Pergamon

Person. individ. Diff. Vol. 23, No. 5, pp. 745–752, 1997

Printed in Great Britain
0191-8869/97 $17.00+0.00

PII: S0191-8869(97)00107-4

A GRADED CONCEPTUALISATION OF SELF-DETERMINATION IN THE REGULATION OF EXERCISE BEHAVIOUR: DEVELOPMENT OF A MEASURE USING CONFIRMATORY FACTOR ANALYTIC PROCEDURES

Elaine Mullan,* David Markland and David K. Ingledew

School of Sport Health and Physical Education Sciences, University of Wales, Ffriddoedd Building, Bangor, Gwynedd LL57 2EN, Wales

(Received 8 March 1997)

Summary—The aim of this research was to test the continuum of behavioural regulation, as outlined by Deci and Ryan (1990), in the exercise domain. A Behavioural Regulation in Exercise Questionnaire (BREQ) was developed to measure external, introjected, identified, intrinsic and amotivated forms of regulation for exercise behaviour. 298 sports centre attendees completed the questionnaire. Confirmatory factor analysis supported the existence of this gradient of autonomy in exercise behaviour regulation but high levels of skewness in the amotivation items indicated that amotivated regulation was not relevant for this sample. A four factor model with amotivation eliminated demonstrated acceptable discriminant validity and internal consistency. A second study confirmed the factor structure and internal consistency of the measure. Multisample analysis established factorial invariance across gender. Subscale intercorrelations approximated a simplex pattern, characteristic of an underlying continuum. The BREQ may allow finer analysis of the motivational forces at play in exercise adoption and maintenance situations. © 1997 Elsevier Science Ltd.

Keywords: exercise, motivation, self-determination, behavioural regulation

INTRODUCTION

The benefits of exercise are well established (see Bouchard, Shephard & Stephens, 1994) and consequently research has examined motivation for exercise with the aim of encouraging greater participation. Deci and Ryan's (1985) cognitive evaluation theory (CET), one of three sub-theories within the broader self-determination theory framework, has had a significant impact on research examining motivations in the sport and exercise domains (see Ryan, Vallerand & Deci, 1984; Vallerand, Deci & Ryan, 1987; Frederick & Ryan, 1995). There is impressive empirical support for the theory's propositions which are based on the hypothesised influence of internal and external events on intrinsic and extrinsic motivation (see Deci & Ryan, 1987). Recently, Deci and Ryan (1990) have suggested that the motivational dichotomy proposed by CET has, in a sense, outlived its usefulness and that pitting external motivation against internal motivation may be misleading. There are clearly degrees of intrinsic or extrinsic motivation that fall between these two extremes. In the case of exercise, it is unlikely that people will maintain a programme of regular exercise, with all the organisation and commitment it entails, purely for the intrinsic reasons of fun and enjoyment. On the other hand, exercisers are unlikely to arrive at any degree of consistency in their exercise behaviour if they are regulated solely by external forces.

Deci and Ryan (1985, 1990) and Deci, Vallerand, Pelletier and Ryan (1991) have reconceptualised the internal-external dichotomy and proposed an intrinsic-extrinsic continuum which is grounded in organismic integration theory (OIT), another sub-theory of self-determination theory. OIT is concerned with the process by which individuals come to regulate acts which are not initially intrinsically interesting by transforming regulation by external contingencies into regulation by internal processes. OIT outlines several forms of behavioural regulation: external, introjected, identified, and integrated, which manifest varying degrees of self-determination and are best placed on a continuum ranging from non-self-determined to completely self-determined motivation.

Behaviour which is externally regulated is undertaken purely to avoid immediate negative conse-

*To whom all correspondence should be addressed.

quences, typically administered by another. In the case of exercise this would represent the "I exercise because I am told to" approach, and represents non-self-determined regulation. Introjected regulation of behaviour follows internalisation of external control which is then applied to the self through the administration of sanctions, pressures and other self-controlling behaviours (Deci & Ryan, 1985). In this case "I'll feel guilty if I don't" might be given as a reason for exercising. Action undertaken because of its value, importance or usefulness to the individual is evidence of identified regulation (Deci & Ryan, 1990; Deci *et al.*, 1991). Finally, when the regulatory process is fully integrated within the individual's sense of self, regulation is completely autonomous and known as integrated regulation; behaviour is undertaken willingly and with no sense of coercion (Deci & Ryan, 1990). Integrated regulation is, consequently, very similar to the concept of intrinsic motivation which also represents fully self-determined regulation. However, according to Deci *et al.* (1991) "intrinsic motivation is characterised by interest in the activity itself, whereas integrated regulation is characterised by the activity's being personally important for a valued outcome" (p. 330).

