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Well-Being in Group-Based Exercise Classes: Do Psychological Need Fulfillment and Interpersonal Supports Matter?

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Abstract Deci and Ryan (2002) posit the importance of three sources of interpersonal support processes that when fostered authentically enhances psychological need fulfillment and well-being. Guided by Deci and Ryan's (2002) contentions, the purpose of the study was to determine if interpersonal supports provided by exercise instructors was associated with well-being via the satisfaction of basic psychological needs in persons living with osteoporosis. Using a non-experimental research design, participants (N = 280) completed a self-report instrument at the mid-point of a 10 week structured OsteoFit exercise class. Results generally supported Deci and Ryan's (2002) hypothesized sequence. Interpersonal supports demonstrated a pattern of small-to-moderate correlations with psychological need fulfillment (r_{12}'s ranged from .37 to .47) and well-being (r_{12}'s ranged from −.07 to .26). Multiple mediation analysis revealed that variance in psychological need satisfaction (R^2 = 0.14 to 0.22) and markers of well-being (R^2 = 0.03 to 0.32) was explained by the proposed model. This investigation provides support for the role of interpersonal supports in a clinical population where sustained and regular exercise is associated with physical and psychological health consequences. The importance of creating supportive environments within OsteoFit classes to optimize effects on well-being is highlighted.

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Osteoporosis is characterized by a reduction in bone density as bones become porous and fragile which is associated with an increased risk of fractures (World Health Organization [WHO] 2007). Prevalence estimates suggest that over 200 million people worldwide are living with osteoporosis with one in every three women and one in every eight men afflicted (Bartl and Frisch 2009). An increased risk of fragility fractures is the primary clinical outcome linked with osteoporosis (Hernlund et al. 2013), however additional health consequences can ensue from this chronic health condition which include mobility impairments, impoverished quality of life and elevated risk of secondary comorbidities (e.g., inflammatory bowel disease, select cancers, diabetes; Cauley 2013). Considering the prevalence of osteoporosis, identifying effective modalities to manage progression and mitigate known consequences of this condition is an important public health agenda (Johnell and Hertzman 2006).

Exercise has been advocated as a key non-pharmaceutical intervention that can improve the management of osteoporosis (Sherrington et al. 2011; Wojtek et al. 2009) and bolster strength which reduces the likelihood of falls and resultant fragility fractures (Giangregorio et al. 2014). However, a recent review published by Giangregorio et al. (2014) failed to provide sufficient evidence pertaining to the role of exercise participation in relation to well-being in persons living with osteoporosis. Further complicating the evidence, select well-being markers (e.g., vitality), but not others (e.g., emotional health), have shown an association with exercise in individuals living with osteopenia or osteoporosis (Li et al. 2009). Taken collectively, it appears as though the exercise-well-being relationship in individuals living with osteoporosis is complex and therefore warrants greater attention.

In an effort to explain the effects of exercise on well-being, Biddle and Ekkekakis (2005) speculated that the nature of the relationship may be indirect (as opposed to direct). Although various biophysical and psychosocial factors have been identified as potential mechanisms (Acevedo and Ekkekakis 2006), *how* physical activity contributes to enhanced well-being remains elusive (Cerin 2010). Clarifying the mechanisms that underpin the exercise-well-being relationship is essential for understanding causal inference (Hill 1965) and ultimately for designing interventions to enhance psychological health (MacKinnon 2008).

Self-Determination Theory: A Guiding Framework

Various health-based theories have been advanced for understanding behavior change (e.g., Social Cognitive Theory; Bandura 1986) and well-being (Broaden-and-Build, Fredrickson 2001). One theory that has demonstrated its applicability to understanding a wide spectrum of behaviors and well-being in exercise settings is that of Self-Determination Theory (SDT; Deci and Ryan 2002). SDT is an organismic-dialectic theory of motivation and human development that contends people are naturally inclined toward learning, growth, assimilation, and connection with others. Under the

