Journal of Scientific Exploration
Anomalistics and Frontier Science

RESEARCH ARTICLE

Impact of Meditation Versus Exercise on Psychological Characteristics, Paranormal Experiences, and Beliefs: Randomized Trial

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SUBMITTED January 9, 2023
ACCEPTED January 1, 2024
PUBLISHED March 31, 2024

https://doi.org/10.31275/20242849

PLATINUM OPEN ACCESS

HIGHLIGHTS

Participants in a meditation program reported more mindfulness, extroversion, connectedness, and paranormal beliefs and experiences over time than those in a similarly structured exercise intervention.

ABSTRACT

Background: Research indicates that meditation increases mindfulness and paranormal experiences of precognition, telepathy, clairvoyance, and synchronicities. There is limited knowledge about the prevalence or impact of these experiences on meditators and the general population. *Aims:* To compare self-reported well-being, mindfulness, connectedness, personality, paranormal experiences, beliefs, and performance on psi tasks in a meditation group versus an exercise control group. *Method:* This is a randomized trial that explored changes, including well-being, mindfulness, connectedness, psi, extraordinary experiences, beliefs, and ability to impact a random number generator in the participants, comparing a meditation vs. exercise control group. We collected data at baseline, "Mid" or halfway through the intervention (week 4), post 1, which is at the end of intervention (week 9), and post 2, which is two months post-intervention. Data was collected securely online with IRB approval. *Results:* Data from 72 participants (*N* = 45 meditation/*N* = 27 exercise) demonstrated improvement in some well-being measures (anxiety and general health). The study examined the effects of meditation versus exercise on various psychosocial measures and paranormal experiences. The meditation group displayed higher scores in openness and extroversion compared to the exercise group, which was unexpected and required further investigation. The meditation cohort also reported more paranormal experiences, with about half of them considering these experiences important or meaningful. However, the experiment exploring psychic abilities did not yield significant results. While the study had limitations, such as a predominantly non-diverse sample, it adds to the existing body of evidence linking meditation and exercise to positive psychosocial outcomes. *Conclusions:* The randomly selected meditation naïve cohort trained in brief structured meditation demonstrated increases over time in mindfulness, connectedness, extraversion, and paranormal experiences and beliefs compared to an exercise cohort. Psi performance did not improve in either group over time, and these tasks may not be sensitive enough to detect significant changes.

KEYWORDS

Meditation, mindfulness, paranormal experiences, psi beliefs, training programs.

INTRODUCTION

The field of meditation research has grown exponentially in the past two decades, driven largely by a growing appreciation of the potential for contemplative practices to affect psychophysiological functioning positively, reduce stress, and increase emotional and physical well-being (Goyal et al., 2014; Khoury et al., 2013). This body of research has shed light on the effects of meditation practices on basic mechanisms of attention, perception, and cognition, among other things (Chiesa et al., 2011; Fox et al., 2014). Studies investigating neural correlates of life-

time meditation practice (Boccia et al., 2015; Fox et al., 2016), as well as changes in brain function and structure associated with short-term mindfulness interventions (Hölzel et al., 2011), have led to a robust new field of contemplative neuroscience. The literature regarding meditation is challenged by the fact that the research area still lacks clear definitions and descriptions of what is meant by the term meditation. In this manuscript, we specifically define meditation as well-being practices that focus on increasing awareness, connection, insight, and purpose using Vipassanā practices from the Theravada tradition in Buddhism (Lama, 2005).

An increasing body of literature indicates that the practice of meditation, as described above, appears to help alleviate a variety of stress-related conditions, enhancing people's positive qualities and improving overall quality of life (Chiesa, 2010; Singh et al., 2019). Many of these meditative practices were originally intended to help achieve enlightenment and ultimately allow the practitioner to achieve extraordinary powers or abilities. The classic yoga text known as Patanjali's Yoga *Sutras (*Satyananda Saraswati, 2000) states that when one attains the state of consciousness known as *Samadhi*, the *siddhis* or psychic powers manifest. Traditional Buddhist texts also state that upon attaining a certain level of enlightenment, the "super knowledge" manifests itself. Fuller discussions of Patanjali's Yoga *Sutras* concerning psi research have been given by Braud (2008) and Radin (2013) and support the idea that deep meditation abilities can facilitate psi and extraordinary experiences, including feelings of connection and oneness, openness to new ideas, and expansive positive emotions and compassion. These aspects of meditation experience and practice remain insufficiently examined in modern research studies involving meditation instruction. Experiences of oneness and interconnectedness; Samadhi and siddhis; Shakti and kundalini energies; spiritual transmission from teacher to student; past-life recall and reincarnation experiences; visions, synchronicities, precognition, extra-sensory perception; experiences of God, deities, and other non-physical entities; difficult stages of meditation, painful processes that can arise, and periods of disorientation and depersonalization are all described in the traditional texts and teachings of most contemplative traditions, but are rarely studied.

The anecdotal, survey, and interview data indicate that extraordinary aspects of meditation such as those described above may be important mediators by which meditation leads to beneficial outcomes and may be viewed as valuable to the individual in and of themselves (Vieten et al., 2006, 2008). Roney-Dougal et al., (2008) and Roney-Dougal and Solfvin (2011) conducted a series of studies with meditation students, monks, Tibetan Lamas and Rinpoches, and found a significant relationship between the amount of lifetime meditation experience and performance on psi tasks. A recent survey conducted by the Institute of Noetic Sciences (IONS) (Vieten et al., 2018) found that a large proportion of people who meditate subjectively reported having had experiences of precognition such as telepathy, clairvoyance, and other psychic abilities, as well as increased synchronicities, memories of past lives, and out-of-body experiences. This retrospective study examined 1120 respondents with an average of 14 years of meditation practice, who reported psychological health in alignment with population norms, and found that over 50% reported "many times" or "almost always" having extraordinary experiences, such as experiences of timelessness and increased synchronicities. Over half reported experiencing clairvoyance or telepathy at least 2-5 times or more during their meditation practice. When asked how meaningful or important these experiences were, 60% of respondents said "quite a bit" or "very much," and another 20% responded "somewhat." Radin and Vieten and their team (2011) also demonstrated that meditators with a long history of meditation practice performed better on psi-related tasks than those with minimal experience.