There have been two distinct yet conceptually similar approaches to the measurement of this behavioural regulation continuum. Connell and Ryan (1984, 1987) and Ryan and Connell (1989) have developed the Self-Regulation Questionnaire for Academic settings (SRQ-A) to measure extrinsic, introjected, identified, and intrinsic forms of regulation. Vallerand, Pelletier, Blais, Brière, Senécal and Vallières (1992) have developed the Academic Motivation Scale (AMS) which, in addition to measuring extrinsic, introjected, and identified regulation, taps three types of intrinsic motivation (to know, to accomplish and to experience stimulation), and also measures amotivation. Amotivation represents a belief that outcomes are not contingent on behaviour and results from perceived incompetence due to repeated failure, or persistent negative feedback (Deci & Ryan, 1985). The theory's primary empirical application has been in the area of educational psychology (e.g. Grolnick & Ryan, 1987, 1989; Deci *et al.*, 1991; Vallerand & Bissonnette, 1992). The continuum has also been found to be relevant to couple happiness (Blais, Sabourin, Boucher & Vallerand, 1990), the elderly (Vallerand & O'Connor, 1989), prosocial motivation (Ryan & Connell, 1989) and sports involvement (Pelletier *et al.*, 1995).

This paper describes the development of a measure of behavioural regulation in exercise. Two studies were conducted. The first study involved the development of the Behavioural Regulation in Exercise Questionnaire (BREQ) from an *a priori*, five factor model comprising external (EXT), introjected (ID), identified (ID), intrinsic (IM), and amotivated (AMOT) forms of regulation. Confirmatory factor analytic procedures were used to test the hypothesised model. In the second study, the findings of the first study were validated with a new sample, and the invariance of the factor structure across gender was examined with multisample analysis. It was considered important to establish the generalisability of the factor structure of the BREQ to both males and females given that past research has found gender differences in motivational orientations (see Weiss & Chaumeton, 1992). Finally, it was hypothesised, as proposed by Ryan and Connell (1989), that the pattern of intercorrelations between the different forms of behavioural regulation would conform to a simplex-like pattern, or ordered correlation structure, wherein forms of behavioural regulation that are nearer in conception, and thus closer on the behavioural regulation continuum, display a greater positive correlation than those deemed more discrepant and farther apart on the continuum. Such a pattern of correlations has also been found by Blais *et al.* (1990) in the context of couple happiness, by Goudas, Biddle and Fox (1994) in the context of school physical education classes, and by Pelletier *et al.* (1995) in the context of sports involvement.

STUDY 1

METHOD

Sample

Respondents were 298 attendees of a local sports centre, 68% female (M age $=29.98$, SD$=9.18$) and 32% male (M age$=30.38$, SD$=8.84$). 36% were university students, 37.5% professional workers, 16% clerical/managerial workers, 7% home carers, 2% manual workers, and 1.6% of no stated occupation. 52.3% of respondents reported being regular exercisers for more than six months, while 44% had either become regular exercisers in the past six months, or were only irregular exercisers. The remaining 3.7% did not exercise.

Item generation

An initial pool of 30 items was derived from AMS (Vallerand *et al.*, 1992) and SRQ (Ryan & Connell, 1989) items, the wording of which were modified to reflect reasons for exercise. Items were scored on a five point Likert-type scale ranging from *not true for me* (0), through *sometimes true for me* (2), *to very true for me* (4).

Procedure

Respondents were approached either before or after an exercise class at the sports centre. Each was briefly informed that the questionnaire examined reasons for exercising, took approximately five minutes to complete and that it would be answered anonymously. Verbal consent was obtained and individuals were referred to the instructional set for instructions on how to complete the questionnaire. Individuals then completed the questionnaire in the sports centre either immediately prior to or following their exercise class.

Model testing strategy

Data were analysed with confirmatory factor analysis using the EQS (Bentler, 1995) statistical package. Model testing involved three stages, as recommended by Jöreskog (1993). In the first stage each subscale was examined individually in order to retain only those items which were good indicators of their underlying latent variable. In the second stage each subscale was paired with every other subscale in order to eliminate any ambiguously loading items. Finally, in the third stage, the fit of the full model, following item deletion, was examined. In stages two and three all factors were allowed to correlate freely. The internal consistency and discriminant validity of each subscale was also examined in the final stage.