rubric of Basic Psychological Needs Theory (BPNT), a subcomponent of the SDT framework, Deci and Ryan (2002) posit that social contexts which provide a means to fulfill the psychological needs for *Competence*, *Autonomy* and *Relatedness* in an ongoing and authentic manner will subsequently promote well-being. In contrast, social contexts perceived by individuals to thwart the basic psychological needs germane to BPNT should engender ill-being and promote the development of a fragmented sense of self (Deci and Ryan 2002). *Competence* refers to individual's natural desire to explore, manipulate, and feel proficient when mastering optimal challenges within the environment (White 1963). *Autonomy* concerns feeling self-governing insofar as one's actions are undertaken volitionally and stem from an internal locus of causality (deCharms 1968). *Relatedness* reflects the need to establish and maintain satisfying and supportive social relationships and feel emotionally connected to others (Baumeister and Leary 1995). Researchers have generally supported the link between psychological need fulfillment and well-being in exercisers (Rahman et al. 2011; Wilson et al. 2006a) including those with osteoporosis (Gunnell et al. 2011).

Within the SDT framework, Deci and Ryan (2002) propose the importance of three interpersonal sources of support – namely *autonomy support*, *structure*, and *involvement* - that can play a role in fostering psychological need fulfillment and well-being. Autonomy support represents instructional practices (e.g., being empathetic and encouraging,) designed to identify and foster psychological need fulfillment (Deci and Ryan 2002) by prioritizing an individual's interests and values. Structure refers to the amount and clarity of information that important others provide in an effort to facilitate desired outcomes (Deci and Ryan 2002). Finally, involvement as an interpersonal support can be provided through warmth, involvement, non-contingent caring, and the ability to empathize with and respond to others unpleasant feelings in an effective manner (Deci and Ryan 2002). The proposition that interpersonal supports are linked with psychological need fulfillment has received support when investigated in the context of exercise (Duda et al. 2014; Edmunds et al. 2006; Klain et al. 2015; Puente and Anshel 2010).

The impetus for this investigation was grounded in three premises. First, the bulk of existing literature examining interpersonal supports in exercise settings has considered only one of the three interpersonal supports identified by Deci and Ryan (2002), namely autonomy support (e.g., Edmunds et al. 2006; Klain et al. 2015; Puente and Anshel 2010). As such, there is considerable scope and justification for examining the full complement of interpersonal supports identified by Deci and Ryan (2002). Second, the role afforded fulfilling each psychological need central to BPNT has typically centered on understanding the link between perceived interpersonal supports and motives (e.g., Markland and Tobin 2010) at the expense of examining markers of well-being. As such, understanding whether perceptions of psychological need fulfillment mediate the role of interpersonal supports on different markers of well-being as hypothesized by Deci and Ryan (2002) has been largely ignored in the applied literature (Vansteenkiste et al. 2010). Finally, Giangregorio et al. (2015) recently highlighted the need to assess outcomes other than fracture risk when studying exercise amongst individuals living with osteoporosis. More specifically, understanding the utility of community-based exercise programs, well-being outcomes, and the utility of behavior change strategies (e.g., interpersonal supports) in facilitating our understanding of exercise behavior in this cohort was identified as a research priority.

Guided by Deci and Ryan's (2002), the purpose of the study was to determine if interpersonal supports provided by exercise instructors was associated with well-being via the satistaction of basic psychological needs. Aligned with Duda et al. (2014) it was hypothesized that greater perceptions of interpersonal supports provided by exercise instructors would be associated with greater psychological need fulfillment and optimal well-being in individuals enrolled in a community-based exercise program tailored to persons living with osteoposis. Second, it was hypothesized that psychological need fulfillment would serve as one mechanism that mediates the interpersonal support - well-being relationship in persons living with osteoporosis who exercise.

Methods

Procedures and Sample

Following institutional ethics clearance, OsteoFit exercise instructors were sent an instructional package consisting of a standardized verbal script to minimize biases during recruitment due to between-subjects effects stemming from test administration (Pedhauzer and Pedhauzer Schmelkin 1991). The instructional package also included a survey package consisting of letters of invitation, informed consent forms, and the study questionnaires. Following delivery of the recruitment script, questionnaire packages were distributed to individuals enrolled in OsteoFit classes at the mid-point of the 10-week programme. Participants were asked to complete the questionnaire package at their convenience. Contact information for members of the research team were included should questions or clarification by study participants be requested. Upon completion of the instruments, questionnaires were returned to the study investigator using a self-addressed stamped envelope provided by the research team.