In another study, Radin et al. (2012) found that meditation experience was positively associated with the effects of attention directed toward a double-slit apparatus on perturbations in the double-slit interference pattern, indicating that meditation experience may increase the so-called "observer effect." The observer effect is the phenomenon when an observed situation or phenomenon is changed just by the act of observing. Observer effects are especially prominent in physics, where observation and uncertainty are fundamental aspects of modern quantum. However, these results have not been able to be reproduced (Walleczek & von Stillfried, 2019). More recently, Penberthy et al. (2020) demonstrated in a two-arm nonrandomized study that meditation-naïve respondents enrolled in an active meditation group reported a higher average total number of psi experiences at the end of training compared to a control group who did not meditate (4.92 vs. 3.14, p = 0.0322).

Based on this promising but preliminary data, we propose to add to the research by conducting a randomized controlled prospective trial in which participants are randomly assigned to either an intensive meditation group or an exercise control group that does not involve meditation but controls for time and engagement. This design helps us further explore the prevalence of specific experiences, including extraordinary experiences and psi abilities in both populations and over time, and the en-

dorsed impact of such experiences or abilities upon the individuals experiencing them. Additionally, we examine the real-time impacts of group meditation on a random number generator as an example of extraordinary psi abilities of the groups. Experiments using truly random number generators (RNGs) have reportedly demonstrated anomalous deviations in various group settings, including group meditations (Radin & Patterson, 2007), but this finding has not been consistent (Williams, 2021). According to research by Nelson et al., 2002, group meditations have a greater possibility of producing deviations or variance in true RNG outputs (Nelson et al., 2002). Additional research has also yielded positive results when comparing time-synchronized group meditation versus non-synchronized meditation (Nelson et al., 1997).

The current study examined the impact of an intervention to teach and practice structured Theravada tradition-based meditation versus the impact of a time equivalent structured physical exercise intervention upon individuals' well-being, mindfulness, connectedness, extraordinary or transformational spiritual experiences and beliefs, and abilities concerning impacting the random number generator. We examined participants who endorsed no significant prior history of meditation and randomly assigned them to a meditation instruction and practice or an exercise intervention that involved comparable virtual interaction and amount of time but did not provide meditation instruction or practice. This study allowed us to examine, more rigorously, the impact of our practices on these measured outcomes. The mindfulness, connectedness, and extraordinary or transformational experiences and beliefs are hypothesized to be significantly more improved in the meditation group versus the exercise group. We also hypothesized that the meditation cohort would endorse significantly more paranormal and psi experiences and increased belief in psi and paranormal experiences over time as compared to the exercise control group, and we examined the impact of both groups' meditations on a random number generator, in order further to explore the impact of meditation on psi abilities. We also explored the self-reported impact of the intervention in both groups and hypothesized it to be more important and meaningful in the meditation group.

METHODS

Trial Design

This parallel randomized trial allocated participants naive to meditation either to a meditation or exercise group. This is a two-arm randomized trial comparing the impact of meditation versus exercise over time on designated variables.

Participants

We recruited participants from the local and online community via IRB-approved flyers and postings. Participants were informed that this was a study exploring the impact of various activities on variables such as wellness and mindfulness. They were informed that they would be asked to complete questionnaires multiple times and to participate in an ongoing manner to practice either meditation or exercise. Inclusion and exclusion criteria included that participants must read and understand English and endorse no prior significant history of meditation knowledge or practice, including yoga and other formal contemplative practices. They needed to endorse having no significant medical or mental disorder that would prevent them from safely and meaningfully participating in the study. They needed to have access to a method for viewing the video sessions and be able to commit to participating for the duration of the study, or about four months total, once their group intervention began. The intervention phase lasted eight weeks, and a follow-up questionnaire was sent electronically two months after the end of the intervention. We screened 272 and excluded 185 individuals, primarily due to the participants having previous knowledge of or currently practicing some form of meditation. Participants were recruited on a rolling basis and randomized into one of two interventions. When a group reached the maximum capacity of participants, the intervention was implemented. We enrolled 87 participants overall (N = 54 in the meditation group and N = 33 in the exercise group). Of these, we excluded 15 participants due to not completing required components or dropping out (N = 9 meditation group and N=6 exercise group), and 72 participants (N = 45 meditation group and N = 27 exercise group) finished the study, including all assessments, and we proceeded to analyze their data. Overall, the study participants were predominantly non-Hispanic white females from the United States of America working full-time. Table 3 presents demographic details of the participants for both groups. Data was collected remotely using secure online data portals approved by the institution.

Measures and Outcomes

We evaluated participants in both groups with the same set of questionnaires (minus the demographic questions) at the beginning, middle, and end of the intervention and two months after the study's conclusion. All assessments were administered online using subject identifiers rather than personally identifiable information. Additionally, group object-focused meditations were conducted with both cohorts with intention directed toward

a random number generator to analyze further the impact practicing/learning meditation has on psi abilities.

Demographic Information. This data includes age, race/ethnicity, gender, marital status, education, household income and employment, psychiatric history, and history of spiritual/religious/contemplative practices.

Five-factor personality assessment (Brief Big 5). The Brief Big 5 (Goldberg, 1992) was developed to measure personality traits or characteristics through a relatively small set of variables for shorter and easily administered markers of the Big-5 factor structure. It contains ten items and measures five personality variables: extraversion, agreeableness, openness, conscientiousness, and neuroticism. We assessed both groups throughout at all time points.

General Wellbeing Schedule (GWBS). This tool (GWBS; Dupuy, 1977) is a brief, reliable, validated Likert scale questionnaire that focuses on one's subjective feelings of anxiety, depression, positive well-being, self-control, general health, and vitality, with scores provided for each.

Applied Mindfulness Process Scale (AMPS). This a 15-item scale with Likert-type response options ranging from zero (never) to four (almost always), designed to quantify how mindfulness practitioners actively use mindfulness to remediate psychological suffering in their daily lives. Three fields that AMPS presents are: decentering, positive emotional regulation, and negative emotional regulation (Li et al., 2016).

Five-Facet Mindfulness Questionnaire - Short Form (FFMQ - 24 items). This is a measure of mindfulness commonly used to assess change before and after interventions. This measure is a short form of the 39-item FFMQ (Baer et al., 2006) and is based on a factor analytic study of five independently developed mindfulness questionnaires. The FFMQ-24 is a validated short form developed by Bohlmeijer et al. (2011) and includes items answered on a 5-point Likert scale. It includes the same five facets as the long form: Observing, Describing, Acting with Awareness, Non-Judging, and Non-Reactivity/Detaching.

