Effects of bali yoga program for athletes (BYP-A) on psychological state related to performance of circus artists

Elena Grilli Cadieux, Véronique Richard and Gilles Dupuis

DOI: https://doi.org/10.22271/yogic.2022.v7.i1a.1249

Abstract

Yoga and the practice of mindfulness have gained popularity as performance psychology interventions, by promoting a relaxed state of focus, increasing body flexibility, and improving awareness during performances. Like professional athletes, circus performers invest a great deal of time, resources, and mental and physical energy in their performances. The present pilot project focuses on the effect of the Bali Yoga Program, adapted for athletes (BYP-A), on the general psychological state, quality of life, performance anxiety, and perceived athletic performance of circus artists studying at the National Circus School in Montreal. Over 8 weeks, student circus artists (n = 18) attended 90-min yoga session. Results showed that following the intervention, participants reported decreased depressive and somatic symptoms, decreased cognitive and somatic performance anxiety and enhanced coping abilities (relaxation, mental distractions). BYP-A has initially shown to provide benefits for circus artists, such as factors related to improved psychological health and mental state related to performance. Future avenues for research should explore yoga intervention more thoroughly and pursue to investigate the differences existing between circus arts and other performance fields.

Keywords: yoga, performance anxiety, quality of life, coping, circus arts, performance

Introduction

Circus performers invest a great deal of time, resources, mental strength, and physical energy in their performances. This clientele must develop multiple skills (dance, music, theater) going beyond the mastery of an athletic discipline. More precisely, they must train the technique of their chosen discipline while perfecting their live stage presence to constantly adapt their expertise to new environments (e.g., various show conditions). There are essential foundations to understanding stage performance psychology, such as balancing the attention required for skill execution, managing the pressure of delivering an outstanding performance, while being sensitive and closely connected with the audience (Filho, Aubertin & Petiot, 2016; Ménard & Hallé, 2014) [22, 57]. These high-level demands can lead to significant psychological health issues such as overtraining, exhaustion, injuries, eating disorders, and performance anxiety. Van Rens & Heritage (2021) [75] found that professional performing artists reported significantly higher rates of mental health disorders and undesirable emotional states than the general population, as well as precarious and low rewards in the work domain, such as remuneration, job security and opportunities for career progression (Donohue et al., 2018; Van Rens et al., 2021; Willis et al., 2019) [17, 75]. Therefore, a major challenge experienced by this population is to maintain a balance between stress and recovery (Kellmann, 2010) [40].

While performance psychology interventions have been shown to contribute greatly to elite athletes’ well-being, optimal psychological states, and performances (Mellalieu & Handon, 2015) [56], there is a paucity of literature emphasizing the effect of yoga practice on the psychological health and performance of circus artists and additional rigorous research is needed to further explore the prospective benefits of these interventions. Given the importance of developing mental strategies and techniques to help circus artists maintain and enhance their psychological well-being, the current study explored the impact of regular yoga practice on circus student-artists' psychological states (Filho, Aubertin & Petiot 2016; Tremblay, 2018) [22, 74].
Mindfulness and Yoga Intervention

Mindfulness is defined as paying attention to the present moment and encouraging individuals to tolerate and change their relationship to internal states (e.g., anxiety), in a nonjudgmental manner (Kabat-Zinn, 1994) [40]. In the last decades, Mindfulness-based interventions have grown in popularity in the athletic domain because of their promising impacts on athletes' psychological states (Anderson, Ferreira, & Ferretti, 2010; Gardner & Moore, 2012) [13, 30]. Kabat-Zinn (1990) [42] suggests that the practice of hatha yoga is one of the most influential to connect to the body through mindful consciousness, by encouraging the acceptance of the body’s physical boundaries and psychological state. Yoga practice, a discipline consisting of several possible features and components (e.g., physical postures, breathing exercises, meditation), is intended to enhance and balance the main aspects of health: physical, mental, emotional, and spiritual. Kabat-Zinn noticed that individuals often try to exceed their limits in training, fighting to push further. Contrarily, yoga practice promotes remaining aware of the body’s limits, by observing and respecting them in the present moment (Grilli Cadieux, Gemme, & Dupuis, 2021) [43]. By accepting their physical limits, athletes may prevent the distress that typically comes with relentless striving to surpass oneself. Because circus disciplines stretch circus artists’ capacity to remain focused on the “here and now” while being highly physically demanding, the practice of yoga appears to be a relevant form of mindfulness practice to ignite wellbeing in this specific population.

Psychological Benefits of Mindfulness and Yoga Intervention

Practicing yoga has revealed multiple benefits on psychological wellbeing. For instance, it has been shown to enhance mood, alleviate anxiety (Cramer et al., 2018) [15], and reduce perceived stress (Wang & Szabo, 2020) [76]. While anxiety is defined as a natural human reaction to stress described by sensations of tension, apprehensive thoughts and physical changes, that is activated whenever a person perceives a danger or threat (APA, 2021) [1], performance anxiety refers to a propensity to consider performing circumstances as threatening and react to these situations with specific negative emotions (e.g. feelings of apprehension and tension), associated primarily and directly with performance (Martens, Vealey, & Burton, 1990; Fletcher & Hanton, 2003) [55, 23]. The literature concerned with yoga highlights its benefit in lowering perceived stress, which might indicate an improved capability to manage negative events and explains its association with anxiety reduction (Goodman, Kashdan, Mallard, & Schumann, 2014) [32]. Increased quality of life is another reported benefit of yoga practice (Harner, Hanlon & Garfinkel, 2010; Büssing, Michalsen, Khalsa, Telles, & Sherman, 2012) [40, 14]. Described as people’s perceptions of their life position in relation to the culture and value systems in which they live and in relation to their objectives, expectations, norms, and concerns (WHOQOL, 1998) [78], quality of life showed signs of improvement following the practice of yoga, on various health-related outcome measures (e.g., HRV, blood glucose, blood lipids, salivary cortisol, and oxidative stress) in both healthy and ill populations (Ross & Thomas, 2010) [65]. In the athletic domain, through acceptance, athletes learn to listen to their body and mind, and thereby prevent the distress that may result from strenuous efforts (Tierney, 2020) [73]. To circumvent the negative impacts of anxiety and increase quality of life, the development of coping strategies is key. According to Lazarus & Folkman (1984) [53], coping strategies allow individuals to devote in behavioral and cognitive efforts and direct them to handle particular external and internal demands. Among the numerous coping skills, the capacity to relax and recognize distracting thoughts could be developed through yoga. One component of yoga is conscious relaxation (yoga nidra, savasana), which consists of reestablishing contact with various body parts, cultivating moment-to-moment awareness, accepting physical sensations, and letting go of disruptive thoughts (Kaufman, Glass, & Pineau, 2019; Polsgrove, Haus, & Lockyer, 2019) [31, 61]. These aspects of yoga appear to be efficacious strategies to enhance awareness of the leading stressors that should be managed, and reject less powerful and significant stressors, thereby enabling athletes to better cope with stress (Marinov, Gancheva, Angelcheva, Ignatov, & Dimitrov, 2017; White, Bethell, Charnock, Leckey, & Penpraze, 2021) [84, 77]. Finally, the practice of yoga also impacted positively on performance indicators in various populations. Namely, research has shown that such practice can allow dancers to enhance mind-body awareness, improve their movement abilities, decrease their pain, and learn to tolerate sensations that emerge during trainings. Similarly, yoga also resulted in enhanced athletic performance, through enhancement in flow disposition dimensions such as increased concentration and greater sense of control (Briegel-Jones, Knowles, Eubank, Giannoulatos, & Elliot, 2013) [111]. Yoga was also shown to increase flexibility and agility (Bal & Kaur, 2009) [7], strengthen stability and control (Hart & Tracy, 2008) [41], cardiorespiratory ability, and well-being (Harinath et al., 2004) [39]. Hence, such a practice could facilitate goal attainment for artists.

