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Effects of motivational climate in Singaporean physical education lessons on intrinsic motivation and physical activity intention

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Abstract

Little is known about the influence of perceived motivational climate in physical education lessons from the Asian perspective. This study of 1122 secondary school pupils from Singapore examined the psychometric properties of an existing classroom climate measure. Additionally, the relationships between perceived motivational climate, achievement goals, perceived competence and intrinsic interest and intention to be physically active were examined. It was hypothesized that the perception of high-task involving climates should lead to the adoption of task orientations, and ego-involving climates lead to ego orientations. Both goal orientations will be mediated by perceived competence, impacting on intrinsic motivation and intentions. The results of the structural equation modelling supported the main hypothesis. Overall, the findings suggest that perceptions of a mastery climate in physical education may foster intrinsic interest and intentions to be physically active. It is noteworthy that 68.5% of the variance in intrinsic motivation and 21.9% of the variance in intention to be physically active were accounted for by the model.

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1. Introduction

Over the past two decades, contemporary achievement motivation theorists (Ames, 1992a) have shown that achievement goal theory is successful in explaining and predicting beliefs, responses and behaviour in achievement settings. However, most research has been conducted in competitive sport settings rather than physical education (PE) contexts (e.g. Duda, 2001). Importantly, it is generally accepted that school physical education is likely to play a key role in encouraging pupils' participation in regular physical activity. Thus, examining pupils' motivation for participation in PE is important for gaining information on the determinants of physical activity in young people.

1.1. Achievement goal theory

Achievement goals govern beliefs, guide decisions and influence behaviours in achievement settings (Ames, 1992b). An individual's goal involvement is held to be the function of his/her disposition towards particular achievement goals (goal orientations) and the situational factors (e.g. motivational climate) that prevail. In sport and PE, task orientation, regardless of levels of perceived competence, has been found to be positively associated with intentions to participate (e.g., Biddle, Soos, & Chatzisarantis, 1999), intrinsic motivation (Wang & Biddle, 2003), a belief that success is achieved through effort and hard work, and positive attitudes towards exercise (Papaioannou, 1994; Walling & Duda, 1995). Ego orientation, especially with low perceived competence, has been associated with the belief that success originates from having high ability and maladaptive affective and behavioural responses (e.g. Kavussanu & Roberts, 1996).

1.2. Motivational climate

A mastery climate is one in which self-referenced improvement and effort are made prominent by the teacher and success is defined as improving ones personal best achievements. In contrast, when a performance climate prevails, the teacher encourages normative comparisons and pupils' success is judged in relation to the performance of others (e.g. Papaioannou, Marsh, & Theodorakis, 2004; Parish & Treasure, 2003). Xiang, Lee, and Shen (2001) recent study suggests that achievement goal theory is relevant across cultures, but the related cognitions may vary as a function of age and cultural background. Therefore, there have been calls for more cross-cultural research in this area (Duda & Hayashi, 1998). Our study marks the first attempt to examine motivational climate in a Singapore PE setting where schools are extrinsically rewarded for enhancing the status of pupils' fitness. Beyond schools, and in contrast to declining participation levels in the USA (Putman & Yonish, 1997), official statistics for Singapore report an increase in physical activity participation levels, and improved fitness levels in its school-age population (Shanmugaratnam, 2004, 2006). PE professionals therefore have to juggle between these performance indicators and the goals of the PE Syllabus (2006) which are intended to produce physically educated individuals.

A common measure for assessing perceived motivational climate is through the use of the 'Learning and Performance Orientations in PE Classes Questionnaire' (LAPOPECQ: Papaioannou, 1994), However, this questionnaire has shown weak psychometric properties when used in English speaking samples (e.g., Biddle et al., 1995; fit statistics: $\chi^2 = 561.94$, df = 248, GFI = .818, AGFI = .780, RMR = .183). There is a need to further examine the construct and structure validity of the measurement tool. However, studies have shown that the LAPOPECQ is considered valid and reliable if the scales are reduced to just mastery and performance dimensions (e.g., Papaioannou et al., 2004). Therefore, there is no urgent need for a new measure. Finally, there is an assumption that the LAPOPECQ conceptual frameworks constructed and validated within Western cultures would map appropriately to an Eastern culture. No study has examined this assumption empirically.

