

PHYSICAL ACTIVITY IN INDIVIDUALS LIVING WITH OSTEOPENIA: ASSOCIATIONS WITH PSYCHOLOGICAL NEED SATISFACTION AND MOTIVES FOR WELL-BEING

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ABSTRACT

The purpose of this investigation was (a) to examine the association between leisure-time physical activity (LTPA) and motives for well-being and (b) to examine the potential role of perceived psychological need satisfaction (Deci & Ryan, 2002) in terms of the physical activity-motive for well-being relationship. Adopting a cross-sectional design, participants ($N = 142$; $M_{age} = 65.01$ years; $SD_{age} = 10.55$ years) were individuals diagnosed with osteopenia who completed a self-report survey on a single occasion. Bivariate correlations indicated that LTPA was associated with motives for hedonic ($r = .28$) and eudaimonic ($r = .35$) well-being and psychological need satisfaction (r 's = .12 to .45). Multiple mediation analysis indicated perceived psychological need satisfaction mediated the LTPA– hedonic/eudaimonic motive relationship. The 95 percent bias-corrected and accelerated bootstrap confidence interval demonstrated that perceived competence and autonomy were the unique mediators. Collectively, results of this study support the relationship between physical activity and levels of hedonic/eudaimonic motives and that the satisfaction of basic psychological needs is a plausible mechanism underpinning such motivational orientations.

INTRODUCTION

Empirical evidence has supported the benefits of engaging in leisure time physical activity (LTPA) at a level commensurate with public health guidelines across a variety of biomedical (Bouchard, Blair & Haskell, 2007) and psychological (Fox & Wilson, 2008) outcomes. Despite established links between LPTA and various health indicators, prevalence data concerning LTPA behavior

internationally demonstrate that less than 50 percent of the population is considered sufficiently active for health benefits (Sisson & Katzmarzyk, 2008) with rates declining in older adult populations (McGuire et al., 2003). In an effort to understand the determinants of LTPA behavior, researchers have generally relied on theories of behavioral prediction (Fishbein et al., 2001) with modest success obtained in terms of

advancing our understanding (Baranowski, Anderson & Carmack, 1998). For example, Tavares, Plotnikoff and Loucaides (2009) found that between 16 and 60 percent of variance in LTPA behavior in employed women was explained through different constructs (e.g., self-efficacy) embedded within varied socialcognitive theories.

As one alternative to the behavioral prediction approach, Ekkekakis, Hall, and Petruzzello (2008) suggested targeting the motivational consequences (or implications) of LTPA. While a considerable amount of literature has focused on motives (e.g., appearance, health and fitness, etc.) for engaging in physical activity (Ingledew & Markland, 2008), reasons for participation linked with well-being has received comparably little attention despite its logical links to initiation and adherence. Such a caveat in the physical activity literature is surprising for at least two reasons. First, a substantial body of evidence supports the link between engagement in regular LTPA and increased well-being, in addition to reduced ill-being (Dionigi, 2007; Fox et al., 2007). Second, improvements in well-being have been identified as the primary motivational force for engaging in LTPA for selected cohorts of the population (e.g., individuals living with Type 2 Diabetes; Ferrand, Perrin & Nasarre, 2008).

Two broad traditions seem worthy of consideration in an effort to understand the relationship between participation in LTPA and motives for well-being. Hedonic theory (Kahneman, 1999) involves focusing on the outcomes (e.g., pleasure, entertainment) one expects to obtain from engaging in a target behavior (Cabanac & Bonniot-Cabanac, 2007). The maximization of experienced pleasure is a universal mechanism inherited within humans to motivate behavior (Cabanac, 1971) with activities aligned with physical pleasures (e.g., eating) and social-emotional pursuits (e.g., going to a party) consistent with the hedonic approach (Steger, Kashan & Oishi, 2008). An emerging body of literature has generated support for the application of the pleasure-displeasure focus of hedonic theory to the investigation of acute bouts of LTPA (Backhouse et al., 2007; Ekkekakis et al., 2008) and subsequent physical activity adherence behavior over time (Williams et al., 2008).

