

Rowan University

Rowan Digital Works

Faculty Scholarship for the College of Science & Mathematics

College of Science & Mathematics

12-1-2013

Pilates, Mindfulness and Somatic Education

Karen Caldwell

Marianne Adams

Rebecca Quinn

Mandy Harrison

Jeffrey M. Greeson

Rowan University, greeson@rowan.edu

Follow this and additional works at: https://rdw.rowan.edu/csm_facpub



Part of the [Health Psychology Commons](#)

Recommended Citation

Caldwell, K., Adams, M., Quinn, R., Harrison, M., & Greeson, J. M. (2013). Pilates, Mindfulness and Somatic Education. *Journal of Dance & Somatic Practices*, 5(2), 141-153.

This Article is brought to you for free and open access by the College of Science & Mathematics at Rowan Digital Works. It has been accepted for inclusion in Faculty Scholarship for the College of Science & Mathematics by an authorized administrator of Rowan Digital Works.

Published in final edited form as:

J Dance Somat Pract. 2013 December 1; 5(2): 141–153.

Pilates, Mindfulness and Somatic Education

Karen Caldwell, Ph.D.,

Department of Human Development and Psychological Counseling, Appalachian State University, Boone, NC USA

Marianne Adams, M.A., M.F.A.,

Department of Theatre and Dance, Chapel Wilson Hall, Appalachian State University, Boone, NC 28608 USA 828-262-3028; FAX: 828-265-8694

Rebecca Quin, M.A.,

Department of Theatre and Dance, Appalachian State University, Boone, NC 28608 USA

Mandy Harrison, PhD, and

Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, NC USA

Jeffrey Greeson, PhD

Duke Integrative Medicine, Duke University Medical Center, Durham, NC USA

Marianne Adams: adamsm@appstate.edu

Abstract

The Pilates Method is a form of somatic education with the potential to cultivate mindfulness – a mental quality associated with overall well-being. However, controlled studies are needed to determine whether changes in mindfulness are specific to the Pilates Method or also result from other forms of exercise. This quasi-experimental study compared Pilates Method mat classes and recreational exercise classes on measures of mindfulness and well-being at the beginning, middle and end of a 15 week semester. Total mindfulness scores increased overall for the Pilates Method group but not for the exercise control group, and these increases were directly related to end of semester ratings of self-regulatory self-efficacy, perceived stress and mood. Findings suggest that the Pilates Method specifically enhances mindfulness, and these increases are associated with other measures of wellness. The changes in mindfulness identified in this study support the role of the Pilates Method in the mental well-being of its practitioners and its potential to support dancers' overall well-being.

Keywords

The Pilates Method; somatic education; mindfulness; self-efficacy; stress; mood

Correspondence to: Marianne Adams, adamsm@appstate.edu.

The content is solely the responsibility of the authors and does not necessarily represent the official views of NCCAM or the National Institutes of Health of the United States.

Introduction

Somatic education has become commonplace in many academic dance curricula (Batson and Schwartz 2007: 47) and efforts to define the field of ‘somatics’ are ongoing (Eddy 2009: 7). Thomas Hanna defined somatics as the ‘the art and science of the inter-relational process between awareness, biological function and the environment, with all three factors understood as a synergistic whole’ (Fitt 1996: 303). Benefits of these mind-body practices include improved strength and alignment, increased body awareness (Geber and Wilson 2010: 50) and ‘sensory authority’ (Batson and Schwartz 2007: 48; Eddy 2002: 6). As more dance professionals embrace the use of somatic education to integrate health and wellness concepts into dance training, ‘these practices can refine bodily perceptions, which can contribute to improvement of technique, aid the development of expressive capacities and prevention of injuries’ (Fortin et al., 2009: 50). For example, one student in a Pilates Method course wrote:

Dancing has always given me the same mind-body connection that I have learned from Pilates, but I had never realized it before. I was forced to think about every step I took and the placement of my body through every motion. It was a way for me to release body tension and mind stress.