1.3. Purpose of the study

To generate further understanding of the motivational climate in an Asian context, the purposes of the present study were twofold. Firstly, the psychometric properties of the LAPOPECQ were examined in a Singapore setting. Secondly, the relationship between perceived motivational climate, goal orientation, perceived competence, intrinsic motivation and intentions to be physically active were investigated. It was hypothesized that the perception of high-task involving climates would lead to the adoption of task orientations, and ego-involving climates to the adoption of ego orientations. Both goal orientations will be mediated by perceived competence, impacting on intrinsic motivation and intentions. In addition, task orientations would have a direct impact on intrinsic motivation.

2. Method

2.1. Participants

We used two separate samples for the study. The first sample consisted of 320 pupils (143 boys and 177 girls) recruited from two co-educational secondary schools in Singapore. Their ages ranged from 14 to 16 years ($M = 15.2$, SD = 0.8). The second sample involved 802 pupils (402 girls and 400 boys) from two different co-educational secondary schools. The pupils aged 12–15 years ($M = 13.4$, SD = 0.5) were attending classes in Years 9 ($n = 405$) and 10 ($n = 397$) and were representative of all socio-economic levels and ethnicity. Pupils were selected based on age groups and gender. Response rate was 100%. The content being covered in these schools bore a close relationship to content prescribed in the Revised Syllabus (Ministry of Education, 2006).

2.2. Procedures

After securing the principal's permission, the heads of PE departments were contacted. Pupils were told that their participation in the study was voluntary and they were free to withdraw at any time and were assured of confidentiality. All pupils secured informed parental consent and completed the questionnaires administered at the beginning of PE lessons. The first sample completed only the original LAPOPECQ and the second sample responded to the modified LAPOPECQ and all other measures about a month later.

2.3. Measures

Learning and Performance Orientations in PE Classes Questionnaire. The original 26-item LAPOPECQ was administered to the first sample. This was used to measure pupils' perception of achievement orientations in PE classes. The measurement model was proposed to be a hierarchical model with five first-order factors and two second-order factors (for review, see Papaioannou, 1994). Two factors, pupils' learning (7 items) and teacher initiated learning (5 items), are first-order factors of a higher order factor, 'Learning', and the remaining three factors (pupil competitive orientation (5 items), pupil worry (5 items), and outcome orientation without effort (4 items) are first-order factors of another higher order factor, 'Performance'.

The second sample completed the modified 17-item LAPOPECQ-Singapore derived from the analysis. The stem of the questionnaire and response method remained unchanged.

Achievement Goal Orientations. Pupils' dispositional task and ego goal orientations in PE lessons were assessed through an established English version of the Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda & Nicholls, 1989). Answers were given on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement model of the TEOSQ yielded a satisfactory fit to the data ($\chi^2 = 342.05$, df = 64, CFI = .947, GFI = .952, AGFI = .930, RMSR = .048, RMSEA = .064).

Perceived competence. The six items from the Sport Competence subscale of the Children's version of the Physical Self-Perception Profile (PSPP-C; Whitehead, 1995) were administered. Confirmatory Factor Analysis (CFA) on Sport Competence showed acceptable fit indices ($\chi^2 = 79.03$, df = 9, CFI = .962, GFI = .967, AGFI = .924, RMSR = .036, RMSEA = .055).

Intrinsic Motivation. The Intrinsic Motivation subscale of the Perceived Locus of Causality (PLOC) scale developed by Goudas, Biddle, & Fox (1994) was used to assess the intrinsic motives in the PE context. CFA was not conducted for the 3-item scale.

Intention to Exercise during Leisure Time. Participants' intention to exercise during leisure time was assessed by using two items from Biddle et al. (1999). The pupils were asked whether they planned and/or intended to play sport or exercise three times weekly for the next two weeks.

2.4. Data analysis

To examine the psychometric properties of the LAPOPECQ, Confirmatory factor analysis (CFA) using EQS for Windows 5.7 using maximum likelihood estimates derived from covariance matrices was used. A series of fit indices and error estimates were examined to evaluate the adequacy of the measurement model. The factor loadings and error variances are reported.

