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In the beginning: Role of autonomy support on the motivation, mental health and intentions of participants entering an exercise referral scheme

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Self-determination theory (Deci & Ryan, 2000, *Intrinsic motivation and self-determination in human behaviour*. New York: Plenum Publishing) highlights the impact autonomy supportive environments can have on exercise motivation and positive health outcomes. Yet little is known about whether differential effects occur as a function of which significant other is providing this support. Further, no research has examined the relationship between motivation and the social environment with participants' mental health and intentions to be physically active before entering an exercise intervention. Study participants were 347 British adults who were about to start an exercise referral scheme. Regression analyses revealed that the effects of autonomy support on mental health and physical activity intentions differed as a function of who provided the support (offspring, partner or physician), with the offspring having the weakest effects. A structural model was supported, indicating that autonomy support and more autonomous regulations led to more positive mental health outcomes and stronger intentions to be physically active. Knowledge of the social environmental and personal motivation of those about to commence an exercise programme can provide important insights for professionals supporting such efforts.

Keywords: self-determination theory; motivational regulations; exercise behaviour change; vitality; depression

Introduction

Despite the overwhelming evidence supporting the benefits associated with regular physical activity (PA; Blair, 2009), people show remarkable resistance to adopting and especially maintaining this positive health behaviour (Williams, Gagne, Ryan, & Deci, 2002). Research grounded in self-determination theory (SDT; Deci & Ryan, 1985) has highlighted the positive influence that autonomy support can have on facilitating health behaviour change as well as associated physical and psychological

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health benefits (Williams et al., 2002). To date, within the SDT-based literature centred on PA promotion, emphasis has been placed on the degree of autonomy support offered by exercise instructors in the case of individuals engaged in exercise classes (Edmunds, Ntoumanis, & Duda, 2008; Wilson & Rodgers, 2004) or perceptions of the autonomy support provided by fitness advisors among those who are participating in exercise on referral schemes (Edmunds, Ntoumanis, & Duda, 2007). However, when people are about to start 'down the road' towards the adoption of an active lifestyle, they are influenced by a variety of significant others, and each may make a unique contribution towards their initial motivation towards behavioural change, intentions to be more active, and associated psychological and emotional state. Further, previous studies have not considered the potential effect of the social environment operating *before* someone initiates a structured PA promotion programme. In summary, little is known about the contribution made by different important others on the motivation and well-being of individuals in the beginning when they are about to commence a PA programme. The overarching aim of this study is to address these gaps in the literature.

Self-determination theory

SDT (Deci & Ryan, 2000) is concerned with why we engage in specific behaviours and focuses on the degree to which people's motivation towards engagement in activities, such as PA, are more or less self-determined or controlled by external or internal pressures. SDT proposes that when an activity is not intrinsically motivating, behaviour is guided by a variety of extrinsic regulations which are assumed to lie on a self-determination continuum (Ryan & Deci, 2002). External regulation is the least autonomous and indicates a behaviour that is conducted for tangible and intangible rewards, externally referenced reinforcement or as an outcome of pressure from external sources. As we progress along the continuum, introjected regulation represents the motive to perform a behaviour to avoid guilt and shame or attain feelings of contingent self-worth and social approval. Identified regulation reflects engagement due to an understanding, acceptance and valuing of the benefits associated with participating in the behaviour. The most self-determined regulation, intrinsic motivation, reflects an inherent interest in the activity in hand and does not necessitate any operationally separable consequences (Deci & Ryan, 2000). Deci and Ryan (2000) indicate that these regulations cluster to form autonomous (intrinsic and identified) versus controlled (introjected and external) regulations. SDT further proposes an amotivated state in which an individual lacks any intention or desire to conduct the behaviour. Previous research has shown that more autonomous motives for exercise correspond to positive outcomes such as adherence (Pelletier, Fortier, Vallerand, & Briere, 2001b) and enhanced well-being (Edmunds et al., 2008). Therefore, environments that support the development of autonomous self-regulations are considered important for optimal physical and psychological health.

Autonomy support

In this study, we focus on the concept of autonomy support because it provides the framework for understanding how significant others can support behavioural change

without undermining the receiver's locus of causality. Autonomy support is clearly defined with respect to a behaviour set that an individual may exhibit that holds implications for the formation of self-determined regulations. Williams et al. (2006b) conceptualised autonomy support as features of the social environment created by significant other(s), such as eliciting and acknowledging perspectives, supporting self-initiative, offering choice, providing relevant information and minimising pressure and control. For example, a health and fitness advisor who creates an autonomy supportive environment offers his/her client the opportunity to choose the activity that he/she will engage in (Pelletier et al., 2001b; Williams, Cox, Kouides, & Deci, 1999), acknowledges positive and negative feelings towards becoming physically active in an empathetic manner (Edmunds et al., 2007), understands the client's perspective (Pelletier et al., 2001b; Reeve & Jang, 2006) and encourages ownership and self-initiative towards becoming physically active (Deci & Ryan, 2000). SDT proposes that when an autonomy supportive environment is created, the reasons for conducting a behaviour become more self-determined or autonomous over time. Previous study in the physical domain has provided evidence for this assumption (Edmunds et al., 2008; Hagger et al., 2009; Tessier et al., 2008).