(Adams et al., 2012, p. 128)

The Pilates Method as a somatic practice was initially used extensively by dancers and athletes and now is in the mainstream of the general public. The method of body conditioning created by Joseph Hubertus Pilates initially developed in the early 1920s was designed to create harmony between body and mind by combining aspects of mental focus and breath awareness with the physicality of gymnastics and other sports (Ungaro 2002: 8). Between the 1920s and 1970s an increasing number of dancer clients worked with Pilates making a strong impact on the development of his method. The well-known principles of this mind-body approach are centering, concentration, control, precision, flow and breath (Friedman and Eisen 1980/2005). Although anecdotal evidence suggests that the Pilates Method increases body awareness, core strength, the natural flexibility of the spine and range of motion in the limbs, several reviews of the literature concluded that well-designed research supporting these claims is still needed (Bernardo and Nagle 2006: 46; Shedden and Kravitz 2006: 111; Cruz-Ferreira et al., 2011: 2079–2080).

Sensory attention, somatic awareness and connecting the mind and body through the breath are all considered key aspects of mindfulness – a mental quality associated with emotional and physical well-being (Keng et al., 2011: 1042). Ralph La Forge of Duke University has proposed five likely criteria for determining whether an activity is ‘mindful’; mindful activities include (1) a self-reflective, present moment and nonjudgmental sensory awareness, (2) a perception of movement and spatial orientation as well as (3) focus on breathing, (4) attention to anatomical alignment and (5) awareness of one’s intrinsic energy (Gavin and McBrearty, 2006: 60). Based on its core principles and practices, the Pilates Method could be an effective way to develop mindfulness; however, this has been the subject of limited study to date. The Pilates Method was initially characterized by a command style of instruction and goals in physical skills, some of which were almost

acrobatic. However, the pedagogical orientation has changed in the past few decades, and the emphasis on alignment and awareness of breath has strong potential for fostering increased mindfulness and well-being. A qualitative study of college students' experiences in a Pilates Method mat class identified commonalities in students' experiences similar to the characteristics of mindfulness such as increases in body awareness, relaxation and improved stress management (Adams et al., 2012). One other observational study of college students participating in several movement-based courses, including the Pilates Method, found increases in mindfulness from the beginning to end of the semester, which were associated with improvements in mood, stress levels and sleep quality (Caldwell et al., 2010: 440).

In sum, although instruction in the Pilates Method appears to have the potential to enhance mindfulness, in principle and in practice, empirical evidence is currently limited to qualitative and observational data. The purpose of this study, therefore, was to determine whether college students participating in a Pilates Method mat class would report increases in mindfulness greater than that of an active control group, and whether changes in mindfulness specifically associated with the Pilates Method were linked to improvements on other measures of well-being, including self-efficacy, perceived stress, mood and sleep quality.

Methods

Study Design

A research team of two dance professors, a therapeutic recreation professional, and two psychotherapists familiar with mindfulness practices initiated this research study. Participants for this quasi-experimental study were recruited in the fall and spring semesters of two academic years from two types of undergraduate classes: Pilates Method and Special Recreation (Exercise Control Group). The Pilates Method mat class was an academic elective that fulfilled a general education wellness literacy requirement, (an elective class for dance majors and minors), while the Special Recreation class was required for majors in Recreation Management. The Special Recreation students were chosen as a comparison group because they were engaged in similar amounts of classroom contact time, similar amounts of social interaction and similar levels of exercise, but without the training in mind-body awareness provided by the Pilates Method. The Pilates Method group included 169 participants (Male= 10; Female= 158). The Special Recreation group included 139 (Male= 88, Female= 44) participants. Preliminary analyses revealed that gender was significantly associated with Self-regulatory self-efficacy, mood, and Total Mindfulness and was not evenly distributed either between or among groups. Therefore, males were excluded from the present analyses.

Pilates Method classes were held three times per week for fifty minutes each, and Special Recreation classes were held either once or twice per week for longer periods of time. In both cases the classes met for 150 minutes for a 15 week semester. Class instructors were comprehensively trained and certified in the classical Pilates Method and taught the students the traditional mat sequence which emphasized making body/mind connections. The Special Recreation class focused on facilitation of adaptive and inclusive recreation programming

for special populations; the in-class activities included lecture as well as experiential involvement in recreation activities that were adapted for use with individuals with limitations in physical or intellectual abilities.

