logistical factors, including instructor availability and school proximity, the study was conducted in Zigong and Chengdu in Sichuan Province. Subsequently, the researcher contacted the Sichuan HQ Association to explain the study's objectives, confidentiality protocols, and intended utilization of results. With the association's assistance, relevant instructors were contacted and provided with support. A total of 336 students from two schools were recruited through convenient sampling from the schools where the designated instructors were located. Inclusion criteria encompassed students from grades 2–4, voluntary participation, guardian consent, absence of prior HQ practice, and no history of mental health issues or psychological disorders. Four students were excluded because their parents refused participation, resulting in a final participation pool of 332 students (156 boys and 175 girls) aged 8–10 years ($M = 8.90$, $SD = 0.86$). Importantly, all participants remained involved in the research throughout the entire process.

The participants were randomly allocated to either the intervention group, which involved practicing HQ for three months, or the control group, which did not engage in HQ practice. Each group comprised 108

grade 2 students and 112 students from grades 3 and 4, respectively. Importantly, there were no notable discrepancies in gender distribution, age, or grade level between the intervention and control groups.

Instrumentation

Ba Duanjin

The Ba Duanjin comprises three key components: the Ready Position, the Closing Form, and eight different movements. These movements include holding the hands high with palms up to regulate the internal organs (movement 1) and posing as an archer shooting both left and right-handed (movement 2). The names and contents of the Ba Duanjin are closely related to traditional Chinese medicine theories, specifically pertaining to the five zang-organs, the six fu-organs, meridians and blood, and the triple burner. These eight movements are repeated six times throughout the practice, each emphasizing gentle and deliberate motions. The complete set of Ba Duan Jin typically lasts approximately 12 min. Its practice emphasizes a harmonious blend of gentle, slow movements, promoting a seamless flow between relaxation and tension, movement and stillness, and unity of mind and body, all while nurturing the flow of qi within the practitioner.

Creativity Self-efficacy

The Chinese version of the Creativity Self-efficacy scale, initially developed by Lin Bifang et al. (2008) and later revised by Xiao Jiachun (2016), was adapted to suit the characteristics of primary school students. Consisting of 10 questions, the scale encompasses three dimensions: creative thinking strategy (four items), creative product belief (three items), and counter-negative evaluation (three items). Employing a six-point scoring system, ranging from one (indicating very inconsistent) to six (signifying very consistent), with item 9 being reverse-scored, the Likert six-point scoring method was utilized. Higher scores on the scale correspond to higher levels of creative self-efficacy. Reliability analysis revealed a Cronbach's α coefficient of .88 for the scale (Xiao J., 2016). In this study, Cronbach's α coefficients for three separate time points were calculated as 0.693, 0.693, and 0.697, respectively, indicating satisfactory internal consistency reliability.

Covariate Variable

To mitigate the potential impact of parenting styles on the creative self-efficacy of primary school students, the study treated parenting styles as a covariate. The relationship between parenting style and self-efficacy has been explored across various countries. In Serbia, for instance, the authoritative parental educational style has been linked to the development of adolescents' self-efficacy (Pavicevic & Lj. Zivkovic, 2021). Similarly, research conducted in Nigeria found that permissive parenting exhibited a negative association with academic, social, and emotional self-efficacy, while authoritarian parenting showed a positive correlation with academic and social self-efficacy but a negative correlation with emotional self-efficacy; authoritative parenting displayed mixed effects across these domains (Nwosu, 2016). Moreover, in Malaysia, the authoritative parenting style was strongly linked with self-efficacy (Tam et al., 2012). In Uganda, all parenting styles demonstrated correlations with self-efficacy, with authoritative parenting styles capable of predicting self-efficacy levels (Noel et al., 2021). While all parenting styles exert varying degrees of influence on children's self-efficacy, authoritative parenting emerges as the most consistently associated, demonstrating predictive capabilities across multiple studies (Nwosu, 2016; Tam et al., 2012; Noel et al., 2021).

