Intervention Study

HEALTH PSYCHOLOGY OPEN

Health Psychology Open
July-December 2015: 1–9

DOI: 10.1177/2055102915600359
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Motivation-related predictors of physical activity engagement and vitality in rheumatoid arthritis patients

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Abstract

This study tests the Basic Psychological Needs Theory (within the Self-determination framework), in relation to the prediction of physical activity and well-being among rheumatoid arthritis patients. Motivation regulations for physical activity were also considered in the process model. A total of 207 patients (150 females, mean age = 58 ± 11 years) completed a questionnaire pack and structural equation modelling was used to test expected relationships. Autonomy support provided by important other(s) regarding physical activity positively predicted rheumatoid arthritis patients' need satisfaction which positively related to autonomous reasons for physical activity participation. Autonomous motivation positively predicted reported physical activity participation levels and feelings of vitality.

Keywords

motivation, physical activity, rheumatoid arthritis, self-determination theory

Introduction

Rheumatoid arthritis (RA) is a chronic autoimmune disorder which causes inflammation leading to symptoms of pain, stiffness, and swelling of the joints (Lee and Weinblatt, 2001). In addition to these physical and physiological symptoms, patients with RA are also more likely to experience compromised psychological well-being (Treharne et al., 2005). Approximately 0.8 per cent of British adults are affected by RA (Symmons et al., 2002).

Regular physical activity (PA) is associated with physical as well as psychological benefits (Nelson et al., 2007) for both non-clinical and patient groups. In the case of RA patients, however, the large majority have been found not to reach the public health recommendations regarding PA participation (Hootman et al., 2003). Thus, there is a particular need to understand the determinants of PA in this patient group and it is important for research on such questions to be theoretically based (Michie et al., 2008).

In recent work on PA promotion, Self-determination Theory (SDT) has been widely used to explain the factors impacting behaviour adoption and maintenance in the exercise domain (Deci and Ryan, 2000). SDT focuses on the 'why' of behaviour and assumes that human motivation varies in the extent to which it is autonomous and/or controlled. When participating for autonomous reasons, people feel free to engage in the activity because they personally value the activity and/or because of inherent interest and enjoyment. People engaging for controlled reasons may feel they have been forced to exercise for extrinsic rewards and/or participate out of the feelings of guilt (e.g. to please their partner and/or because their general practitioner told them to be more active).

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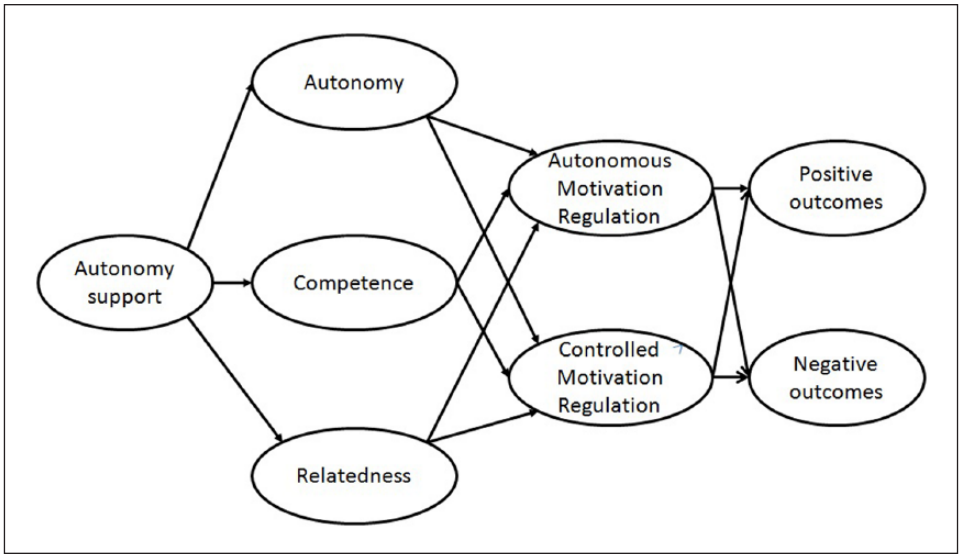

Figure 1. Hypothesized model: Social environmental–Needs–Motivation–Consequences.