Instruction in the Pilates Method that Supports Mindfulness

The pedagogical orientation for the Pilates Method classes was to engage the students in the process of body mind awareness using the Pilates Method. This approach influences the language choices and concepts that are stressed within the classes. While improved fitness is an appreciated aspect of the Pilates Method, the approach was not simply to teach an exercise regime but a body mind perspective, encouraging mindfulness in motion. For example, to increase attentional awareness in motion and coordinating breath with movement, instructors give verbal cues to notice breath patterns and reinforce the exhalation of breath with effort for ease in motion, helping students to attend to the sensation of flow created by a full and even breath rhythm. Instructors also give encouragement to notice pain and/or strain, and permission to modify as needed. This empowers students to notice and make conscious choices, i.e., to stop and rest, alter positioning, etc. Instructors also give direction to attend to the quality of movement by directing students to focus on experiencing sensations in the body i.e., noticing where tension is held, when breath is exhaled, or noticing asymmetrical muscular use within the body. Students are encouraged to use only the effort that is necessary, engaging the core to experience freedom in limbs. Using this approach, an instructor might begin a group mat class with this type of instruction, 'As you lower yourself down to the floor, pay attention to the point at which you exhale, sense your abdominal engagement, notice the relationship of your spinal alignment to your limbs as you move seamlessly to the floor.'

Another important principle of instruction is to assist students in maintaining a positive mental attitude (PMA) in a number of ways. First instructors assist student in recognizing progress by giving students encouragement to notice small incremental progress over time. Instructors also encourage students to notice what they can do, rather than emphasizing limitations. Instructors will also suggest gratitude by encouraging thankfulness for the range of motion, strength and body awareness that does exist. At intervals throughout the semester, students are asked to reflect on capacities, noticing changes. Classes often begin by choosing a positive intention or an acknowledgment of gratitude for capabilities. Within each class setting, the instructor emphasizes the importance of 'PMA' or being mindful of keeping a positive mental attitude. This approach was used throughout the semester long course as the Basic, Intermediate and Advanced exercises and principles of the Pilates Method Mat exercises were introduced.

Instrumentation

Students in both the Pilates Method and control groups completed a survey in class at the beginning, mid-point and end of the semester. The Institutional Review Board at the university approved the study procedures prior to collecting data. All students who participated in the survey provided informed consent. A number of wellness variables have been associated with increases in mindfulness, and we selected the variables of self-efficacy,

stress, mood and sleep quality for this study (Keng et al., 2011: 1041). All scales used in this study were found to have acceptable reliability.

Mindfulness—The Five Facet Mindfulness Questionnaire (FFMQ) is a 39-item instrument that uses a five point Likert-type scale (Baer et al., 2006). The FFMQ was developed from a factor analytic study of five previously developed mindfulness questionnaires. The five facets of mindfulness in this instrument are (1) observing or attending to sensations, perceptions, thoughts and feelings, (2) describing or labeling these internal experiences with words, (3) acting with awareness rather than on ‘automatic pilot’, (4) nonjudging of inner experiences and (5) nonreactivity to inner experience. Higher scores indicate greater levels of mindfulness. A Total Mindfulness score was calculated by adding scores on each of the five scales.

Self-efficacy—Self-efficacy beliefs are people’s judgments of their capability to organize and successfully complete different types of actions. Bandura contends, and research supports his contention, that “people’s level of motivation, affective states, and actions are based more on what they believe than on what is objectively true” (Bandura 1997: 2). Self-efficacy beliefs influence many aspects of behavior including the choices people make, the courses of action they pursue, how much effort they will expend, how long they will persevere and how resilient they will be. Improving physical and emotional well-being and reducing negative emotional states is one way to raise self-efficacy, and enhanced self-efficacy beliefs can, in turn, influence the physiological states themselves (Pajares 2002).

The Self-Regulatory Self-Efficacy Scale (SRE) is a four item, Likert format instrument designed to measure self-regulatory self-efficacy which is motivating oneself to keep trying difficult tasks (Harrison & McGuire 2008: 10).

Stress—The Perceived Stress Scale – 4 (PSS4) is a four item Likert format scale designed to measure the degree to which situations in one’s life are appraised as stressful. The scale has good reliability, and elevated scores on the scale are associated with life-event scores, depression, physical symptoms and increased use of health services (Cohen et al., 1983: 390; Cohen and Williamson 1988: 31).