Complementing the hedonic approach is the conceptualization of well-being housed within the eudaimonic tradition (Waterman, Schwartz, & Conti 2008), whereby the focus of motivational consequences shifts from the experience of pleasure to positive psychological functioning and optimization of human development. In accordance with the eudaimonic tradition, motivation is

fostered when people engage in activities for reasons linked to positive goal pursuits that facilitate personal growth (Ryan, Huta & Deci, 2008). The promotion of eudaimonic well-being has been linked to activities whereby effort (e.g., volunteering), challenging oneself (e.g., learning to play a new musical instrument), and engagement with others (e.g., expressing gratitude) are foundational requirements (Steger et al., 2008; Seligman, 2002). Limited consideration of the eudaimonic tradition is evident in the physical activity literature, yet isolated studies with older adults indicate that LTPA must be perceived of as meaningful and have a sense of purpose to be adopted (Atachley, 1999; Grant, 2008; Nimrod & Kliber, 2007). Based on the above, principles stemming from the eudaimonic tradition may have motivational relevance when studying LTPA within select cohorts (Ryan et al., 2008).

Researchers have argued for the advancement of theory-driven research in contexts where LTPA is a focal topic of interest (Bauman et al., 2002) to facilitate an understanding of the mechanisms responsible for promoting (or thwarting) psychological outcomes (Acevedo & Ekkekakis, 2006). Self-Determination Theory (SDT) (Deci & Ryan, 2002) has demonstrated utility for understanding the motivational basis for LTPA (Wilson, Mack & Grattan, 2008). According to the SDT framework (Deci & Ryan, 2002),

humans are active growth-oriented organisms who innately strive to master challenges in their social environment in an effort to actualize their innate potentials (Deci & Ryan, 2002). Deci and Ryan (2002) posit the existence of essential supports for motivation and wellness that manifest themselves in the form of basic psychological needs. Specifically, Deci and Ryan (2002) purport that the ongoing satisfaction of competence, autonomy and relatedness needs promote the motivation of behavior and optimize feelings of well-being (Deci & Ryan, 2002). The approach taken by Deci and Ryan (2002) within SDT is that basic psychological needs represent innate tendencies that when authentically satisfied exert universally positive effects on growth, actualization, and well-being.

This study contributes to, and extends, existing scientific literature through various means. First, the present study addresses previous recommendations in the literature (e.g., Ryan et al., 2008; Williams et al., 2008) to understand behaviors that engender hedonic/eudaimonic outcomes. In particular, while emerging studies have begun to identify the essential features that characterize a eudaimonic lifestyle (e.g., Seligman, 2002; Steger et al., 2008), considerable scope exists to consider other 'target' behaviors that may promote perceptions of personal growth, which is the defining feature

representing a eudaimonic orientation, to the study of motivation and well-being. Second, this study represents an initial attempt to consider basic psychological needs housed within SDT (Deci & Ryan, 2002) as a viable theoretical framework for explaining the relationship between LTPA and motives for well-being. Third, the sampling frame (i.e., individuals diagnosed with osteopenia) represents a known cohort whereby LTPA is promoted for condition management and represents those who are at risk for decreased psychological well-being (Sawka et al., 2005).

The main purpose of this investigation was to examine the association between LTPA and motives for well-being that differ in their hedonic/eudaimonic orientation. A secondary purpose of this study was to examine the role of fulfilling basic psychological needs as a potential mediating influence connecting participation in LTPA with variation in and the endorsement of hedonic / eudaimonic motives. Given the evidencebase concerning the link between LTPA and well-being among older adults (e.g., Fox et al., 2007; Grant, 2008), a positive relationship was hypothesized between engagement in LTPA and hedonic / eudaimonic motives for well-being. Extrapolating from Deci and Ryan's (2002) contentions, it was further hypothesized that psychological need fulfillment would mediate the

relationship between LTPA and hedonic/eudaimonic motives for well-being.

METHODS

PARTICIPANTS

Participants were 142 ($n_{female} = 133$) individuals with osteopenia ($M_{age} = 65.01$ years; $SD_{age} = 10.55$ years). Majority of participants reported their ethnic origin as Caucasian (88.00 percent) and were currently "married/common-law" (63.90 percent). Approximately half of the sample reported earning a university/college degree (47.20 percent). Time since condition diagnosis was approximately 7 years ($M = 6.79$ years; $SD = 5.44$) with 45.10 percent reporting a fracture in their lifetime. Body Mass Index (BMI) values calculated based on self-reported height and weight data indicated, on average that the participants were consistent with a "healthy" weight classification ($M = 24.19$ kg/m²; $SD = 3.82$; Health Canada, 2011).