Furthermore, previous research has highlighted the detrimental effects of fathers' reluctance to indulge their children, which can hinder the development of their creative personalities. Parental encouragement of novelty has been linked to an increased perception of children exhibiting creative behaviors (Dechaume & Lubart, 2021). The authoritarian parenting style is a significant predictor of children's creativity, albeit with a negative association. Analysis outcomes have indicated a correlation between maternal parenting style and children's creativity development, revealing that children whose mothers adopt a permissive parenting style tend to display lower levels of creativity development. Consequently, parenting styles influence creativity and self-efficacy, with studies demonstrating that parental acceptance and autonomous support positively correlate with children's creative self-efficacy and the development of their creative personal identity.

The Parenting Style and Dimension Questionnaire (PSDQ), developed by Robinson et al. (2001), was translated and adapted for use with primary school children in China by Lin Mengying (2009). This abbreviated version of the PSDQ primarily assesses parental styles and behaviors. The scale comprises three dimensions: authoritative parenting, authoritarian parenting, and permissive parenting. Respondents indicate their agreement with each statement using a 5-point Likert scale, where 1 represents "never," 2 denotes "occasionally," 3 signifies "about half the time," 4 indicates "often," and 5 represents "always." Higher scores within each dimension suggest a stronger alignment of the parents' behavior with a particular parenting style, with scores across different dimensions considered independent of each other. The reliability coefficients for authoritative, authoritarian, and permissive parenting were .91, .86, and .60, respectively, while the overall scale's Cronbach's α was calculated at .79, indicating satisfactory internal consistency.

Procedure

Although existing HQ teaching guidelines cater to adults, they cannot be directly applied to primary school students owing to differences in cognition, receptiveness, and knowledge reserves. Thus, the first author developed tailored teaching guidance specifically for primary school students to meet the requirements of this study. Over 12 weeks, comprising 36 lessons, participants engaged in three phases of instruction, with each lesson lasting 40 min. The first phase, focusing on physical movement practice, spanned 18 lessons, followed by

the second phase, dedicated to breath method practice, encompassing ten lessons. The final phase centered on psychological regulation practice and consisted of eight lessons. Participants received instruction in a group setting led by trained instructors. Each phase of instruction, meticulously detailed in Chinese, delineates teaching time, procedures, content, aids, and methods. This comprehensive guide ensures that instructors possess a clear framework for conducting HQ Ba Duanjin practice, thereby enhancing the consistency and efficacy of teaching. Instructors received thorough briefings on utilizing the teaching guidance and implementation of training protocols to minimize variations in teaching practices across instructors.

Ethical permission for the study was obtained from Universiti Tunku Abdul Rahman. The class teacher facilitated the distribution of paper consent forms to students, ensuring parental involvement in the informed consent process. The researcher provided detailed explanations of the study to parents through phone calls or face-to-face discussions to address any questions or concerns they may have had. Furthermore, participants and their parents collectively signed consent letters at home.

The participants' creative self-efficacy was evaluated during the pre-test phase. The test administration was overseen by class teachers who were independent of the research. All participants from the intervention and control groups within the same school collectively completed a paper-based test at the school premises before morning classes on the third day preceding the commencement of the intervention. Participants' parents were also requested to complete a parenting style assessment on the same day before the intervention initiation to serve as a control variable. Each participant took the test materials home, and the parents returned them to the class teacher. The intervention commenced in the spring semester of 2022, with students in the intervention group engaging in HQ practice from March to June 2022. Practice sessions were scheduled for the afternoon following regular school hours. During the post-test phase, participants' creative self-efficacy was assessed one day after the completion of the intervention, employing the same methodology as in the pre-test phase. Finally, a follow-up test was administered in July 2022, one month after the intervention concluded, to assess the same variable. The testing procedure remained consistent with the methods employed during the initial two assessments.