Mood—The Four Dimensional Mood Scale (FDMS) is based on a circumplex model of dispositional mood measuring Positive Energy, Tiredness, Negative Arousal and Relaxation (Huelsman et al., 1998: 814; Huelsman et al., 2003: 656). This twenty item adjective checklist uses a five-point Likert format (1 = not at all, 5 = extremely), and scores on each scale are the mean response to items on the scale. Examples of adjectives used in the scales are (1) Lively and Energetic for Positive Energy, (2) Exhausted and Weary for Tiredness, (3) Agitated and Irritable for Negative Arousal and (4) Calm and Peaceful for Relaxation. The scales have been correlated with other established measures of mood. There is also evidence for good internal consistency of the scales as well as discriminant validity (Huelsman et al., 1998: 813; Huelsman et al., 2003: 665–666).

Sleep quality—The Pittsburgh Sleep Quality Index (PSQI) consists of nineteen self-rated questions related to normal sleep habits (Buysse et al., 1989: 195). Scores range from zero to

twenty-one, and the instrument has strong temporal stability (Pearson $r=.85$ over 28 days). Higher numbers on the PSQI indicate greater sleep disturbance, or poorer sleep quality. A PSQI global score greater than five has served as a marker to distinguish sleep disturbances in insomnia patients versus controls.

Data Analysis

Data analysis was conducted using the Statistical Packages for Social Sciences version 19 (SPSS, Chicago, Ill, USA). To address the research question of whether students in a Pilates Method mat class would report increases in mindfulness greater than that of an active control group, a series of mixed linear models using a Toeplitz residual covariance structure were calculated. When significant group, time or interaction effects were found, follow-up *t*-tests were then performed to more fully explain the source of statistical significance.

The second research question asked whether changes in mindfulness were associated with the end of semester ratings for the other wellness variables. A change score was calculated for Mindfulness subtracting beginning of semester scores from end of semester scores. Partial correlations were then calculated between the change scores and the end of semester values for the well-being variables controlling for the beginning of the semester values for each well-being variable.

Results

Baseline Characteristics and Normalization of Data

The Pilates Method group consisted of 158 females aged 18–31 ($M = 20.9$, $SD = 2.0$). The special recreation group consisted of 44 females aged 19–28 ($M = 21.0$, $SD = 2.3$). Prior to analysis, all data were checked for normal distribution and a transforming function was used when needed. Normalization of PSQI required removal of an outlier >2.5 SD and then transforming data using square root function. Removal of the one outlier for the PSQI resulted in a slight reduction of sample size (Pilates Method $n=158$, control group $n=43$). This slightly smaller data set was used for the remainder of the analyses.

Because there was no random assignment to treatment groups, we explored the possibility of baseline differences between the two groups on each outcome variable (See Table 1). The only statistically significant difference between groups initially was that the Pilates Method group reported lower levels of Relaxed Mood in comparison to the control group.

Results comparing changes in mindfulness and other well-being variables across time as a function of exercise group are shown in Table 2. As hypothesized, there was a significant group X time interaction for change in Total Mindfulness scores (See Figure 1). Follow-up *t*-tests were calculated to investigate this interaction. Whereas total Mindfulness scores for the control group did not change over time, mindfulness scores increased significantly in the Pilates Method group from the beginning of the semester (Time 1) to mid-semester (Time 2: $t = -7.190$, $p = .000$) and end of the semester (Time 3: $t = -7.434$, $p = .000$). The Special Recreation control group did not differ from the Pilates Method group at Time 1 or Time 2, but students who took Pilates Method reported significantly higher mindfulness scores by the end of the semester ($t = -3.112$, $p = .002$) (see Figure 1).

A significant group X time interaction was also found for Negative Mood ($F = 5.482, p = .005$). Over time, the Pilates Method participants experienced a reduction in Negative Mood. Specifically, compared to the beginning of the semester (Time 1), negative mood scores were marginally lower for Pilates Method students at mid-semester (Time 2: $t = 1.879, p = .061$) and were significantly lower at the end of the semester (Time 3: $t = 4.223, p = .000$). The Control Group tended to have higher negative mood at mid-semester (Time 2: $t = -1.706, p = .089$) and at the end of the semester (Time 3: $t = -1.408, p = .161$) compared to baseline (Time 1). Finally, there was a significant group effect for Relaxed Mood. The Pilates Method group reported increased relaxation from the beginning to the end of the semester ($t = -2.709, p = .007$), while the control group did not experience any significant change in relaxation. The two groups differed from each other only at Time 1 on relaxation scores ($t = 2.913, p = .004$).