Health behaviours have been the focus of previous research investigating autonomy supportive environments. Williams, Freedman and Deci (1998) and Williams et al. (1999) studied the impact of autonomy support on a series of health behaviours (smoking, weight control and medication adherence) and revealed that the perceptions of autonomy support positively predicted autonomous reasons and its change over time for engaging in the specified health-related behaviour. Williams, Lynch and Glasgow (2007) also highlighted the predictive utility of perceived autonomy support on positive and negative indicators of emotional well-being (i.e. subjective vitality and depressive symptoms) in diabetes patients. When validating the Important Other Climate Questionnaire (IOCQ), Williams et al. (2006a) found that 6-month change in percent calories from fat and tobacco abstinence were each predicted independently by autonomy support from the health care practitioner *and* by important others. However, Williams et al. did not distinguish between those referred to in this latter group. Thus, it remains unclear whether autonomy support from different significant others make similar or unique contributions towards affective outcomes and behavioural intention regarding health behaviour change. In terms of PA behaviours specifically, research has been conducted that investigates the implications of autonomy supportive environments created by exercise professionals (e.g. Edmunds et al. 2008; Fortier, Sweet, O'Sullivan, & Williams, 2007). However, these studies fail to examine as well as distinguish between the support provided by the family, friends and or medical staff, which is the focus of this research.

The major purpose of this study is to investigate the role of existing 'important other' autonomy support on the reasons for becoming PA in terms of participants who are about to commence a 12-week PA programme. While previous research on behavioural change and PA promotion has focussed on a pre-identified and selected important others as a composite group, our aim here is to investigate whether a variety of specific important others, such as partners, family members and physicians, make important and unique contributions to an individuals' motivation for becoming physically active as they enter a PA promotion programme.

Behavioural intentions and affective outcomes

Autonomous motivational regulations are important for health behaviour change because of their positive association with beneficial outcomes such as persistence, intentions and indices of mental health. When an individual is amotivated or motivated by controlled regulations, negative outcomes often ensue. For example, in a sample of exercise referral participants, Edmunds et al. (2007) found intrinsic motivation to be a positive predictor of general positive affect while introjection, a controlling regulation, was a negative predictor of subjective vitality. Autonomous regulations have also been found to be positively related to behavioural intentions. Wilson and Rodgers (2004) showed that exercise regulations of an intramural sport sample accounted for 49% of the variance in behavioural intentions to exercise. Furthermore, autonomous regulations demonstrated the strongest positive associations with exercise intentions in a study of undergraduate students (Maltby & Day, 2001). Standage and Gillison (2007) revealed that students' autonomous motivation towards physical education was associated with global indicators of well-being such as self-esteem and health-related quality of life. Therefore, reasons for participating in PA may not just impact outcomes specific to PA, but can also predict a more global level of well-being. This would be important in helping exercise referral schemes achieve the aim of improving the physical and mental health of their clients.

Autonomy support has also been shown to facilitate positive attitudes and PA intentions in research conducted in the physical domain (Chatzisarantis, Hagger, & Brickell, 2008; Chatzisarantis, Hagger, & Smith, 2007; Lim & Wang, 2009). In two studies examining the influence of perceived autonomy support on PA intentions, Chatzisarantis et al. (2007) supported a positive relationship between these two constructs in both the school children and university students. In a physical education setting, Lim and Wang (2009) found external regulations to be negatively associated with PA intentions, while autonomous regulations were positively linked with these intentions.

Study aims

No SDT-grounded research, that we are aware of, has investigated the differential predictive utility of different important others' autonomy support on positive and negative indicators of emotional well-being (i.e. subjective vitality and depressive symptoms) and PA intentions, as a function of who is providing the support. Therefore, our study of participants who are about to enter an exercise referral scheme investigated whether differential effects on self-reported mental health and PA intentions occur as a function of who provides autonomy support. To this end, we requested the participants to identify one important other who is most pertinent to their attempt to become physically active and provide a rating of the autonomy support that this important other provides. Due to the lack of previous research and the explorative nature of the this study, no hypothesised relationships were made a priori.

The second purpose of this study was to test an SDT-based structural model. Our hypothesised model is based on research conducted in teaching, coaching and exercise settings (Edmunds et al., 2007; Pelletier, Fortier, Vallerand, & Briere, 2001a; Williams et al., 1999). We expected that the autonomy support provided by

an important other identified by each participant will be positively correlated with autonomous exercise regulations and negatively correlated with more controlling exercise regulations and amotivation. Further, we predicted that more autonomous regulations would be positively associated with an indicator of good mental health (vitality) and behavioural intentions to be physically active. In contrast, we expected that the autonomous exercise regulations would be negatively correlated with an indicator of poor mental health (depressive symptoms). Finally, we hypothesised that more controlled exercise regulations and amotivation would have the reverse relationships with these outcomes. It was anticipated that the indicators of good and poor mental health would be negatively associated.

Method

Participants

Participants ($n = 347$) were individuals who were about to participate in an exercise referral scheme in a large city within the UK. In this, 73% were female (M age = 48.40 $SD = 13.84$) and 27% were male (M age = 52.40 years $SD = 13.19$) participants. The majority of participants (90.3%) were either overweight or obese (M BMI = 33.21 $SD = 6.70$), and 28.3% were from a non-white UK ethnic group. About 20% of participants were identified as having probable clinical depression, and 34.8% marked by high anxiety. Entrance onto the exercise referral scheme was based on being identified by a physician or practice nurse at a primary care level as (1) marked by at least two risk factors of cardiovascular disease (e.g. being overweight, smoking), (2) currently not participating in regular PA and (3) perceived to have the motivation to increase his/her PA levels. The sample was self-selected from a larger sample of referred patients who were invited to participate in the study.

Measures

Important other autonomy support

Autonomy support was assessed through the previously validated IOCQ (Williams et al., 2006a) derived from the Health Care Climate Questionnaire (HCCQ; Williams, Virginia, Zachary, Deci, & Ryan, 1996). Participants were asked an open-ended question that aimed to identify one important other who was particularly influential in their attempt to become physically active (i.e. 'Who is the most important person in your effort to become healthier through physical activity?'). The perceived level of autonomy support provided by the identified important other was assessed using six items (e.g. 'I feel that my important other understands how I see things with respect to my physical activity'). Each item was responded to using a seven-point Likert-type scale (*strongly disagree* = 1; *strongly agree* = 7). Previous research in a sport setting has demonstrated good internal reliability using the IOCQ (Adie, Duda, & Ntoumanis, 2008).