OsteoFit is a twice weekly, 1 hour long community based exercise programme for individuals living with osteoporosis currently offered in over 70 communities across British Columbia (BC), Canada. The central aims of OsteoFit classes are to reduce participants' risk of falling, improve functional ability, and bolster quality of life by specifically using exercises that target posture, balance, gait, coordination, and hip/trunk stabilization. All instructors are registered by the BC Recreation and Parks Association and certified by the BC Women's Hospital Osteoporosis programme. For the purposes of this study, 20 communities were selected with a blend of urban and rural areas targeted for study recruitment. A total of 359 survey packages were delivered across the 20 sites where recruitment for this study took place. Participants were not directly compensated; however, BC Women's Hospital and Health Centre (OsteoFit) received a $3.00 donation per usable questionnaire returned.[1]

[1] Directors of the Osteofit program served a gatekeeper role in the recruitment phase of this study and had no direct input into the research questions investigated or the manner in which the data were analysed and reported within this study.

Instrumentation

Demographics Participants were asked to provide their gender, height/weight, marital status, educational attainment, and ethnicity.

Interpersonal Need Support The Environmental Need Support Scale (ENSS; Markland and Tobin 2010) was used to measure perceived interpersonal supports emanating from exercise contexts in accordance with SDT (Deci and Ryan 2002). The ENSS is a 15-item instrument designed to capture the extent to which participant's perceived the OsteoFit environment provided them with autonomy support (Sample item: 'Considered my individual needs'), structure (Sample item: 'Made it clear what I need to do to get results'), and involvement (Sample item: 'Care about me'). The following instructional stem preceded ENSS items "The following questions take into account the environment in which you exercise. The staff at the exercise facility…". Each ENSS item was scored on a five-point scale ranging from 0 (*Not true for me*) to 4 (*Very true for me*). Consistent with Markland and Tobin (2010), scores from ENSS items were combined to create a composite score theorized to represent global perceptions of interpersonal support provided by Osteofit class exercise instructors within exercise contexts. Support for the reliability and validity of ENSS scores has been reported in a sample of individuals participating in an exercise on referral scheme (Markland and Tobin 2010).

Psychological Need Satisfaction Participants completed the Psychological Need Satisfaction in Exercise Scale (PNSE; Wilson et al. 2006b) to assess feelings of autonomy, competence, relatedness derived from exercising in line with the tenets of BPNT. The instructional stem presented before the full complement of PNSE items was "The following statement represent different feelings people have when they engage in exercise. Please answer the following questions by considering how you typically feel when you engage in your OsteoFit classes". The PNSE contains 18 items scaled by 1 (*False*) and 6 (*True*) with higher scores representing greater psychological need fulfillment. Evidence for both validity and reliability of scores derived from the PNSE has been demonstrated (e.g., Wilson et al. 2006a, b).

Well-Being Participants completed two instruments that tapped different dimensions of well-being. The short form of the Positive and Negative Affect Scale (PANAS; Mackinnon et al. 1999) was used to measure the intensity associated with affective responses to exercise classified as both positive (5-items; Sample item: 'Excited') and negative (5-items; Sample item: 'Distressed'). Items were presented following a contextual stem "This scale consists of a number of words that describe different feelings and emotions. Please indicate to what extent you generally feel this way when you engage in OsteoFit. That is, how you feel on average when you are in your OsteoFit classes". were assessed across a 5-point Likert scale ranging from 1 (*Very slightly or Not at all*) to 5 (*Extremely*). The Flourishing Scale (FS; Diener et al. 2009) is an 8-item global instrument designed to measure the extent an individual perceives his/her life as meaningful. The instructional stem for the FS was "Below are 8 statements which you may agree or disagree with. Each statement pertains to feelings people typically have in their life. Using the scale provided below, indicate your agreement with each statement."

with each item anchored by 1 (*Strongly Agree*) and 7 (*Strongly Disagree*). Item scores were reversed such that higher scores were representative of greater flourishing. Support for the construct validity of PANAS scores has been documented in adults who exercise (Wilson et al. 2006a, b). Scores from the FS have demonstrated validity evidence based on internal structure and relations to other variables (Diener et al. 2009).