Does increased mindfulness relate to improvements in well-being?

To address the second main research question, difference scores were calculated for the Pilates Method group for beginning to end of semester reports on Total Mindfulness. Partial correlations then were calculated for the relationship between changes in Total Mindfulness and end of semester values for the well-being variables controlling for beginning levels of each well-being variable. Changes in Total Mindfulness were related to improvements in Self-Regulatory Self-Efficacy ($df = 122, r = .284, p = .001$), Perceived Stress ($df = 97, r = -.269, p = .007$), Positive Energy ($df = 123, r = .203, p = .023$), Tiredness ($df = 123, r = .181, p = .044$), Negative Mood ($df = 123, r = -.307, p = .000$) and Relaxation ($df = 123, r = .409, p = .000$). No significant relationship was found between changes in Total Mindfulness and Sleep Quality ($df = 122, r = -.045, p = .621$).

In summary, mindfulness increased overall for the Pilates Method group but not for the control group. Increases in mindfulness were associated with improvements in students' belief in their ability to continue with difficult tasks, lower perceived stress and better mood

Discussion

Somatic approaches that value sensorial experience, intuitive ways of knowing and developing habits of consciousness are subtly shifting the curriculum in dance training. The Pilates Method can be taught as a somatic practice that encourages students to bring awareness to bodily processes such as breathing, sensing and initiating movement from the core. Thus, the Pilates Method can be considered a method for cultivating mindfulness, which is defined by Bishop and colleagues (2004: 23) as self-regulation of attention maintained on immediate experience with an attitude characterized by curiosity, openness and acceptance.

While both dance and Pilates Method training involve a striving for improvement, the shift in training to include mindfulness involves setting aside judgmental thoughts on occasion so as to not always be in a mental state of judgment. Of all the qualities of mindfulness, facility in directing attention is basic to other facets of mindfulness such as the development of non-judgment (Carmody, 2009: 272). Noticing improvement, accepting limitations and

developing a sense of gratitude for abilities are examples of the value shift that occurs when a Pilates Method pedagogy emphasizes mindfulness.

The main findings of this study support the hypothesis that the Pilates Method as taught in this study is specifically associated with increases in mindfulness, which, in turn, are associated with improvements in multiple aspects of well-being among college students. The observed improvements in mindfulness, negative mood and relaxation were limited to students participating in Pilates Method and were not found in a demographically similar group of students who received a similar amount of exercise training, but were not engaged in mind-body practices in class. The Pilates Method students who experienced increases in mindfulness were more likely to experience enhanced self-regulatory self-efficacy, lower stress levels and improved mood.

There are limitations to the current study. Without random assignment to groups, alternative explanations of the findings are possible. For example, the initial lower levels of relaxation for members of the Pilates Method group may partially account for the improvements found in relaxed mood by virtue of regression to the mean. Despite the lack of randomization, however, we did use an active comparison group that allowed us to control for several potentially confounding factors such as the passage of time, attention from instructors, social interaction and recreational exercise. This quasi-experimental design allowed us to specifically associate changes in mindfulness and other well-being variables with the Pilates Method, which is a significant advance over prior studies. Future research using random assignment is needed to control for expectancy bias, selection bias and other possible explanatory factors that could establish a specific, causal relationship between the Pilates Method, increased mindfulness and well-being, as observed here. Although we previously identified a significant association between increased mindfulness and improved sleep quality in college students following a semester of Pilates Method classes (Caldwell et al., 2010: 433), this association was not found in this all female sample. Therefore, future studies would likely benefit from examining the potential moderating role of gender on changes in mindfulness, well-being and sleep quality in samples of both men and women.