Social Connectedness and Social Reassurance Scale (SCS). The scale by Lee and Robbins (1995) measures the degree of interpersonal closeness that an individual experiences in his or her social world (e.g., friends, peers, society) as well as the degree of difficulty in maintaining this sense of closeness. This self-report scale consists of eight items that are rated along a 6-point Likert-type scale.

Adult Self-Transcendence Inventory (ASTI): The ASTI (Levenson et al., 2005) is a self-report scale including Likert-scaled items ranging from 1 (disagree strongly) to 4 (agree strongly). The scale consists of five dimensions: self-knowledge and integration (SI), peace of mind (PM), non-attachment (NA), self-transcendence (ST), and presence in the here-and-now and growth (PG).

Noetic Experiences and Beliefs Scale (NEBS). The NEBS (Wahbeh et al., 2019) is a 20-item self-report measure of paranormal beliefs, paranormal experiences, psi beliefs, and experiences. The NEBS is a concise, valid, and reliable tool for evaluating individual differences in paranormal beliefs and experiences. We assessed experiences people have either during or related to their meditation practice or spontaneously using a modified version of the survey we have used in our retrospective studies of meditators. This survey examines: (a) mystical, transcendent, or transformative experiences during or related to meditation practice, (b) social, relational, and group aspects of meditation, (c) contextual aspects of meditation practice, (d) anomalous physical phenomena related to meditation, (e) extended human capacities such as precognition, clairvoyance, or ESP, and (f) difficult states and stages of meditation practice. The survey asks respondents to report on whether any of these occurred in the course of their meditation, how frequently they occurred, and how important or meaningful they were to the respondent. These measures were used to assess the frequency and salience of these experiences.

Psi Task - A Random Number Generator (RNG). This was utilized as a target for group meditation to assess the difference in psi abilities between those learning/practicing meditation and those who have never been trained or practiced meditation. The random number generator used was the Araneus Alea I. The Araneus Alea I is a compact true random number generator that can also be used as a hardware random number generator and uses a USB interface. This produces a continuous stream of random numbers at 100 kilobits/second and, due to rigorous statistical testing, should not display any distinguishable patterns in their appearance or generation. The RNG utilizes a reverse-biased semiconductor junction that generates wide-band Gaussian white noise, which is then amplified and digitized using the product's analog-to-digital converter. Output bits from the converter are then further processed by an embedded microprocessor, which results in a random bit stream that is free from bias and correlation.

Randomization

Participants were randomized to the control or intervention group by a generated random allocation sequence and allocated to either exercise or meditation group by the study coordinator, who could not predict the group

into which the participant would be randomized. Participants who were oriented to the study, met the criteria, and reviewed and signed consent were then randomized to one of the groups in a rolling enrollment. When a group of at least ten was formed, the intervention was started for that group. We enrolled and implemented interventions until our time limit was up for the study funding, and thus, the number of participants enrolled is not equal in the two conditions. We enrolled and implemented interventions until our time limit was up for the study funding, and thus, the number of participants enrolled is not equal in the two conditions.

Procedure

This study was conducted at the University of Virginia (UVA) School of Medicine, Division of Perceptual Studies (DOPS) in Charlottesville, VA, and consisted of an 8-week trial to examine the impact of meditation or physical exercise on the variables stated above. This study was approved by the institution's IRB. Subjects were recruited from the general population and community of Charlottesville, Virginia, and the surrounding area from 2020 to 2021. Those recruited were naïve to formal meditation, yoga, and mindfulness training. After screening for eligibility and a brief study orientation, consent was obtained by a member of the research team by phone or online. Participants were then randomized to one of the two intervention cohorts and completed a baseline demographic assessment including age, ethnicity, gender, income, employment, region, marital status, religious and spiritual background, beliefs, and practices, meditation history, psychiatric history, and history of attitudes toward and beliefs about extraordinary, unusual, or transformational experiences and abilities. Participants were asked to complete additional assessments of interest at the onset of the intervention, halfway through, at the end of the intervention, and two months following completion of the study.

Intervention. The random allocation sequence was generated by the study team, and participants were assigned to receive the intervention. We delivered the interventions online and via an application program (accessible on smartphone, tablet, or computer) over eight weeks with nine weekly online live sessions to provide guidance and support with the materials.

The meditation intervention focused on the implementation of awareness/attention and connection with the help of an application focused on teaching and practicing such meditations. The active control intervention was a similarly interactive program with a focus on exercise and physical activity of equal duration.

We conducted the random number generator procedure to analyze the impact of practicing/learning meditation on psi abilities with all groups at the beginning, middle, and end of the study to evaluate deviations in non-random activity.

Two-thirds of the instruction and exercises for the meditation group focused on increasing awareness and connection, and the remainder of the weeks focused on insight and purpose. Meditation instruction and practice were based on practices that stem from classical meditation texts in the yoga and Buddhist schools of meditation as well as its modern secular adaptations, including Mindfulness-Based Stress Reduction (MBSR) training, subtle mind/body movement practices, and visualization exercises. Components from the "Healthy Minds" app-based well-being program that focuses on increasing awareness, connection, insight, and purpose were used for the intervention. This program of instruction was developed by the Center for Healthy Minds at the University of Wisconsin-Madison and tailored for UVA. This specialized program was provided for research participants in this study in collaboration with UVA and Healthy Minds Innovations, the external, affiliated nonprofit dedicated to supporting the mission of the Center for Healthy Minds at the University of Wisconsin. Instruction was provided online during live weekly meetings and via the app, with the participants recording practice data on their app. Topics of instruction and requested time of practice over the 8-week intervention can be found in Table 1.

The active control intervention was a similarly interactive program providing training in physical exercise of the same length and duration. The exercises were based on information from Harvard Health, the Cleveland Clinic, and the Mayo Clinic and were based on a progressive program of gentle exercises that can be modified as needed by the individual. The exercise content was comparable in time to the meditation cohort intervention. These exercises were introduced and explained during the live virtual weekly meetings, and exercises and demonstrations of such were provided online virtually. Participants tracked their practice via an app or device of their choice, such as Strava. A list of the various exercises and practice times is provided in Table 2.