Data Analyses

The frequency of missing data was estimated using IBM-SPSS software (Version 23). Subsequent analyses were conducted in Mplus 7.3 using robust full information maximum likelihood estimation (MLR). Full information MLR is a recommended procedure to handle missing data given that this approach makes use of all available data provided by a sample and is considered robust o non-normality (McArdle 2009). Confirmatory factor analyses (CFA's) were first conducted on scores for each instrument separately. In each analysis, the proposed indicators were set to load on to their respective latent factor, latent factors were allowed to correlate, and errors were not free to covary. The metric of the latent variables were specified by setting their variance to one. Second, composite reliabilities were calculated based on standardized parameter values obtained from each CFA (Diamantopoulos and Siguaw 2000). Third, given the complexity of the main analysis, each CFA was re-estimated using manifest subscales (or item parcels) to reduce the overall degrees of freedom in the models to be estimated. More specifically, item parcels were created for flourishing (four parcels created by averaging two items each) and perceived psychological need satisfaction (three parcels per psychological need, created by averaging two items each). Manifest variables representing autonomy support, structure, and involvement were created by averaging respective subscale items. These three manifest variables served as the indicators of the latent factor representing overall interpersonal support. The structure of the PANAS was not altered given its low number of indicators. Fourth, as advocated by Anderson and Gerbing (1988) a two-step approach for structural equation modelling was used. In the first step, the measurement model included all latent variables from each instrument. In the measurement model, respective indicators, parcelled indicators, or subscale indicators were targeted to load on to their hypothesized latent factor, and latent factors were correlated. Bivariate correlations between latent variables obtained from the measurement model were interpreted. In step two, the hypothesized structural model was estimated by regressing each well-being latent factor onto each psychological need satisfaction latent variable and interpersonal support. Each psychological need satisfaction latent variable was also regressed onto interpersonal support. To account for the intercorrelation between psychological needs, all three psychological needs were correlated via their disturbance terms. Fit indices and standardized parameter estimates from this model were interpreted. Fifth, because bootstrapping is currently unavailable with MLR, the model was re-estimated with ML estimation while using the bootstrapping procedure to test for multiple mediation (Hayes 2013; Preacher and Hayes 2008). In line with recommendations for testing multiple mediator models (Preacher and Hayes 2008), 5000 bootstrapped resamples were requested and the unstandardized estimates using the 95 % bias corrected confidence intervals (95 % BcCI's; Hayes 2013) were interpreted for statistical significance.

Goodness of Fit Statistics (GOFS) pertaining to each model estimated were assessed using a variety of indices. A significant MLRχ^2 implies that the data were not a good fit to the model. However, MLRχ^2 is over-powered and sensitive to sample size (Brown 2006). Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) values close to or above 0.90 and 0.95, and a Root Mean Square Error of Approximation (RMSEA) value close to or below 0.08 or 0.06 were considered acceptable (Brown 2006; Hu and Bentler 1999). Finally, parameter estimates (e.g., factor loadings, error variances) were examined to ensure no out of range values (Brown 2006).

Results

Seventy-eight percent of individuals enrolled in OsteoFit classes contacted to participate enrolled in the data collection phase of the investigation. The response rate noted in this investigation is considerably higher than average rates of mail-based surveys reported in the literature (Shih and Fan 2008). Of those providing responses missing data was noted on 0.40 % to 2.90 % of the study variables. The final sample ($N = 280$, $n_{\text{female}} = 270$; $M_{age} = 74.13$ years; $SD = 8.01$ years) was comprised of members who attended Osteofit classes. Participants reported being married or in a common law relationship (50.4 %), widowed (25.4 %), separated/divorced (17.5 %) or single/never married (6.8 %). The majority of participants self-identified as being Caucasian/White (74.6 %) followed by Asian (23.2 %), Aboriginal (.7 %) and other (1.4 %). Most participants indicated that a high school diploma (46.4 %) was the highest educational qualification held at the time of data collection. The majority of participants self-reported being physician diagnosed with osteoporosis (71.7 %) with the remainder reporting a diagnosis of osteopenia (28.3 %).

Reliability Estimates and Bivariate Correlations

Bivariate correlations between all latent variables are presented in Table 1 along with estimates of composite reliability.