In her writings on the relationship between somatics and dance medicine, Martha Myers characterized somatics as historically focused on an intuitive way of knowing. She also noted that the 'soft' nature of somatics was changing as advances in measurement in medical sciences enabled measurement of motion and physical phenomena (Myers 1991: 3). One of the founders of another somatic practice, Moshe Feldenkrais, also acknowledged the difficulty of measuring somatic experience when he titled one of his books, *The Elusive Obvious* (1981). Mindfulness is only one of the 'softer' qualities developed through somatic practice, and advances in the development of psychometrically sound methods of measuring mindfulness have supported research on the interconnection between processes of mind and body (Baer et al., 2008: 339). Future researchers are encouraged to investigate the connection between mindfulness and measures of physiological changes and brain changes that are of interest to the dance world.

Conclusion

Within the past decade an important theme in dance has been the integration of somatic practices into the dance curriculum in order to facilitate mind-body connections. Although many of the concepts related to mindfulness and dance such as an awareness of movement and intention (Geber and Wilson 2010: 50) or balancing effort and rest (Batson and Schwartz 2007: 47), have been discussed or documented anecdotally, few have been formally researched. For example, one qualitative study by Kearns (2010: 39) reports her observations of improvements in students' movement, mindfulness and expressiveness after integrating somatic practices into the dance curriculum. Batson under the auspices of the International Association for Dance Medicine and Science (2009: 4) identifies the challenge for researchers now is 'to show the precise ways that somatic practices bear directly on improvement in technique and performance' (p. 4).

Somatic practices have been integrated into the training of dance programs as part of a shift acknowledging the importance of dancers' health and wellness (Geber and Wilson 2010: 50). As a somatic practice, the Pilates Method has been known for developing strength, flexibility and body awareness. While the Pilates Method was initially characterized by a command style of instruction, the pedagogical orientation has changed in the past few decades. The instructional style as described in this article has a strong potential for fostering increased mindfulness and well-being. The Pilates Method offers a unique bridge for training dancers since it can be considered both a cross training method and a somatic approach. The specific changes in mindfulness identified in this study support the role of the Pilates Method in somatic education and its importance in the movement to support dancers' overall well-being. By extension, future research is now warranted to examine whether changes in mindfulness produced by the Pilates Method correspond with improved technique and performance among dancers.

Acknowledgments

This manuscript was supported, in part, by a career development award, (R00AT004945) from the National Center for Complementary & Alternative Medicine (NCCAM).

Works Cited

- Adams M, Caldwell K, Atkins L, Quin R. Pilates and mindfulness: a qualitative study. *Journal of Dance Education*. 2012; 12(4):123–130.
- Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment*. 2006; 13(1):27–45. [PubMed: 16443717]
- Baer RA, Smith GT, Lykins E, Button D, Krietemeyer J, Sauer S, Walsh E, Duggan D, Williams JMG. Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment*. 2008; 15(3):329–342. [PubMed: 18310597]
- Bandura, A. *Self-efficacy: The Exercise of Control*. New York: WH Freeman & Co; 1997.
- Batson, G. and the International Association for Dance Medicine and Science. [Accessed 14 August 2013.] Somatic studies and dance. 2009. http://www.iadms.org/associations/2991/files/info/somatic_studies.pdf
- Batson G, Schwartz RE. Revisiting the value of somatic education in dance training through an inquiry into practice schedules. *Journal of Dance Education*. 2007; 7(2):47–56.