In light of these findings and yoga’s rising recognition as a complementary mental performance intervention, the aim of the present study was to test the effect of yoga practice on anxiety, depression, quality of life, coping, and goal achievement among circus artists, a group for which the effect of yoga has never been studied before. Specifically, given its ecological validity within the motor domain, we focused on Bali Yoga Program for Athletes.

Bali Yoga Program for Athletes

The Bali Yoga Program for Athletes (BYP-A) is a standardized yoga intervention based on Madan Bali’s method (Bali, 2015) [8]. Bali is a notorious yoga instructor who has been teaching for almost 60 years now (Blackman, 1973; Thompson, 2012; Gyulai, 2014) [10, 71, 38]. The BYB-A intervention consists of idiosyncratic characteristics, including psychoeducational matters on the psychophysiological features of athletic performance (e.g., reduction of performance anxiety, increasing concentration and mindfulness). Furthermore, through frequent relaxation periods between each posture, this method allows the body to develop its capacity to regulate and rejuvenate. More specifically, the BYP is adapted to athletes/artists needs (Filho et al., 2016; Anestin, Duips, Lanctôt, & Bali, 2017; Tremblay, 2018) [22, 4, 74] and designed to provide them with an efficient support program, that can be easily integrated into their training plan and particular reality.

The Present Study

In addition to examining the impacts of an 8-week yoga intervention (BYP-A) on the psychological state (anxiety, performance anxiety, depression, somatic symptoms, quality
of life, mindfulness, and coping skills) as well as the perceived performance of circus artists, the present pilot project explored the feasibility of such an intervention in an elite circus school context. It was expected that: (a) the BYP-A program for circus artists was feasible, (b) student-artists who participated in the study reported an improved psychological state (reduced anxiety, depression and somatic symptoms, increased quality of life), an enhanced mental performance state (reduced performance anxiety, increased mindfulness, and coping skills) and an improved perceived athletic performance following the intervention.

Method
Study Design
Led in an ecologically valid setting, this study evaluated variations from longitudinal pre- to post intervention through investigating responses of 18 subjects of the group analysis.

Participants
Participants were 18 adult student artists (9 females, 9 males; M age =19, SD=1.77 of the National Circus School (NCS) in Montréal (Canada). Specialized in various circus disciplines such as acrobatics (n=7), dual acts (n=6), aerials acts (n=5), juggling (n=3), and balancing (n=3), student artists were predominantly Caucasian (n=14). They had a high school (n=15) or college (n=3) education, and originated from Quebec (n=6), other Canadian provinces (n=2), or other countries (n=10). Eligibility criteria for participation were as follows: 18 years and older, registered at NCS, able to understand French or English, not regularly practicing yoga, and not taking part in any psychotherapy.

Measures
Sociodemographic Questionnaire. This questionnaire assesses basic characteristics (sex, age, ethnicity) and background information (place of origin, housing status, level of education, previous athletic discipline and experience, actual circus specialty) of participants.

Feasibility Measures
Satisfaction Questionnaire: This retrospective questionnaire evaluates the participants’ adherence to the yoga program. It focuses on participants’ satisfaction and experience, by assessing which aspects of the intervention were found useful, were appreciated or disliked, and how much participants would recommend it to other circus artists. Each item is rated on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely).

Logbook
This questionnaire assesses the participants’ adherence to individual home yoga practice. Subjects reported how many times per day or per week they had practiced yoga (frequency), at what time of the day (morning, afternoon, and evening) and how long it has lasted (duration).

Measures of Effects
Patient Health Questionnaire-Somatic/Anxiety/Depression: (PHQ-SAD; Kroenke, Spitzer, Williams, & Löwe, 2010) [49]. Based on the DSM-IV, this questionnaire is a short screening instrument, developed to detect mental disorders in the primary care settings (Löwe et al., 2004) [53]. Extensively used to evaluate the presence and severity of depressive, anxious, or somatic symptoms, the PHQ-SAD incorporates three scales: the Patient Health Questionnaire-9 (PHQ-9); the Generalized Anxiety Disorder-7 (GAD-7), and the Patient Health Questionnaire-15 Somatic Symptoms (PHQ-15). This questionnaire has been reported to have adequate psychometric properties (Spitzer, Kroenke, Williams, & Löwe, 2006) [70].

Quality of Life Systemic Inventory
(QLSI; Dupuis, Perrault, Lambany, Kennedy, & David, 1989). The QLSI is a self-reported questionnaire which includes 28 items (life domains) divided in 8 dimensions: physical health, emotional and cognitive function, social and family environment, spirituality, hobbies, domestic work. Building on Van Rens et al. recommendations (2021) [75], an additional section covering five items intended to capture specific characteristics of student-artists, that were not comprised in the initial questionnaire items, was included: (a) learning efficacy, (b) application of instructions, (c) kindness toward the body, (d) retention of instructions, and (e) ease of movement. For each domain, this scale evaluates the gap existing between one’s actual situation and personal objectives. Using a Visual Analogue Scale indicator, this gap is measured by the importance of each life domain and the movement either towards or away from the goals. Then, a Likert scale ranging from 1 (essential to my life) to 7 (completely useless) is used to rate the importance of each item. QLSI has demonstrated strong global consistency (α = 0.87). Subscales are relatively independent with no correlations exceeding 0.53. The test–retest reliability is 0.86 (p<.001) for the English version and 0.88 for the French version (Dupuis, Taillefer, Martel, Rivard Roberge, & St-Jean, 2004) [19].

Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990) [55]. The CSAI-2 is used to assess the level of anxiety of student-artists after receiving the intervention. The CSAI-2 contains 16 self-reported items measuring three aspects of the state of anxiety (i.e., cognitive anxiety, somatic anxiety, and self-confidence), including scales for direction, frequency, and intensity of each symptom. The intensity was rated on a 4-point Likert scale from 1 (not at all) to 4 (very much so), the direction was scored on a 7-point scale ranging from -3 to +3, and the frequency was rated from 1 (not at all) to 7 (all the time). Martens et al (1990) [55] reported Cronbach alpha reliability coefficients of 0.81 for cognitive anxiety, 0.82 for somatic anxiety, and 0.88 for self-confidence.