In the first two stages an item was considered for deletion if it displayed large standardised residuals ($> \pm 2$), if there were indications that its error term was correlated with that of another item, if it had a low factor loading (< 0.40), or if there were indications that it would cross load on to a non-intended factor. Measurement models were specified a priori and error terms were not allowed to correlate in order to gain improvements in fit (see Anderson & Gerbing, 1988; Jöreskog, 1993; Byrne, 1994).

Examination of skewness and kurtosis values indicated that the data were non-normally distributed. There was significant multivariate kurtosis (Mardia's coefficient $= 391.79$) and several items had univariate skewness values greater than three and kurtosis values greater than 10, most noticeably in the five-item amotivation subscale. Accordingly the data were analysed with normal theory ML estimation with the 'Robust' statistics option. This option calculates the Satorra-Bentler scaled chi-square, a scaling correction computed on the basis of estimation method, model and sample kurtosis values (Bentler, 1995). Under violation of distributional assumptions the scaled chi-square statistic has been shown to have more trustworthy standard errors (Bentler, 1990; Hu, Bentler & Kano, 1992; Byrne, 1994; Hu & Bentler, 1995).

RESULTS

The five amotivated regulation items exhibited particularly high levels of skewness (range $= 1.14$–4.62; $M = 3.03$) indicating that the majority of respondents found that the amotivated items were not true for them. Thus, the five-item amotivation subscale appeared to be irrelevant for the current sample and was eliminated from further consideration. In the first stage of model testing, separate single factor models were tested for each of the four remaining subscales. On the basis of a priori item deletion criteria one confounding item was deleted from each of the external regulation (EXT), identified regulation (ID) and intrinsic regulation (IM) scales, reducing item numbers from six to five in each case. Re-specification of the modified EXT, ID and IM measurement models resulted in improved fit. Factor loadings ranged from 0.34 to 0.88 indicating some scope for further item deletion in the second stage.

Table 1. Items and factor loadings (with 'Robust' standard errors) at final stage of model testing in Study 1

Factors and items	Factor loading (*SE*)
External regulation	
I exercise because other people say I should	0.66 (0.06)
I take part in exercise because my friends/family/spouse say I should	0.77 (0.07)
I exercise because others will not be pleased with me if I don't	0.56 (0.09)
I feel under pressure from my friends/family to exercise	0.75 (0.10)
Introjected regulation	
I feel guilty when I don't exercise	0.67 (0.07)
I feel ashamed when I miss an exercise session	0.75 (0.07)
I feel like a failure when I haven't exercised in a while	0.74 (0.07)
Identified regulation	
I value the benefits of exercise	0.63 (0.07)
It's important to me to exercise regularly	0.72 (0.06)
I think it is important to make the effort to exercise regularly	0.74 (0.05)
I get restless if I don't exercise regularly	0.73 (0.06)
Intrinsic regulation	
I exercise because it's fun	0.74 (0.05)
I enjoy my exercise sessions	0.88 (0.05)
I find exercise a pleasurable activity	0.87 (0.04)
I get pleasure and satisfaction from participating in exercise	0.85 (0.05)

Problems were encountered during analysis of the seven-item introjected (IJ) subscale. Results indicated the likely presence of two factors explaining the relationships among the items. Further analysis supported the separation of the seven item subscale into three-item and four-item groupings with goodness of fit criteria revealing satisfactory fits for both single factor models. The correlation between these three-item and four-item groupings was examined in order to determine their relationship. The correlation was extremely small (0.01) underscoring the fact that they were not tapping the same construct. The three-item grouping was considered to best capture the true meaning of introjected regulation and in view of the essentially confirmatory nature of the approach to developing the BREQ, it was decided to remove the four-item grouping from the model.

In the second stage of analysis each of the four subscales, EXT, IJ, ID and IM was paired with each of the other subscales in order to examine their psychometric integrity in the presence of another related factor. The aim was to retain only those items that clearly loaded on the appropriate factor and delete any ambiguously loading items. A further item was deleted from each of these subscales, in accordance with *a priori* criteria, leaving a total of 15 items. The remaining items and their factor loadings can be seen in Table 1.