Similar to the initial part of our study, CFA procedures were used to examine the factor structure of the LAPOPECQ using a separate sample. Multigroup analysis tested the invariant factor structure across gender and age, after equality constraints were imposed across models. Structural equation modeling examined the relationships between perceived motivational climate, goal orientations, perceived competence, intrinsic motivation, and intentions to be physically active. A series of fit indices and error estimates evaluated the adequacy of the measurement model, as well as, the full latent model. The standardised solution for the proposed model is presented in graphical format.

3. Results

3.1. Initial analysis

Initial analysis on the first sample revealed that the ‘outcome orientation without effort’ subscale of the original LAPOPECQ had an unacceptable alpha coefficient of .52. This subscale supposedly measures a climate in which success is defined clearly by winning without effort. As previous studies found low internal consistency and were subsequently dropped from perceived classroom climate measures (e.g., Papaioannou et al., 2004), this subscale was deleted from further analysis. There were no missing cases. Univariate skewness and kurtosis values between +2 and −2 indicated that all the items were approximately normal; Mardia’s coefficient was 35.61, indicating multivariate normality.

3.2. CFAs of the original LAPOPECQ

Confirmatory factor analysis (CFA) was conducted on the remaining LAPOPECQ items to examine factorial validity using EQS for Windows 5.7 (Bentler & Wu, 1998). The modified measurement model has four first-order factors and two higher-order factors (see Fig. 1). The following indices of fit provided by EQS were examined to evaluate the adequacy of the models: the comparative fit index (CFI); the goodness-of-fit index (GFI); the adjusted goodness-of-fit index (AGFI); root mean square residual (RMSR); and the root mean square error of approximation (RMSEA). The CFI assesses the lack of fit as estimated by the non-central chi-square distribution of a target model compared to a baseline model. GFI and AGFI are indexes of absolute fit. AGFI adjusts the GFI by taking into account the number of estimated parameters in the model (Tabachnick & Fidell, 1996). Typically, for these fit indices, .95 or above indicates a good fit to the data (Hu & Bentler, 1999). The RMSR is the square root of the mean of the squared discrepancies between the implied and the observed covariance matrices. The RMSEA is also based on the analysis of residuals and compensates for the effects of model complexity. For these two values, below .10 is thought to indicate a good fit to the data. Hu & Bentler (1999) recommended a cut-off “close to .06” (p. 27) for RMSEA.

In the assessment of invariance of the measurement tool, Cheung & Rensvold (2002) have recently recommended using change in CFIs with a value of smaller than or equal to −.01 as ideal for measurement invariance. This was included as additional criteria.

The results of the first CFA indicated a less than satisfactory fit of the model to the data ($\chi^2 = 431.76$, df = 206, CFI = .816, GFI = .840, AGFI = .803, RMR = .072, and RMSEA = .073). From the standardised loading, five items had loadings of less than .40 and error variance of higher than .93. These five items (two items each from ‘student learning orientation’ “The way the lesson is taught helps me learn how to exercise by myself”, “The way the lesson is taught helps