Analysis strategy

The study clarified that only individuals with over one year of primary school teaching experience and who have achieved first prize in the provincial HQ competition are eligible to serve as instructors. Furthermore, comprehensive HQ teaching guidance was provided to instructors, mandating strict adherence to the provided guidelines during instruction. However, certain variables beyond direct control, such as individual teaching styles, may still influence the teaching process. An independent sample T-test was employed to examine potential discrepancies in creative self-efficacy among participants within the same group (intervention or control) across Time 1, Time 2, and Time 3 after being taught by different instructors.

Before commencing the experiment, it was crucial to recognize the potential impact of varying parenting styles on the psychological attributes of primary school students, including their creative self-efficacy. To address this, an independent samples T-test was employed to assess whether significant differences existed in the parenting styles of participants' parents between the intervention and control groups.

Following this preliminary analysis, SPSS 21.0 was utilized to investigate the influence of HQ practice on children's creative self-efficacy. The analysis involved the examination of between-subject variables to discern significant differences between the control and intervention groups across three assessment points: pre-test (Time 1), post-test (Time 2), and follow-up (Time 3). Additionally, within-subject variables were assessed to determine any significant differences in test results within each group, both within the intervention and control groups. The analysis incorporated parenting styles as covariates to account for their potential influence.

Results

An examination of the impact of both practicing and not practicing HQ on participants' creative self-efficacy was conducted using a mixed ANCOVA. Initial data analysis involved using a Kolmogorov–Smirnov test on the data of 332 students, with each group's $df = 166$, revealing no significant differences in measurement time and measurement group ($p = .55$). Subsequently, main effects analysis revealed statistically significant results for both the intervention (between-subject effect) with $F(1,330) = 32.73$, $p < .001$, and Time (within-subjects effect) with $F(1.79,589.23) = 31.936$, $p < .001$. Following Mauchly's sphericity test, the Time \times Intervention interaction effect violated the sphericity assumption, with $\chi^2 = 45.484$, $p < .001$. Huynh–Feldt correction was then applied, resulting in $\epsilon^b = .893$, and subsequent analysis revealed a significant interaction effect, $F(1.79, 589.23) = 19.055$, $p < .001$. Further examination through simple effect analysis indicated no significant difference between the intervention and control groups at Time 1.

However, at both Time 2 ($F(1, 330) = 65.46$, $p < .001$) and Time 3 ($F(1, 330) = 23.11$, $p < .001$), the intervention group outperformed the control group significantly (Table 1). Additionally, within the intervention group, participants reported significantly higher scores at Time 2 compared to Time 1 ($F(2, 329) = 62.14$, $p < .001$) and Time 3 ($F(2, 329) = 62.14$, $p = .004$), respectively. Moreover, participants also demonstrated a notable increase in creative self-efficacy scores at Time 3 compared to Time 1 ($F(2, 329) = 62.14$, $p < .001$). Conversely, no significant differences were observed in scores in the control group across the time points.

Table 1. Creative Self-efficacy

Variable	Time point	Intervention		Control	
		Mean	Standard Deviation	Mean	Standard Deviation
Creativity Self-efficacy	Time 1	35.62	3.77	36.00	3.61
	Time 2	39.26 ^{a,b}	2.66	36.62	3.26
	Time 3	38.01 ^{a,b,c}	4.45	35.83	4.90

^a The difference between this score and the control group score tested simultaneously was found to be statistically significant. ^b The difference between this score and the score tested at Time 1 within the same group was also statistically significant. ^c Furthermore, the difference between this score and the score tested at Time 2 within the same group was statistically significant.

The abovementioned results remained consistent even after considering the influence of parental parenting styles. An independent sample T-test demonstrated no notable difference in parental parenting styles between the control and intervention groups. Specifically, the control group ($n = 332$) exhibited a mean score of 91.23, while the intervention group ($n = 332$) displayed a mean score of 90.55, yielding $F = 0.07$ with homogeneity of variance and $p = 0.38$. These results are presented in Table 2.