In the final stage the four-factor, 15-item model was tested. Acceptable goodness of fit indices were obtained: Satorra-Bentler scaled $\chi^2_{84} = 184.16$ ($\chi^2_{84} = 239.28$), $p < .001$; goodness of fit index (GFI) = 0.90, root mean square error of approximation (RMSEA) = 0.07, non-normed fit index (NNFI) = 0.91. The internal consistency of the four subscales was assessed with Cronbach's alpha reliability coefficient. The subscales demonstrated acceptable reliability levels (EXT = 0.789, IJ = 0.763, ID = 0.786, IM = 0.903). Discriminant validity was established with reference to subscale inter-correlations for which 95% confidence intervals (± 1.96 SE) were computed. In each case confidence intervals did not encompass 1.0 indicating that all factors were imperfectly correlated (Anderson & Gerbing, 1988).

STUDY 2

The aim of the second study was to validate the findings from the initial development of the BREQ, to confirm that the factor structure of the BREQ was equally applicable to both males and females using multisample confirmatory factor analysis and to examine subscale inter-correlations for the presence of a simplex pattern.

METHOD

Sample

The new 15-item, four-factor BREQ was administered to a second sample of 310 individuals as part of a larger study examining relationships between the continuum of behavioural regulation and the stages and processes of change (Prochaska & DiClemente, 1984). The results concerning stages and processes of change will not be reported here. Respondents comprised 155 females (M age $= 36.04$, SD $= 11.07$, 28 did not report their age) and 155 males (M age $= 39.07$, SD $= 11.45$, 12 did not report their age). 56.4% were blue collar workers, 34% were white collar workers and 9% were retired or full-time home carers. 13.3% reported that they did not exercise, 51% reported exercising a little and 47% reported exercising regularly.

Procedure

Questionnaires were distributed directly to employees at three work sites: two white collar and one blue collar. An additional subset of questionnaires was distributed to members of a local Bridge Club. Individuals were informed that the questionnaires examined reasons for exercising, would be answered anonymously and took approximately five minutes to complete. Verbal consent was obtained and individuals were referred to the instructional set for instructions on how to complete the questionnaires. Blue collar workers completed their questionnaires during their break and questionnaires were collected immediately. Completed questionnaires were collected from white collar workers and Bridge Club members during the following week.

Analysis

Skewness values ranged from -0.01 to 3.28 and kurtosis values ranged from 0.074 to 13.20 (Mardia's multivariate kurtosis coefficient $= 100.82$). Accordingly, ML estimation was used in conjunction with the 'Robust' option in the EQS statistical package. There were two stages to the analysis. First, the complete four-factor, fifteen-item model was subjected to confirmatory factor analysis and Cronbach's coefficient alpha was examined for each subscale. Examination of the distribution of scores revealed that the data were non-normally distributed. Second, the factorial invariance of the BREQ was tested across gender using multisample confirmatory factor analytic procedures. Multisample analysis permits a powerful test of the generalisability of factor analytic solutions across groups for which there is parallel data (Marsh, 1993). The procedure involves the examination of the combined goodness of fit of increasingly restrictive models with invariance constraints being successively imposed on the model's parameters.

Factorial invariance was tested hierarchically. The complete model was first examined for males and females separately to establish the adequacy of the baseline model. At the next level of testing the equivalence of the factor loadings across groups was tested. At the third level, equivalence of factor loadings and factor variances and covariances was examined. Finally, equivalence of factor loadings, factor variances and covariances, and measurement errors was tested. A notable decrease in fit following an increase in equality constraints is evidence of inequality of model parameters across groups. Tests of invariance at each level were evaluated with the parsimony normed fit index (PNFI: James, Mulaik & Brett, 1982; this was calculated by hand) in addition to the fit statistics used previously. A more constrained model should show higher PNFI values, that is, be more parsimonious than one which is less constrained. Therefore, as additional invariance constraints are imposed PNFI values should increase if factorial invariance is to be demonstrated. In sum, a model with more constraints should not show a notable decrease in goodness-of-fit indices and should have higher PNFI values than its less constrained counterparts. Multisample factor analytic procedures in EQS generate a smaller range of fit statistics than does the single sample confirmatory factor analysis procedure and the Satorra-Bentler scaled chi-square and the robust standard errors are not available.