The tenets of SDT have been examined within different populations and supported by studies conducted in different health-care settings (Ng et al., 2012). However, research testing predictions emanating from this theoretical framework in relation to PA behaviour in clinical populations have received limited attention. In an SDT-based study involving RA patients by Hurkmans et al. (2010), higher levels of autonomous motivation significantly predicted higher levels of self-reported PA.

Basic Psychological Needs Theory (BPNT) (Ryan, 1995), a sub-theory of SDT, suggests that the origins of autonomous motivation is initiated from individuals' innate propensity to fulfil three basic psychological needs; that is, the needs for autonomy, competence and relatedness. Past research in the exercise domain has been supportive of the expected positive relationship between basic need satisfaction and participants' autonomous motivation for engaging in PA (Wilson et al., 2002). It is also assumed (Deci and Ryan, 2000) that when the basic psychological needs have been satisfied, this would negatively predict controlled motivation (Figure 1). Previous work in PA settings has supported this prediction (Gunnell et al., 2014). To our knowledge, however, the implications of basic need satisfaction for autonomous and controlled motivations to participate in PA have not been examined in the case of patient groups, such as people living with RA.

According to BPNT, the social environment plays a critical role in the degree to which the needs are satisfied (Deci and Ryan, 2000). BPNT places emphasis on the interpersonal styles of significant others whose behaviours and interactions create that social environment. Two interpersonal styles that have received the most attention are a *controlling style*, which entails the important other being coercive and acting in a pressuring manner, and an *autonomy supportive style* (Deci and Ryan, 1987). Autonomy support is evidenced when important others provide opportunities for choice and a meaningful rationale, recognize the feelings and experience of the participants involved and minimize the use of pressures and demands (Williams et al., 1996). Autonomy supportive social environments are also considered to facilitate greater autonomous motivation and internalization of regulatory processes and thus promote effective, long-term behaviour change.

Iversen et al. (1999) found RA patients who indicated had experience engaging in PA to perceive that their rheumatologist provided more social support for PA. Research by Hurkmans et al. (2010), however, indicated that the patients' views of the amount of autonomy support from the rheumatologist were not significantly related to self-reported PA participation. It might be the case that the key source(s) of autonomy support for PA participation in RA patients may not only be their rheumatologist but also other important person/people such as their general practitioner or nurse (Wilcox et al., 2006), their partner and/or their children (Rouse et al., 2011). In the present study and extending the research of Hurkmans et al. (2010), the RA patients sampled were able to indicate who might be their 'significant other' in terms of their efforts to be physically active, and ratings of autonomy support were referenced to this individual (e.g. my rheumatologist) or individuals (e.g. my children).

According to BPNT (Ryan, 1995), the fulfilment of the basic needs is not only expected to be relevant to different motivation regulations and levels of participation in the activity in question, but also to the likelihood of experiencing well-being and/or ill-being within and as a result of engagement in the activity. These predictions have been supported within exercise settings where basic need satisfaction was

positively predicted a number of well-being indicators in non-clinical populations (e.g. (Ferrand et al., 2012), including feelings of vitality (Gunnell et al., 2013). The present study expands on past work by considering whether autonomy support provision by one's important other(s) predicts RA patients' basic need satisfaction, autonomous and controlled motivation for PA, and reported vitality and PA participation.

Within the seminal work of Hurkmans et al. (2010) focused on people living with RA, the associations between SDT-based constructs (and other variables including age, disease duration) to PA levels were examined univariately via hierarchical multiple regression. A major purpose of the present study was to test, in a sample of RA patients, a BPNT-based hypothesized motivational sequence (autonomy support to basic need satisfaction to motivation regulations to PA/well-being) following the theoretical structure proposed by Vallerand (1999). Structural equation modelling (SEM), which controls for measurement error, was employed to test the hypothesized motivational sequence.