INSTRUMENTS

Demographic and Health History:

Participants provided self-reported information on gender, educational attainment, marital status, and ethnicity. Health variables relevant to condition diagnosis including BMI, fracture history, and family history of osteoporosis were also queried for descriptive purposes.

Leisure-time Physical Activity: The Godin Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985) assessed the frequency of mild, moderate, and strenuous LTPA done for at least 15 minutes per session during a typical week. An overall score (expressed in metabolic equivalent units or METS) was calculated by summing the weighted product of each LTEQ item using the following formula: $\sum([mild \times 3] + [moderate \times 5] + [strenuous \times 9])$. Construct validity evidence for scores derived from the LTEQ has been demonstrated (Jacobs et al., 1993).

Hedonic and Eudaimonic Motives for Activities (HEMA): The HEMA (Huta, 2005) was used to assess hedonic and eudaimonic motives in LTPA contexts. Given the focus of the present investigation on LTPA, the stem of the HEMA was modified slightly to reflect the contextual change. Following the instructional stem "To what degree do you typically approach your physical activity with each of the following intentions, whether or not you actually achieve your aim?", participants were asked to rate the extent to which engagement in LTPA was associated with hedonic (4 items) and eudaimonic (4 items) motives. One sample item for hedonic motivation was "experiencing pleasure". A sample item assessing eudaimonic motivation

was "pursuing excellence or a personal ideal". Each HEMA item was rated on a Likert-type scale from '1' (not at all) to '7' (very much). Initial support for the structural validity and reliability of scores derived from items comprising the original HEMA has been documented (Huta, 2005).

Psychological Needs: The Psychological Need Satisfaction in Exercise Scale (PNSE; Wilson et al., 2006) was modified for use as an index of perceived psychological need satisfaction in LTPA contexts. Each item from the original PNSE was modified by replacing the term "exercise" with "physical activity". Assessing each of the three psychological needs proposed by Deci and Ryan (2002) within the SDT framework, the 18-item PNSE is anchored by response options ranging from '1' (False) to '6' (True) with higher scores being reflective of greater fulfillment of each psychological need derived from engagement in LTPA. Construct validity of scores derived from the original PNSE (Cf. Wilson et al., 2008) and a version of the PNSE modified for use in LTPA research forthcoming (Gunnell et al., in press).

PROCEDURES

Following institutional ethical clearance, participant recruitment adopted Dillman's (2007) recom-

mendddations for administering surveys. Participant referrals were made through one-to-one contact with a physician. Each participant was subsequently briefed about the study purpose, given unlimited opportunity to ask questions, and provided with study materials including informed consent. A self-addressed stamped envelope was included along with explicit instructions on survey completion procedures and contact information should additional questions or concerns arise during the data collection phase of this study. Upon completion of the study, a \$5.00 donation was made on behalf of the participant to the bone health organization (e.g., Osteoporosis Canada) of their choice.

DATA ANALYSIS

Preliminary data analysis was conducted in order to identify data entry error, patterns of missing data, and compliance with relevant statistical assumptions. Descriptive statistics were calculated and estimates of internal consistency (Cronbach's α ; Cronbach, 1951) were computed to determine score reliability for responses to the HEMA and PNSE items. Pearson correlations (r) were calculated between LTEQ, HEMA, and PNSE subscale scores to determine patterns of bivariate association between these constructs. Confidence intervals were calculated

as an additional source of information complementing the r -point estimate related to null hypothesis testing. Finally, to test for mediation, bootstrapping analyses ($k = 5000$ samples) using methods described by Preacher and Hayes (2007; 2008) for estimating direct and indirect effects with multiple mediators was conducted. Preacher and Hayes (2008) recommend that the absence of zero in the 95 percent bias corrected and accelerated confidence interval (BCa CI), rather than interpretation of p -values, serves as evidence for mediation in the bootstrap samples. Specific indirect effects and pairwise contrasts were examined through the use of BCa CI's to examine the unique contribution and strength of each psychological need in the multiple mediator model analysis.

RESULTS

PRELIMINARY ANALYSES

Inspection of sample data indicated minimal presence of non-response errors for items representing HEMA and PNSE scores for competence and autonomy, with no more than 1.30 percent of the data missing on any item. Missing data were deemed nonrandom and replaced using a within-person mean substitution procedure (Hawthorne & Elliot, 2005). Thirteen participants did not respond to any PNSE-relatedness

item suggestive that LTPA was engaged in as an individual pursuit as opposed to one with others. As a consequence, analyses incorporating the psychological need for relatedness were based on $n = 129$.