RESULTS

The complete four-factor, 15-item model was tested and the resulting goodness of fit indices were similar to those found in study 1: Satorra-Bentler scaled $\chi^2_{84} = 172.93$ ($\chi^2 = 277.19$), $p < 0.001$, GFI $= 0.91$, RMSEA $= 0.07$, NNFI $= 0.92$. Alpha reliabilities were adequate: EXT $= 0.79$, IJ $= 0.78$, ID $= 0.79$, IM $= 0.90$. Table 2 shows the fit indices for the male and female data separately and for the increasing invariance constraints applied simultaneously to the male and female data. In support of the invariance constraints, fit was acceptable at each level of constraint and PNFI values increased as constraints increased. Although there was a clear decrement in fit when measurement errors were

Table 2. Fit statistics for complete model for males and females separately and for equality constrained models for combined male and female data in Study 2

	χ^2	(df)	p	NNFI	CFI	PNFI
Males only	180.69	(84)	*	0.89	0.91	
Females only	152.20	(84)	*	0.93	0.94	
FL invariant	377.50	(183)	*	0.90	0.91	0.74
FL, FCr, FV invariant	385.97	(188)	*	0.90	0.91	0.75
FL, FCr, FV, ME invariant	496.26	(203)	*	0.86	0.87	0.77

Note: NNFI = Nonnormed fit index; CFI = Comparative fit index; PNFI = Parsimony normed fit index; FL = factor loadings; FCr = factor correlations; FV = factor variances; ME = measurement error.
* $p < .001$

Table 3. Factor intercorrelations (with 'Robust' standard errors) in Study 2

Subscale	External	Introjected	Identified	Intrinsic
External	–			
Introjected	0.30 (0.08)	–		
Identified	0.01 (0.06)	0.58 (0.04)	–	
Intrinsic	−0.08 (0.06)	0.36 (0.05)	0.84 (0.02)	–

constrained to equality, equality of measurement error across groups is a stringent requirement that is also a less important invariance constraint than either invariance of factor loadings or factor variances and covariances (Marsh, 1993). Table 3 shows the subscale intercorrelations. Adjacent subscales were found to be more highly correlated than those at opposite ends of the continuum and thus conformed to a simplex pattern.

DISCUSSION

The aims of this research were to develop a measure of behavioural regulation in exercise, validate the findings with a second sample, examine the equality of the factor structure across gender and examine the pattern of subscale inter-correlations. The findings supported the factorial validity of the differentiated conception of motivation in the exercise domain and resulted in the development of a brief measure of behavioural regulation in exercise. In addition, multisample analyses revealed that the four factor structure of the BREQ is valid for both males and females.

The major modification to the target model was the removal of the amotivation factor. Although theory (Deci & Ryan, 1985) and previous use (Vallerand *et al.*, 1992; Pelletier *et al.*, 1995) have established the significance of this factor in other contexts, high levels of skewness testify to its irrelevance to the current sample. Amotivated reasons for exercise such as "I can't see why I should bother exercising" are likely to be inapplicable for those freely choosing to exercise, where regular exercising is not an external requirement, as it is, say, in fire fighting (job requirement), or coronary rehabilitation (prevention of relapse) settings. The amotivation items were derived from questionnaires examining behavioural regulation in academic settings where attendance is an external requirement and, therefore, where amotivation may be a common experience. The final four-factor model, measuring extrinsic, introjected, identified, and intrinsic regulation is consistent, however, with Ryan and Connell's (1989) model of behavioural regulation.

The pattern of intercorrelations found is an ordered pattern reflecting an underlying continuum rather than an underlying dichotomy. This offers some support for the construct validity of the BREQ. According to Ryan and Connell (1989) introjected regulation represents low self-determination and it should, therefore, be highly correlated with external regulation. In the second study here however, the introjected subscale displayed a greater correlation with the more self-determined identified subscale than it did with the less self-determined external scale. Nevertheless, findings from previous research in this regard have been mixed (e.g. Goudas *et al.*, 1994; Ryan & Connell, 1989; Blais *et al.*, 1990). It may be that while the ordering of correlations across the continuum generally conforms to a simplex pattern, the actual size of the correlations between adjacent pairs may differ in different contexts.