Reasons to exercise

Participants' motivation for engaging in exercise was measured using the Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2; Markland & Tobin, 2004). Participants were requested to respond to the BREQ-2 in terms

of their reasons for wanting to engage in PA. The BREQ-2 measures four different exercise regulations (i.e. intrinsic, identified, introjected and external), as well as amotivation. All the BREQ-2 subscales have been shown to have good internal consistency in previous research conducted in an exercise referral scheme ($\alpha = 0.70\text{--}0.91$; Edmunds et al., 2007). Each subscale was measured with four items except the introjected subscale which comprised three items. An example item for intrinsic regulations is, 'I engage in physical activity because it is fun'; identified 'I value the benefits of physical activity'; introjected 'I feel very guilty when I don't exercise'; external 'I regularly engage in physical activity because other people say that I should' and amotivation 'I don't see the point in being physically active'. All items were anchored between 0 (*not at all true*) and 4 (*very true*).

Subjective vitality

The six item version of the Subjective Vitality Scale (SVS; Bostic, Rubio, & Hood, 2000; Ryan & Frederick, 1997) was employed as a positive indicator of mental health and well-being. Participants responded to how they felt over the last 2 weeks, using a scale anchored by 1 (*not at all true*) to 7 (*very true*), and an example item is 'I feel alive and full of vitality'. The SVS has shown good internal consistency in the past studies in the exercise context with Cronbach's alphas ranging from 0.84 to 0.86 (Bostic et al., 2000).

Depressive symptoms

Depressive symptoms were assessed with a seven-item subscale from the Hospital Anxiety and Depression Scale (HADS-D; Zigmond & Snaith, 1983). The items (e.g. 'I have lost interest in my appearance') were scored on a four-point scale ranging from 0 (*not present*) to 3 (*considerable*). Previous research that has utilised the HADS-D with the general public, has revealed Cronbach's alpha values ranging from 0.67 to 0.90 (Bjelland, Dahl, Haug, & Neckelmann, 2002), thus supporting the internal consistency of this subscale.

Physical activity intentions

Participants' intentions to engage in regular PA (at least 5 days a week for a total of 30 min each day during the next 3 months, to match government recommendations) were assessed with three items (e.g. 'I intend to regularly engage in physical activity during the next 3 months'). These items were rated on a scale ranging from 1 (*strongly agree*) to 7 (*strongly disagree*). Previous research has successfully employed similar measures of PA intentions ($\alpha = 0.77$; Hagger, Chatzisarantis, & Biddle, 2001).

Procedure

Ethical approval to conduct the study was obtained from the local university ethics review committee. Participants were sent via post a multi-section questionnaire containing the instruments described above, and were asked to complete each section before arriving for their first consultation on the exercise referral scheme. Instructions informed the participants that there were no right or wrong answers and asked to respond truthfully. They were also reassured that their admission

on the exercise referral scheme was unrelated to their participation in the study. The questionnaire batch took approximately 20–25 min to complete.

Data analyses

To examine whether the individual providing autonomy support has an impact on PA intentions and indicators of well-being, a series of hierarchical regression analyses were conducted to explore the independent and interactive effects of perceived autonomy support as a function of who provides that support on three dependent variables: PA intentions, vitality and depression. The three most commonly cited significant others (partner, physician/nurse and offspring) were included in the analysis. The partner ($n = 126$) was most frequently identified as the significant other important in participants' planned attempt to become more physically active. An offspring ($n = 47$) and a physician/nurse ($n = 43$) were also frequently cited, and all the three combined represented 74% of the important others identified. There were no significant differences in the mean levels of autonomy support between the three important others [$F(2, 205) = 0.51$, $p > 0.05$]. Additional important others (e.g. friends $n = 18$) were identified by too few participants to allow meaningful analysis. Therefore, data from 216 (M age = 50.12 ± 13.4 years) were included in the regression analyses.

Due to the categorical nature of the variable important other autonomy support, dummy coding was employed as it is the most frequently utilised procedure when investigating interactions between categorical and continuous variables (Aiken & West, 1991). Two dummy variables were created. The partner was selected as the comparison group because this significant other represented the most frequently selected category (Field, 2005) and was coded as zero in both dummy variables. Dummy variable 1 identified autonomy support provided by physician/nurse which was coded as 1 (offspring = 0). In the second dummy variable, offspring was coded as 1 (physician/nurse = 0). Following the recommendations by Aiken and West (1991), autonomy support scores were standardised before the analyses were conducted. In step 1 of each regression, the standardised scores for autonomy support by a significant other were entered with dummy variable 1 (physician/nurse) and dummy variable 2 (offspring). In step 2 of each regression, the interaction terms between each dummy variable and autonomy support variables were added. Entering these simultaneously with the original variables, the interaction variables test the difference between the slope of the group with a non-zero value and the reference group (J. Cohen, P. Cohen, West, & Aiken, 2003). In terms of interpreting the results of the regression analysis, the regression coefficient for the main effect is β for autonomy support provided by a partner. The β 's for the two dummy variables are the differences between autonomy support provided by partner and the other important others (i.e. physician/nurse and offspring). The regression coefficients for the two interactions are the differences between the autonomy support slope for each important other and that of the partner (Cohen et al., 2003).

Although the significant interactions will reveal whether the effect of autonomy support varies as a function of who provided it, they do not identify where these differences lie (Aiken & West, 1991). *Post-hoc* probing of the significant interactions was conducted to examine whether the slope of the simple regression lines differed significantly from zero for each dependent variable. Therefore, to probe

the significant interactions, the standard errors (SEs) of the simple slopes of the regression equations were calculated and *t*-tests for the significance of the simple slopes were computed (Aiken & West, 1991).

