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Original Research

Hot, sweaty, and satisfied: Effects of Bikram yoga on psychological well-being

Allison A. Rissell, Brian K. Miller, Lisa K. Lloyd, James S. Williams

Texas State University

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Corresponding Author:
Brian K. Miller,
Texas State University
bkmiller@txstate.edu

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Abstract

Background: Bikram yoga is sometimes referred to as hot yoga and a typical class is 90-minutes in duration, consists of 26 Hatha yoga postures and 2 breathing exercises, and is performed in a room heated to 41°C (105° F) with 40% humidity. This study examined the effects of Bikram yoga on two aspects of psychological well-being: core self-evaluation (CSE) and life satisfaction. Core self-evaluation is sometimes referred to as positive self-concept and is comprised of aspects of self-esteem, self-efficacy, locus of control, and emotional stability. Life satisfaction is a holistic appraisal of one's life in which a comparison is made of one's current circumstances to what is thought to be an appropriate internally determined personal standard. Methods: Twenty-two subjects completed a 60-day Bikram yoga challenge. Self-report survey responses were gathered before and immediately after the challenge. A within-subjects one group pretest-posttest experimental design was used. Results: Bonferroni-adjusted t-tests for change over time in CSE and life satisfaction were both statistically significant. Cohen's d statistic as a measure of effect size was .53 for core-self-evaluation and .40 for life satisfaction. Conclusions: Life satisfaction and CSE each improved over the course of the intervention. It is likely that the well-known effects of participating in intense physical exercise also contributed to improvements in psychological well-being.

INTRODUCTION

Most research on the effects of yoga has focused on improvements to one's physical health. Yoga training improves maximum voluntary ventilation (+10 to +32%) [1-3], forced vital capacity (+33%) [1], forced expiratory volume in the first second (+18 to +19%) [1,3], peak expiratory flow rate (+6 to +60%) [1,4], and vital capacity (+18%) [3]. These positive findings may be due, in part, to *pranayama* (i.e., strenuous breathing exercises), as greater results are seen when more time is devoted to this practice during a session. However, yoga is slow-paced and makes use of static stretching so it is not considered an aerobic activity [5-7]. Nevertheless, yoga training has been reported to result in slight increases in VO_2max (+4 to +6%) [8-10], a wide range of improvements in movement economy (+9 to +60%) [9,11-13], slight reductions in exercise heart rate (-7%) [9,13], and varying reductions in both resting blood pressure (-7 to -24%) and resting heart rate (-4 to -30%) [1,8, 14, 15]. Yoga thus provides some cardiopulmonary benefits to healthy populations and is warranted for inclusion in a regular fitness program.

Research is lacking, however, on the psychological benefits of yoga. The present study focuses on the effects of a particular style of yoga training known as Bikram yoga on two psychological variables: core-self evaluation (CSE) and life satisfaction. Bikram yoga, also referred to as hot yoga, is a style of Hatha yoga that was developed and popularized by Bikram Choudhury in the early 1970's. A typical Bikram class is 90-minutes in duration, consists of a set series of 26 Hatha yoga postures and 2 breathing exercises, and is performed in a room heated to 41°C (105° F) with 40% humidity [16].

BENEFITS OF EXERCISE ON PSYCHOLOGICAL WELL-BEING

Core-self Evaluation

Core self-evaluation (CSE), sometimes referred to as positive-self concept, is a dispositional evaluation of how one feels about one's self [17]. It is a fundamental evaluation of one's self, as opposed to the description of one's self upon which many other dispositional models rely [18-20]. Core self-evaluation contains elements of four lower-order traits: self-efficacy, self-esteem, emotional stability, and locus of control [21]. Given that disposition, or personality, is so deeply rooted and thought to drive various forms of behavior, including exercise participation, research on the relationship between personality and physical activity as a specific form of behavior is further warranted.

So far, only one study has investigated the association between CSE and physical activity [22]. In that study, CSE was found to be predictive of the adoption of a progressive resistance-training program in older adults. Though research investigating the association between CSE and health is limited, the lower-order elements of CSE have been consistently shown to be predictive of self-rated health outcomes. For example, it was found that the beliefs (akin to locus of control) that "there are obstacles or factors beyond one's control that interfere with reaching goals " [23] is negatively correlated with self-reports of physical health in three independent samples. Multidimensional self-esteem is expected to improve in older adults participating in either a stretching and toning or a walking program [24]. Adults with a more internal locus of control are less likely to be sedentary and more likely to engage in regular exercise [25]. A meta-analysis of 33 studies found that emotional stability is related to physical activity participation [26]. Additionally, exercise self-efficacy is highly associated with physical activity participation [24]. With this research in mind, it follows that a composite measure of the CSE traits will also likely be correlated with exercise behavior. To this end, it is suggested that 60 days of strenuous Bikram yoga exercise will also impact one's core evaluation. Therefore:

Hypothesis 1: Regular engagement in Bikram yoga for 60 days will improve one's core self-evaluation.