Table 2. Parenting style comparison

Covariate Variable	Group	Mean	Standard Deviation	Sig.
Parenting styles	Control group	91.23	10.12	.38
	Intervention group	90.55	9.67	

The study utilized independent sample t-tests to evaluate whether different instructors had a significant impact on their students' creative self-efficacy. At Time 1, students instructed by Instructor 1 achieved an average score of 33.93, while those instructed by Instructor 2 attained an average score of 33.69. The disparity in scores between the two instructors was found to be statistically insignificant ($p = .54$). Likewise, the findings at Time 2 ($p = .71$) and Time 3 ($p = .61$) also revealed no noteworthy differences. Consequently, the research concluded that the teaching provided by different instructors did not influence the outcomes of creative self-efficacy assessments across the three testing periods. These results are summarized in Table 3.

Table 3. Instruction effect comparison

Time point	Instructor	Mean	Standard Deviation	Sig.
Time 1	Instructor 1	33.93	3.58	.54
	Instructor 2	33.69	3.8	
Time 2	Instructor 1	36.01	3.27	.71
	Instructor 2	35.87	3.24	
Time 3	Instructor 1	37.06	4.43	.61
	Instructor 2	36.87	4.47	

Note. Instructor 1 and Instructor 2 refer to two teachers who separately instructed students in the practice of HQ.

Discussion

The primary focus of this study is on the relationship between HQ and creative self-efficacy among primary school students. This research aims to determine whether engaging in HQ practice influences the creative self-efficacy of these students. Employing self-reported questionnaires, the study evaluates participants' perceptions of their creative self-efficacy. The findings reveal that practicing HQ positively impacts the creative self-efficacy of primary school students. Moreover, although this impact lessens after discontinuing HQ practice, it remains superior to not practicing at all. This underscores the notion that HQ, as a form of physical activity, has a beneficial influence on the creative self-efficacy of primary school students through regular practice, and this influence persists even after cessation of practice. While prior experimental investigations on the correlation between HQ and creative self-efficacy are lacking, our research results align with existing literature exploring the effects of physical activity on creativity and self-efficacy. Notably, physical activity has been shown to enhance creativity, with creative self-efficacy recognized as a fundamental prerequisite to fostering creativity. For instance, Rominger et al.(2023) demonstrated, through a 5-day experiment involving 157 university students, that simply increasing walking can enhance everyday creative ideation performance. They proposed that completing 100 steps within 5 min before engaging in a creative task can enhance performance outcomes, and walking 500 steps can increase creativity's quality. Furthermore, a meta-analysis corroborated positive effects on creative thinking, regardless of whether the physical activity is acute or chronic (Rominger et al., 2022). Yoga, similar to HQ, encompasses gentle body postures, breath control, and meditation, constituting a form of physical activity known for its holistic benefits. In a randomized controlled trial by Bollimbala et al.(2020) involving 92

students, yoga practice enhanced their originality and flexibility of divergent thinking. The researchers attribute this improvement to the Ego Depletion Theory, suggesting that yoga positively impacts the restoration and augmentation of divergent thinking resources. This aligns with Vilar's (2018) perspective, suggesting that during HQ practice, the brain enters a state of rest, facilitating the emergence of creativity. Although empirical research on the impact of HQ on creativity is limited, Si Hongyu (2012) discovered, through questionnaires and interviews, that HQ positively influences aesthetic creativity. Furthermore, physical activity has consistently been linked to increased self-efficacy, with creative self-efficacy representing a specific facet of self-efficacy. Wang et al. (2020) concluded from a survey involving 853 college students that physical activity levels positively correlate with self-efficacy. Similarly, other studies support the notion that physical activities like Tai Chi can bolster self-efficacy across various age groups, particularly among middle-aged and older individuals. In a study conducted in Japan, researchers discovered that individuals involved in sports activities, whether in sports clubs or exercising alone, exhibited higher levels of self-efficacy than non-participants (Lingzhi et al., 2018). Reverdito et al. (2017), surveying 821 adolescents around the age of thirteen, found a positive correlation between the duration of participation in extracurricular physical activities and self-efficacy levels. Consequently, analogous conclusions can be inferred from studies utilizing HQ as an intervention method, suggesting that practicing HQ enhances participants' self-efficacy (Lee et al., 2004; Tsang et al., 2013). These studies, focusing on the impact of physical activity on creativity or self-efficacy, collectively contribute to the understanding that HQ can enhance creative self-efficacy. This observation resonates with the broaden-and-build theory, which posits that positive emotions can increase and enrich psychological resources. Engaging in either single-session or long-term HQ practice not only alleviates negative emotions such as depression, anger, and anxiety but also instills a sense of pleasure following just 20 min of HQ activity. Qualitative research echoes these findings, with practitioners frequently reporting positive emotions like joy, happiness, or satisfaction during and after Qigong practice. Thus, cultivating these positive emotions provides psychological resources that enable HQ to enhance creative self-efficacy.