Structural equation modelling (SEM), utilising the statistical software package EQS 6.1, was used to test a SDT-based structural model. The robust maximum likelihood estimation method of analysis was implemented which provides a correction for non-normality (Byrne, 2006). Model fit was evaluated using the comparative fit index (CFI), the standardised root mean square residual (SRMR) and root mean square error of approximation (RMSEA). A hypothesised model is thought to show a good fit to the data if the CFI is equal to or above 0.95, and the SRMR and RMSEA are equal to or less than 0.08 and 0.06, respectively (Hu & Bentler, 1999). Consistent with the previous research (Sebire, Standage, & Vansteenkiste, 2009) and to reduce non-normality in the data (Little, Cunningham, Shahar, & Widaman, 2002), the number of observed variables was reduced by forming parcels. The parcels were created using factor loadings as a guide. The largest factor loading was paired with the smallest to provide balance between the parcelled indicators (Little et al., 2002). Three parcels were created for perceived autonomy support, PA intentions and depressive symptoms. In-line with Deci and Ryan's (2000) theoretical writings, an autonomous latent variable was created by combining intrinsic motivation and identified items, and a controlled motivation latent variable by combining external regulations and introjected items. Autonomous and controlled motivations were indexed by four parcels each. Amotivation was represented by four observed variables while five items were used as indicators of vitality. Although multi-group invariance testing would have been desirable following the regression analyses, unfortunately, we did not have sufficient sample size to achieve this. We, therefore, used the results of the regression analysis to guide our decisions. In the SEM, we included those participants who identified their partner or their physician/nurse as the most important other because the β values for these important others were significant and similar to each other in the regression predicting PA intentions. In contrast, in the same regression, the β values for the offspring were not significant and therefore we did not include the participants who identified offspring as the most influential significant other in the SEM.

Results

Table 1 (descriptive statistics, bivariate correlations and internal reliability coefficients) reveals that participants perceived their important others (average of all three important others) to be providing a high level of autonomy support. Further, the BREQ-2 scores indicate that the autonomous regulations were moderately high in our sample and amotivation scores were low. Mean scores for vitality were moderate, those for depressive symptoms were low while scores for PA intentions were high. Bivariate correlations between the latent variables were in accordance with the theoretical postulates. Perceived autonomy support was positively associated with autonomous motivation, negatively with amotivation and positively with vitality. Autonomous motivation was positively associated with vitality and PA intentions. Indicating acceptable levels of internal consistency, the alpha coefficient for the IOCQ was 0.93, while the alpha coefficient

Table 1. Reliability analyses (Cronbach's coefficient α), descriptive statistics and bivariate correlations for perceived autonomy support, motivational regulations for exercise, mental health and physical activity intentions ($n = 216$).

Serial No.	Variables	α	M	SD	1	2	3	4	5	6	7
1.	Perceived autonomy support	0.93	5.26	1.48							
	Partner	0.93	5.23	1.40							
	Physician/nurse	0.94	5.45	1.62							
	Offspring	0.92	5.13	1.57							
2.	Autonomous regulations	0.89	2.50	0.89	0.24**						
3.	Controlled regulations	0.77	1.16	0.82	0.07	0.33*					
4.	Amotivation	0.70	0.35	0.57	-0.20**	-38**	0.11				
5.	Vitality	0.92	3.62	1.58	0.17*	0.34**	0.01	-0.16*			
6.	Physical activity intentions	0.94	5.02	1.71	0.42**	0.21**	0.08	-0.13	0.14		
7.	Depression	0.85	1.08	0.62	-0.12	-0.04	0.19*	0.07	-0.62**	-0.05	

Note: * $p < 0.05$; ** $p < 0.01$.

for the motivational regulation subscales and outcome measures ranged from 0.70 to 0.89 and 0.85 to 0.94, respectively.

Regression analyses

With respect to PA intentions, step 1 was significant [$F(3, 203) = 9.56$; $p < 0.01$]; important other autonomy support accounted for 12.4% of the variance in participants' intentions. In step 2, the interaction between dummy two (offspring) and autonomy support was also significant ($\beta = -0.67$; $p < 0.05$). For depressive symptoms, step 1 was significant [$F(3, 204) = 3.79$; $p < 0.01$]; important other autonomy support accounted for 5.3% of the variance in participants' depressive symptoms. In step 2, the interaction between dummy one (physician/nurse) and autonomy support was significant ($\beta = 0.22$; $p < 0.05$). For vitality, step 1 was non-significant [$F(3, 204) = 2.22$; $p > 0.05$] and step 2 was also non-significant [$F(5, 202) = 1.90$; $p > 0.05$]. Full details of each regression analysis are available in Table 2.

Post-hoc probing

Figure 1 shows the emerging interaction plots. *Post-hoc* probing revealed that autonomy support provided by the partners ($b = 0.75$; $t = 4.71$; $p < 0.05$) and physicians ($b = 0.87$; $t = 2.54$; $p < 0.05$) significantly predicted PA intentions. In contrast, autonomy support provided by the offspring ($b = 0.07$; $t = 0.22$; $p > 0.05$) did not significantly predict these intentions. Further, autonomy support provided by the partners significantly and inversely predicted depressive symptoms ($b = -0.16$; $t = -2.94$; $p > 0.05$); autonomy support provided by the physicians/nurse ($b = 0.01$; $t = 0.72$; $p > 0.05$) and offspring ($b = 0.01$; $t = 0.16$; $p > 0.05$) did not predict depressive symptoms.

Table 2. Dummy variable interactions and main effects of perceived autonomy support (partner, physician/nurse and offspring) on three outcomes.