Life Satisfaction

Core self-evaluations have been shown to significantly correlate with life satisfaction [27]. Therefore, as CSE increases, life satisfaction also likely increases [28, 24]. To be satisfied with one's life is to engage in a cognitive, judgmental process in which a comparison is made of one's current circumstances with what is thought to be an appropriate standard and that standard is not externally imposed [29]. In other words, persons evaluate their own life satisfaction as compared to their own personal criterion, not some societal or group standard [30]. Brickman and Campbell developed the hedonic treadmill theory to explain why persons experiencing great joy or tremendous despair rebound from their experiences and gravitate back to some set point for happiness [31]. Their theory is derived from an automatic habituation model [32,33] in which psychological systems respond to deviations from one's current psychological level and allow constant stimuli to fade into the background [34]. Thus, lottery winners and persons with paraplegia settle back into their own personal set points for life satisfaction after some time has elapsed since their windfall or tragedy, respectively [35]. However, these set points are neither neutral nor unitary [36]. That is, most people are generally happy [36] but they have different set points for different forms of subjective well-being [37]. The multiple well-being components (e.g., life satisfaction, job satisfaction, relationship satisfaction) can, and often do, change over the course of one's life, sometimes in directions that are opposite to each other [34]. Thus, events and experiences play important roles in deviations from happiness set-points and in different set-points for different forms of happiness.

One set of variables shown to correlate with forms of subjective well-being is physical health. Lachman and Weaver's research found that life satisfaction was positively correlated with self-reported health at .28 ($p < .001$) and .35 ($p < .001$) in two independent studies and negatively correlated with functional limitations, chronic problems, and acute health symptoms at -.46, -.40, and -.40, respectively (all at $p < .001$) in a third sample [23]. In a longitudinal panel study, it was found that physical activity at time one was concurrently correlated at .12 with satisfaction with life and longitudinally correlated at .29 again five years later [28]. This increase in the correlation between activity and life satisfaction over time suggests that active individuals can improve their life satisfaction by engaging in regular exercise and fitness activities. In light of this, participants in a Bikram yoga program will likely also show improvement in their life satisfaction.

Hypothesis 2: Regular engagement in Bikram yoga for 60 days will improve one's life satisfaction.

METHODS

Participants

Forty-two participants, enrolled in a 60-day Bikram yoga challenge in the southwestern part of the U.S., volunteered to participate in this study. To be eligible to participate in this Institutional Research Board-approved study, participants had to be 18 years or

older, and participate in at least 80% (i.e., 48 days) of a 60-day challenge. A written consent form outlining the procedures was provided to all participants and informed consent was obtained prior to enrollment in the study. This study was restricted to apparently healthy adults exhibiting no signs or symptoms suggestive of heart, metabolic (diabetes), and pulmonary disease based on the American College of Sports Medicine guidelines [28]. Thus, a comprehensive health-history survey was administered to screen out participants who: 1) had heart disease, diabetes, chronic obstructive pulmonary disease (including severe asthma), 2) had experienced recent musculoskeletal injuries, 3) were pregnant (or think they were pregnant), and 4) had no more than one risk factor for atherosclerotic cardiovascular disease. This questionnaire was completed and reviewed before the first day of the challenge.

Based on results from the health history questionnaire, 35 participants (seven males and 28 females) were considered to be low risk and were eligible to participate in the challenge. Previous experience with yoga was not a requirement for inclusion in this study; however, participants had an average of 1.79 years of yoga experience before the study began. The mean age was 40.91 years. The participants' physical activity and diet outside of the Bikram yoga challenge was not monitored, but each participant was asked to maintain his/her current diet and refrain from participating in any other forms of exercise.