Also extending SDT-grounded research on clinical populations, the second aim of the present study was to test the assumed indirect effects within this sequence in the case of RA patients. Specifically, we hypothesized that (1) autonomy support provided by an important other(s) will positively predict the three basic psychological needs, (2) the three basic psychological needs will positively predict autonomous motivation regulation and negatively predict controlled motivation regulation, (3) autonomous motivation will positively predict subjective vitality and self-reported level of PA, and controlled motivation will negatively predict these variables, and (4) the three basic psychological needs will mediate the relationship between autonomy support provided by the important other(s) and the composite motivation regulations, and the motivation regulations will mediate the relationships between the three basic psychological needs and subjective vitality and self-reported PA.

Material and methods

Participants and procedures

After receiving ethical approval from the National Health Services ethics committee, participants were recruited via mail if listed as a member of the National Rheumatoid Arthritis Society (NRAS). Following the completion of the consent form, the participants were requested to respond to a multi-section questionnaire and return by post. A postal survey was mailed to 500 members of the NRAS, 335 questionnaire packs were returned (return rate 67%) and 207 of these questionnaires were usable in terms of completion of the targeted scales (57 males, 150 females). Missing values were replaced by the mean of each subscale in order to retain the maximum participant number. The observed response rate is similar to what has been reported in previous research on this population (e.g. 62%, Eurenius et al., 2005; and 64%, Van Den Berg et al., 2006). In the Hurkmans et al. (2010) study, the response rate to a postal survey was increased from 33 to 42 per cent after telephone contact with the non-responders.

The mean age of the RA patients in the current sample was 58 years (range = 27–82 years; standard deviation (*SD*) = 11). Over 99 per cent of the study participants were White British. Within the sample, the educational levels represented were A level (28.5%, equivalent to high school level), degree/undergraduate level (18%) and postgraduate level (12%). The large majority (69.6%) were married, 4.3 per cent were living with a partner, 6.8 per cent were single, 12.1 per cent were separated/divorced and 7.2 per cent of the patients in the sample were widowed.

Measures

Autonomy support for PA engagement. The autonomy support deemed to be offered for PA engagement from important others, in the view of the RA patients, was assessed through the previously validated Important Other Climate Questionnaire (Williams et al., 2006). Participants were requested to identify one significant other who was particularly influential in their attempt to become physically active. The perceived level of autonomy support provided from the identified significant other(s) was subsequently assessed via six items (e.g. 'I feel that my important person provides me with choices and options about physical activity and health'). Each item was responded to using a 7-point Likert-type scale (*strongly disagree* = 1; *strongly agree* = 7). In previous research in the exercise context, this scale has demonstrated good internal reliability with an observed Cronbach's alpha of .93 (Rouse et al., 2011).

Basic need satisfaction in exercise. The Psychological Need Satisfaction in Exercise Scale (Wilson et al., 2006) was used to assess participants' perceptions of competence, autonomy and relatedness within their PA/exercise programme. Each of the subscales contains six items and responses were provided on a 6-point scale ranging from 1 = *false* to 6 = *true*. An example item for the need for autonomy is 'I feel free to be physically active in my own way', for relatedness is 'I feel attached to those who participate in physical activities with me because they accept me for who I am', and for competence is 'I feel that I am able to participate in physical activities that are personally challenging'. Previous research in the PA domain has provided support for the internal reliability of the autonomy (α = .91), relatedness (α = .90) and competence (α = .90) subscales (Wilson et al., 2006).

Exercise motivation regulations. The Behavioural Regulation in Exercise Questionnaire–2 (BREQ-2) (Markland and Tobin, 2004) was used to measure participants' motivational

regulations for engagement in PA. The 19-item BREQ-2 assesses external (4 items, such as 'I engage in physical activity because other people say I should'), introjected (3 items, such as 'I feel guilty when I don't exercise'), identified (4 items, such as 'It's important for me to regularly participate in physical activity') and intrinsic (4 items, such as 'I engage in physical activity because it's fun') regulations as well as amotivation (4 items, such as 'I don't see why I should have to be physically active'). Responses to each of the items were scored on a scale ranging from 0 (*not at all true*) to 4 (*very true*). Previous research (Markland and Tobin, 2004) provided support for the internal reliability of the intrinsic regulation (α=.86), identified regulation (α=.73), introjected regulation (α=.80), external regulation (α=.79) and amotivation (α=.83) subscales.