	Physical activity intentions				Vitality				Depressive symptoms			
	β	SE _B	<i>t</i>	<i>F</i>	β	SE _B	<i>t</i>	<i>F</i>	β	SE _B	<i>t</i>	<i>F</i>
Main effects												
Intercept	5.13	0.15	(3, 203) 9.56*		3.66	0.14	(3, 204) 2.20		0.96	0.05	(3, 204) 3.79*	
Partner autonomy support	0.61	0.12	5.12*		0.26	0.11	-1.59		-0.07	0.04	2.31*	
Physician/nurse vs. partner	-0.54	0.30	-1.80		-0.29	0.28	3.05*		0.32	0.11	-1.02	
Offspring vs. partner	-0.28	0.29	-0.95		-0.24	0.28	0.96		0.10	0.10	-0.87	
Full model												
Intercept	5.13	0.15	(5, 201) 7.23*		3.66	0.14	(5, 201) 1.90		0.96	0.05	(5, 202) 3.50*	
Partner autonomy support	0.75	0.16	4.68*		0.43	0.15	2.80*		-0.16	0.06	-2.81*	
Physician/Nurse vs. partner	-0.59	0.30	-1.97*		-0.24	0.28	-0.86		0.60	0.11	2.84*	
Offspring vs. partner × autonomy	-0.30	0.29	-1.03		-0.24	0.27	-0.87		0.10	0.10	0.98	
Physician/nurse × autonomy support interaction	0.12	0.30	-0.41		-0.42	0.27	-1.55		0.22	0.10	2.17*	
Offspring × autonomy support interaction	-0.67	0.29	-2.34*		-0.30	0.27	-1.08		0.18	0.10	1.70	

Note: * $p < 0.05$.

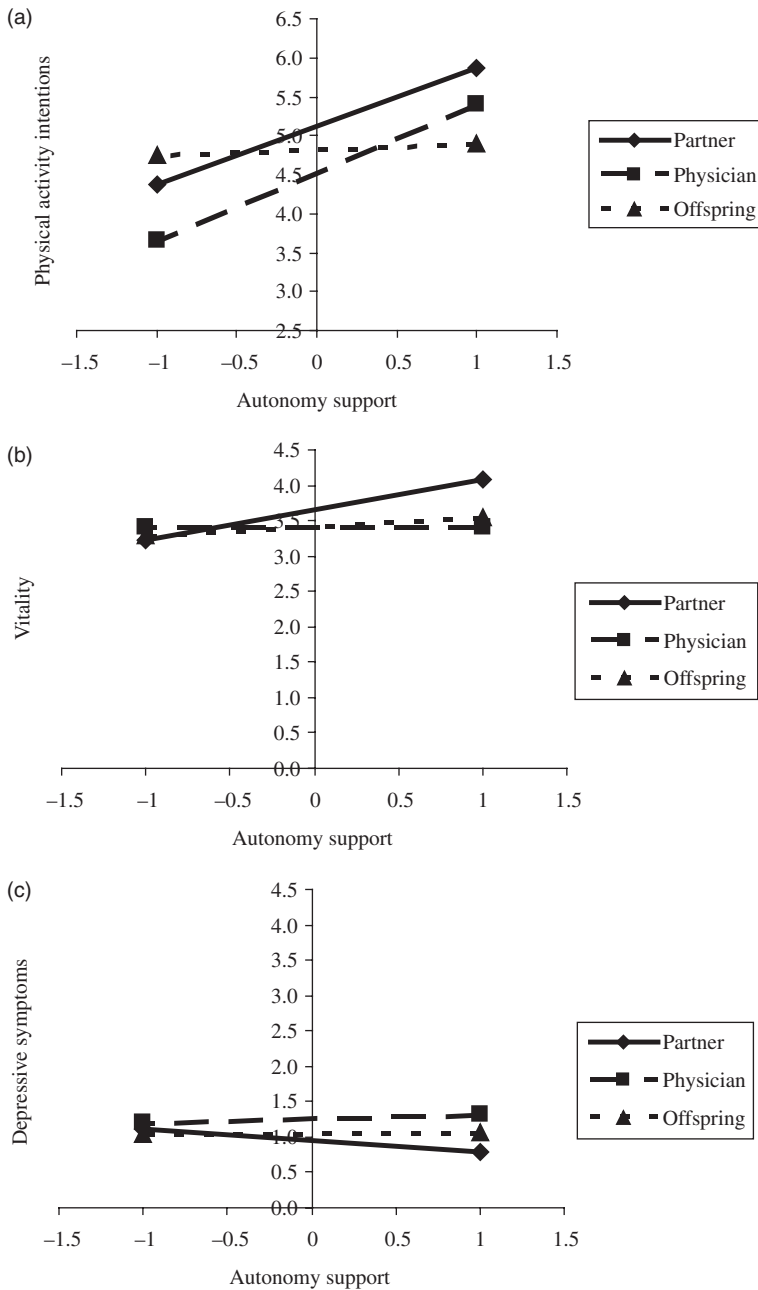
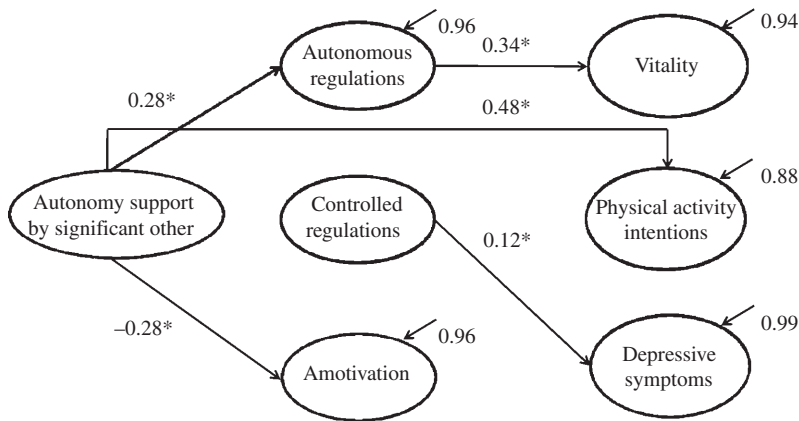


Figure 1. Significant interactions between three significant others'. Autonomy support in predicting physical activity intentions, vitality and depressive symptoms.