All participants in both groups also participated in a group meditation with a focus on getting a true random number generator (RNG) to go "off random." These meditations happened in each group at the first live real-time session, the middle session, and the final session of the study. The dates and times of these meditations were recorded for each cohort, and the impact on the random number generator was assessed.

Statistical Analysis

To test the study hypothesis, we conducted a series of multivariate regression models for each of the outcomes, combining mid, and follow-up measures for each score using the cohort groups as the unique independent variable. This analysis is appropriate since we have several dependent variables jointly regressed on the same independent variables. Using a joint estimator, it is possible to measure between-equation covariances, making this model more convenient for several measures across time points (Table 4). For the psi and paranormal experiences related to meditation variables (Table 5), we conducted a unique multivariate regression model with all outcomes at post 1 using the cohort groups as the sole independent variable. For the self-reported paranormal beliefs and experiences variables (Table 6), we compared both groups at follow-up using linear probability regression models with standard errors robust to heteroscedasticity. We reported p-values ≤ 0.005 and confidence intervals for the β (beta) regression coefficients as multiple tests were performed (Benjamin et al., 2018). We used *STATA 15* for all statistical analysis.

RNG data was statistically analyzed using Matlab functions that calculate the total number of bits, percent deviation, cumulated Z scores for the time interval, and max Z score. Data were analyzed for each individual cohort due to differences in meeting dates and times. Excluded participants were excluded prior to running the final analyses.

Our study flow diagram is found in Figure 1, and the results from our analyses are reported in Tables 4-6 and Figures A-C. Specifics of the differences in groups over time are summarized in Table 4 for the five-factor personality assessment (Big 5), the General Wellbeing Schedule, Applied Mindfulness Process Scale, Five-Facet Mindfulness Questionnaire - Short Form, and the Social Connectedness and Social Reassurance Scale. We were specifically interested in the changes over time in the meditation group regarding self-transcendence and noetic experiences and beliefs and thus explored those via the ASTI and NEBS with a focus on the meditation group in comparison to the exercise group in Table 5. Data regarding changes in Psi/Paranormal Lived Experiences and Perceived Significance in both groups over time are provided in Table 6.

RESULTS

We assessed personality traits using the five-factor personality assessment (Brief Big 5). See Table 4 for details. We hypothesized that variables of agreeableness, openness, and conscientiousness, which are positively associated with mindfulness, would increase in the meditation cohort versus the exercise cohort and that neuroticism would significantly decrease over time in the meditation group versus the exercise group. We found some support for our hypothesis in the differences between groups on the openness sub-scale at post-1, with the meditation group endorsing significantly more openness at the end of the intervention (p = 0.001) and suggestive effects at Mid and post-2 interventions (p < 0.030). Openness is a characteristic that includes imagination and insight. As a caveat, the data indicates that openness was higher at the baseline stage for the meditation group. However, effects are still suggestive with the inclusion of the baseline openness as a confounding variable (p = 0.009, results not shown in Table 4). Extroversion also significantly increased in the meditation group as assessed at post-1 also (p = 0.001), but no other significant changes in personality variables were noted over time. Extroversion is a characteristic that includes assertiveness and high amounts of emotional expressiveness, which may have increased in the meditation group during their practice. Extroversion significantly increased over time only in the meditation group, and we may speculate that meditation allowed access to a fuller awareness and expression of emotions for these participants.

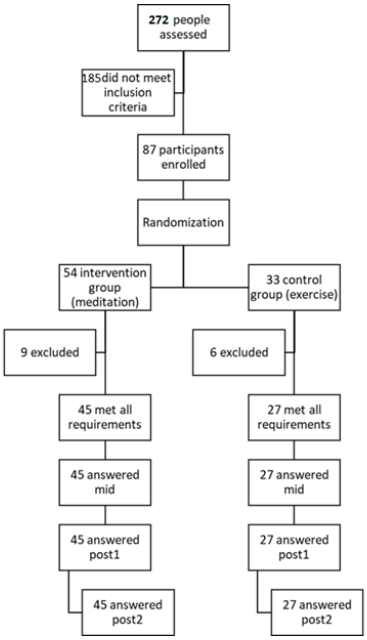

Figure 1. Study Flow Diagram.

Regarding our hypothesis that participants in the meditation group would demonstrate significantly increased perceived well-being over time compared to the exercise group, this was not supported. There were no significant differences between groups on the scales of the GWBS, with both groups demonstrating significant

Table 1. Description of Content and Duration of Meditation Group

Week	Exercise	Minimal Daily Practice
1	Foundations of Awareness	10 min
2	Mindfulness	10 min
3	Focused Attention	10 min
4	Mindfulness of Emotion & Thought	15-20 min
5	Appreciation, Savoring & Gratitude	15-20 min
6	Extending Appreciation & Kindness	15-20 min
7	Compassion	20-30 min
8	Purpose	20-30 min

improvements over time on the anxiety and general health subscales of the GWBS at the follow-up. See Table 4 for more details. The data supports that both meditation and exercise have a positive impact on well-being over time, as it can be seen for anxiety and general health, which has previously been supported in the literature (Iwon et al., 2021). This finding may have interesting implications for designing future wellness programming since exercise alone appears to be as effective in improving wellness as meditation.

Our hypothesis that meditation group members would demonstrate significantly increased mindfulness scores on the FFMQ-24 overtime was partially supported. See Table 4 for details. We found significant increases in the meditators acting with awareness at the end of the study ($p < 0.001$, *CI* 95% -5.85; -1.90) and at the two months follow-up after the study ended ($p < 0.001$, *CI* 95% -5.88; -2.02) when compared to the participants in the exercise cohort. Additionally, at the end of the intervention, meditators endorsed suggestive changes in non-judging when compared to those at the post-follow-up two months later ($p = 0.011$, *CI* 95% -4.96; -0.68).

We further explored mindfulness as assessed by the AMPS, which is designed to quantify how mindfulness is used. See Table 4 for details. At the end of the study, we found that the exercise group endorsed significantly more use of negative emotional regulation versus the meditation group at the 2-month follow-up ($p < 0.001$, *CI* 95% 1.56; 5.07). As a caveat, the data indicates that negative emotional regulation was higher at the baseline stage for the exercise group. However, effects are still suggestive with the inclusion of the baseline variable as a confounding variable ($p < 0.001$ at post-2, results not shown in Table 4).