During analysis of the hypothesised introjected regulation subscale two latent variables were identified as underlying the seven items. According to Deci and Ryan (1990) introjection "involves establishing 'shoulds' or rules for action that are associated with, or enforced by, expectations of self approval, or of avoiding guilts and anxieties" (p. 256). Introjected regulation may, therefore, have two clearly discernible components: internalisation of rules and enforcement, or regulation, of behaviour. The items in the three-item grouping (the final introjected scale) concern exercising because of feelings of guilt, shame, or failure, that is, regulation by guilt-avoidance. Those in the four-item grouping represent the internalisation of exercise as a required or necessary effort: 'I feel I ought to', 'exercise is a bind but has to be done', 'I have to push myself', and 'it is a real effort'. These three-item and four-item groupings, however, were uncorrelated (0.01). It appears, therefore, that although all seven items are in accord with the concept of introjection, empirically the two components are unrelated and not, in fact, measuring the same construct. Whether or not these elements should represent separate points on the behavioural regulation continuum requires further detailed research.

This conceptual quandary highlights the need for rigorous definition of such constructs. There is much disparity in operational definitions among current measures of behavioural regulation. More consistency among construct indicators is needed which requires detailed attention, both empirical and theoretical, to construct definition. Ryan (1992, personal communication) notes that "if you have an interest in the idea of autonomy or internalisation then you already understand how imperfect and merely heuristic these current scales are. I therefore encourage changes, adaptations and especially improvements".

Before concluding, it is appropriate to outline the limitations of the first study resulting from the sample used in the instrument's development. First, the predominant mode of exercise undertaken by the majority of the sample was organised aerobics and circuit training-style classes. It is often the case, however, that those involved in more self-directed activities, such as running, swimming, or cycling, are in training for a competitive purpose and, as such, may have different motives for exercise. Further research is needed to determine whether it is the type of exercise structure that influences motivation, or whether it is existing regulation that influences choice of exercise structure (Fortier *et al.*, 1995). Second, the majority of questionnaire respondents in the first study were female. However, multisample analysis in the second study confirmed the invariance of the factor structure of the BREQ across gender.

The BREQ may allow finer analysis of the motivational forces at play in exercise adoption and maintenance situations. Such analysis can be conducted with equal confidence in the validity of findings for both males and females. A focus on underlying, source level motives for exercise, as represented by the behavioural regulation continuum, rather than surface level motives (such as weight control, socialisation, and fitness) may increase our understanding of the way in which perceived self-determination for action influences behaviour. Knowing a person's surface level motive for undertaking a behaviour may not pin point their regulatory source. For example, exercise for purposes of weight control could be regulated by the importance and value of a trim body, by guilt at failure to expend more calories, or to control medical conditions. Therefore, it maybe unwise to gauge the degree of self-determination from such specific motives. Furthermore, the BREQ's implied continuum and its theoretical background, which considers the development of internal regulation of initially non-intrinsically interesting behaviours, makes it ideally suited to examining motivational change across a period of behaviour change such as exercise adoption. In conclusion, the current studies demonstrate the generalisability of the continuum of behavioural regulation to the exercise domain. This gradient of autonomy, as measured by the BREQ, may have positive implications for research into exercise adoption and adherence.

AUTHOR NOTES

This manuscript was prepared while the first author was in receipt of the Price-Davies scholarship from the University of Wales. A section of this paper was presented at the British Association for Sport and Exercise Sciences conference (1996) in Lilleshall, U.K. Further details on the confirmatory factor analyses reported here and the final version of the Behavioural Regulation in Exercise Questionnaire are available from the first author on request.

REFERENCES

Anderson, J. C. & Gerbing, D. W. (1988). Structural equation modelling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *102*, 411–423.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*, 238–246.

Bentler, P. M. (1995). *EQS structural equation program manual*. Encino, CA: Multivariate Software Inc.

Blais, M. R., Sabourin, S., Boucher, C. & Vallerand, R. J. (1990). Towards a motivational model of couple happiness. *Journal of Personality and Social Psychology*, *59*, 1021–1031.

Bouchard, C., Shephard, R. J. & Stephens, T. (1994). The consensus statement. In C. Bouchard, R. J. Shephard & T. Stephens (Eds.), *Physical activity, fitness and health: International proceedings and consensus statement* (pp. 9–15). Champaign, IL: Human Kinetics.

Byrne, B. M. (1994). Testing for the factorial validity, replicability and invariance of a measuring instrument: A paradigmatic application based on the Maslach Burnout Inventory. *Multivariate Behavioural Research*, *29*, 289–311.

Connell, J. P. & Ryan, R. M. (1984). A developmental theory of motivation in the classroom. *Teacher Education Quarterly*, *11*, 64–77.