Five Facet Mindfulness Questionnaire-Short Form: (FFMQ-SF; Bohlmeijer Ten Klooster, Fedde, Veehof, & Baer, 2011) [12]. The FFMQ-SF measures 24 items, which are split among five subscales of mindfulness: observing the present moment, describing thoughts and feelings, acting with awareness, non-judging of thoughts and feelings, and non-reactivity to inner experience. Items (e.g., “I can easily put my beliefs, opinions and expectations into words”) are rated on a 5-point Likert scale ranging from 1 (never or rarely true) to 5 (very often or always true), with higher scores representing higher levels of mindfulness. The FFMQ-SF has shown acceptable model fit, strong correlations to the original FFMQ and good reliability, displaying Cronbach alpha’s ranging from 0.75 to 0.87 (Bohlmeijer et al., 2011; Baer et al., 2006) [12, 5].

Coping Inventory for Competitive Sport
(CICS; Gaudreau & Blondin, 2002) [27]. The CICS consists of
39 items examining 10 coping strategies that are divided in three second-order dimensions: (a) task-oriented coping (thought control, mental imagery, relaxation, effort expenditure, logical analysis, and seeking support), (b) distraction-oriented coping (distancing and mental distraction), and (c) disengagement-oriented coping (disengagement/resignation and venting of unpleasant emotions). Subjects rate their coping capacities on a scale ranging from 1 (does not correspond at all) to 5 (corresponds very strongly). This instrument has demonstrated satisfactory reliability, Cronbach’s index ranging between 0.67 and 0.87 (Gaudreau et al., 2002) [27].

Attainment of Sport Achievement Goals Scale
(A-SAGS; Gaudreau, Amiot, Blondin, & Blanchard, 2002, [27] as cited in Gaudreau & Blondin, 2004) [28]. This questionnaire measures 12 items describing one of the three dimensions of goal achievement: (a) mastery, (b) self-improvement, and (c) performance. Student artists respond to the different statements according to their performance during the last month of training, on a scale ranging from 1 (does not correspond at all) to 7 (corresponds completely). The A-SAGS has been reported to have good psychometric properties, with composite reliability (Time 1 = 0.90, Time 2 = 0.93) and acceptable validity (Gaudreau & Antl, 2008; Gaudreau et al., 2004) [26,28).

Procedure
Participants were recruited in coordination with the school’s College Program Direction. Prior to the yoga intervention, researchers met with the student artists to introduce them to the program and address any concerns. All students gave written informed consent to voluntarily participate in the research. Student-artists were explicitly advised that all data would be kept confidential and that they could disengage from the investigation at any time. Flowchart of participants at each phase of the study is available in supplemental materials. This research was accepted by the Institutional Ethics Committee for Student Research Project. One week before the BYP-A, participants were asked to complete questionnaires (sociodemographic and effect size measures), through an online survey. Questionnaires required approximately 45 minutes to complete. Subsequently, student artists participated in a weekly 90 min yoga session for 8 weeks. All sessions were carried out in a training studio at the NCS. They were administered by a certified yoga teacher and senior circus artist, and by the first author who led the psychoeducational content, who both received an 8 weeks training. A standardized guidebook of the program was provided, with detailed session instructions and description of the topics developed by Dr. Bali and two psychologists. The BYP-A combines Hatha yoga components: postures, relaxation between postures, breathing techniques, meditation, and visualization. Each session of the BYP-A intervention was conducted as follows: introduction to psychoeducational theme (15 min), sequence of yoga poses and relaxation with breathing exercises (55 min), guided meditation related to the session’s theme (10 min), OM chant and final relaxation (10 min). The eight psychoeducational themes were presented in the following order: (a) importance and benefits of yoga, (b) definition and causes of stress and performance anxiety, (c) power of a concentrated and positive mind, (d) self-regulation process, (e) benefits of breathing and relaxation, (f) open consciousness, (g) acceptance, kindness, and self-compassion philosophy, and (h) importance of daily yoga practice. During the session, the instructors explored the physiological and psychological aspects of the postures and highlighted the relevance of being attentive to physical sensations. Between each posture, a brief relaxation (breathing and visualization) sequence was executed. Throughout the program, poses were added gradually. By the sixth session, 21 poses were being performed (see supplemental materials). A variety of alternative poses were also suggested to accommodate participants’ specific conditions. During sessions, a yoga mattress and supportive blocks were provided to circus artists. Between each yoga sessions, participants were given the recommendation to practice at home using a cue-card with all posture figures and completing the online logbook. For a thorough explanation of the yoga program (postures, psychoeducational themes, etc.) administered in the project, please contact the first author.

In the following week of the yoga program, participants completed the different questionnaires (measure of effect) a second time. The Satisfaction Questionnaire was also completed at the end of the yoga intervention to better understand students-artists’ experience.

Data Analysis
To analyze research data, the statistical software Jeffreys’s Amazing Statistics Program (JASP) v. 0.13.1 was used. Histograms were inspected to observe distribution aspects of the continuous variables. Normality distribution was examined by asymmetry, kurtosis coefficients, and Shapiro-Wilk test. Absolute and relative frequencies were calculated for categorical variables (e.g., demographic data). Central tendencies (mean) and variability (standard deviation, minimum, and maximum) were also analyzed. To compare participants who completed all questionnaires and the ones who didn’t complete parts or all post intervention questionnaires, we conducted ANOVAs on both time measures. To examine the influence of the yoga intervention on the different variables, Wilcoxon’ tests were conducted on participant’s questionnaires scores (p < .10) over the two time points. Given the small sample size and some variables not normally distributed, we choose Wilcoxon test and conducted effect-size estimates using Matched-pairs rank-biserial correlation (Kerby, 2014) [47]. It is interpreted as the proportion of responses in the hypothesis direction minus the proportion of responses against the hypothesis. This coefficient varies from -1 to 1, like Pearson’s r. Considering Winer (1962) [80], Rowell (1989) [66], as well as Rosnow & Rosenthal (1989) [63] reflections on the importance of pondering the cost of alpha and beta errors in choosing alpha level and considering that risks in our study are minor, we decided to use an alpha threshold of 0.1 instead of 0.05, with a Type II error of 0.2 and giving twice as much importance to Type I error than to Type II error. Initially, statistical power was calculated using Gpower for three-time measure (i.e., pretest, postest, follow-up), with a sample size of 17 subjects, an effect size of $f=0.25$ and a time correlation of 0.6, the statistical power reaches 80% at an alpha threshold of 0.1. However, due to the covid-19 pandemic and it’s impacts on the circus artists school program, the follow-up wasn’t completed by enough participants and couldn’t be included in the analysis. Therefore, with the pre-post sample size of 15 subjects, the sensitivity of the study allows to detect an effect size of $d=0.6$ (equivalent to $r=0.33$), with a power of 80% at an alpha threshold of 0.1. In addition, considering our small sample size, results will be described in terms of effect size.
Regarding individual yoga practice at home, participants practiced yoga individually on average nearly once a week ($M=0.92$, $SD=0.28$) for 48 minutes. 52% of home yoga was practiced in the afternoon, 22% in the evening, 20% in the morning and 6% at noon. As per the subjective perception of the intervention based on the satisfaction and questionnaire, the sense of usefulness related to the various components of the yoga intervention is globally high ($M \geq 2.86$). It should be noted that the guided relaxation is the component considered to be the most useful. Yet, the results show a moderate recommendation rate. Therefore, this BYP-A seems quite feasible both in terms of content and adherence.