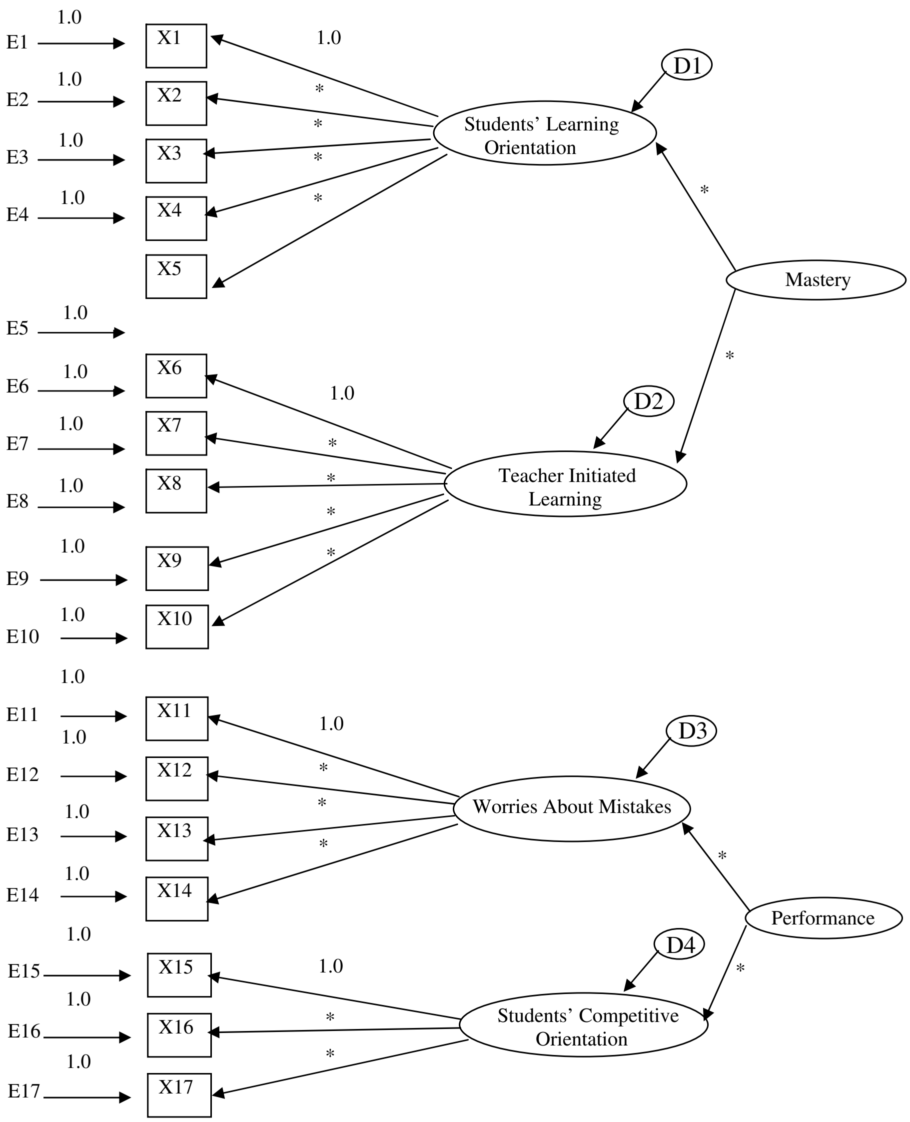

Fig. 1. Modified measurement model for LAPOPECQ.

me to learn how to use PE to improve my health and fitness'', and 'student competitive orientation' ''The most important thing is for a student to demonstrate that he or she is better in sports than others'', ''Successful students are thought to be those who perform skills better than their classmates'' subscales; one item from the 'worry' subscale ''Students feel very bad when they cannot perform a skill as well as others'') were deleted (based on large standardised residuals as well as content examination) and a second CFA was conducted. The results of the second CFA revealed an adequate fit of the model to the data ($\chi^2 = 242.34$, df = 116, CFI = .918, GFI = .918, AGFI = .886, RMR = .055, and RMSEA = .061). Table 1 shows the correlations among the four