A significant limitation of this research is its regional specificity because the study participants are exclusively from southern China. Consequently, extrapolating conclusions to the entire country or other regions may be unwarranted. Future research should broaden the scope by including participants from northern, eastern, and western China. Moreover, this study relied solely on self-assessment scales to measure variables, which introduces limitations inherent to such measurement methods and indicators. To address this limitation, future research could adopt a more diverse approach to explore the potential benefits of HQ in various domains. In addition to self-assessment scales, objective methods—such as observing academic performance or employing other relevant indicators—could be incorporated for a more comprehensive understanding of the effects of HQ. In terms of practical implications, this study provides comprehensive teaching guidance tailored for instructing primary school students in HQ. Additionally, it provides empirical evidence affirming the advantageous outcomes of HQ practice among primary school students. Given the government's commitment to policy provision and financial backing for each primary school, the study's findings serve as compelling evidence for the judicious allocation of national resources towards HQ instruction in educational settings. This research underscores its practical significance by demonstrating the effectiveness and value of such resource allocation. On a theoretical level, the study offers empirical validation for the broaden-and-build theory. Furthermore, it provides concrete empirical evidence regarding the influence of physical activity on creative self-efficacy.

Conclusions

Following a three-month HQ intervention involving 332 primary school students from China, it was determined that students' creative self-efficacy improved under the guidance of primary school teachers proficient in HQ. Notably, this enhancement persisted even after accounting for the impacts of parenting styles and variations in teaching approaches among instructors. Consequently, the findings advocate for the integration of HQ into the physical education curriculum of schools, presenting a valuable opportunity to foster the development of creative self-efficacy among primary school students.

Conflicts of interest

This study does not contain any conflicts of interest.

References:

- Beghetto, R. A. (2009). Correlates of intellectual risk taking in elementary school science. *Journal of Research in Science Teaching*, 46(2), 210–223. <https://doi.org/10.1002/tea.20270>
- Beghetto, R. A., & Baxter, J. A. (2012). Exploring student beliefs and understanding in elementary science and mathematics. *Journal of Research in Science Teaching*, 49(7), 942–960. <https://doi.org/10.1002/tea.21018>
- Bicer, A., Lee, Y., Perihan, C., Capraro, M. M., & Capraro, R. M. (2020). Considering mathematical creative self-efficacy with problem posing as a measure of mathematical creativity. *Educational Studies in Mathematics*, 105(3), 457–485. <https://doi.org/10.1007/s10649-020-09995-8>
- Bollimbala, A., James, P. S., & Ganguli, S. (2020). The effect of Hatha yoga intervention on students' creative ability. *Acta Psychologica*, 209, 103121. <https://doi.org/10.1016/j.actpsy.2020.103121>