- Bernardo LM, Nagle EF. Does Pilates training benefit dancers? An appraisal of Pilates research literature. *Journal of Dance Medicine and Science*. 2006; 101–2:46–50.
- Bishop S, Lau M, Shapiro S, Carlson L, Anderson N, Carmody J, Segal Z, Abbey S, Speca M, Velting D, Devins G. Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*. 2004; 11(3):230–241.
- Buyssse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*. 1989; 28:193–213. [PubMed: 2748771]
- Caldwell K, Harrison M, Adams M, Quin RH, Greeson J. Developing mindfulness in college students through movement based courses: Effects on self-regulatory self-efficacy, mood, stress, and sleep quality. *Journal of American College Health*. 2010; 58(5):433–442. [PubMed: 20304755]
- Carmody J. Evolving conceptions of mindfulness in clinical settings. *Journal of Cognitive Psychotherapy*. 2009; 23(3):270–280.
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of Health and Social Behavior*. 1983; 24(4):385–396. [PubMed: 6668417]
- Cohen, S.; Williamson, G. Perceived stress in a probability sample of the United States'. In: Spacapan, S.; Oskamp, S., editors. *The Social Psychology of Health: Claremont Symposium on Applied Social Psychology*. Newbury Park, CA: Sage; 1988. p. 31–67.
- Cruz-Ferreira A, Fernandez J, Laranjo L, Bernardo LM, Silva A. A systematic review of the effects of Pilates method of exercise in healthy people. *Archives of Physical Medicine and Rehabilitation*. 2011; 92(12):2071–2081. [PubMed: 22030232]
- Eddy M. Dance and somatic inquiry in studios and community dance programs. *Journal of Dance Education*. 2002; 2(4):119–127.
- Eddy M. A brief history of somatic practices and dance: Historical development of the field of somatic education and its relationship to dance. *Journal of Dance and Somatic Practices*. 2009; 1(1):5–27.
- Feldenkrais, M. *The Elusive Obvious*. Cupertino, CA: Meta Publications; 1981.
- Fitt, SS. *Dance Kinesiology*. 2. New York: Schirmer Books; 1996.
- Fortin S, Vieira A, Tremblay M. The experience of discourses in dance and somatics. *Journal of Dance and Somatic Practices*. 2009; 1(1):47–64.
- Friedman, P.; Eisen, G. *The Pilates Method of Physical and Mental Conditioning*. New York: Viking Studio; 1980/2005.
- Gavin J, McBrearty M. Exploring mind-body exercise modalities. *IDEA Fitness Journal*. 2006; 3(6): 58–65.
- Geber P, Wilson M. Teaching at the interface of dance science and somatics. *Journal of Dance Medicine and Science*. 2010; 14(2):50–57. [PubMed: 20507721]
- Harrison MB, McGuire FA. An investigation of the influence of vicarious experience on perceived self-efficacy. *American Journal of Recreational Therapy*. 2008; 7(1):10–16.
- Huelsman TJ, Nemanick RC, Munz DC. Scales to measure four dimensions of dispositional mood: Positive energy, tiredness, negative activation, and relaxation. *Educational Psychological Measurement*. 1998; 58(5):804–819.
- Huelsman TJ, Furr RM, Nemanick RC. Measurement of dispositional affect: Construct validity and convergence with a circumplex model of affect. *Educational and Psychological Measurement*. 2003; 63:655–673.
- Kearns LW. Somatics in action: How “I feel three-dimensional and real” improves dance education and training. *Journal of Dance Education*. 2010; 10(2):35–40.
- Keng SL, Smoski MJ, Robins CJ. Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review*. 2011; 31(6):1041–1056. [PubMed: 21802619]
- Myers M. Dance science and somatics: A perspective. *Kinesiology and Medicine for Dance*. 1991/92; 14(1):3–19.
- Pajares, F. [Accessed 21 December 2012.] Overview of social cognitive theory and of self-efficacy. 2002. <http://www.uky.edu/~eushe2/Pajares/eff.html>
- Shedden M, Kravitz L. Pilates exercise: A research-based review. *Journal of Dance Medicine and Science*. 2006; 10(3–4):111–116.

Ungaro, A. The Pilates Body in Motion. London: Dorling Kindersley Publishing, Inc; 2002.