**Table 1: Program Adherence and Subjective Perception of Participants**

| Adherence indexes        | $M$  | $SD$  |
|--------------------------|------|-------|
| Number of class sessions | 7.5  | 0.96  |
| Number of home sessions  | 7.36 | 2.26  |
| Number of AM sessions    | 2.1  | 1.45  |
| Number of noon sessions  | 1    | 0     |
| Number of PM sessions    | 4.5  | 2.061 |
| Number of evening sessions | 2.55 | 1.95  |

| Program Components Evaluation |
|------------------------------|
| Explications of session’s theme | 3.2   | 0.85 |
| Guided Relaxation             | 3.6   | 1.14 |
| Postures and breathing techniques | 3.2   | 1.22 |
| Guided meditation             | 2.87  | 1.63 |
| In class yoga practice        | 3.2   | 1.38 |
| Individual home yoga practice | 2.53  | 1.3  |

| Recommendation   | Percentage | $26.38$ |

**Effects on Psychological and Performance Variables**

Table 2 presents the detailed statistics results. Following the intervention, participants reported enhanced psychological health, with significant reduction in depression symptoms and somatization symptoms, with large effect sizes. A slight decrease in anxiety symptoms was observed, however not significant, and with a small effect size. Regarding QoL, there was no significant changes from pre to post-tests measures. As per the performance psychology variables, participants reported significantly less cognitive and somatic performance anxiety levels following the intervention. No statistically significant differences were found for the confidence component. Similarly, no statistically significant differences in the 5 components of mindfulness (i.e., observation, acting with awareness, non-reaction, description, and non-judgement) were observed. However, medium effect sizes were observed on the non-reaction and non-judgement components. Regarding the coping skills, circus artists reported significant enhancements from pre to post testing on two items: (a) a greater use of relaxation with a near large effect size and (b) a reduction in mental distraction with a medium effect size. No significant differences in the other aspects of coping were observed. However, there are three medium effect size on mental imagery, venting of unpleasant emotions and logistic analysis, as well as two small effect size on though control and seeking support. Finally, the analysis of the perceived athletic performance revealed no significant statistical improvement. However, the effect size was small.
Table 2: Mean scale scores before and after the intervention

| Variable                  | Scale  | Pre M(SD) | Post M (SD) | W(p) | ES Wi | 95 % CI LL | 95 % CI UL |
|---------------------------|--------|-----------|-------------|------|-------|------------|------------|
| Anxiety                   | GAD7   | 6.67 (7.09)| 5.2 (3.3)   | 67.5 (0.69) | 0.125 | -2.500 | 4.000 |
| Depression                | PHQ9   | 9.87 (5.66)| 7.47 (3.56) | 90.5 (0.09) | 0.508*** | -4.222 | 5.000 |
| Somatization              | PHQ15  | 11.6 (8.11)| 8.87 (5.54) | 79.0 (0.02) | 0.736*** | 1.000 | 5.500 |
| Quality of Life           | QLSI   | 6 (2.94)  | 6.24 (3.42) | 19 (0.95)  | 0.056  | -0.618 | 0.682 |
| Performance Anxiety       | CSAI-2 |           |             |       |       |            |            |
| Cognitive                 |        | 24.53 (7.62)| 21.33 (7.47)| 86.5 (0.03) | 0.648** | 4.853e-5 | 6.000 |
| Somatic                   |        | 23.13 (5.82)| 20 (6.26)  | 3 (0.099)  | 0.527*** | -0.500 | 7.000 |
| Confidence                |        | 25.6 (7.26)| 25.33 (8.7) | 34.5 (0.93) | 0.045  | -2.000 | 4.000 |
| Mindfulness               | FFMQ   |           |             |       |       |            |            |
| Observation               |        | 13.87 (3.25)| 13.93 (3.47)| 22.5 (1)   | 0.000  | -3.000 | 4.000 |
| Acting with awareness     |        | 17.33 (3.22)| 17.6 (2.47) | 46.5 (0.73) | -0.114 | -4.000 | 2.500 |
| Non-reaction              |        | 14.33 (3.52)| 15.47 (4.22)| 26.5 (0.35) | -0.321** | -4.000 | 1.500 |
| Description               |        | 17.87 (3.31)| 17.13 (3.94)| 58.5 (0.38) | 0.286  | -0.500 | 2.500 |
| Non-judgement             |        | 15.13 (4.12)| 16.53 (3.98)| 22.5 (0.20) | -0.423** | -4.000 | 1.000 |
| Coping skills             | CICS   |           |             |       |       |            |            |
| Mental imagery            |        | 3.88 (0.7) | 3.63 (0.94) | 60.5 (0.30) | 0.330** | -0.250 | 0.625 |
| Thought control           |        | 3.45 (0.96)| 3.38 (0.86) | 41.5 (0.47) | 0.258*  | -0.750 | 0.750 |
| Relaxation                |        | 3.27 (1.07)| 2.82 (1.02) | 67.5 (0.13) | 0.484** | -0.125 | 1.125 |
| Distanciation             |        | 2.58 (0.71)| 2.67 (1.05) | 45.5 (0.68) | -0.133 | -0.585 | 0.415 |
| Venting of unpleasant emotions |    | 2.23 (1.14)| 1.98 (1.12) | 59 (0.36)  | 0.297** | -0.250 | 1.000 |
| Effort explainitude       |        | 4.05 (0.56)| 4.04 (0.6)  | 36 (0.82)  | 0.091  | -0.665 | 0.505 |
| Seeking support           |        | 3.2 (1.01)| 2.97 (0.98) | 55 (0.53)  | 0.209*  | -0.500 | 1.000 |
| Disengagement/resignation |        | 2.18 (1.18)| 1.98 (0.72) | 52 (0.67)  | 0.143  | -0.500 | 0.625 |
| Mental distraction        |        | 2.05 (0.74)| 2.88 (0.74) | 52 (0.18)  | 0.429** | -0.125 | 1.000 |
| Logical analysis          |        | 3.2 (0.79)| 2.18 (1.18) | 65 (0.39)  | -0.303** | -0.750 | 0.250 |
| Athletic performance      | A-SAGS | 3.97 (1.18)| 4.06 (1.16) | 23 (0.65)  | -0.205* | -0.154 | -0.648 |

M= Mean; SD= standard deviation; W(p)= Wilcoxon p value; ES Wi= Wilcoxon Effect size
Note: For the Wilcoxon test, effect size is given by the matched rank biaiserial correlation.
*Small ES (.15); ** medium ES (.30); *** Large ES (.50).