Examination of the distributional properties (see Table 1) for all study variables, in combination with their respective standard error (SE) values (Tabachnick & Fidell, 2007), demonstrated a pattern of non-normal distributions for PNSE-Autonomy and PNSE-Relatedness scores, and HEMA responses for both hedonic and eudaimonic motives in this sample. Estimates of internal consistency score reliability (Cronbach, 1951) ranged from 0.83 to 0.94 (see Table 1 for specific values).

Participants reported engaging in an average of 30.94 METS ($SD = 19.91$) per week (see Table 1). Interpretation of LTEQ scores suggested individuals living with osteopenia were comparable to adults living with chronic conditions (Gunnell et al., in press; Motl & McAuley, 2009). Descriptive statistics for HEMA and PNSE scores fall above the theoretical midpoint with motives in LTPA contexts aligned with hedonic and eudaimonic traditions highly endorsed (see Table 1). The fulfillment of autonomy and relatedness was endorsed more strongly in the context of LTPA

behaviour than were perceptions of effectance and skill mastery characteristic of the psychological need for competence.

Pearson correlations between study variables were in the hypothesized direction (see Table 1 for specific values and confidence intervals). Interpretation of relationships demonstrated that LTEQ scores ranged from weak (i.e., $r_{12} \leq |.20|$) to moderate (i.e., $r_{12} = .45$) with PNSE and HEMA scores (Cohen, 1992). All Pearson correlations were statistically significant ($p < .01$; one-tailed significance), with the lone exception of LTEQ scores and fulfillment of the psychological need for relatedness in LTPA ($r_{12} = 0.12$; $p = .08$). A moderate-to-strong (Cohen, 1992) positive correlation between HEMA subscales representing scores for hedonic and eudaimonic motives towards well-being was noted in this sample (see Table 1).

Inspection of the results of the multiple mediator model examining LTEQ scores on hedonic motives for well-being through the three psychological needs was significant ($R^2_{adj} = .29$; $F(4,123) = 14.04$, $p = .001$). The total indirect effect through the three mediators was meaningful with a point estimate of .0107 (BCa CI's ranged from .0037 to .0205; see Table 2). Perceived fulfillment of competence and autonomy served as the unique

mediators in this model, however interpretation of the pairwise contrasts indicated that the magnitude of each psychological need did not differ appreciably (i.e., BCa CI's did not span zero).

When examining the role of psychological need fulfillment on the LTEQ – eudaimonic motive relationship, the multiple mediator model was significant ($R^2_{adj} = .36$; $F(4,123) = 18.88$, $p < .001$). The point estimate for the total indirect effect through the three mediators was 0.0107 and a corresponding BCa CI ranging from .0043 to .0186 in this sample. Consideration of the specific indirect effects evident in the multiple mediation analysis indicates that fulfillment of perceived competence and autonomy needs in LTPA were the unique mediators. However, interpretation of pairwise contrasts suggests that the magnitude of the effects for each psychological need was comparable in the LTEQ – eudaimonic motives for well-being relationship.

DISCUSSION

The main aim of the present study was to examine the link between LTPA and motives for well-being that vary in their hedonic versus eudaimonic focus. In addition, the secondary aim was to test the utility of SDT (Deci & Ryan, 2002) as a framework for understanding the

mechanisms via which engagement in regular LTPA impacts hedonic / eudaimonic motives for well-being. Overall, this investigation of adults living with osteopenia offers initial evidence for the link between greater LTPA and stronger endorsement of motives for well-being irrespective of their hedonic or eudaimonic orientation. Evidence from the multiple mediation analyses demonstrated the plausibility of basic psychological need fulfillment, especially perceptions of competence and autonomy, long championed by Deci and Ryan (2002) as viable pathways linking engagement in LTPA with both hedonic and eudaimonic motives for well-being.