Table 1 Bivariate correlations among latent variables and composite reliability

Variables	1.	2.	3.	4.	5.	6.	7.
1. ENSS	.97						
2. PNSE Competence	.37*	.94					
3. PNSE Autonomy	.39*	.49*	.92				
4. PNSE Relatedness	.47*	.58*	.44*	.94			
5. Positive Affect	.26*	.53*	.27*	.46*	.88		
6. Negative Affect	−.07	−.17*	−.09	−.09	.00	.82	
7. Flourishing	.12	.25*	.15†	.12	.33*	−.17*	.89

*$p < .05$, †$p = .052$. *ENSS* Environmental Need Supports, *PNSE* Psychological Need Satisfaction in Exercise. Bivariate correlations between latent variables were obtained from the measurement model. The diagonal contains estimates of composite reliability calculated using values obtained from the individual CFAs where parcels were not used

Confirmatory Factor Analyses of Instrument-Specific Measurement Models

Results from all CFAs are presented in Table 2 and provide evidence for the factor structure from responses to instruments used. Scores from the FS fell below recommended GOFs ($MLR\chi^2_{(20)} = 112.62$, $p < .05$; CFI = .85, TLI = .79, RMSEA = .13, [90 % CI = .11–.15]. Inspection of the data and modification indices suggested including a correlation between the error terms for two FS items ('good person' and 'respected') would improve model fit. Based on previous research that has also found that correlating the errors of these two items provides a better fit to the data (Hone et al. 2014), an error covariance was incorporated into the revised model between the two FS items which resulted in an acceptable model fit. Similarly, scores from the PANAS items resulted in an unacceptable fit between the proposed measurement model and the sample data ($MLR\chi^2_{(34)} = 109.32$, $p < .05$; CFI = .87, TLI = .83, RMSEA = .09, [90 % CI = .07–.11]. Inspection of the parameters and modification indices suggested adding a covariance between error terms linked with two PANAS items ('distressed' and 'upset') that were presented to study participants in sequence during data collection. The addition of the error covariance led to an acceptable model fit in the revised measurement model. Next, each model was re-analyzed to reduce the degrees of freedom (i.e., either through parcelling or manifest variables described above). Results indicated that the revised models were a good fit to the data. Except for the items comprising the FS whereby the two items with correlated errors were combined into one parcel, all parcels were created randomly.

Main Analyses

Results of the measurement model analysis were ($MLR\chi^2_{(277)} = 433.88$, $p < .05$; CFI = .96, TLI = .95, RMSEA = .05, [90 % CI = .04–.05]). GOFS for the multiple mediation analysis between the proposed model and the sample was ($MLR\chi^2_{(277)} = 433.88$, $p < .05$; CFI = .96, TLI = .95, RMSEA = .05 [90%CI = .04–.05). Finally, between 14 and 22 % of the variance in psychological need fulfillment and between 3 and 32 % of the variance in well-being was accounted for by the proposed model tested in this study. Interpersonal supports predicted higher

Table 2 Goodness-of-fit Statistics for individual CFA's

Model	χ^2 (df)	CFI	TLI	RMSEA (CI)
ENSS	229.94(90)*	.91	.90	.08 (.06–.09)
PNSE	315.17 (132)*	.93	.92	.07(.06–.08)
PNSE_parcels	53.05(24)*	.98	.97	.07(.04, .09)
PANAS	61.73(33)*	.95	.93	.06(.03–.08)
FL	64.75(19)*	.93	.89	.09(.07–.12)
FL_parcels	26.99(2)*	.94	.83	.21(.15, .29)

*$p < .05$; *ENSS* Environmental Need Supports, *PNSE* Psychological Need Satisfaction in Exercise Scale, *PANAS* Positive and Negative Affect Schedule, *FL* Flourishing Scale, *CFI* Comparative Fit Index, *TLI* Tucker Lewis Index, *RMSEA* Root Means Square Error of Approximation, *CI* 95 % confidence interval. ENSS with manifest variables is fully saturated and therefore no fit indices are presented

levels of competence, autonomy, and relatedness fulfillment (see Fig. 1). Competence satisfaction predicted elevated levels of flourishing and positive affect and reduced experiences of negative affect. Relatedness satisfaction predicted greater feelings of positive affect while exercising in OsteoFit classes. Examination of the total indirect effects within the model revealed that all three psychological needs mediated the relationship between interpersonal supports and positive affect (specific indirect effects through perceptions of competence and relatedness; see Table 3). Although there was no total indirect effect, perceived competence satisfaction produced a specific indirect effect between interpersonal supports when linked with flourishing and negative affect (see Table 3).