Effect of Subject Attrition

Of the initial 35 participants, only 22 participants (five males and 17 females) returned for post-testing. To ascertain the impact of subject attrition, or dropping out of the study, [39] as a threat to the internal validity of the results of this experiment, independent sample *t*-tests and one chi-square test were conducted to compare the group of subjects ($n = 22$) who completed the study to the group ($n = 13$) who did not. The *t*-tests revealed that there were no statistically significant differences between the groups. The chi-square test for gender differences, using Fisher's exact test, revealed a significant difference ($p < .001$) between the two groups, indicating that men were more likely to drop out of the study than women.

Data Collection Procedures

This study is essentially a one-group pretest-posttest experiment [39]. At time one and approximately 60 days later at time two, the psychological constructs described below were measured. A repeated measures paired sample *t*-test was used to examine change over time within subjects for the two constructs (with Bonferroni corrections for the propensity for Type I error because of multiple tests on the same data).

Between the two rounds of data collection, subjects participated in a 60-day Bikram Yoga Challenge at a yoga studio located in the southwestern United States and certified by the Bikram Yoga College of India. Each 90-minute session consisted of a set series of 26 postures performed in a heated (105°F) and humidified (40% relative humidity) studio. Bikram yoga is a standardized, trademarked program that requires all classes, regardless of instructor and studio, to be conducted in exactly the same manner [40]. All classes were taught by a Bikram yoga certified instructor. The first 60 minutes of class consisted of standing and balance poses, and the last 30 minutes involved seated poses. For a detailed description of all poses practiced during Bikram yoga, see Choudhury [40]. All postures were performed twice. Attendance was tracked using a sign-in sheet. To be included in final data analysis, subjects needed to attend a minimum of 48 classes (80% attendance).

The Measures

Core-self evaluation (CSE). Core self-evaluation was measured with a 12-item scale [27] using a seven-point Likert response scale anchored by 1 = strongly disagree and 7 = strongly agree. Sample items include: "When I try, I generally succeed" and "I am filled with doubts about my competence" (reverse scored). Reverse scored items were corrected before averaging items to create a scale composite. Cronbach's coefficient alpha of internal consistency reliability for scores at time one on this measure was .76. At time two, Cronbach's alpha was .80.

Life satisfaction. Life satisfaction refers to an overall evaluation about the quality of one's life at a particular point in time. This variable was measured with a five item scale [29] using the same seven-point Likert response scale as above. A sample item is: "So far I have gotten the important things I want in life." Cronbach's coefficient alpha for scores at time one on this measure was .88. At time two, Cronbach's alpha was .93.

RESULTS

Correlational Results

Of the demographic variables, none were correlated with each other except gender (coded as 0 = female and 1 = male) and weight at $r = .49$ ($p < .05$). Of the relationships between the demographic and psychological variables, age and life satisfaction at time two were correlated ($r = .44$, $p < .05$) and average days per week of previous yoga attendance was significantly correlated with CSE (.45 at time one and .50 and at

time two, both at $p < .05$) and with life satisfaction (.52, $p < .05$ at time one and .61, $p < .01$ at time two). Amongst the psychological variables, CSE and life satisfaction at both time points were all correlated with each other at a range from .54 ($p < .01$) to .82 ($p < .001$). See Table 1 for these results.

Paired Sample *t*-tests

To determine if the hypotheses were supported, paired samples (within subjects) *t*-tests with Bonferroni corrections were applied to each construct across time. The Bonferroni correction restricts the allowable Type I error by dividing the nominal alpha level by the number of tests performed. In this case, the *a priori* alpha level was .05, which when divided by two required a statistical significance level of $p < .025$. The *t*-test for change in CSE within-subjects was statistically significant with $t = -2.77$ ($df = 21$, $p = .011$). Thus, hypothesis one was supported. Cohen's *d* statistic as a measure of effect size for the change in CSE was .53. The *t*-test for the within-subjects change in life satisfaction was also statistically significant at $t = -3.15$ ($df = 21$, $p = .005$). Therefore, hypothesis two was supported. The Cohen's *d* for the change in life satisfaction was .40.

DISCUSSION

Both hypotheses were supported in this study. Sixty days of Bikram yoga improved CSE and life satisfaction. The increase in CSE suggests that engaging in Bikram yoga enhanced one or more of the elements of CSE: self-esteem, self-efficacy, locus of control, or emotional stability. This is consistent with previous research examining the psychological effects of participation in other forms of non-yoga physical activity [24,29,28,41-43]. As previous research suggests, if self-esteem and self-efficacy increase, then life satisfaction [23, 24,28] also usually increases. In this study, life satisfaction also improved significantly as a result of participation in the Bikram yoga program. Overall, it is likely that the strenuous nature of the Bikram yoga challenge enhanced CSE and life satisfaction. The effect sizes of .53 for CSE and .40 for life satisfaction indicate that the improvement in these psychological variables was at or near one half pooled standard deviation units.