Structural equation modelling

Due to the lack of a predictive effect from offspring in the regression analyses, only data collected from participants who identified a partner or physician/nurse as the main providers of autonomy support are included in our SEM.



Note: For figure simplicity the correlations between indicators of autonomous regulations and controlled regulations, autonomous regulations and amotivation, and vitality and depression are not shown. * $p < 0.05$.

Figure 2. The re-specified structural model showing the error terms and significant path coefficients between autonomy support, exercise regulations, mental health and physical activity intentions.

Our hypothesised model ($n = 169$; partner $n = 126$ and physician/nurse $n = 43$) was tested and revealed an inadequate fit to the data $CFI = 0.92$; $NNFI = 0.90$, $RMSEA = 0.06$ (90% $CI = 0.05-0.08$), $SRMR = 0.10$. We proceeded in a model generating fashion to modify and re-estimate the relationships. In model assessment, misspecifications in our hypothesised model were investigated through the Wald and Lagrange Multiplier (LM) tests. Inspection of the modification indices revealed that co-varying autonomous regulations and controlled regulations, as well as autonomous regulations with amotivation and finally vitality with depressive symptoms would improve the model fit. The positive relationship between the autonomous regulations and controlled regulations indicates that our participants may have both controlling and autonomous reasons for becoming physically active. The modification indices suggested that improvement would also be made by freeing model parameters. Non-significant relationships between latent variables were removed and a direct relationship between perceived autonomy support and PA intentions was added. All identified changes were considered in theoretical terms and with respect to previous empirical evidence before being implemented. For example, previous research has shown a direct link between perceived autonomy support and PA intentions (Chatzisarantis et al., 2007).

Our final model was found to provide an adequate fit to the data: $CFI = 0.94$; $NNFI = 0.93$, $RMSEA = 0.06$ (90% $CI = 0.04-0.06$), $SRMR = 0.085$ (Figure 2). This model indicated a significant and positive relationship between perceptions of autonomy support provided by one's important other and autonomous regulations and a significant but inverse relationship with amotivation. In turn, autonomous regulations revealed a positive association with vitality. Perceptions of autonomy support provided by an important other also revealed a direct positive relationship with PA intention that was significant. Controlled reasons for participating in PA were significantly and positively associated with characteristics of negative mental health (i.e. depressive symptoms).

Discussion

This explorative research highlights that the relationship between the perceptions of autonomy support and the mental health and PA intentions of our participants varied according to the person who offered that support. Our structural model revealed that perceived autonomy support provided by partners or physician/nurses was associated with more autonomous reasons for becoming physically active and intentions to be physically active. Further, these autonomous motivations were linked to a positive mental health outcome whereas controlled motivations were associated with depressive symptoms when individuals were about to commence an exercise referral scheme.

Autonomy support provider matters

Previous research (Chatzisarantis et al., 2008) has requested participants to rate autonomy support afforded by a particular important other without differentiating between particular agents of support. In contrast, this research asked participants to specify a single most influential important other, who is relevant to their forthcoming attempt to become physically active and rate his/her level of autonomy support. Our results indicate that it may be important to specify the significant other providing autonomy support as the relationships between perceived autonomy support, mental health and PA intentions varied as a function of who imparted it.

Physical activity intentions

Our regression analyses indicated that perceived autonomy support contributed to the prediction of PA intentions. This result is consistent with previous studies involving high school children, university students and young adults in which a positive relationship has also been found between autonomy support and PA intentions (Chatzisarantis et al., 2007, 2008). This research is extended to an older population and also reveals that the significant other providing an autonomy supportive environment influences the strength of this relationship. Specifically, our results have shown that perceived autonomy support provided by partners and physician/nurse contributes to the prediction of PA intentions, but this was not the case for offspring autonomy support. Offspring's differential pattern of association with PA intentions may be explained by the lack of opportunities available for them to make meaningful contributions to their parents attempt to become physically active. Sixty-five percent of our sample was aged between 40 and 65 years suggesting that the majority of offspring referred to were approximately 10–25 years old. At this stage of the offspring lives, the amount of time and opportunities to support their parent's attempts to be physically active may be minimal. Determining the approximate age at which offspring begin to have sufficient opportunities and experience to offer salient autonomy support would be a valuable addition to the literature. Further explanation for our current findings may lie in the balance between the importance placed on the interpersonal relationship and the actual expertise that offspring possess in order to provide effective autonomy support. Also, it may be that offspring motivate behaviour change (e.g. physical activity) more through relatedness support or competence support, than through autonomy support. This may be more likely because parents are typically the authority figure

in this dyad, and thus may not experience extensive autonomy support from their offspring as they potentially could need in relationships with health practitioners or partners.

Depressive symptoms

Perceptions of autonomy support provided by partners predicted depressive symptoms negatively; in contrast, the autonomy support afforded by one's physician/nurse or offspring did not predict these symptoms significantly. The relationship between partner autonomy support and depressive symptoms may be dependent upon the type and quality of relationship that exists between the partners. Proulx, Helms, & Buehler (2007) highlights that partner relationship discord predicts the onset of major depression, and that this relationship is particularly pertinent in women, the predominant gender in this sample. This possibility is further supported by Gaine and La Gaurdia (2009) who assessed the contributions of motivation to the well-being of the relationship and found that when people are more willing to engage in various dimensions of their relationship (e.g. physical intimacy, instrumental support and disclose thoughts and feelings) greater levels of vitality are evidenced. In contrast, the more pressured or coerced they feel in their relationship, the more poorly the relationship functions. The lack of significant effect from physician/nurse to depressive symptoms contradicts that found by Williams, McGregor, King, Nelson, & Glasgow (2005), who highlighted that autonomy support provided by the US physicians was negatively linked to reported depressive symptoms among their patients. The frequency at which the two (American vs. English) samples tend to see the same physician may provide an explanation for these contradictory results. Participants in Williams et al.'s study consistently visited the same physician. In contrast, participants in this study may have visited a series of different physicians (i.e. whoever was available to see in their general practice) therefore reducing the opportunity for them to build rapport and effectively impact affective outcomes such as depressive symptoms. However, it is important to note that although a significant relationship between autonomy support and depressive symptoms was observed in our study, the amount of variance explained in depressive symptoms was low. Further research is necessary to help elucidate whether cultural differences or patterns of visits to the physicians impact the degree of association between one's main health care provider and negative indicators of mental health.