Table 2. Description of Content and Duration of Exercise Group

Week	Exercise	Minimal Daily Practice
1	Gentle Stretching Exercises	10 min
2	Introductory Balance Exercises	10 min
3	Gentle Aerobic/Cardiovascular	10 min
4	Introductory Strength Training	15-20 min
5	Moderate Stretching Exercises	15-20 min
6	Balance Exercises with Partner	15-20 min
7	Moderate Aerobic/Cardiovascular	20-30 min
8	Moderate Strength Training	20-30 min

We examined the hypothesis that social connectedness would increase significantly more in the meditation versus the exercise group over time and found that the overall sense of closeness and connectedness at the end of the study was not higher in the meditation group than in the exercise group. Results are just weakly suggestive (at post-1: $p = 0.025$, *CI* 95% -3.61; -0.26). We also explored self-transcendence over time and found no differences in the measures of self-transcendence on the ASTI between groups over time (see Table 4 for details).

We hypothesized that the meditation cohort would endorse significantly higher frequencies of paranormal and noetic experiences and beliefs over time than the exercise control group. See the full results in Table 5. Paranormal beliefs and experiences were assessed with the NEBS, administered at baseline and follow-up (POST 2) to both groups. We explore significant findings below. At the end of the study (Post 1), participants in the meditation cohort versus the exercise cohort reported suggestive more believing that they had an experience of seeming outside of their body so that they could see their body from a point of view outside it ($p = 0.008$), having a medical condition that suddenly or unexpectedly resolved in a way that was not the result of normal medical intervention ($p = 0.003$), seeing colors or energy fields around people or things ($p = 0.032$), being in communication or contact with someone distant from them or without conventional means of communication ($p = 0.039$), feeling like they delivered or directed healing energy to another person that had an impact on their mind or body ($p = 0.021$), and having other experiences that they would consider paranormal ($p < 0.001$). All results should be seen with caution as we performed multiple hypothesis tests with results above the $p < 0.005$ threshold.

We explore the hypothesis that meditators would report significantly more paranormal and psi experiences during and throughout the study versus the exercisers at Table 6. We expected that the meditators would endorse significantly more real-time experiences of psi and paranormal activity and that these would be more important and meaningful during the study. We examined the im-

Table 3. Demographics for Meditation and Exercise Cohorts

Variable		Cohort group		
		Meditation n (%)	Exercise n n (%)	z-test
COUNTRY	USA	43 (95.6)	25 (92.6)	
	Brazil	1 (2.2)	0 (0)	
	China	0 (0)	1 (3.7)	
	India	1 (2.2)	0 (0)	
	UK	0 (0)	1 (3.7)	
	Total	45 (100)	27 (100)	
GENDER	Female	35 (77.8)	22 (81.5)	
	Male	9 (20)	5 (18.5)	
	Other	1 (2.2)	0 (0)	
	Total	45 (100)	27 (100)	
MARITAL STATUS	Cohabiting	2 (4.4)	2 (7.4)	
	Divorced	1 (2.2)	3 (11.1)	
	Married	16 (35.6)	14 (51.9)	
	Separated	2 (4.4)	0 (0)	
	Single	23 (51.1)	8 (29.6)	
	Widow(er)	1 (2.2)	0 (0)	
	Total	45 (100)	27 (100)	
ETHNICITY	American Indian or Alaskan Native	0 (0)	1 (3.7)	
	Asian American or Pacific Islander	4 (8.9)	2 (7.4)	
	Black or African American	1 (2.2)	0 (0)	
	Hispanic - Cuban	0 (0)	1 (3.7)	
	Hispanic - Other	1 (2.2)	0 (0)	
	Mixed Race	3 (6.7)	0 (0)	
	Non-Hispanic white	34 (75.6)	21 (77.8)	
	Non-Hispanic white	0 (0)	1 (3.7)	
	Other	2 (4.4)	1 (3.7)	
	Total	45 (100)	27 (100)	
EDUCATION	Bachelor's degree	12 (26.7)	7 (25.9)	
	Doctoral degree or Professional degree (MD, JD, etc.)	3 (6.7)	0 (0)	
	High school or equivalent	4 (8.9)	0 (0)	
	High School or equivalent	0 (0)	2 (7.4)	
	Less than high school	0 (0)	9 (33.3)	
	Master's degree	18 (40)*	1 (3.7)*	p<0.001
	Some college/ technical school (2 years)	0 (0)	7 (25.9)	
	Some college/technical school (High School Equivalent)	4 (8.9)	0 (0)	
	Some graduate school	4 (8.9)	1 (3,7)	
	Total	45 (100)	27 (100)	
EMPLOYMENT	Full-time	28 (62.2)	16 (59.3)	
	Full-time College/ University Student	8 (17.8)	2 (7.4)	
	Other	1 (2.2)	1 (3.7)	
	Part-time	3 (6.7)	4 (14.8)	
	Retired	1 (2.2)	1 (3.7)	
	Self-employed	1 (2.2)	3 (11.1)	
	Unemployed	3 (6.7)	0 (0)	
	Total	45 (100)	27 (100)	
Household Income	$100K to under $150K	7 (15.6)	6 (22.2)	
	$150K to under $250K	6 (13.3)	6 (22.2)	
	$250K or greater	1 (2.2)	1 (3.7)	
	$30K to under $75K	16 (35.6)	9 (33.3)	
	$75K to under $100K	5 (11.1)	3 (11.1)	
	Decline to answer	3 (6.7)	0 (0)	
	Under $30K	7 (15.6)	2 (7.4)	
	Total	45 (100)	27 (100)	

pact of the intervention via a survey to assess the frequency and salience of these experiences.