Observations reported in this study are largely consistent with those reported in previous research linking LTPA with constructs embedded in hedonic theory (e.g., Williams et al., 2008). The noted link between more frequent LTPA and stronger endorsement of eudaimonic motives for well-being evident at both the bivariate and multivariate levels of analyses extends the available literature considering different factors associated with a eudaimonic lifestyle to include LTPA (Ryan & Deci, 2002; Seligman, 2002; Steger et al., 2008). Joint consideration of the direction and absolute magnitude of the effect size evident between LTPA and motives for well-being (Cohen, 1992) in individuals

living with osteopenia suggests this health behavior contributes to fulfilling one's human potentials and with pleasurable outcomes at ostensibly comparable levels. As hedonic pleasure is associated with a person's well-being in the short term (Oishi, Schimmack, & Diener, 2001) and eudaimonic wellness associated with more enduring characteristics (Ryan et al., 2008), it seems logical to suggest that sustained LTPA holds promise as one means through which an individual may gain both short and long term benefits.

Consistent with our original hypotheses and SDT (Deci & Ryan, 2002), it appears that fulfilling the basic psychological needs for competence, autonomy, and relatedness in adults living with osteopenia mediates the impact of LTPA on motives for well-being that vary in their hedonic and eudaimonic focus. Closer inspection of the findings indicated that perceived competence appeared to be the most important psychological need satisfied via engagement in LTPA in terms of shaping motives for well-being. This observation has been previously noted in samples of exercisers free from known markers of disease (Wilson et al., 2008) and physically active adults living with chronic disease (Gunnell et al., in press). It seems reasonable to suggest on the basis of these observations encouraging people irrespective of health status to engage

in the mastery of challenging tasks that create a sense of effectance and competence may contribute to markers of well-being that are characterized by both hedonic pleasure and eudaimonic growth.

Further evidence in support of our original hypotheses was found in terms of the role played by self-governance and volitional direction in the context of understanding the potential influence of LTPA on hedonic and eudaimonic motives for well-being in adults living with osteopenia. Such observations are consistent with SDT and Ryan et al. (2008) who asserted that feeling autonomous in any given context within life is a fundamental prerequisite to eudaimonic well-being. Interestingly, it was further noted in this study that perceiving oneself to be autonomous when engaged in LTPA was also linked with hedonic outcomes in the form of well-being motives characterized by features such as pleasurable sensations. Previous studies of adults engaged in various forms of structured exercise have noted comparable evidence (Wilson et al., 2009). It remains unclear at this juncture why satisfying the need for autonomy via participating in LTPA would promote both hedonic and eudaimonic motives for well-being yet this remains an important agenda for future research to consider in greater depth.

Observations pertaining to the role of perceived relatedness in the context of LTPA noted in this study further contribute to the equivocal nature of research concerning this aspect of the SDT framework when applied to physical activity contexts (Edmunds et al., 2006; Wilson & Garcia Bengoechea, 2010; Wilson et al., 2003). It remains plausible that the centrality of perceived competence and autonomy to well-being outcomes in physically active humans (Ryan et al., 2008), combined with the knowledge that individuals can sustain motivation for individual activities without a network of meaningful connections to others (Ryan & Deci, 2002), may render fulfilling the need for relatedness as less important in the context of LTPA. It is also plausible that the research design used in this study masked potential contributions from relatedness to the criteria of interest. Other studies in structured exercise contexts using single time point designs have found that competence, and to a lesser extent autonomy, remain uniformly linked with motivational outcomes in a positive fashion (Edmunds et al., 2006; Wilson & Rogers, 2008). Alternatively, the limited number of longitudinal studies demonstrate considerable variability in the fulfillment of each psychological need as a function of time including perceived related-

ness (Edmunds et al., 2007; Wilson et al., 2003) that could easily render any psychological need (including perceived relatedness) more important at various time points than at others in terms of links with motivational outcomes and well-being criteria. It seems clear that arguing over the scope of influence attributable to any of the psychological needs espoused by Deci and Ryan (2002) within the framework of SDT especially perceived relatedness is largely premature at this juncture. Future studies using more sophisticated research designs will provide greater insight into the dynamic nature of 'how' and 'why' each psychological need central to SDT operates in the domain of LTPA especially in relation to the role of fluctuations in psychological need satisfaction across time in relation to variation in motivational and well-being outcomes.