Discussion
The aim of the present study was to explore the effects of the BYP-A on student circus artists’ psychological health, mental state related to performance and athletic performance as well as the feasibility of implementing such a program in a circus school environment. As expected, artists that received BYP-A experienced increased psychological health, with enhanced general mental health. The yoga practice was also positively associated with artists’ psychological state related to performance, with decreased performance anxiety, increased mindfulness, and improved coping skills. These results are discussed thoughtfully next.

The findings of the current study support that implementing a yoga intervention once a week in an elite circus school is feasible. Indeed, the average percentage of frequency adherence throughout the intervention is 92%, which is much higher than the one from Ribeiro, Atchley, & Oken (2018) [62] who considered 76% as strong adherence. Specifically, the satisfaction rates of the different program components emphasize positive and promising viability of this intervention. The guided relaxation is the aspect considered to be the most useful which has been shown by previous studies to allow a healthy stress-recovery balance, especially regarding enhanced general well-being, reduced somatic symptoms, and improved ability to cope with pain (Filho et al., 2016; Willmarth, Davis, & Fitzgerald, 2014) [22]. In addition, we obtained fairly high average of home practice duration. This tends to suggest that, for some individuals, the practice of yoga can be motivated by sincere pleasure and joyful effort, and therefore by faith in the practice (Guillaume, Bélisle, Jean & Dupuis, 2021; Gyatso, 2010, 2014) [35, 36, 37]. Despite these encouraging results, only 57% of participant reported they would suggest the yoga program to other circus artists. This low percentage might be explained by the fact that student circus artists often have an intensive training and academic program (Kellmann, 2002; Decker, Aubertin, & Kriellaars, 2019) [46, 22]. Thus, this highlights the need to make certain adjustments to circus artists’ schedule, which may benefit from integrating complementary psychological interventions.

The first hypothesis that artists receiving the BYP-A would experience increased psychological health was partially supported. Data analysis demonstrated significant reduction in depressive and somatic symptoms after the yoga-based intervention, indicating its effectiveness as a treatment intervention. These outcomes agree with other research that investigated the impacts of yoga and mindfulness-based interventions on athletes’ psychological health (Aherne, Moran, & Lonsdale, 2011; Bernier, Thienot, Codron, & Fournier, 2009; Thompson, Kaufman, De Petrillo, Glass, & Arnkoff, 2011; Schober, 2018) [2, 6, 72, 68]. Given that student circus artists report significantly greater levels of depression,
fatigue, and isolation than professional circus artists and the
general population (Donohue et al., 2018; Van Rens et al.,
2021) [17, 28], learning to balance stress and recovery through
yoga thus appears to be relevant. As per anxiety symptoms,
no significant change was observed. It is possible that yoga
practice increased these artists’ awareness of anxiety. Indeed,
the meditation component of yoga involves awareness of
present-moment experience, including unpleasant sensations
and emotions. This could explain the absence of perceived
anxiety reduction in the short term. Nevertheless, by
enhancing awareness of uncomfortable feelings like anxiety,
without avoiding or trying to suppress them, artists might
improve their ability to manage their emotions both within
and outside the context of performance (Glass, Spears,
Perskauadas, & Kaufman, 2019) [31].

Likewise, the effect of yoga practice on student artists’ quality
of life was not found significant. Different studies have observed
enhanced levels of quality of life after yoga in patients with cancer (Lancôt, Dupuis, Marc Aurell, Anestin, &
Bali, 2016) [52], chronic pain (Patil et al., 2018) [59],
hypertension (Parikh, Mahida, Vaghela, & Shah, 2021) [60],
ADHD (Girard-Bériault, 2019) [60], anxiety (Kirkwood,
Rampes, Tuffrey, Richardson, & Pilkington, 2005; Cramer et
al. 2018) [61, 19], and healthy adults (Büssing et al., 2012) [14].
Mindfulness in sport settings has also been shown to have
significant positive effects on athlete’s global wellbeing and
life satisfaction (Balzellt & Summers, 2018; Foster, 2017) [9].

While some authors suggest that self-consciousness developed
through yoga practice is not acquired immediately, but may
progress properly with the passage of time (Feitoza, Dantas,
& Bastos, 2017) [21, 29], these results’ discrepancies might be explained by the use of inadequate psychometric tools. In the current
study, the assessment of mindfulness relies on self-reports
(FFMQ). According to Grossman and Van Dam (2011) [134],
the initial Buddhist concept of mindfulness encompasses a
distinctive composition of various interacting factors, that the
current methodological approaches often neglect to consider,
which may lead to wrong or distorted representations of
mindfulness. Moreover, broadly contrasting working
definitions of mindfulness are found in the literature and the
absence of external standards to validate measures emphasize
this relevant issue.

With regard to coping skills, results suggests that on
completion of the yoga intervention student artists reported
enhancements in their capacity to relax and to manage mental
distractions. While it has been demonstrated that regular yoga
practice improves the ability to react efficiently in stressful
situations, to concentrate on the problem, and actively cope in the
general population (Marinov et al., 2017) [54], to our
knowledge, this is the first time that enhanced coping
strategies are observed in performers following a yoga
intervention. In the athletic domain, relaxation skills have
been shown to help athletes manage competitive anxiety and
encourage recovery. Specifically, while physical relaxation
tools (e.g., muscle relaxation) are beneficial to cope with
competitive anxiety, mental relaxation strategies (e.g.,
meditation) are helpful to deal with general anxiety
(Kudlackova, Eccles, & Dieffenbach, 2013) [50]. Therefore,
yoga practice and its multifarious components (e.g.,
breathing, asanas, meditation) may provide performers with a
tool that allows them to choose which aspects of the program
they want to integrate in their training routine, according to
their current needs.

Despite the positive impact of BYP-A on psychological states
and skills, the intervention did not impact subjective athletic
performance of circus artists. This contradicts Glass et al. (2019) [31] randomized controlled trial, who found that
Mindful Sport Performance Enhancement training program
(including mindful yoga) improve collegiate athletes’ self-
rated sport performance with regards to physical skills (e.g.,
agility, mechanics). Performance being a complex and
multidimensional phenomenon, many elements must be
aligned to enhance it. It is thus challenging to pinpoint the
reason why the current intervention failed to benefits circus
artist performance without adopting a complex system
perspective (Woods, McKeown, Rothwell, Araújo, Robertson,
& Davids, 2020; Rudd, Pesce, Strafford, & Davids, 2020) [81].