Exploring differences between the groups at the immediate end of the study (Post 1), we see that data supports that meditators endorsed having significant results compared to exercisers in reporting: an altered sense of hearing and hearing things that were not in the physical environment ($p < 0.001$); having an altered sense of taste in tasting things that were not physically present ($p < 0.001$); having an altered sense of space such as feeling distortions in space around them ($p < 0.001$); having an altered sense of identity ($p < 0.001$); experiencing disturbing feelings or fear ($p < 0.001$); having a sense of collective energy from the group they were with ($p < 0.001$); being aware of a non-physical entity, such as a God presence higher powers, divine beings or other visitors ($p < 0.001$); experiencing things moving, objects appearing with no physical cause ($p < 0.001$); and experiencing clairvoyance or telepathy ($p < 0.001$). The exercise cohort endorsed experiencing altered breathing significantly more than the meditation cohort ($p = 0.003$). We did not collect data on this variable at Post 2, and thus are not certain if these differences persisted over time. Future research may wish to extend follow-up periods to examine this.

We also explored the impact of both groups' meditations upon a random number generator to explore the impact on the randomness of the numbers generated as an indicator of psi abilities. We hypothesized that the mediation cohort would show more significant deviations from

Table 4. Comparison of Big 5, GWBS, FFMQ, AMPS, SCSA Between Groups over Time

Variable Time: Name	Meditation Mean (*SD*)	Exercise Mean (*SD*)	*p*
Five-factor personality assessment (Big Five)			
Pre: Extroversion	6.77(1.72)	6.33(2.02)	
Mid: Extroversion	6.77(1.72)	5.86(2.06)	0.053
Post 1: Extroversion	7(1.67)	5.55(1.63)	0.001*
Post 2: Extroversion	6.43(1.85)	5.39(1.58)	0.112
Pre: Agreeableness	6.84(1.76)	6.78(1.72)	
Mid: Agreeableness	7.14(1.82)	7(1.9)	0.595
Post 1: Agreeableness	6.86(1.92)	6.73(1.8)	0.156
Post 2: Agreeableness	7.03(1.99)	6.83(1.98)	0.792
Pre: Conscientiousness	7.82(2.11)	7.37(2.1)	
Mid: Conscientiousness	8.11(2.01)	8.29(1.98)	0.751
Post 1: Conscientiousness	7.86(1.97)	8(1.88)	0.633
Post 2: Conscientiousness	8.13(2.15)	7.67(2.03)	0.267
Pre: Neuroticism	6.53(2.31)	6.22(2.33)	
Mid: Neuroticism	5.8(2.29)	5.76(1.95)	0.947
Post 1: Neuroticism	5.61(2.27)	5.82(1.99)	0.384
Post 2: Neuroticism	5.6(1.83)	6.17(2.07)	0.225
Pre: Openness	7.51(1.88)	6.81(1.84)	
Mid: Openness	7.71(1.96)	6.52(1.47)	0.023
Post 1: Openness	7.84(1.85)	6.14(1.39)	0.001*
Post 2: Openness	7.6(2.04)	6.28(1.49)	0.025
The General Wellbeing Schedule			
Pre: GWBS Anxiety	14.96(5.01)	13.48(4.48)	
Mid: GWBS Anxiety	12.09(3.31)	11.76(4.86)	0.877
Post 1: GWBS Anxiety	11.68(3.39)	11.59(4.55)	0.525
Post 2: GWBS Anxiety	12.33(3.99)	12.28(4.66)	0.693
Pre: GWBS Depression	9.89(1.23)	8.07(1.38)	
Mid: GWBS Depression	10.51(1.31)	10.71(1.62)	0.534
Post 1: GWBS Depression	10.36(1.48)	10.59(1.68)	0.517
Post 2: GWBS Depression	10.5(1.46)	10.72(1.93)	0.352
Pre: GWBS Positive Wellbeing	14.6(2.82)	13.93(2.63)	
Mid: GWBS Positive Wellbeing	13.09(1.74)	12.71(1.95)	0.670
Post 1: GWBS Positive Wellbeing	12.5(2.42)	12.82(2.42)	0.415
Post 2: GWBS Positive Wellbeing	12.53(2.03)	13.17(2.92)	0.781
Pre: GWBS Self Control	8.31(1.5)	9.22(1.87)	
Mid: GWBS Self Control	8.46(1.34)	8.81(1.36)	0.924
Post 1: GWBS Self Control	8.41(1.15)	9(1.6)	0.111
Post 2: GWBS Self Control	8.77(1.3)	8.78(1.17)	0.747
Pre: GWBS General Health	10.07(1.66)	10.96(1.37)	
Mid: GWBS General Health	10.66(1.51)	11.43(1.66)	0.113
Post 1: GWBS General Health	10.84(1.35)	11.82(1.37)	0.034
Post 2: GWBS General Health	10.8(1.49)	11.39(1.38)	0.198
Pre: GWBS Vitality	14.98(2.8)	14.22(2.31)	
Mid: GWBS Vitality	13.49(2.15)	13(2.28)	0.842
Post 1: GWBS Vitality	13.16(2.31)	12.18(2.79)	0.504
Post 2: GWBS Vitality	12.9(2.09)	11.56(2.62)	0.139
Applied Mindfulness Process Scale			
Pre: FFMQ Observing	13.89(3.36)	13.7(3.23)	
Mid: FFMQ Observing	15.09(2.9)	15.38(2.48)	0.769
Post 1: FFMQ Observing	15.48(2.72)	15.64(3.19)	0.819
Post 2: FFMQ Observing	15.17(3.11)	16.28(3.14)	0.389
Pre: FFMQ Detached	13.76(3.54)	16(2.96)	
Mid: FFMQ Detached	15.71(2.94)	16.62(3.71)	0.551
Post 1: FFMQ Detached	16.45(2.94)	17.59(3.33)	0.518
Post 2: FFMQ Detached	16.73(3.27)	18.39(3.29)	0.171
Pre: FFMQ Awareness	14.98(3.41)	15.59(3.7)	
Mid: FFMQ Awareness	16.54(3.13)	15.24(4.1)	0.015
Post 1: FFMQ Awareness	16.91(3.37)	14.95(4.1)	<0.001*
Post 2: FFMQ Awareness	17.53(2.89)	13.67(3.29)	<0.001*
Pre: FFMQ Non-Judging	15.33(4.17)	15.89(4.46)	
Mid: FFMQ Non-Judging	16.91(3.36)	15.38(4.28)	0.112
Post 1: FFMQ Non-Judging	17.27(3.33)	15.91(4.31)	0.038
Post 2: FFMQ Non-Judging	18.03(2.66)	15.33(4.26)	0.011
Five-Facet Mindfulness Questionnaire - Short Form			
Pre: AMPS Decentering	10.98(3.25)	12.07(2.29)	
Mid: AMPS Decentering	12.43(2.84)	12.1(2.28)	0.275
Post 1: AMPS Decentering	13.14(2.82)	12.73(2.29)	0.120
Post 2: AMPS Decentering	13.77(2.82)	13.11(2.59)	0.277
Pre: AMPS Positive Emotional Regulation	13.91(3.7)	13.59(3.25)	
Mid: AMPS Positive Emotional Regulation	14.8(3.02)	13.95(3.99)	0.110
Post 1: AMPS Positive Emotional Regulation	15.59(3.08)	14.59(3.81)	0.048
Post 2: AMPS Positive Emotional Regulation	15.37(3.47)	14.44(3.78)	0.190
Pre: AMPS Negative Emotional Regulation	8.69(3.26)	9.85(4.5)	
Mid: AMPS Negative Emotional Regulation	11.69(2.96)	13.05(4.12)	0.504
Post 1: AMPS Negative Emotional Regulation	10.32(2.66)	13.5(3.49)	0.005*
Post 2: AMPS Negative Emotional Regulation	10.3(2.28)	13.78(3.41)	<0.001*
Pre: AMPS Total Score	35.62(9.77)	38.33(8.19)	
Mid: AMPS Total Score	38.91(7.69)	39.1(9.49)	0.499
The Social Connectedness and Social Reassurance Scale3			
Pre: SCSA Social Connectedness	19.11(2.94)	17.74(3.14)	
Mid: SCSA Social Connectedness	19.74(2.5)	19(2.77)	0.089
Post 1: SCSA Social Connectedness	19.55(2.87)	18.82(3.11)	0.025
Post 2: SCSA Social Connectedness	19.67(2.48)	18.67(3.05)	0.104
The ASTI transcendence			
Pre: ASTI Transcendence	115.78(20.76)	125.37(18.35)	
Mid: ASTI Transcendence	125.74(17.9)	129.38(15.35)	0.868
Post 1: ASTI Transcendence	129.3(17.13)	129.05(17.2)	0.430
Post 2: ASTI Transcendence	128.03(17.11)	128.28(18.55)	0.719