Discussion

Grounded in SDT (Deci and Ryan 2002) and previous research (Duda et al. 2014; Giangregorio et al. 2014), the purpose of this study was to examine whether perceptions of interpersonal supports provided by exercise leaders was associated with greater psychological need fulfillment and well-being in adults enrolled in a community-based exercise program for individuals living with osteoporosis. Overall, two key findings emerged from this study. First, while at the bivariate level a positive association between perceived interpersonal supports and well-being was noted, no evidence of a direct effect was found when the mediational model was interpreted. Second, it is clear that experiencing interpersonal supports from an OsteoFit instructor was associated with greater psychological need fulfillment, which in turn, is linked with greater well-

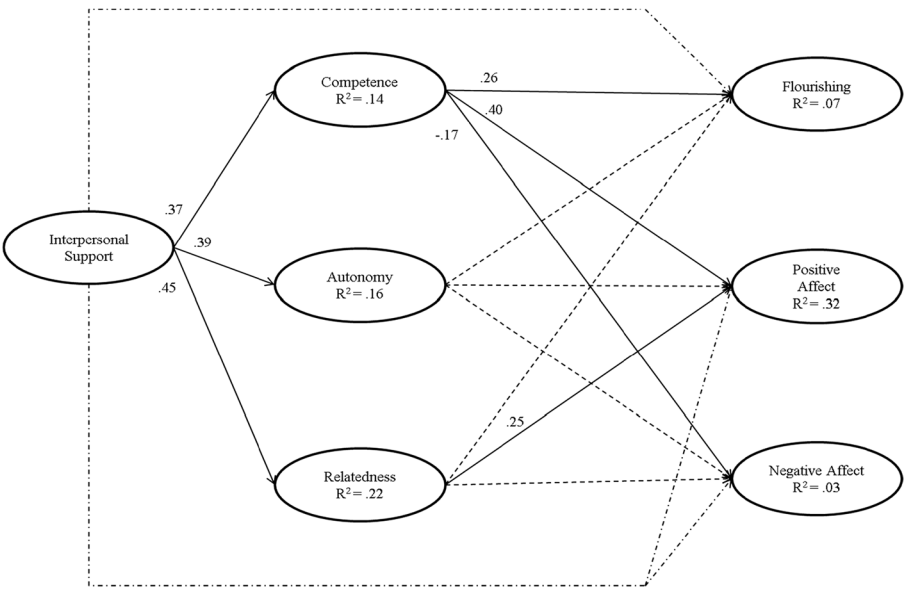

Fig. 1 Standardized values for the hypothesized model. Not shown for clarity are the indicators of latent factors and the disturbance covariances between psychological need satisfaction: $r_{competence.autonomy}$ = .40, $p < .05$, $r_{competence.relatedness}$ = .50, $p < .05$, $r_{relatedness.autonomy}$ = .31, $p < .05$. *Solid lines* $p < .05$. *Dashed lines* $p > .05$

Table 3 Results of the mediation analysis

	Total Estimate (95 % BcCI)	Indirect Estimate (95 % BcCI)	Direct Estimate (95 % BcCI)	Specific Estimate (95 % BcCI)
Support → Flourishing	.12 (−.03, .49)	.08 (−.02, .21)	.04(−.14, .23)	
Competence				.10 (.03, .23)[a]
Autonomy				.01(−.04, .09)
Relatedness				−.03(−.17, .05)
Support → Positive Affect	.31(.13, .49)[a]	.30(.17, .47)[a]	.01(−.17, .18)	
Competence				.18(.09, .31)[a]
Autonomy				−.02(−.09, .06)
Relatedness				.14(.04, .29)[a]
Support → Negative Affect	−.07(−.28, .05)	−.06(−.19, .02)	−.01(−.24, .16)	
Competence				−.06(−.14, −.03)[a]
Autonomy				−.001(−.06, .06)
Relatedness				.01(−.09, .09)

[a] used to indicate statistically significant effects obtained by interpreting the Bias corrected confidence intervals (BcCI)

being in a manner largely consistent with Deci and Ryan's (2002) contentions. This study extends previous research and offers a more complete understanding of the factors linked to well-being by using multiple criteria to assess well-being and including theoretically plausible mechanisms to account for how an exercise instructor's actions can impact another person's well-being.