Vitality

Although a small significant bivariate correlation was observed, perceived autonomy support did not significantly contribute to the prediction of vitality. Similar to depressive symptoms, a small amount of variance was explained by autonomy support; therefore it appears that other factors may be responsible. These data suggest that the autonomy supportive aspect of the environment is not particularly relevant to the targeted indicator of positive mental and emotional health. It is also possible that the relationship between autonomy support and vitality is indirect via the satisfaction of the basic psychological needs and motivational regulations (Vallerand, 1997), an explanation we return to shortly when we describe the results stemming from the SEM analysis.

Taken together, the results of our regression analyses indicate that different significant others may make a unique contribution to an overall autonomy supportive environment. Therefore, it is important that future studies identify all 'important others' when tapping the wider environment relevant to behaviour initiation and change. For example, future research could request each participant to rate their perceptions of autonomy support for a range of significant others to allow normative comparisons.

An explanation of the mechanism behind the differential effect between important others may lie in the possibility that basic psychological needs (Ryan & Deci, 2000) are being satisfied to different degrees by different important people in our lives. Further, the psychological needs might have differential relationships with the identified outcomes (e.g. vitality, depression and intentions). Research has shown that the autonomy support leads to the satisfaction of all three basic needs, but the level to which each need is satisfied may vary (Adie et al., 2008). For example, it is conceivable that the autonomy support provided by a health and fitness advisor may lead to greater satisfaction of the need for competence, whereas autonomy support provided by a partner may satisfy the need for relatedness. In the context of sport, Adie et al. (2008) found that the autonomy support provided by a coach led to the satisfaction of all three needs. However, relatedness demonstrated the largest path coefficient followed by autonomy, and then competence. Satisfaction of the basic psychological needs via PA engagement was not assessed at baseline in this study due to the fact that the participants had not started the exercise programme. However, we would speculate that when the quality and quantity of autonomy support is the same from different individuals (e.g. a friend *vs.* a physician), then internalisation will be facilitated. Self-determination theorists indicate that the differential status that exists between the subject (or client, or student or child) and the practitioner (or teacher or parent) may provide a greater effect in the internalisation of autonomy and competence, but this has not been determined empirically. For example, if a physician and an acquaintance of the subject made the same autonomy and competence supportive comments about the issue of healthy levels of PA to the participant, the physician might be expected to facilitate greater levels of autonomous self-regulation for physical activity. In addition, personal perceptions and preference may also be predictive factors. Future research that assesses the degree of satisfaction of each basic psychological need as a function of who provides the support could test the aforementioned possibilities.

Testing a process model

Our model indicates that perceived environmental support and reasons for participating in PA have an impact on well-being and PA intentions in the beginning before commencing an exercise referral programme. Perceived autonomy support by the partner and physician/nurse, positively predicted autonomous reasons for participating in physically active behaviours. Predominantly middle aged adults, about to enter a PA intervention, showed more self-determined reasons for participating in PA when they perceived their important others to have been creating an environment that is autonomy supportive. This finding provides further support to literature showing a positive relationship between autonomy support and autonomous regulations for participating in PA (Wilson & Rodgers, 2004).

As predicted, autonomy support was negatively linked to being amotivated towards becoming physically active. This observed negative relationship indicates that when choice is provided, perspective of opinion is taken and there is an acknowledgment of positive and negative feelings towards the targeted behaviour by significant others, amotivation is an unlikely outcome. A similar relationship between amotivation and autonomy support has been found in relation to coach (Pelletier et al., 2001b) and physical education teacher environment (Lim & Wang, 2009; Standage, Duda, & Ntoumanis, 2003). We further predicted that autonomy support would negatively predict controlling behaviours. However, in the final model, no significant path was found. An explanation for this non-finding may be that it requires more than the absence of perceived autonomy support to create controlled regulations. It is possible that a controlling and actively need thwarting environment is necessary to form these types of regulations. In the past research that has studied the relationship between autonomy support and controlled regulations, the path coefficients are far lower than those observed for autonomous regulations. For example, among young women, Wilson and Rogers (2004) reported model path coefficients between autonomy support provided by friends and intrinsic regulation and identified regulation of 0.56–0.58, respectively, compared to two non-significant path coefficients for external and introjected regulations (which were -0.10 and 0.09 , respectively). Further, as yet unexplored is how to assess undermining effects of the environment created by significant or important others. Future research might ask participants to consider rating more controlling behaviours of influential others that may undermine participants' efforts to be physically active.