randomness vs. the exercise cohort, even with the knowledge that neither group was experienced in meditation practices. As expected, the RNG did not show any deviations in randomness during any of the pre-test baselines at the $p = 0.05$. The RNG also did not show any residual deviations during any of the post-test data acquisitions at the $p = 0.05$. The results of the first meditation cohort, three meditation sessions for 26 minutes and 1796 trials, yielded a non-significant result of $Z = -0.0013$ $p = 0.4995$. The results from the second meditation cohort, 3 meditation sessions for 22 minutes and 1415 trials, yielded a non-significant result of $Z = 0.0004$ $p = 0.5002$. The results from the exercise cohort, 3 meditation sessions for 18 minutes, and 1303 trials yielded a non-significant result of $Z = 0.0001$ $p = 0.5000$. The deviation plots below show lines at $p = 0.05$; the jagged lines show the cumulative deviations from all trials. None of the results were significant in showing deviations from randomness.

DISCUSSION

Overall, results indicate that both groups improved significantly in well-being scores, such as anxiety and general health. Perhaps this is due to the widely accepted positive effects of both exercise and meditation. Although this may not be a surprising finding, it is a helpful finding in that it supports exercise groups as an effective active control. The meditation group endorsed significantly higher scores on the personality variables of openness and extroversion over time. The increased extroversion variable was unexpected and deserves further exploration. The meditation cohort also endorsed experiencing all of the paranormal events on the scale at significant levels over time, with about half of these experiences being endorsed as important or meaningful to them. The psi experiment to explore actual abilities did not produce significant results.

Our overarching research question was whether participants naïve to meditation who learn and engage in meditation versus exercise would report significant changes in several variables, including increased mindfulness, social connectedness, and specific paranormal and psi experiences by self-report and in a psi task of impacting a random number generator (RNG). These questions are rooted in the theory that subjective experiences of mind-

Table 5. Noetic Experiences and Beliefs Scale Individual Item Results Comparing Meditation and Exercise Cohorts at Post 1

Variable Time: Name	Meditation Mean (*SD*)	Exercise Mean (*SD*)	*p*
Intuition	2.76(1.77)	3.52(1.85)	0.086
After Death Communication	2.38(1.66)	2.59(1.82)	0.610
Out of Body	1.69(1.08)	2.7(2.09)	0.008
Healing	1.24(0.71)	2.15(1.75)	0.003
Past Life	1.73(1.23)	2.26(1.75)	0.139
Universal Force	3.18(1.67)	3.26(1.68)	0.842
Energy Field	1.64(1.25)	2.44(1.85)	0.032
Communicate	1.87(1.46)	2.7(1.9)	0.039
Dream	3.4(1.4)	2.78(1.78)	0.105
Knowing	2.44(1.74)	2.41(1.69)	0.930
Receive Healing	2.73(1.79)	2.89(1.91)	0.729
Give Healing	2.38(1.59)	1.52(1.31)	0.021
Premonition	2.64(1.65)	3.15(1.92)	0.243
Other Paranormal	0.18(0.39)	1.78(0.42)	0.000

fulness, oneness, interconnectedness, timelessness, and dissolution of ordinary limits of perception might have some basis in reality and lead to increases in abilities and experiences such as intuition and extrasensory perception. To examine these questions, our research examined 45 participants learning and practicing meditation, and 27 participants engaged in an active control exercise group. The study participants were predominantly non-Hispanic white females from the United States of America and working full-time; thus, future research would benefit from examining a more diverse population in order to expand the generalizability of findings.