These findings suggest that persons already active in yoga benefitted from the programmatic and strenuous nature of the Bikram yoga classes. These participants improved how they felt about themselves deep inside and how happy they were with their lives. It is believed that this is the first study examining the psychological effects of Bikram yoga. Nevertheless, as Bikram yoga continues to grow in popularity in the United States, so does an increase in the need for further research on other psychological benefits. Although this study examined the effects of Bikram yoga on participants with varying yoga experience, the effects of Bikram yoga on untrained individuals would likely be beneficial to their core self-evaluation and life satisfaction.

Table 1. Means, standard deviations, correlations, and alpha reliabilities[a] for demographic and psychological variables (n = 22)

Variable	Mean	SD	1.	2.	3.	4.
1. Gender[b]	.23	.43	--			
2. Age	40.95	11.55	.08	--		
3. Body weight (kg)	66.65	14.68	.49*	-.10	--	
4. Previous experience[c]	2.07	2.69	.31	-.06	-.05	--
5. Average attendance[d]	4.86	1.60	.01	.20	-.09	-.24
6. CSE[e] at T1[f]	5.08	.75	-.04	.03	-.33	.07
7. CSE[e] at T2[g]	5.46	.68	-.07	.22	-.07	.02
8. Life satisfaction at T1	5.33	1.07	-.05	.40	-.14	.04
9. Life satisfaction at T2	5.76	1.09	-.27	.44*	-.19	-.16

[a] On the diagonal in parentheses

[b] Coded as 0 = female, 1 = male

[c] Yoga experience measured in years previous to start of program

[d] Yoga attendance measured in days per week previous to start of program

[e] Core self-evaluation

[f] Time one

[g] Time two

Table 2. Paired sample t-tests of changes in core self-evaluation, life satisfaction, and intrinsic work motivation (n = 22)

	Time one		Time two					
Variable	Mean	SD	Mean	SD	*t*-value	*df*	*p*	Cohen's *d*
Core self-evaluation	5.08	.75	5.46	.68	-2.77	21	.011*	.53
Life satisfaction	5.33	1.07	5.76	1.09	-3.15	21	.005*	.40

* Statistically significant after Bonferroni correction

This study has some limitations. First, the small sample size is a limitation in that it affects the statistical power of the tests. However, there was support for both hypotheses and it is expected that the results would generalize to other samples as well, especially those with less yoga experience than this sample. Two other limitations are self-selection bias and the previous yoga experience of the participants. Almost all who were approached about participation agreed to do so, even though some dropped out before the time two measures were conducted. Similarly, all participants were recruited from existing members of a yoga facility and had ample experience and foreseeably recognized the difficulty of Bikram yoga, yet still agreed to participate. Even though this study made use of a small sample size, the impact of participation in a 60-day Bikram yoga challenge was still significant for both psychological variables even after effectively cutting the allowable Type I error in half via Bonferroni corrections. These results are even more paramount given that the participants had ample previous yoga experience and engaged in yoga very regularly. One might not expect to see such pronounced change in participants already engaged in healthy lifestyles.

Future research of the impact of yoga (and Bikram yoga in particular) on psychological variables such as the Big Five personality traits (conscientiousness, agreeableness, emotional stability, openness-to-experience, extroversion) [44-46] as well as on maladaptive traits like Machiavellianism, psychopathology, and narcissism is in order. While high levels of the Big Five are typically considered socially virtuous and may also improve as a result of strenuous exercise participation, the three aforementioned maladaptive traits in particular (sometimes referred to as the Dark Triad) [47], might be ameliorated by activities like Bikram yoga. Healthy lifestyle choices of most sorts are likely to enhance desirable traits and attitudes like those in this study as well as minimize the impact of maladaptive ones.