- Cataldo, R., John, J., Chandran, L., Pati, S., & Shroyer, A. L. W. (2013). Impact of Physical Activity Intervention Programs on Self-Efficacy in Youths: A Systematic Review. *ISRN Obesity, 2013*, 1–11. <https://doi.org/10.1155/2013/586497>
- Dechaume, M., & Lubart, T. (2021). Parenting Style and Creative Potential of Children. *Educar Em Revista, 37*, 1-16. <https://doi.org/10.1590/0104-4060.80045>
- Gouw, V. X. H., Jiang, Y., Seah, B., He, H., Hong, J., & Wang, W. (2019). Effectiveness of internal Qigong on quality of life, depressive symptoms and self-efficacy among community-dwelling older adults with chronic disease: A systematic review and meta-analysis. *International Journal of Nursing Studies, 99*, 103378. <https://doi.org/10.1016/j.ijnurstu.2019.06.009>
- Han, S., Li, B., Wang, G., Ke, Y., Meng, S., Li, Y., Cui, Z., & Tong, W. (2022). Physical Fitness, Exercise Behaviors, and Sense of Self-Efficacy Among College Students: A Descriptive Correlational Study. *Frontiers in Psychology, 13*. <https://doi.org/10.3389/fpsyg.2022.932014>
- He, W., & Wong, W. (2022). Affective state contributes to creative self-efficacy: Evidence from an experimental study of emotion induction. *Thinking Skills and Creativity, 45*, 101061. <https://doi.org/10.1016/j.tsc.2022.101061>
- Karwowski, M., & Barbot, B. (2016). *Creative self-beliefs: Their nature, development, and correlates*. <https://doi.org/10.1017/CBO9781139941969.016>
- Lee, M.-S., Lim, H.-J., & Lee, M. S. (2004). Impact of Qigong Exercise on Self-Efficacy and Other Cognitive Perceptual Variables in Patients with Essential Hypertension. *The Journal of Alternative and Complementary Medicine, 10*(4), 675–680. <https://doi.org/10.1089/acm.2004.10.675>
- Li, K., Walczak-Kozłowska, T., Lipowski, M., Li, J., Krokosz, D., Su, Y., Yu, H., & Fan, H. (2022). The effect of the Baduanjin exercise on COVID-19-related anxiety, psychological well-being and lower back pain of college students during the pandemic. *BMC Sports Science, Medicine and Rehabilitation, 14*(1), 102. <https://doi.org/10.1186/s13102-022-00493-3>
- Lin, B., & Qiu, H. (2008). The development and related research of self-efficacy scale in creative teaching. *Journal of Education Research and Development, 4*(1), 142–170.
- Lin M.Y. (2009). *Comparison of parenting attitude and social ability of preschool only child and non-only child* [Unpublished Master's Thesis]. Institute of Infant and Childcare, National Taipei College of Nursing.
- Ma Z. L., Wang B., & Xi B. S. (2016). Influence of Health Qigong and Mawangdui guiding technique exercise on mood state and anxiety level of middle-aged and elderly women. *Chinese Journal of Gerontology, 36*(13), 3248–3249. [10.3969/j.issn.1005-9202.2016.13.075](https://doi.org/10.3969/j.issn.1005-9202.2016.13.075)
- Noel, J., Kemeza, I., Kiaritha, E. N., & Muhwezi, D. (2021). Parenting Styles and Self-Efficacy among Secondary School Students in Ibanda North, *International Journal of Social Sciences & Educational Studies, 8*(2). <https://doi.org/10.23918/ijsses.v8i2p135>
- Nwosu, K. (2016). Parenting styles, test anxiety, and self-efficacy of secondary school students in Nigeria: Lessons from Nigerian sociocultural context. *Education Research Journal, 6*, 32–41.
- Pavicevic, M. S., & Lj. Zivkovic, T. (2021). Parenting Styles as Predictors of Adolescents' Self-Efficacy and Subjective Well-Being. *The New Educational Review, 65*, 29–39. <https://doi.org/10.15804/tner.21.65.3.02>
- Reverdito, R. S., Carvalho, H. M., Galatti, L. R., Scaglia, A. J., Gonçalves, C. E., & Paes, R. R. (2017). Effects of Youth Participation in Extra-Curricular Sport Programs on Perceived Self-Efficacy: A Multilevel Analysis. *Perceptual and Motor Skills, 124*(3), 569–583. <https://doi.org/10.1177/0031512517697069>
- Robinson, C., Mandlco, B., Roper, S., & Hart, C. (2001). The Parenting Styles and Dimensions Questionnaire (PSDQ). *Handbook of Family Measurement Techniques, 3*, 319–321.
- Rominger, C., Fink, A., Weber, B., Benedek, M., Perchtold-Stefan, C. M., & Schwerdtfeger, A. R. (2023). Step-by-step to more creativity: The number of steps in everyday life is related to creative ideation performance. *American Psychologist, No Pagination Specified-No Pagination Specified*. <https://doi.org/10.1037/amp0001232>
- Rominger, C., Schneider, M., Fink, A., Tran, U. S., Perchtold-Stefan, C. M., & Schwerdtfeger, A. R. (2022). Acute and Chronic Physical Activity Increases Creative Ideation Performance: A Systematic Review and Multilevel Meta-analysis. *Sports Medicine - Open, 8*(1), 62. <https://doi.org/10.1186/s40798-022-00444-9>
- Slovakova, M., Bendikova, E., Rozim, R., & Daubnerova, J. (2022). The effect of goal-directed extracurricular physical activities on development of physical abilities in children of early school age. *Journal of Physical Education and Sport, 22*(5), 1105–1111. <https://doi.org/10.7752/jpes.2022.05139>
- Si H. (2012). Health Qigong teaching and aesthetic education [Doctor's Thesis, Shanxi University]. http://gffiy28995338bdc041dasfxcpo5x6nub66c9x.fffb.suse.cwkeji.cn:999/kcms2/article/abstract?v=j6HAoO1nZAwB1YIUpiCnwVpEO4WVK_fOznHKj9z0hGRofWDIU5hb9rljdPQJMMwWPfg79SVOfB1povzUHIn60n39TJQDhc8ofassKXwPu4rAVvyRXjEIM0nnfvXyKIS7wP-o49F5VvLRADPOV8BNg=&uniplatform=NZKPT&language=CHS
- Tam, C. L., Chong, A., Kadirvelu, A., & Khoo, Y. T. (2012). Parenting styles and self-efficacy of adolescents: Malaysian scenario. *Global Journal of Human-Social Science: Arts & Humanities, 12*(14), 19–25. https://globaljournals.org/GJHSS_Volume12/3-Parenting-Styles-and-Self-Efficacy-of-Adolescents.pdf