Many of the psychosocial measures were significantly improved during the study, both within the meditation cohort and when compared to the exercise group. This is not a surprise, given the robust body of evidence linking meditation practice with an array of positive psychosocial outcomes. In addition, the cohort engaging in meditation demonstrated suggestive increased mindfulness scores over time. Both the meditation and exercise groups endorsed improvements in aspects of general well-being. This is also not surprising given the literature that supports the positive impact of both meditation and exercise on well-being. Although self-transcendence did not differ across time between groups, measures of social connectedness increased more suggestively in the meditation group than the exercise group, with the ove-

Table 6. Psi/Paranormal Lived Experiences and Perceived Significance in Meditation versus Exercise Group at End of Intervention (Post 1)

Variable Time: Name	Meditation Mean (*SD*)	Exercise Mean (*SD*)	*p*
Body Sensations	0.68(0.47)	0.59(0.5)	0.481
Importance/Meaning	56.43(33.47)	31.14(29.41)	0.002
Visions	0.5(0.51)	0.73(0.46)	0.070
Importance or Meaningfulness	38.98(33.6)	20.36(26.65)	0.017
Somatic changes	0.55(0.5)	0.68(0.48)	0.285
Importance or Meaningfulness	43.34(37.57)	19.41(28.72)	0.005
Hearing Things	0.14(0.35)	0.95(0.21)	0.000
Importance or Meaningfulness	25.7(29.2)	11.91(21.18)	0.032
Tasting things	0.05(0.21)	0.82(0.39)	0.000
Importance or Meaningfulness	22.11(25.74)	17(23.46)	0.421
Breathing changes	0.75(0.44)	0.36(0.49)	0.003
Importance or Meaningfulness	53.75(33.34)	49.73(31.32)	0.631
Sense of time changes	0.73(0.45)	0.73(0.46)	1.000
Importance or Meaningfulness	49.84(32.03)	27.09(32.12)	0.008
Sense of space changes	0.39(0.49)	0.82(0.39)	0.000
Importance or Meaningfulness	36.61(32.67)	20.5(28.61)	0.043
Synchronicities	0.36(0.49)	0.64(0.49)	0.036
Importance or Meaningfulness	39.93(35.87)	32.23(30.84)	0.367
Creativity	0.59(0.5)	0.64(0.49)	0.725
Importance or Meaningfulness	57.36(37.6)	35.27(34.58)	0.020
Identity	0.3(0.46)	0.77(0.43)	0.000
Importance or Meaningfulness	37.45(37.24)	23.95(33.28)	0.139
Fearful	0.18(0.39)	0.91(0.29)	0.000
Importance or Meaningfulness	27.66(29.03)	19.77(31.42)	0.326
Collective Energy	0.32(0.47)	0.77(0.43)	0.000
Importance or Meaningfulness	35.57(36.12)	21.14(29.54)	0.087
Distant Energy	0.48(0.51)	0.64(0.49)	0.223
Importance or Meaningfulness	0.45(0.5)	0.64(0.49)	0.164
Connection	43.89(36.2)	31.32(31.1)	0.147
Importance or Meaningfulness	49.86(35.56)	30.09(32.5)	0.027
God like presence	0.18(0.39)	0.77(0.43)	0.000
Importance or Meaningfulness	33.43(32.4)	24.23(31.12)	0.266
Moving things	0.09(0.29)	0.86(0.35)	0.000
Importance or Meaningfulness	22.55(26.32)	17.95(27.34)	0.516
Telepathy	0.07(0.25)	0.91(0.29)	0.000
Importance or Meaningfulness	24.05(28.87)	17.14(28.6)	0.358

rall sense of closeness and connectedness present in the meditation group during the study and at the end of the study. The meditation group reported more psi and paranormal experiences than the comparison group, and these persisted over time into the two-month follow-up after the end of the study. Furthermore, the meditation cohort endorsed at least some of the experiences that were significantly important or meaningful to them. Reported that these experiences were more important or meaningful to them than they were to the comparison group.

None of the results were significant in showing deviations from randomness on the RNG.

Limitations

There are several limitations to this study that need to be acknowledged and discussed. One potential limitation is the sample size. The study may lack statistical power to detect small but meaningful effects. This is especially important given the large number of outcomes examined. The lack of power could result in false negatives, meaning that the study may have failed to detect the true effect because of insufficient sample size. Additionally, we used a more demanding threshold to detect significance due to the numerous hypothesis tests done, as Benjamin et al. (2018) suggested, which further reduces the statistical power of the tests.

Another limitation of this study is the relatively short duration of the intervention. The study involved an 8-week intervention period, and although this period of time is fairly standard in the field, it may not have been long enough for participants to experience significant changes in outcomes. Meditation, in particular, is known to be a practice that requires a significant amount of time to produce noticeable changes in individuals. Therefore, the results of the study may not be generalizable to longer interventions or to individuals who practice meditation or exercise for a longer duration.

Furthermore, the study did not account for potential confounding variables such as the experience of the participants in the meditation and exercise groups. While we tried to control for past and current experience, participants in the exercise groups could have begun meditating on their own during the study, although they were explicitly directed not to do so. In conclusion, while the study provides valuable insights into the effects of meditation and exercise on various psychological outcomes, it is important to consider its limitations. The sample size and the short duration of the intervention may limit the generalizability of the study's findings. Future studies could address these limitations by using larger sample sizes, longer intervention periods, and controlling for potential confounding variables.

Implications and Applications

We conclude that this study provides enough evidence to warrant additional research exploring the impact of meditation on paranormal or psi abilities. We recommend increased sample sizes to increase power and additional studies that utilize a controlled design with perhaps more intense or lengthy practice. Additionally, exploring the abilities of advanced meditators and their psi abilities would be an ideal next step. Based on this preliminary data, we intend to further our research by examining such individuals and exploring their abilities and experiences in more detail. We also wish to explore the endorsed impact of such experiences or abilities upon the individuals experiencing them. Exploring the significance of these experiences on the beliefs and well-being of those who experience them is also important to expand our full understanding of the impact on individuals and in larger communities.

ACKNOWLEDGMENTS

Author Contributions: J. Kim Penberthy: Conceptualization, Methodology, Writing- Reviewing and Editing. Heloísa Garcia Claro: Data curation, Writing- Reviewing and Editing, Visualization. Tevfik Kalelioglu: Data curation. Caroline Centeno: Data curation, Resources, Writing- Original draft preparation. Ahoora Ladoni: Data curation, Resources, Writing- Original draft preparation. Emma Ragone: Data curation, Resources, Writing- Original draft preparation. Christopher Rowley: Writing- Original draft preparation. Elizabeth Hanchak: Data curation, Resources, Writing- Original draft preparation. Funding: Bial Foundation Grant number 2018-110. Conflict of Interest: No conflicts of interest, financial or otherwise, are to be disclosed from any author listed.

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