REFERENCES

1. Harinath K, Malhotra AS, Pal K, Prasad R, Kumar R, & Kain, TC, et al. Effects of Hatha yoga and Omkar meditation on cardiorespiratory performance, psychological profile and melatonin secretion. *J of Alt and Complementary Medicine.* 2004*;* 10(2): 261-268.
2. Joshi LN, Joshi VD, & Gokhale LV. Effect of short term 'pranayam' practice on breathing rate and ventilatory functions of lung. *Indian J of Physi and Pharma*. 1992; 36(2): 105-108.
3. Makwana K, Khirwadkar N, & Gupta HC. Effect of short term yoga practice on ventilatory function tests. *Indian J of Physi and Pharma.*1987; 32(3): 202-208.
4. Telles S, Nagarathna R, Nagendra HR, & Desiraju T. Physiological changes in sports teachers following 3 months of training in yoga. *Indian J of Med Scie.* 1993;47(10): 235-238.
5. Clay CC, Lloyd LK, Walker JL, Sharp KR., & Pankey RB. The metabolic cost of Hatha yoga. *J of Strength and Conditioning Res.* 2005; 19(3), 604-610.
6. DiCarlo LJ, Sparling PB, Hinson BT, Snow TK, & Rosskopf LB. Cardiovascular, metabolic, and perceptual responses to Hatha yoga standing poses. *Med, Scie and Health.* 1995; 4, 107-112.
7. Prasad KVV, Ramana YV, Raju PS, Reddy MV, & MurthyKDR. Energy cost and physiological efficiency in male yoga practitioners. *J of Exercise Physiology.* 2001; 4(3), 38-44.
8. Bowman AJ, Clayton RH, Murray A, Reed JW, Subhan MMF, & Ford GA. Effects of aerobic exercise training and yoga on the baroreflex in healthy elderly persons. *European Journal of Clinical Investigation.* 1997; 27, 443-449.
9. Raju PS, Prasad KVV, Venkata RY, Murthy KJR, & Reddy MV. Influence of intensive yoga training on physiological changes in 6 adult women: A case report. *J of Alt and Compl Medicine.* 1997; 3(3): 291-295.
10. Tran MD, Holly RG, Lashbrook J, & Amsterdam EA. Effects of Hatha yoga practice on the health-related aspects of physical fitness. *Preventative Cardiology.* 2001; 4(4): 165-170.
11. Raju PS, Anil Kumar K, Reddy SS, Madhavi S, Gnanakumari K, Bhaskaracharyulu C, et al. Effect of yoga on exercise tolerance in normal healthy volunteers. *Indian J of Physiology and Pharmacolog.* 1985; 30: 121-132.
12. Raju PS, Madhavi S, Prasad KVV, Reddy MV, Reddy ME, Sahay BK, et al.Comparison of effects of yoga and physical exercise in athletes. *Indian J of Med Research.* 1994; 100: 81-87.
13. Selvamurthy W, Nayar HS, Joseph NT, & Joseph S. Physiological effects of yogic practice. *NIMHANS J.* 1983; 1(1): 71-80.
14. Murugesan R, Govindarajulu N, & Bera TK. Effect of selected yogic practices on the management of hypertension. *Indian J of Physiology and Pharmacology. 2000;* 44(2): 207-210.
15. Ray US, Mukhopadhyaya, S, Purkayastha SS, Asnani, V,

Tomer OS, Prashad R, et al. Effect of yogic exercises on physical and mental health of young fellowship course trainees. *Indian J of Physiology and Pharmacology.* 2001;45(1): 37-53.