Connell, J. P. & Ryan, R. M. (1987). Development within the context of schools. In *International Society for the Study of Behavioural Development Newsletter*, (2, serial no. 12).

Deci, E. L.. & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. New York: Plenum.

Deci, E. L. & Ryan, R. M. (1987). The support of autonomy and the control of behaviour. *Journal of Personality and Social Psychology*, *53*, 1024–1037.

Deci, E. L. & Ryan, R. M. (1990). A motivational approach to self: Integration in personality. In R. D. Dienstbier (Ed.), *Nebraska symposium on motivation: Vol.* 38, *perspectives on motivation*, (pp. 237–288). Lincoln: University of Nebraska Press.

Deci, E. L., Vallerand, R. J., Pelletier, L. G. & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist*, *26*, 325–346.

Fortier, M. S., Vallerand, R. J., Brière, N. M. & Provencher, P. (1995). Competitive and recreational sport structures and gender: A test of their relationship with sport motivation. *International Journal of Sport Psychology*, *26*, 24–39.

Frederick, C. M. & Ryan, R. M. (1995). Self-determination in sport: A review using cognitive evaluation theory. *International Journal of Sport Psychology*, *26*, 5–23.

Goudas, M., Biddle, S. & Fox, K. (1994). Perceived locus of causality, goal orientations and perceived competence in school physical education classes. *British Journal of Educational Psychology*, *64*, 453–463.

Grolnick, W. S. & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology*, *52*, 890–898.

Grolnick, W. S. & Ryan, R. M. (1989). Parent styles associated with children's self regulation and competence in school. *Journal of Educational Psychology*, *81*, 143–154.

Hu, L. & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modelling: Concepts, issues and applications*, (pp. 76–99). London: Sage.

Hu, L., Bentler, P. M. & Kano, Y. (1992). Can test statistics in covariance structures be trusted? *Psychological Bulletin*, *112*, 351–362.

James, L. R., Mulaik, S. A. & Brett, J. M. (1982). *Causal analysis: Assumptions, models and data*. Beverly Hills, CA: Sage.

Jöreskog, K. G. (1993). Testing structural equation models. In K. A. Bollen & J. S. Long, (Eds.), *Testing structural equation models*, (pp. 294–316). Newbury Park, CA: Sage.

Marsh, H. W. (1993). The multidimensional structure of physical fitness: Invariance over gender and age. *Research Quarterly for Exercise and Sport*, *64*, 256–273.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Brière, N. M. & Blais, M. R. (1995). Toward a measure of intrinsic motivation, extrinsic motivation and amotivation in sports: The Sport Motivation Scale (SMS). *Journal of Sport and Exercise Psychology*, *17*, 35–53.

Prochaska, J. O. & DiClemente, C. C. (1984). *The transtheoretical approach: Crossing traditional boundaries of therapy*. Homewood, IL: Dow-Jones Irwin.

Ryan, R. M. & Connell, J. P. (1989). Perceived locus of causality and internalisation: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology*, *57*, 749–761.

Ryan, R. M., Vallerand, R. J. & Deci, E. L. (1984). Intrinsic motivation in sport: A cognitive evaluation theory interpretation. In W. F. Straub & J. M. Williams (Eds.) *Cognitive sport psychology*, (pp. 231–242). Lansing, NY: Sport Science Associates.

Vallerand, R. J. & Bissonnette, R. (1992). Internal and external motivation styles as predictors of behaviour: A prospective study. *Journal of Personality*, *60*, 599–620.

Vallerand, R. J., Deci, E. L. & Ryan, R. M. (1987). Intrinsic motivation in sport. In K. Pandolf (Ed.), *Exercise and Sport Science Reviews*, Vol. 15, (pp. 389–425). New York: Macmillan.

Vallerand, R. J. & O'Connor, B. P. (1989). Motivation in the elderly: A theoretical framework and some promising findings. *Canadian Psychology*, *30*, 539–550.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senécal, C. & Vallières, E. F. (1992). The Academic Motivation Scale: A measure of internal, external and amotivation in education. *Educational and Psychological Measurement*, *52*, 1003–1017.

Weiss, M. R. & Chaumeton, N. (1992). Motivational orientations in sport. In T. S. Horn (Ed.), *Advances in sport psychology*, (pp. 61–100). Champaign, IL: Human Kinetics.