More research aiming at enhancing performance should
adopt this type of perspective to better capture the mechanism
of performance optimization.

Strengths and Limitations

This research has several qualities. This is the first
investigation that empirically studied the impacts of yoga
practice on mental health and performance showing
promising psychological benefits for circus arts students. The
program was adapted to correspond to the circus training
environment and specific needs of performers. For example,
given that student artists are often faced with overscheduling
concerns, the yoga intervention can be easily integrated
within training and performance time, and lasting
incorporated over their training lifespan. It was given by a
certified teacher, who is also a circus artist that studied at the
NCS, and thus understands the issues, reality and stressors
related to circus arts training. Moreover, the 8-week yoga
program is a standardized intervention that can be easily
adapted and used in high level sport and performance
contexts. Finally, thanks to the participation of high-
performance circus student artists bringing great ecological
validity, the design of this pilot study offers a significant
contribution to the developing literature in this field.

Despite promising results, this study presents limitations.
First, the small sample size, combined with nonattendance to
yoga sessions due to unexpected events (e.g., injury) and missing data, might have limited the power in testing the hypothesis, lowered generalizability and contributed to the nonsignificant findings. In addition, this study utilized a convenience sample which might have reduced the representativeness of our results. Due to the feasibility and exploratory phase of the BYP-A intervention, this study was conducted using a nonrandomized control design. Since no control comparison group was used to compensate for confounding variables, reliability might not have been ensured. Especially, a historic event (Covid-19 pandemic) occurred at the same time as our post-test, which might have impacted the results. At the onset of the pandemic, NCS closed for an indefinite period, as did the entire circus industry, making this field even more precarious. Consequently, student-artists faced great amount of worry and uncertainty related to their future career potentially leading to changes in psychological health, performance anxiety and performance. This situation might explain the high dropout rates for the follow-up phase of this investigation. Furthermore, the study design did not control for general factors related to the BYP-A other than the passage of time, such as, social desirability, therapeutic expectations, changes in lifestyle of the artists, injuries, and diet, which might have impacted the results.

Implications for Future Research

Future research is necessary to address the lack of studies investigating the influence of yoga-based interventions with athletic populations (e.g., sport, circus, dance settings). Precisely, randomized controlled trials should be conducted in forthcoming investigation to allow stronger reliability regarding outcome effects between active groups. Comparing BYP-A with different psychological skills training programs (e.g., mindfulness-based, relaxation) could also be relevant. These high-quality research designs would help to identify specific mechanisms through which yoga contributes to enhance psychological health or performance related mental state. Future research would also benefit from developing interventions for circus performers who experience difficulties such as reduced psychological wellbeing and emotional state (e.g., high level of anxiety, choking-susceptible, less coping skills). Indeed, previous studies reported that circus artists with low self-efficacy (e.g., fear, self-doubt) would benefit from using interventions that allow them to mentally prepare, visualize their performance, and subsequently receive the protection needed to succeed and reach higher level of flourishing (Ménard et al., 2014; Mesagno & Marchant, 2013; Van Rens et al., 2021) [57, 58, 75]. Finally, research suggests that mental skills training and techniques can be used for discipline-specific performance issues, with unique idiosyncratic performance stressors. For example, aerial acts artists tend to struggle with fear of injury, jugglers with fear of failure, contortionists with pain control, and clowns with social pressure from the audience (Felho et al., 2016; Ross & Shapiro, 2017) [22, 64]. Thus, subsequent studies would contribute to examine the effect of yoga practice with specific circus disciplines according to their related issues.

Conclusion

In summary, this exploratory study offers preliminary support for the feasibility and utility of the BYP-A, with promising impacts on psychological health and mental performance state of circus student artists. The continued study of yoga-based interventions with high level performers will considerably deepen our actual understanding of psychological health and coping skills in performing arts populations and our capacity to support them in improving their current performance. The collaboration between a clinical psychology student and a yoga practitioner led to a holistic intervention, allowing knowledge building and experiential learning. Researchers and practitioners may benefit from using this type of transdisciplinary approach in the future to better support and optimize human psychological health and performance. On behalf of the co-authors, the corresponding author declares that there is no conflict of interest.

Data availability statement

The data that support the findings of this research are openly accessible in “Figshare” at http://doi.org/10.6084/m9.figshare.17057819.v1.

References

1. American Psychological Association (2021, 22 octobre). Anxiety https://www.apa.org/topics/anxiety.
2. Aherne C, Moran AP, Lonsdale C. The effect of mindfulness training on athletes’ flow: An initial investigation. The Sport Psychologist. 2011;25(2):177-189.
3. Anderson D, Ferreira C, Ferretti A. Yoga of champions. Yoga Journal. 2010;226:34-36. Retrieved from http://www.yogajournal.com/lifestyle/2981.
4. Anestin AS, Dupuis G, Lancôt D, Bali M. The Effects of the Bali Yoga Program for Breast Cancer Patients on Chemotherapy-Induced Nausea and Vomiting: Results of a Partially Randomized and Blinded Controlled Trial. Journal of Evidence-based Complementary & Alternative Medicine. 2017;22(4):721-730.
5. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Five facet mindfulness questionnaire. Assessment. 2006;13:27-45.
6. Bernier M, Thienot E, Codron R, Fournier JF. Mindfulness and acceptance approaches in sport performance. Journal of Clinical Sport Psychology. 2009;3(4):320-333.
7. Bal BS, Kaur PJ. Effects of selected asanas in hatha yoga on agility and flexibility level. Journal of Sport Health Research. 2009;1(2):75-87.
8. Bali M. Yoga for taming the mind: Chitta Vritti Nirodha (1st ed). Soham Publishing, 2015.
9. Balzett A, Summers J. The power of mindfulness: Mindfulness meditation training in sport (MMTS). Springer. 2018.
10. Blackman T. Three Canadians want remedial yoga but which three? Montreal Gazette, 1973.
11. Briegel-Jones RM, Knowles Z, Eubank MR, Giannoulatos K, Elliot D. A preliminary investigation into the effect of yoga practice on mindfulness and flow in elite youth swimmers. The Sport Psychologist. 2013;27(4):349-359.
12. Bohlmeijer E, Ten Klooster PM, Flederus M, Veehof, M & Baer R. Psychometric properties of the five facet mindfulness questionnaire in depressed adults and development of a short form. Assessment. 2011;18(3):308-320.
13. Bühlmayer L, Birrer D, Röthlin P, Faude O, Donath L. Effects of mindfulness practice on performance-relevant parameters and performance outcomes in sports: A meta-analytical review. Sports Medicine. 2017;47(11):2309-
Blüssing A, Michalsen A, Khalsa SBS, Telles S, Sherman KJ. Effects of yoga on mental and physical health: A short summary of reviews. Evidence-based Complementary and Alternative Medicine, 2012.