Self-reported PA. The Godin–Shephard Leisure Time Physical Activity Questionnaire (Godin and Shephard, 1985) was employed to assess leisure time PA. This self-report questionnaire has been used in previous research on clinical groups, such as diabetes patients (Margaret et al., 2004). Past work has revealed the test–retest reliability of this questionnaire to be 0.64 and its concurrent validity has been supported (Godin et al., 1986). Participants were asked to report their PA over the past 7 days, using a 15-minute bout as the minimum time. Specifically, they indicated the frequencies of the time spent engaged in PA of strenuous, moderate and mild intensity levels. Weekly overall leisure time PA was calculated using the following formula: Physical Activity Index (PA index) = (9 × strenuous) + (5 × moderate) + (3 × mild). The PA index was used in the current study as the indicator of the RA patients' level of PA.

Feelings of energy and vitality. The 6-item Subjective Vitality Scale (Ryan and Frederick, 1997) was employed to assess participants' state of feeling alive and alert (i.e. having energy available to the self, Bostic et al., 2000) as an indicator of psychological well-being. An example item is 'In general, over the last 2 weeks, I feel alive and full of vitality'. Answers were rated on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*). Good internal consistency had been reported in the exercise context (e.g. Cronbach's α=.92, Rouse et al., 2011).

Data analysis. Following the conducting of descriptive and correlation analyses, the data were analysed through SEM (AMOS, version 19). The maximum likelihood method was used, and the Satorra–Bentler adjustment for the chi-square was considered because it provides more accurate standard errors when data are marked by non-normality (Byrne, 2006). The application of the chi-square to assess the adequacy of model fit has been criticized on account of the statistic's sensitivity to sample size. A non-significant Satorra–Bentler χ^2 value indicates that the data fit the proposed model. The following fit indices were also used to provide additional evidence regarding the adequacy of the proposed model: Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR) and the Non-Normed Fit Index (NNFI). It is recommended that the CFI and NNFI should be close to 0.90 or above to indicate a good model fit to the data (Hu and Bentler, 1995). In terms of the SRMR and RMSEA, it is recommended that SRMR and RMSEA values between .05 and .10 are considered acceptable, close or lower than .08 is optimal (Cole and Maxwell, 1985). The factorial structure of each scale in the current study was tested via confirmatory factor analysis.

In order to reduce non-normality in the data (Little et al., 2002), the number of observed variables was reduced by parcelling. The guide for parcelling was based on the factor loading, the largest of which was paired with the smallest to gain a balance between the parcelled indicators (Little et al., 2002). In line with Deci and Ryan's (2000) theoretical reasoning, an autonomous motivation regulation latent variable was created by combining intrinsic motivation and identified items. A controlled motivation regulation latent variable was formed by combining external regulations and introjected items. The autonomous motivation regulation was indexed by four parcels, and the controlled motivation regulation was indexed by three parcels and one single item.

Results

Descriptive statistics, Pearson correlations and reliability

Descriptive statistics, internal reliability coefficients and bi-variate correlation coefficients for all variables are provided in Table 1. On average, the RA patients reported moderately high autonomy support from their important other. Mean levels of autonomous motivation were moderate while the observed mean for controlled motivation was low. Participants reported moderate levels of subjective vitality and low levels of PA. All of the subscales demonstrated acceptably high internal reliability (α=.80–.92). The correlations between the three need satisfactions were moderately high and positive. The observed correlation between the need for autonomy and the need for relatedness was lower (r=.29) than the other two pairs of associations (r=.48 and .46, respectively).

SEM

The paths which achieved statistical significance are presented in Figure 2. For ease of viewing, only the latent variables and the significant paths are presented. All hypothesized paths between autonomy support and three basic psychological needs were positive and significant. Competence need satisfaction only positively predicted

Table 1. Descriptive statistics, internal reliabilities and correlations between study variables.