- Tsang, H. W. H., Tsang, W. W. N., Jones, A. Y. M., Fung, K. M. T., Chan, A. H. L., Chan, E. P., & Au, D. W. H. (2013). Psycho-physical and neurophysiological effects of qigong on depressed elders with chronic illness. *Aging & Mental Health*, 17(3), 336–348. <https://doi.org/10.1080/13607863.2012.732035>
- Vilar, E. (2018). Understanding Chinese Qigong in the context of Western culture. *Journal of Acupuncture and Tuina Science*, 5(16), 315–318. <https://doi.org/10.1007/s11726-018-1069-4>
- Wang, K., Yang, Y., Zhang, T., Ouyang, Y., Liu, B., & Luo, J. (2020). The Relationship Between Physical Activity and Emotional Intelligence in College Students: The Mediating Role of Self-Efficacy. *Frontiers in Psychology*, 11. <https://www.frontiersin.org/articles/10.3389/fpsyg.2020.00967>
- Witt, C., Becker, M., Bandelin, K., Soellner, R., & Willich, S. N. (2005). Qigong for Schoolchildren: A Pilot Study. *The Journal of Alternative and Complementary Medicine*, 11(1), 41–47. <https://doi.org/10.1089/acm.2005.11.41>
- Xiao J. (2016). A longitudinal analysis of the effectiveness of scientific creativity curriculum. *Journal of Educational Practice and Research*, 29(2), 65–104. <https://doi.org/10.6173/CJSE.2017.2501.03>