Cramer H, Lauche R, Ahneyer D, Pilkington K, de Manincor M, Dobos G, et al. Yoga for anxiety: A systematic review and meta-analysis of randomized controlled trials. Depression and Anxiety. 2018;35(9):830-843.

Decker A, Aubertin P, Kriellaars D. Sleep and fatigue of elite circus student-artists during one year of training. Medical Problems of Performing Artists. 2019;34(3):125-131.

Donohue B, Miller A, Beisecker M, Houser D, Valdez R, Tiller S, Taymar T. Effects of brief yoga exercises and motivational preparatory interventions in distance runners: results of a controlled trial. British Journal of Sports Medicine. 2006;40(1):60-63.

Dupuis G, Perreauault J, Lambany MC, Kennedy E, David P. A new tool to assess quality of life: the quality of life inventory. Quality of Life and Cardiovascular Care. 1989;5:36-45.

Dupuis G, Taillefer MC, Martel JP, Rivard MJ, Roberge, MA, St-Jean K. L'inventaire systémique de la qualité de vie (ISQV©): Sensibilité au changement et caractéristiques psychométriques, 2004.

Ferreira-Vorkapic C, Feitoza JP, Dantas ELHM, Bastos A. The impact of yoga-based interventions on ju-jitsu wrestlers' psychological profile: A pilot study. Gazzetta Medica Italiana Archivio per le Scienze Mediche. 2017;176(7-8):399-401.

Ferreira-Vorkapic CF, Rangé B. Reducing the symptomatology of panic disorder: The effects of a yoga program alone and in combination with cognitive-behavioral therapy. Frontiers in Psychiatry. 2014;5,177.

Filho E, Aubertin P, Petiot B. The making of expert performers at Cirque du Soleil and the National Circus School: A performance enhancement outlook. Journal of Sport Psychology in Action. 2016;7(2):68-79.

Fletcher D & Hanton S. Sources of organizational stress in elite sport performers. The Sport Psychologist. 2003;17(2):175-195.

Foster B. The contributions of psychological skills and mindfulness to NCAA student-athlete well-being (Doctoral dissertation, The Florida State University), 2017.

Gaudreau P, Amiot CE, Blondin JP, Blanchard CM. A hierarchical model of goal attainment in sport competition. In Annual meeting of the Canadian Society for Psychomotor Learning and Physical Activity, Vancouver, BC, 2002.

Gaudreau P, Antl S. Athletes’ broad dimensions of dispositional perfectionism: Examining changes in life satisfaction and the mediating role of sport-related motivation and coping. Journal of Sport and Exercise Psychology. 2008;30(3):356-382.

Gaudreau P, Blondin JP. Development of a questionnaire for the assessment of coping strategies employed by athletes in competitive sport settings. Psychology of Sport and Exercise. 2002;3(1):1-34.

Gaudreau P, Blondin JP. Differential associations of dispositional optimism and pessimism with coping, goal attainment, and emotional adjustment during sport competition. International Journal of Stress Management. 2004;11(3):245.

Gardner FL, Moore ZE. Mindfulness and acceptance models in sport psychology: A decade of basic and applied scientific advancements. Canadian Psychology. 2012;53(4):309.

Girard-Bériault F. Étude de faisabilité sur l'utilisation de la méthode de yoga Bali et ses effets auprès des enfants ayant un trouble du déficit de l'attention avec hyperactivité. (Doctoral thesis, Université du Québec à Montréal, Montréal, Canada). Retrieved from http://archipel.uqam.ca/id/eprint/13269, 2019.

Glass CR, Spears CA, Perskaudas R & Kaufman KA. Mindful sport performance enhancement: Randomized controlled trial of a mental training program with collegiate athletes. Journal of Clinical Sport Psychology. 2019;13(4):609-628.

Goodman FR, Kashdan TB, Mallard TT & Schumann M. A brief mindfulness and yoga intervention with an entire NCAA Division I athletic team: An initial investigation. Psychology of Consciousness: Theory, Research, and Practice. 2014;1(4):339-356.

Cadieux EG, Gemme C & Dupuis G. Effects of Yoga Interventions on Psychological Health and Performance of Competitive Athletes: A Systematic Review. Journal of Science in Sport and Exercise, 2021, 1-9.

Grossman P & Van Dam NT. Mindfulness, by any other name...: trials and tribulations of sati in western psychology and science. Contemporary Buddhism. 2011;12(1):219-239.

Guillaume N, Bélisle MP, Jean M, Dupuis G. Training in tranquil abiding meditation as a treatment for core symptoms and a cognitive remediation program of executive functions in young adults with ADHD: A pilot study. Psychology of Consciousness: Theory, Research, and Practice, 2021, 1-26.

Gyatso GK. Joyful path of good fortune: The complete Buddhist path to enlightenment (2nd ed.). Tharpa Publications, 2010.

Gyatso GK. How to understand the mind: The nature and power of the mind (4th ed.). Tharpa Publications, 2014.

Gyulai L. Montreal from A to Z: Y is for yoga. Montreal Gazette, 2014. https://montrealgazette.com/news/local-news/montreal-from-a-to-z-y-is-for-yoga.

Harinath K, Malhotra AS, Pal K, Prasad R, Kumar R, Kain TC et al. Effects of Hatha yoga and omkar meditation on cardiorespiratory performance, psychologic profile, and melatonin secretion. The Journal of Alternative & Complementary Medicine. 2004;10(2):261-268.

Harner H, Hanlon AL, Garfinkel M. Effect of Iyengar yoga on mental health of incarcerated women: A feasibility study. Nursing Research. 2010;59(6):389-399.

Hart CE, Tracy BL. Yoga as steadiness training: Effects on motor variability in young adults. The Journal of Strength & Conditioning Research. 2008;22(5):1659-1669.

Kabat-Zinn J. Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center, 1990.

Kabat-Zinn J. Wherever you go, There you are: Mindfulness Meditation in Everyday Life. New York, NY: Hyperion Books, 1994.