Variables	*M*	*SD*	*Range*	*Alpha*	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Important other's autonomy support	5.70	1.38	1–7	.88	–						
(2) Autonomy	4.93	1.37	1–6	.89	.31**	–					
(3) Competence	3.12	1.51	1–6	.90	.27**	.48**	–				
(4) Relatedness	3.54	1.70	1–6	.91	.27**	.29**	.46**	–			
(5) Autonomous motivation regulation	2.62	1.16	0–4	.91	.28**	.46**	.50**	.36**	–		
(6) Controlled motivation regulation	1.03	1.12	0–4	.80	.07	−.21**	−.09	.09	−.13	–	
(7) Subjective vitality	3.93	1.63	1–7	.92	.22**	.43**	.49**	.13	.34**	−.22**	–
(8) PA index	24.17	18.54	0–89		.08	.27**	.23**	−.01	.29**	−.15*	.31**

SD: standard deviation; PA: physical activity.
*$p < .05$; **$p < .01$.

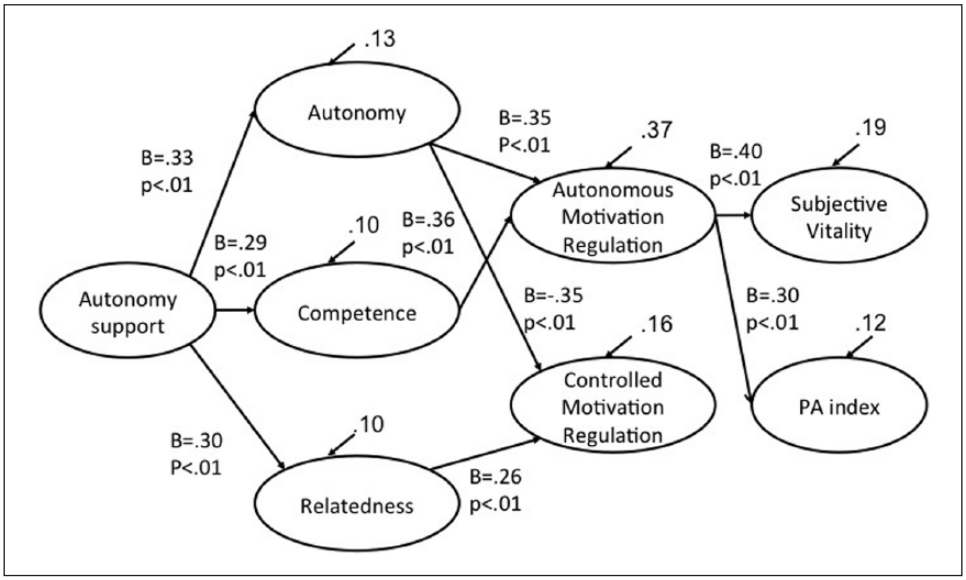

Figure 2. Result of structural equation modelling analysis on the proposed model. For simplicity, the loading of each item is not presented here (PA index = physical activity index).

autonomy motivation regulation. Relatedness was not related to autonomous motivation regulation, and unexpectedly was positively associated with controlled motivation regulation. A positive path between autonomous motivation regulation and each of the outcome variables (i.e. subjective vitality and the PA index) was observed. However, no significant path between controlled motivation regulation and either of the outcome variables emerged.

Based on the modification indices, three co-variances were added between the residual of the three basic psychological needs to improve the model fit. These changes are reasonable as they are theoretically consistent (i.e. we expect the three basic psychological needs to be positively correlated; Deci and Ryan, 2000; Ryan, 1995) and are aligned with the approach taken in past studies from exercise (Puente and Anshel, 2010) contexts. Adding the three co-variances could help us estimate the model more accurately and indeed improved fit indices: observed CFI values increased from 0.89 to 0.91, and the NNFI improved from 0.87 to 0.90. These revised fit indices could be considered marginally acceptable. The SRMR decreased from .13 to .09, and RMSEA decreased from .087 to .078. Taken in their totality, these results provided partial support for the hypothesized model (Satorra–Bentler χ^2 value was decreased from 613.79 (270) to 536.18 (237)).