While the results of this study are novel and theoretically informative, a number of limitations should be acknowledged. First, extensive construct validation into the original (Huta, 2005) or modified HEMA adopted in the present investigation has not been undertaken. Additional construct validation research (Messick, 1995) is recommended to determine the meaningfulness of test score interpretation. Additional concerns

may be forwarded based on the degree of statistical overlap evident between dimensions of eudaimonic / hedonic motives. While being associated at such a magnitude not uncommon in existing literature (Waterman et al., 2008), the task of demonstrating discriminant validity between constructs offers a unique challenge. As Telfer (1990) has suggested that eudaimonic activities are always associated with perceptions of pleasure (but not vice versa), the association between hedonic / eudaimonic motives should not be surprising and is deserved of empirical inquiry. Third, the data collected was restricted to a sample of individuals with osteopenia assessed on a single occasion. This approach limits the internal and external validity attributable to the interpretations advanced and suggests that more formal tests of mediation, adopting longitudinal designs, are warranted.

In summary, the purpose of this study was (a) to examine the role of LTPA in relation to hedonic and eudaimonic motives for well-being, and (b) to test the importance of SDT-based psychological needs as a unifying framework for understanding how LTPA contributes to variation in motives for well-being characteristic of hedonia and eudaimonia. On the basis of this study, support for the positive relationship between LTPA and

endorsement of hedonic and eudaimonic motives for well-being was found. Additional evidence generated in this investigation suggests that satisfying basic psychological needs, especially for competence and autonomy, represent one plausible mechanism toward the promotion of hedonic / eudaimonic outcomes (Deci & Ryan, 2002; Ryan, 1995). On the whole, the observations reported in this study support the beneficial role of participating in LTPA as a factor motivating well-being outcomes in adults living with a chronic disease. Further support for the utility of Deci and Ryan's (2002) conceptualization of psychological needs within SDT as a unifying framework for the study of well-being markers linked with LTPA is warranted.

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Table-1
Descriptive statistics, internal consistency, and correlation coefficients

	M	SD	Skew	Kurt	1	2	3	4	5	6
1. LTEQ	30.94	19.91	0.57	-0.60	--					
2. PNSE-Competence	3.94	1.25	-0.37	-0.49	.45 (.30 - .57)	.92				
3. PNSE-Autonomy	5.28	0.82	-1.36	2.28	.21 (.04 - .36)	.22 (.06 - .37)	.92			
4. PNSE-Relatedness	4.93	1.15	-1.30	1.47	.12 (-.05 - .29)	.32 (.15 - .46)	.23 (.05 - .38)	.94		
5. HEMA: Hedonic	5.40	1.40	-1.06	1.00	.28 (.12 - .42)	.29 (.13 - .44)	.39 (.24 - .58)	.44 (.28 - .57)	.85	
6. HEMA: Eudaimonic	5.72	1.22	-0.94	0.13	.35 (.19 - .48)	.46 (.32 - .59)	.39 (.24 - .52)	.47 (.32 - .59)	.67 (.56 - .71)	.83

Note: M = Mean. SD = Standard Deviation. Skew. = Univariate Skewness. Kurt. = Univariate Kurtosis. LTEQ = Leisure-time exercise questionnaire; PNSE = Psychological Need Satisfaction in Exercise; HEMA: Hedonic and Eudaimonic Motives for Activities. Reliability estimates Cronbach's (1951) coefficient alpha (α) are placed along the principal diagonal. Sample size for bivariate correlations range from 142 - 129 depending on participant responses. 95% confidence intervals for each bivariate correlation can be found in parentheses.

Table 2
Bootstrapped indirect effects of change in LTPA on well-being motives through psychological need satisfaction

Variable	Point Estimate	Bca CI	R ² adj.
Hedonic Motives			
Total	.0107	.0037- .0207	.29*
PNSE - Competence	.0056	.0009 - .0132	
PNSE - Autonomy	.0032	.0005- .0092	
PNSE - Relatedness	.0019	-.0011- .0067	
C1	.0024	-.0044 - .0105	
C2	.0037	-.0024 - .0116	
C3	.0012	-.0046 - .0064	
Eudaimonic Motives			
Total	.0107	.0043- .0186	.36*
PNSE - Competence	.0063	.0025- .0124	
PNSE - Autonomy	.0027	.0004- .0078	
PNSE - Relatedness	.0017	-.0010- .0057	
C1	.0036	-.0018 - .0102	
C2	.0045	-.0007 - .0110	
C3	.0010	-.0033 - .0057	

Note: Number of bootstrap resamples = 5000. Bca CI = Bias Corrected and Accelerated Confidence Intervals. PNSE = Psychological Need Satisfaction in Exercise C1 = contrast between competence and autonomy, C2 = contrast between competence and relatedness and C3 = contrast between autonomy and relatedness.

*p = .