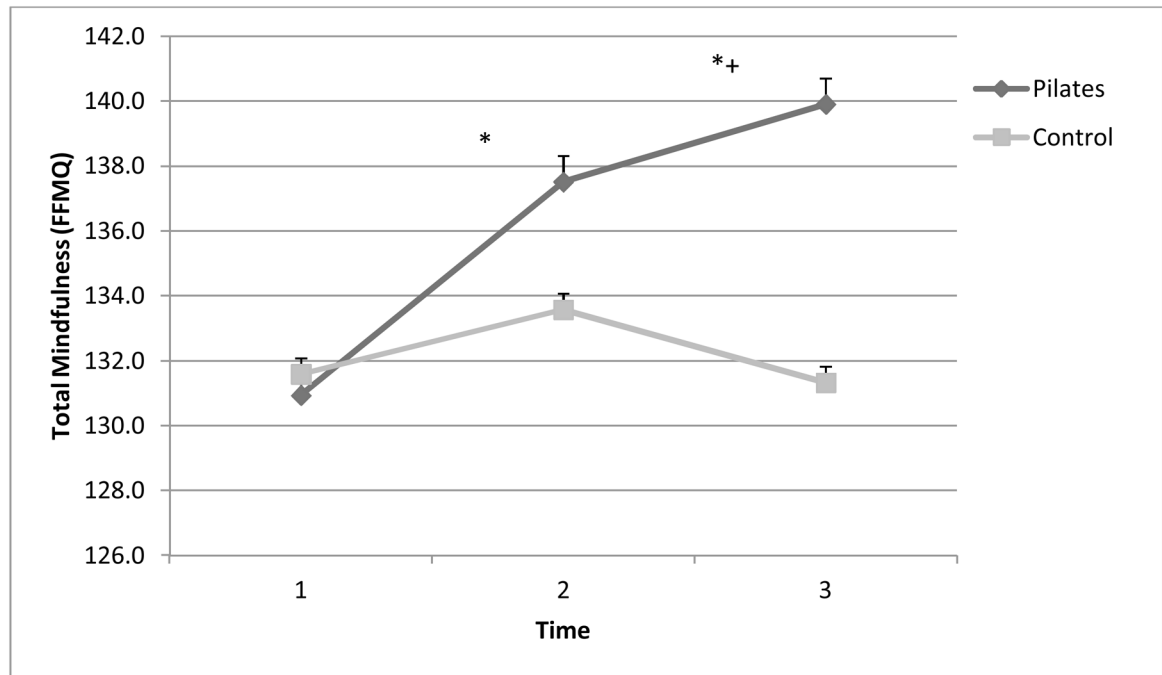


Figure 1.

Changes in Mindfulness Across Time by Group

Note: *Pilates Method Time 1 is significantly different from Time 2 and Time 3.

+Groups are significantly different at Time 3.

Baseline Differences Between Pilates Method and Control Group

Variable	Pilotates Method			Control Group			
	Mean	Median	SD	Mean	Median	SD	p-value ⁺
Age	20.9	21.0	2.0	21.0	20.0	2.3	.24
Hours of weekly exercise	5.7	5.0	3.5	5.1	4.5	3.6	.16
Exercise intensity	3.9	4.0	.8	3.9	4.0	.8	.83
Total Mindfulness	130.9	131.0	14.8	131.2	132.0	14.8	.92
Self-Regulatory Self-Efficacy	20.5	20.0	3.0	20.0	20.0	2.9	.30
PSS Total	6.3	6.0	3.0	5.5	5.0	2.9	.14
Tired Mood	2.6	2.4	.8	2.4	2.2	.7	.13
Negative Mood	2.0	1.8	.6	1.8	1.8	.6	.06
Relaxed Mood	2.8	3.0	.8	3.2	3.2	.7	.00*
Positive Mood	3.2	3.2	.7	3.4	3.5	.6	.10
PSQI	5.8	6.0	2.7	6.1	6.0	2.7	.44

⁺The tests of difference between group means were Mann-Whitney U test for Age, Hours of Weekly Exercise, Exercise Intensity. All others were independent samples *t*-tests.

* initial significant difference between groups at .05 level of significance

Table 2

Mixed Model Analysis Fixed Effects of Change over Time in Study Variables

Variable	Group Effect F (df ⁺) significance	Time Effect F (df ⁺) significance	Group * Time Effect F (df ⁺) significance
Total Mindfulness	2.762 (1, 209) .098	9.031 (2/224) .000**	6.156 (2/224) .002**
Self-Regulatory Self-Efficacy	2.199 (1/198) .140	2.285 (2/266) .104	.075 (2/266) .928
Perceived Stress	1.678 (1/161) .197	.678 (2/217) .509	.195 (2/217) .823
Positive Mood	.727 (1/203) .395	.128 (2/279) .880	1.137 (2/279) .322
Tiredness	.087 (1/207) .769	.444 (2/278) .642	1.754 (2/278) .175
Negative Mood	.000 (1/204) .990	.991 (2/254) .373	5.482 (2/254) .005**
Relaxed Mood	4.953 (1/204) .027*	.224 (2/278) .800	1.977 (2/278) .140
PSQI	.144 (1/213) .705	1.116 (2/252) .329	.250 (2/252) .779

Note:

⁺ degrees of freedom for the denominator are estimated