Indirect effects

To test the theoretically assumed indirect effects, first, we examined the indirect effects from autonomy support to the PA index and reported vitality which were both significant but minimal. Second, the assumed indirect effects of need satisfaction between autonomy support from important others and the composite motivation regulations, as well as to the targeted outcome variables were tested. The indirect effect from autonomy support to autonomous motivation

Table 2. Indirect effects.

Independent variable (IV)	Mediators (M)	Dependent variable (DV)	Standardized indirect effect
Autonomy support	Basic needs and motivational regulation	Vitality	.11*
	Basic needs and motivational regulation	Physical activity index	.09*
Autonomy support	Competence	Autonomous motivation regulation	.24*
	Autonomy		
	Relatedness		
	Competence	Controlled motivation regulation	−.08
	Autonomy		
	Relatedness		
Competence	Motivation regulation	Vitality	.17*
	Motivation regulation	Physical activity index	.14*
Autonomy	Motivation regulation	Vitality	.19*
	Motivation regulation	Physical activity index	.14*
Relatedness	Motivation regulation	Vitality	−.01
	Motivation regulation	Physical activity index	.02

*$p < .05$.

regulation was significant and from autonomy support to controlled motivation regulation was not statistically significant. These results indicated that the effect of autonomy support from important other(s) to autonomous motivation regulation was mediated by need satisfaction.

Third, the presumed mediational roles of autonomous and controlled regulations in terms of the relationship between need satisfaction and the outcome variables were tested. Considering the three different needs to the two outcome variables separately, results indicated that the indirect effects from need for competence to vitality ($\beta = .17$; $p < .05$), and the need for autonomy to vitality ($\beta = .19$; $p < .05$) were significant (Table 2). The need for relatedness to vitality ($\beta = -.01$; $p = .09$) approached significance. The indirect effects of the motivation regulations to vitality were only significant for the need for competence and the need for autonomy, and these effects were low. The indirect effects of the need for competence to PA was $\beta = .14$ ($p < .05$), the need of relatedness to the PA index was $\beta = .02$ ($p = .09$) and the need for autonomy to the PA index was $\beta = .14$ ($p = .09$).

Discussion

Extending past research, this study examined a hypothesized motivation sequence which assumed differential relationships from autonomy support to the basic needs, to autonomous and controlled motivation regulation and then to the two targeted outcome variables (reported PA and subjective vitality, as a key marker of well-being), in the case of RA patients. In the present study and aligned with previous research (Moustaka et al., 2012), autonomy support provided from a significant other was positively linked to patients' need satisfaction. When RA patients perceived that their significant other provides them with choice, considers their perspective, and encourages input into and decision making in terms of their PA pursuits, they indicated feeling more competent within the PA domain, more close to the people pertinent to their PA participation, and also witnessed a greater sense of autonomy when participating in PA.

Our results revealed differential relationships between the three psychological needs and the RA patients' motivation regulations for PA. First, the observed significant paths from autonomy need satisfaction to both autonomous motivation regulation and controlled motivation regulation were consonant with our hypotheses. These findings suggest that where the need for autonomy had been fulfilled, RA patients are more prone to feel that they engage in PA volitionally. On the contrary, for the RA patients who reported low autonomy need satisfaction, they were more likely to indicate that they are engaging in PA because of more controlling reasons (e.g. free coupon for gym visits; complying with someone who expects them to be more active).

The predicted and observed positive link between competence need satisfaction and autonomous motivation regulation is consonant with past work in exercise (Puente and Anshel, 2010) and physical education (Ntoumanis, 2001) contexts. It is interesting to note that in previous research, competence need satisfaction tends to be the strongest predictor of autonomous reasons for engagement. However, in our study, the paths between autonomy and competence need satisfaction to autonomous motivation were more or less equivalent. This is perhaps because the RA patients were not likely to be in an achievement-focused context

when engaged in PA and thus, were less likely to centre on demonstrating high levels of ability.