Outcomes of autonomy support and motivation regulations

Our revised model revealed that none of the regulations were associated with PA intentions. However, a direct link between perceived autonomy support and PA intentions was found. Previous research (Chatzisarantis et al., 2007) has indicated that autonomy support contributes to intentions regarding subsequent PA engagement. Our structural model indicates that this path is not indirect via motivational regulations, as had been predicted, in participants who are about to enter a PA intervention. It is possible that their motivational regulations for participation become important once the intervention progresses and participants start to become physically active. However, when our participants perceived their 'incoming' social environment to be autonomy supportive, it was more likely that they possessed more positive intentions to be physically active over the forthcoming exercise programme. Even when no direct link between autonomy support and intentions is included in SDT-based structural models, a correlation appears to be evident. For example, despite Lim and Wang's (2009) structural model revealing no significant path from autonomy support (teacher) to PA intentions, a significant positive correlation was observed. The relationship of autonomy support to intentions could be underpinned by the impact of this environmental dimension on the basic psychological needs. For example, when an individual is in an autonomy supportive environment, your feelings of competence regarding the behaviour at hand may be enhanced which could then influence your intentions. A mediating role for the basic psychological needs is consonant with the self-efficacy literature which predicts and has observed a positive association between self-efficacy and PA intentions (Tulloch et al., 2009). It is also possible that change in autonomous need

satisfaction mediates the indirect relationship between autonomy support and PA intentions. Consonant with this supposition, results stemming from a recent randomised control trial (Teixeira et al., 2009) found autonomous motivations predicted successful behaviour change.

Our model also revealed a positive association between autonomous regulations and vitality. This finding corroborates the previous research and supports the link between self-determined motivation and indices of well-being. For example, Nix, Ryan, Manly, & Deci (1999) concluded that engaging in self-determined activity can enhance subjective vitality relative to engaging in a more controlled activity. This observed relationship between autonomous regulations and vitality might explain the non-significant association revealed in this study between autonomy support and vitality. It is possible that individuals' motivation towards a behaviour is a more proximal determinant of their perceptions of vitality. In cases where autonomous motivation is high, individuals are more likely to value energy and volitionally engage in the behaviour. Therefore, it makes sense that autonomously initiated participants are likely to feel invigorated in association with the prospect of becoming more physically active.

In contrast, when motivation for PA engagement is more controlled, our model indicates that depressive symptoms are more likely to be evidenced. This finding provides corroborative evidence for the potentially negative impact of controlled motivations on psychological health (Vansteenkiste, Zhou, Lens, & Soenens, 2005). It is important to keep in mind, however, that the present findings are based on cross-sectional data. Thus, the present results merely suggest that when we participate in behaviours for external rewards or because of external or internal pressure (without self-endorsement), feelings of depression, such as being unable to look forward to participate in activities, are likely to ensue. It might be the case that individuals who experience depression are more likely to feel controlled motivation for participation in positive health-related behaviour.

Practical implication

This research provides a unique insight into the determinants and consequences of motivation among those at the beginning of their journey towards health behaviour change. These findings may be extended to other health behaviours, such as dieting, smoking cessation and medical adherence, and highlight that perceptions of autonomy support and the reasons for commencing behaviour change could impact behavioural intentions and indicators of well-being from the offset. However, further research would be necessary to corroborate such extrapolations. Our research also indicates that when designing autonomy support interventions, it is important to determine who the participants believe to be an important significant other. This sample investigated was drawn from a population that is about to commence participation in an exercise referral scheme. Knowledge of these participants' incoming perceptions of environmental support and motivation offers an important information for health fitness advisors regarding their clients' reasons for and potential supports for or barriers to commencing the adoption of the new behaviour. This knowledge can aid exercise professionals in how to continue with the most effective advice and guidance, in terms of achieving behavioural change combined with optimal physical and psychological functioning.

Strength and limitations

This investigation provides an important and unique contribution to the literature by indicating that the provider of autonomy support influences the relationship of autonomy support to PA intentions and indicators of mental health. Specifically, this research paves the way for future studies exploring which important other's autonomy support has the greatest positive impact on well-being and PA intentions. Such findings can inform future health initiatives that attempt to increase the PA and well-being through social environmental intervention (e.g. the provision of informational programmes for the partners of individuals who are about to commence a behavioural change programme).

Although some non-expected findings have been revealed, we have shown that the participants arrive at the beginning of their exercise programmes with a variety of motivations and that these motivations are already linked to variability in their psychological health and well-being in theoretically consonant ways. Therefore, knowledge about their client's motivation could be critical for the exercise instructors to help progress the process of behaviour change and improve their mental health.

It is important to note that this investigation only recruited participants who attended the exercise referral scheme and therefore failed to sample individuals who received a referral to the scheme but failed to attend. Participants who had been recommended but showed no intention of participating in the intervention represent a critical population that is frequently neglected and indeed difficult to access in research studies. Future research that centres on the motivation-related and health characteristics of non-attenders would be a welcome addition to the literature. It is also noteworthy that due to a restricted sample size, we were unable to implement more fine-grained analysis techniques, such as multi-group invariance testing. Future research that includes such analytical procedures would help establish any differential effects on motivational regulations as a function of who provides autonomy support.

A limiting aspect of this study is the self-report nature of perceived autonomy support and PA intention. High scores on the HCCQ indicate that all participants rated their important others favourably, resulting in less variance in the data. This limited variability may be attributable to a methodological artefact or because participants were requested to select a particularly influential important other. Thus, in future research in this area, it may be revealing to specify that 'influential' can be both promotive and/or reflective of a negative impact. PA intention is also self-reported and thus does not represent the actual PA a participant achieves. Self-regulation of a behaviour may change over time when one moves from initiating to maintaining the behaviour in question. Thus, the actual self-regulation may be connected with behaviour, while the self-regulation may not be related or as strongly related to a behavioural intention. Autonomy support is theorised to aid the internalisation of our reasons for participating in a behaviour and it is this change in autonomous self-regulation that predicts change in physical activity. The current cross-sectional data only provides a single snapshot in time, therefore, preventing an examination of the internalisation process. Future research with a longitudinal design would provide a means of examining the relationship between autonomy support and changes in PA over time.

In conclusion, this research draws attention to the importance of the source of autonomy support when predicting the well-being and PA intentions. This study

also provides a basis for future research designs that test the inter-relationships between autonomy support, motivational regulations and indicators of well-being and ill-health before exercise interventions.

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