The first hypothesis, namely that greater perceptions of interpersonal supports by exercise instructors would be associated with greater psychological need fulfillment and well-being was partially supported. Deci and Ryan (2002) have long claimed that interpersonal supports embedded in the social environment are associated with psychological need fulfillment. Results of the present investigation support their claim and that of previous exercise research (e.g., Duda et al. 2014; Markland and Tobin 2010) as perceptions of interpersonal support from OsteoFit instructors was associated with the fulfillment of each psychological need embedded within BPNT. At the bivariate level, interpersonal supports were significantly associated with positive affect only in the hypothesized direction. However, when interpretating the path model interpersonal supports were not directly related to any marker of well-being used in this investigation. Findings of the present investigation highlight the equivocal nature of the interpersonal support (in the form of autonomy support) and well-being in physical activity settings (López-Walle et al. 2012; Quested and Duda 2010). Differences in context (e.g., sport versus exercise), individual participant goals, age, or other confounds may contribute to the differences noted across these studies. As such, researchers may want to systematically investigate characteristics of the exercise leader that may be linked with elevated or dimished levels of well-being, especially for those persons who engage in exercise mainly for health reasons (e.g., exercise referral scheme patients).

The absence of a direct effect in this study between perceived interpersonal supports and well-being should not prevent or deter future investigations of plausible models

that contain mediational pathways (MacKinnon et al. 2002). The second hypothesis–that psychological need fulfillment would serve as one mechanism underpinning the percieved interpersonal supports → well-being relationship was supported for positive affect in this study. When comparing the relative contribution of the three psychological needs to well-being, the fulfillment of the need for competence was linked to all markers used to represent the conceptual bandwidth of well-being as a psychological entity. As such, experiences leading to the fullfillment of competence may have a greater potential to enhance levels of well-being in this setting and seems worthy of follow-up investigation.

Pereptions of autonomy and relatedness were not associated with the full spectrum of well-being indices embedded within this investigation. Researchers have noted similar findings when examining psychological need fulfillment in physical activity contexts (Mack et al. 2012; Gunnell et al. 2014) including samples comprised of individuals living with osteoporosis (Gunnell et al. 2011). The more limited contribution of perceptions of autonomy and relatedness in this study may imply that select psychological needs (at least in the context of OsteoFit classes) have a diminshed role to play in terms of influencing well-being. While this may be plausibe, the unique characteristics of community-based exercise classes for adults living with osteoporosis (i.e., OsteoFit) may contribute to positive affect through fulfillment of the psychological need for relatedness.

The results of this study hold appeal for researchers and health professionals with an interest in promoting well-being amongst individuals living with osteoporosis. However, there are number of limitations plus future directions needed in order to advance our understanding of psychological need satisfaction and well-being especially in cohort living with chronic diseases. First, the design of this study was cross-sectional in nature and relied exclusively on a sample of participants who were purposively recruited. Cross-sectional research designs confer limited evidence for causality and the use of a non-probability sampling techniques constrains the external validity of study findings (Pedhauzer and Pedhauzer Schmelkin 1991). Researchers could extend these initial findings to include longitudinal designs that offer greater insight into causal mechanisms preferably using probability-based sampling techniques that confer greater confidence in the generalizability of the study findings. Second, this study relied exclusively on self-report data that may be susceptible to various confounds including, but not limited to, issues of social desirability and monomethod bias (Streiner and Norman 2008). Finally, while the fulfillment of basic psychological needs seems to be one route via which perceived interpersonal supports are linked with well-being it also seems likely that other potential routes exists that are equally as important to identify and comprehend. With this in mind, researchers may wish to consider alternative mechanisms (preferably theory-based) to further elucidate ‘how’ and ‘why’ perceived interpersonal supports from exercise leaders impact markers of well-being.

Implications emanating from study findings highlight the utility of examining autonomy support, structure and involvement as intervention targets for fostering psychological need satisfaction in exercise settings. However, researchers have rarely examined the combined effects of the three interpersonal supports identified by Deci and Ryan (2002). For those interested in health promotion, the present investigation offers some insight into the benefits of community-based exercise programming for individuals living with osteoporosis on well-being.

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