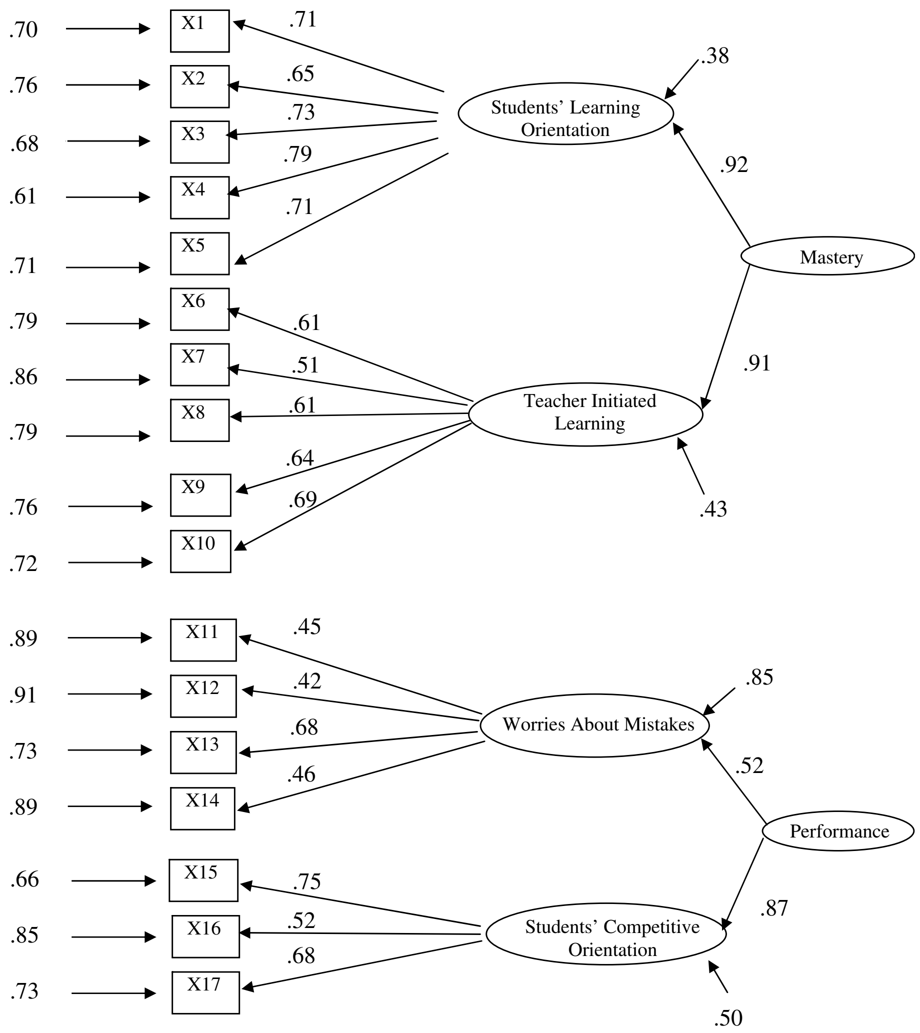

Fig. 2. Standardised solutions of the modified measurement model for LAPOPECQ ($N = 320$).

Table 1
Correlation among the four first-order factors of the LAPOPECQ for both samples

	1	2	3	4
1. Students' learning orientation	1.00	.68**	.08*	.39**
2. Teacher initiated learning orientation	.65**	1.00	.11**	.43**
3. Students' worries about mistakes	.09	.09	1.00	.34**
4. Student competitive orientation	.42**	.48**	.33**	1.00

Note: Correlations among the four first order factors of the LAPOPECQ for the first sample ($N = 320$) are shown below the diagonal and for the second sample ($N = 802$) above the diagonal.

first-order factors, and the correlation between mastery and performance climates supports the discriminant validity of the two higher order factors ($r = .32$). Fig. 2 details the factor loading and error variances of the items and factors. Based on the evidence, the modified hierarchical measurement model termed LAPOPECQ-Singapore has acceptable factorial validity. Cronbach's alpha coefficients showed that both mastery and performance scales were internally consistent (alphas were .86 for mastery and .70 for performance; alphas for students' learning orientation = .82; teacher initiated learning = .76; worries about mistakes = .65; and students' competitive orientation = .67).

3.3. Invariance factor structure of the LAPOPECQ-Singapore

Using CFA procedures, the LAPOPECQ-Singapore was tested with the second sample ($N = 802$). Univariate skewness and kurtosis values indicated that all the observed variables were normal, and Mardia's coefficient indicated multivariate normality. The fit indices were good and better than those obtained from the first sample ($\chi^2 = 376.44$, df = 110, CFI = .933, GFI = .946, AGFI = .926, RMSR = .043, RMSEA = .055). The correlation between mastery and performance climates was also .32 (see Table 1 for correlations among the four first-order factors) indicating a moderate fit and the internal consistency of the sub-scales was satisfactory ($\alpha = .87$ for mastery and .71 for performance).

The next phase of the analysis involved testing the factorial invariance of the LAPOPECQ-Singapore across gender and age through multi-sample analyses using EQS. There is a need to establish a consistency in the relationship between the construct under study and its corresponding indicators across different populations (e.g., age, gender, ability). The measurement items should be equally valid across different groups. Furthermore, the factor structure of the measurement tool needs to be cross-validated across independent samples of the same population.