16. Choudhury B. *Bikram Yoga: The guru behind hot yoga shows the way to radiant health and personal fulfillment.* New York: Harper Collins Publishers; 2007.
17. Judge TA, Bono JE. Relationship of core self-evaluations traits--self-esteem, generalized self-efficacy, locus of control, and emotional stability--with job satisfaction and job performance: A meta-analysis. *J of Applied Psychology.* 2001; 86: 80-92.
18. Arvey RD, Bouchard TJ, Segal NL, Abraham LM. Job satisfaction: Environmental and genetic components. *J of Applied Psychology.* 1989; 74(2): 187-192.
19. Staw BM, Bell NE, Clausen JA. The dispositional approach to job attitudes: A lifetime longitudinal test. *Administrative Science Quarterly.* 1986; 31(1): 56-77.
20. Staw BM, Ross J. Stability in the midst of change: A dispositional approach to job attitudes. *Journal of Applied Psychology.* 1985 70(3), 469-480.
21. Judge TA, Locke EA, Durham, CC. The dispositional causes of job satisfaction: A core evaluations approach. *Research in Org Beh*. 1997; 19: 151-188.
22. Baker MK, Kennedy DJ, Bohle PL, Campbell D, Wiltshire JH, Singh MA. Core self-evaluation as a predictor of strength training adoption in older adults. *Maturitas*. 2011; 68(1): 88-93.
23. Lachman ME, Weaver SL. The sense of control as a moderator of social class differences in health and well-being. *J of Personality and Social Psychology*, 1998; 74: 763-773.
24. McAuley E, Blissmer B. Self-efficacy determinants and consequences of physical activity. *Exercise and Sport Science Reviews*. 2000; 28(2): 85-88.
25. Gale CR., Batty GD, & Deary IJ. Locus of control at age 10 years and health outcomes and behaviors at age 30 years: The 1970 British cohort study. *Psychosomatic Medicine*. 2008;70: 397-403.
26. Rhodes RE, Smith NE. Personality correlates of physical activity: a review and meta-analysis. *British J of Sports Medicine.* 2006; 40 (12): 958-965.
27. Judge TA, Erez A, Bono JE, Thoresen CJ. The Core Self-Evaluations Scale (CSES): Development of a measure. *Personnel Psych.* 2003; *56:* 303-331.
28. Elavsky S, McAuley E, Motl RW, Konopack JF, Marquez DX, Hu L, et al. Physical activity enhances long-term quality of life in older adults: Efficacy, esteem, and other affective influences. *Annals of Behavioral Medicine.* 2005; 30(2):, 138-145.
29. Diener E, Emmons R, Larsen J, Griffin S. The Satisfaction With Life Scale. *J of Personality Assessment*. 1985; 49(1): 71-75.
30. Diener E. Subjective well-being. *Psychological Bulletin.* 1984; 95*:* 542-575.
31. Brickman P, Campbell DT. Hedonic relativism and planning the good society. In M. H. Appley (Ed.), *Adaptation level theory: A symposium* New York: Academic Press; 1971. P. 287-303.
32. Helson H. Adaptation-level as a basis for quantitative theory of frames of reference. *Psychological Review,* 1948; *55:* 297-313.
33. Helson H. Current trends and issues in adaptation-level theory. *American Psychologist.* 1964; 19*:* 26-38.
34. Diener E, Lucas R, Scollon CN. Beyond the hedonic treadmill: Revising the adaptation theory of well-being. *American Psychologist.* 2006; *61:* 305- 314.
35. Suh E, Diener, E, Fujita F. Events and subjective well-being: Only recent events matter. *J of Personality and Social Psychology.* 1996; 70: 1091-1102.
36. Diener E, Diener C. Most people are happy. *Psychological Science,* 1996; 7*:* 181-185.
37. Lucas RE, Diener E, Suh E. Discriminant validity of well-being measures. *J of Personality and Social Psychology.* 1996; 70*:* 616-628.
38. American College of Sports Medicine. *Guidelines for Exercise Testing and Prescription* (8th ed.). Philadelphia: Lippincott, Williams and Wilkins; 2010.
39. Campbell DT, Stanley JC. *Experimental and quasi-experimental designs for research.* Boston: Houghton Mifflin; 1963.
40. Choudhury B. *Bikram's beginning yoga class* (2nd ed.). New York: Penguin Putnam Inc; 2000.
41. McAuley E, Blissmer B, Katula J, Duncan TE, Mihalko SL. Physical activity, self-esteem, and self-efficacy relationships in older adults: A randomized controlled trial. *Annals of Behavioral Medicine*. 2000; 22: 131-139.
42. Sonstroem RJ, Harlow LL, Josephs L. Exercise and self-esteem: Validity of model expansion and exercise associations. *J of Sport and Exercise Psychology*. 1994; 16: 29-42.
43. Stewart AL, Mills KM, Sepsis PG, King AC, McLellan BY, Roitz KBA, Ritter PL. Evaluation of CHAMPS, a physical activity promotion program for older adults. *Annals of Behavioral Medicine*. 1997; 19: 353-361.
44. Barrick MR, Mount MK. The big five personality dimensions and job performance: A meta-analysis. *Personnel Psychology.* 1991; *44*: 1–26.
45. Costa PT, McCrae RR. *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual.* Odessa, FL: Psychological Assessment Resources: 1992.
46. Digman JM. Personality structure: Emergence of the five-factor model. *Annual Review of Psychology.* 1990; 41*:* 417-440.
47. Wu, J., & LeBreton, J. M. (2011). Reconsidering the dispositional basis of counterproductive work behavior: The role of aberrant personality. *Personnel Psychology, 64,* 593-626.