Contrary to our hypotheses, the need for relatedness positively predicted controlled motivation regulation and did not significantly relate to autonomous motivation regulation. These findings may be due to RA patients participating in PA because they did not want to disappoint or 'let down' their important other(s) by not engaging in a behaviour that is beneficial to their overall functioning and disease management. That is, the heightened feelings of relatedness with significant others related to their PA may have led to an exacerbation of more controlled reasons for PA participation in this clinical population; that is, they felt more like they *have* to be physically active for the people they are close to within the PA setting, because of the overall and disease-specific benefits of regular PA for people with RA. Further research is required to substantiate such speculations. More in-depth information garnered via qualitative methodologies will help us to further understand the nature of RA patients' social interaction and exchanges with fellow exercisers or others (e.g. fitness instructors, their families, friends) pertinent to their reasons for PA engagement (Wilcox et al., 2006) and their motivational implications.

The hypothesized relationships between autonomous motivation regulation and the targeted outcomes were significant and consistent with previous research conducted within the exercise setting (Standage et al., 2012). Results indicated that when the reasons for RA patients participating in PA were more autonomous or self-determined, it was more likely that they reported greater psychological well-being and higher levels of PA participation. With respect to the observed non-significant relationship between controlled motivation regulation and subjective vitality, it has been suggested that controlled motivation may be less relevant to indicators of positive functioning (Teixeira et al., 2012). In future studies, the potential implications of controlled motivation regulation for negative health-related outcomes in RA patients should be considered, for example, negative affect, depression or persistence (Gonzalez-Cutre and Sicilia, 2011; Pelletier et al., 2001). This might be a particularly important line of work with the targeted patient group as RA patients have been found to have higher prevalence of depression than the general population (Evers et al., 1997).

The expected indirect effects of need for autonomy and need for competence, in terms of the relationship between autonomy support from important others and autonomous motivation regulation, were both significant, but the indirect effects were quite low. This suggests that there are other variables which may serve as mediators in the relationship in question. For example, according to the expectancy value model (Wigfield and Eccles, 2000), individuals' beliefs regarding their ability and achievement values will be influenced by the larger social context, including partners, children and/or whoever the individual considers as an important person in that particular situation.

Regarding the hypothesized indirect effects of motivation regulations, the relationship between the need for competence and the need for autonomy to subjective vitality was significantly mediated by autonomous motivation, as well as the associations between the need for competence and the need for autonomy to the PA index. These findings extend results from previous work in the sport setting (Reinboth et al., 2004) which have indicated that the effect of need satisfaction would be mediated by motivational regulations instead of having a direct effect on the outcome variables, that is, subjective well-being and PA engagement.

As the current study adopted a cross-sectional design, it is important that the observed significant relationships between autonomy support, basic needs, motivation regulations and the targeted outcomes are not considered to be causal. Longitudinal work is warranted and, in particular, experimental studies which would allow a test of the effects of different levels of autonomy support on PA engagement and associated well-being indicators in people living with RA. The measurement of PA in this study entailed the use of a valid (e.g. the questionnaire had been successfully used in studies involving other clinical populations such as spinal cord injured patients (Keegan et al., 2012) and stroke patients (Cavalcanti et al., 2012) albeit self-report questionnaire. In future research, objective measures of PA (such as pedometers or accelerometers) could also be employed to complement the assessment of subjective levels of PA.

In conclusion, our findings indicate that the autonomy support provided by important other(s) in terms of PA engagement can fulfil RA patients' basic psychological needs. Satisfaction of these basic needs may enhance autonomous motivation and contribute to higher levels of PA and subjective vitality in this patient group. The present results provide valuable insight into how we can foster greater health and functioning in RA patients, as past work has indicated that regular PA results in both psychological and physiological benefits for RA patients (Metsios et al., 2008) and has pointed to the health-related costs of insufficient levels of PA in this patient group (Hootman et al., 2003; Metsios et al., 2008).

Acknowledgements

Trial Number: The trial is registered as Current Controlled Trials ISRCTN04121489.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The research described within this article was conducted within a larger project funded by the Medical Research Council National Prevention Research Initiative (Phase 3).

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