First, the total data set was split by gender and school year with model testing involving fitting the measurement model of the LAPOPECQ-Singapore to each subgroup separately. Subsequently, the invariance of the model across gender and year group was tested by simultaneously fitting the model to the data for males and females, and subsequently the two year groups (Years 9 and 10). Table 2 details the fit indices of the single group analyses. The baseline models were identical across groups and the fit indices support the adequacy of the model for all groups separately.

Following on, equality constraints were imposed on all factor loadings and factor variances but not on the fixed parameters. The equivalency of the measurement model between gender and age was then assessed. Other than the fit indices provided by EQS, the Lagrange Multiplier Test (LMT) was also used to investigate any model misspecifications. Specifically, the LMT tests whether any parameters that were set to zero in the model were, in fact, zero. It tests the effect of releasing the constraints specified to the models (Bentler, 1995). Finally, the changes in CFIs was lower than or close to the recommended value of $-.01$ (ΔCFIs = $-.006$ for gender, $-.025$ for year), thus supporting the measurement invariance across gender and year. The results provide strong support for the invariance of the LAPOPECQ-Singapore across gender and age (see Table 3).

In summary, the results supported the factor structure and loadings of the LAPOPECQ-Singapore across gender and age.

Table 2
Fit statistics for the LAPOPECQ by groups

Fit statistics	Overall	Male	Female	Year 9	Year 10
N	802	402	400	405	397
χ^2 (116)	376.44	247.42	297.89	261.58	237.43
CFI	.933	.917	.923	.917	.942
GFI	.946	.933	.919	.928	.935
AGFI	.926	.907	.888	.900	.909
RMSR	.043	.047	.051	.053	.042
RMSEA	.055	.056	.065	.058	.054

Note: CFI = Comparative Fit Index; GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; RMSR = Root Mean Squared Residual; RMSEA = Root Mean Square Error of Approximation.

Table 3
Fit statistics for multi-group analyses of LAPOPECQ

Fit statistics	Gender	Age
χ^2	574.41	634.97
df	231	242
CFI	.916	.903
GFI	.922	.915
AGFI	.896	.892
RMSR	.054	.057
RMSEA	.043	.045

Note: CFI = Comparative Fit index; GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; RMSR = Root Mean Squared Residual; RMSEA = Root Mean Square Error of Approximation.

3.4. Network of climate, goals, perceived competence, intrinsic motivation and intentions

The next stage of the analyses examined the relationships between perceived motivational climates, goal orientations, perceived competence, intrinsic motivation and intentions (see Fig. 3). This model was a replication of the model tested in Biddle et al.'s study (1995). However, a full latent variable model was preferred to a structural model. To reduce error correlations between multiple indicators and to facilitate interpretation, items were combined by examining the content to equalise the measurement weighting across the indicators. This procedure was outlined by Byrne (1994). A total of 22 indicators, representing seven latent factors, were used to represent the hypothesised structural model (see Fig. 3).

Table 4 shows the descriptive statistics, alpha coefficients, and zero-order correlations of the main variables in this study. It was found that the participants scored highly in (a) intrinsic motivation, (b) intention to be physically active, and (c) task orientation. They also perceived a high mastery climate in PE classes. Mastery climate was moderately correlated with performance climate ($r = .32$, $p < .001$) and positively related to task orientation ($r = .56$, $p < .001$), perceived competence ($r = .22$, $p < .001$), intention ($r = .26$, $p < .001$), and intrinsic motivation ($r = .58$,