Kaufman KA, Glass CR, Pineau TR. Mindful Sport Performance Enhancement (MSPE). In Handbook of Mindfulness-Based Programmes. Routledge, 2019, 173-
190.
45. Kellmann M. Underrecovery and overtraining: Different concepts-similar impact? In M. Kellmann (Eds.), Enhancing recovery: Preventing underperformance in athletes. Champaign, IL: Human Kinetics. 2002, 3-24.
46. Kellmann M. Preventing overtraining in athletes in high-intensity sports and stress/recovery monitoring. Scandinavian Journal of Medicine & Science in Sports. 2010;20:95-102.
47. Kerby DS. The simple difference formula: An approach to teaching nonparametric correlation. Comprehensive Psychology. 2014;3:11-IT.
48. Kirkwood G, Rampes H, Tuffrey V, Richardson J & Pilkington K. Yoga for anxiety: A systematic review of the research evidence. British Journal of Sports Medicine. 2005;39(12):884-891.
49. Kroenke K, Spitzer RL, Williams JB, Löwe B. The patient health questionnaire somatic, anxiety, and depressive symptom scales: A systematic review. Journal of Clinical Psychopharmacology. 2010;30(4):345-359.
50. Kudlackova K, Eccles DW & Dieffenbach K. Use of relaxation skills in differentially skilled athletes. Psychology of Sport and Exercise. 2013;14(4): 468-475.
51. Kusunna DWY & Bin W. Effect of yoga program on mental health: Competitive anxiety in semarang badminton athletes. Jurnal Kesehatan Masyarakat. 2017;13(1):121-130.
52. Lancot D, Dupuis G, Marcarel R, Anastin AS & Bali M. The effects of the Bali Yoga Program (BYP-BC) on reducing psychological symptoms in breast cancer patients reieving chemotherapy: results of a randomized, partially blinded, controlled trial. Journal of Complementary and Integrative Medicine. 2016;13(4):405-412.
53. Lazarus RS, Folkman S. Stress, Appraisal, and Coping. Springer publishing company, 1984.
54. Löwe B, Spitzer RL, Graefe K, Kroenke K, Quenter A, Zipfel S, et al. Comparative validity of three screening questionnaires for DSM-IV depressive disorders and physicians’ diagnoses. Journal of Affective Disorders. 2004;78(2):131-140.
55. Marinov T, Gancheva N, Angelcheva M, Ignatov I, Dimitrov V. Influence of Yoga Practices on Stress Coping Strategies. Journal of Medicine, Physiology and Biophysics. 2017;39:57-63.
56. Martens R, Burton D, Vealey RS, Bump LA, Smith DE. Development and validation of the Competitive State Anxiety Inventory-2. In R. Martens, R. S. Vealey, & D. Burton (Eds.), Competitive anxiety in sport. Champaign, IL: Human Kinetics, 1990, 117-190.
57. Mellalieu S, Hanton S. (Eds.). Contemporary advances in sport psychology: A review, 2015.
58. Ménard JF, Hallé M. Circus Also Needs Performance Psychology. In J. G. Creamedes & L. S. Tashman (Eds.), Becoming a sport, exercise, and performance psychology professional: A global perspective (1st ed., p.127-134). New-York : Psychology Press, 2014.
59. Mesagno C, Marchant D. Characteristics of polar opposites: An exploratory investigation of choking-resistant and choking-susceptible athletes. Journal of Applied Sport Psychology. 2013;25(1):72-91.
60. Patil NJ, Nagaratna R, Tekur P, Manohar PV, Bhargav H & Patil D. A randomized trial comparing effect of Yoga and exercises on quality of life in among nursing population with chronic low back pain. International Journal of Yoga. 2018;11(3):208.
61. Parikh S, Mahida P, Vaghela N, Shah H. Effect of Home Based Yoga on Blood Pressure and Quality of Life in Patients with Hypertension. International Journal of Clinical and Experimental Physiology. 2021;8(1):26-30.
62. Polsgrove J, Haus D, Lockyer R. Athlete Perspectives on 8-Weeks of Yoga Practice. Spotlight on Yoga Research. 2019.
63. Ribeiro L, Atchley RM, Oken BS. Adherence to practice of mindfulness in novice med- itators: Practices chosen, amount of time practiced, and long-term effects following a mindfulness-based intervention. Mindfulness. 2018;9:401-411. https://doi.org/ 10.1007/s12671-017-0781-3
64. Rosnow RL, Rosenthal R. Statistical procedures and the justification of knowledge in psychological science. American Psychologist. 1989;44:1276-1284.
65. Ross A, Shapiro J. Under the big top: An exploratory analysis of psychological factors influencing circus performers. Performance Enhancement & Health. 2017;5(3):115-121.
66. Ross A, Thomas S. The health benefits of yoga and exercise: A review of comparison studies. The journal of Alternative and Complementary Medicine. 2010;16(1):3-12.
67. Rowell RK. Partitioning predicted variance into constituent parts: How to conduct commonality analysis. In B. Thompson (Ed.), Advances in Social Science Methodology. 1996;4:33-44. Greenwich, CT: JAI Press.
68. Rudd JR, Pesce C, Strafford BW & Davids K. Physical literacy - A journey of individual enrichment: An ecological dynamics rationale for enhancing performance and physical activity in all. Frontiers in Psychology. 2020;11:1-13. doi:10.3389/fpsyg.2020.01904
69. Schober PD. The Introduction of Yoga Recovery on Physiological and Psychological Stress and Performance in NCAA Athletes, 2018.
70. Singh R. Personality, spiritual exercise and cognitive-behavioural interventions in enhancing sports performance. Indian Journal of Positive Psychology. 2014;5(3):301.
71. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Archives of Internal Medicine. 2006;166(10):1092-1097.
72. Thompson J. Yoga prescribes a path to wellness. Montreal Gazette, 2012. https://www.pressreader.com/canada/montreal-gazette/20121119/282003259707327.71.
73. Thompson RW, Kaufman KA, De Petrello LA, Glass C R, Arnkoff DB. One year follow-up of mindful sport performance enhancement (MSPE) with archers, golfers, and runners. Journal of Clinical Sport Psychology. 2011;5(2):99-116.
74. Tierney TN. A Systematic Review of Mindfulness Interventions’ Impact on Athlete Emotional Distress & Wellbeing, 2020.
75. Tremblay MP. Description et exploration des besoins de santé de la clientèle de l’École nationale de cirque de Montréal (Mémoire de maîtrise inédit). Université Laval, 2018.
76. Van Rens FE, Heritage B. Mental health of circus artists: Psychological resilience, circus factors, and demographics predict depression, anxiety, stress, and flourishing. Psychology of Sport and
77. Wang F, Szabo A. Effects of yoga on stress among healthy adults: A systematic review. Alternative Therapies in Health and Medicine. 2020;26(4):58-64.
78. White RG, Bethell A, Charnock L, Leckey S, Penpraze V. Mindfulness-and Acceptance-Based Interventions for Performance and Mental Health Outcomes in Sport. In Acceptance and Commitment Approaches for Athletes’ Wellbeing and Performance, Palgrave Macmillan, Cham, 2021, 37-65.
79. Whoqol Group. Development of the World Health Organization WHOQOL-BREF quality of life assessment. Psychological Medicine. 1998;28(3):551-558.
80. Willmarth E, Davis F, Fitzgerald K. Biofeedback and integrative medicine in the pain clinic setting. Biofeedback. 2014;42:111-114. doi:10.5298/1081-5937-42.03.10
81. Winer BJ. Statistical principles in experimental design. New York, McGraw-Hill, 1962.
82. Woods CT, McKeown I, Rothwell M, Araújo D, Robertson S, Davids K. Sport Practitioners as Sport Ecology Designers: How Ecological Dynamics Has Progressively Changed Perceptions of Skill “Acquisition” in the Sporting Habitat. Frontiers in Psychology, 2020, 11. doi:10.3389/fpsyg.2020.00654