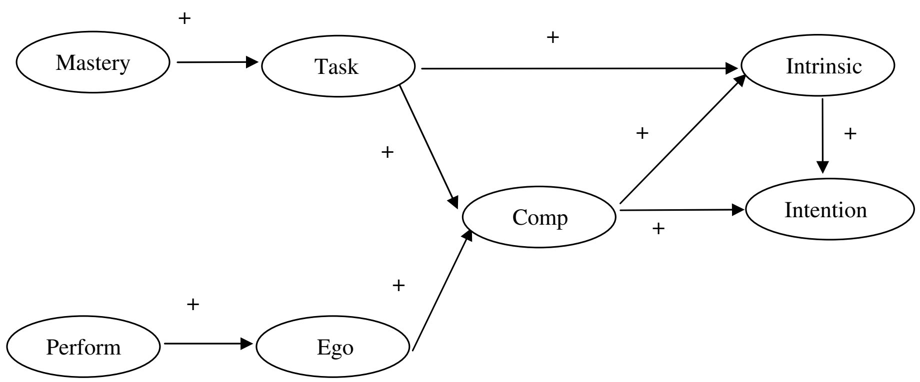

Fig. 3. Proposed full latent model of the relationships between perceived motivational climates, goal orientations, perceived competence, intentions to be physically active, and intrinsic motivation ($N = 802$).

Table 4
Descriptive statistics and Pearson's correlation coefficients of the main variables ($N = 802$)

Variable	Mean	SD	α	1	2	3	4	5	6
1. Task	3.73	.62	.83	1.00					
2. Ego	2.72	.85	.86	.29**	1.00				
3. Mastery	3.70	.57	.87	.56**	.04	1.00			
4. Performance	3.08	.59	.71	.20**	.23**	.32**	1.00		
5. Perceived competence	2.94	.82	.86	.27**	.29**	.22**	.26**	1.00	
6. Intrinsic motivation	3.86	.74	.82	.57**	.08*	.58**	.18**	.41**	1.00
7. Intention	3.43	1.13	.87	.22**	.05	.26**	.21**	.35**	.35**

* $p < .05$.
** $p < .01$.

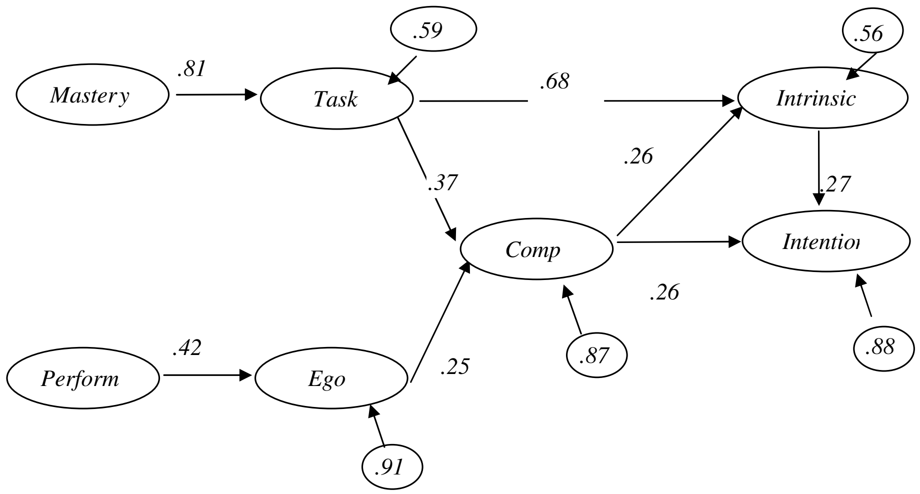

Fig. 4. Standardised solution for the proposed model of the relationships between perceived motivational climates, goal orientations, perceived competence, intentions to be physically active, and intrinsic motivation ($N = 802$).

$p < .001$). Correspondingly performance climate was moderately correlated with ego orientation ($r = .23$, $p < .001$) and perceived competence ($r = .26$, $p < .001$).

The results of structural equation modelling showed that the fit was acceptable for the proposed relationships ($\chi^2 = 556.23$, df = 199, CFI = .931, GFI = .939, AGFI = .912, RMSR = .050, RMSEA = .043). Fig. 4 presents the standardised solutions and error variances for the overall sample and indicates that mastery climate strongly predicted task orientation and that performance climate is associated with ego orientation. Intrinsic motivation is directly predicted by task orientation as well as indirectly predicted through perceived competence. The total effect of task orientation on intrinsic motivation was .78 and the indirect effect was .10. Finally, perceived competence predicted intrinsic motivation and intention, with a total effect of .33, and intrinsic motivation was positively associated with intention to be physically active.

4. Discussion

This research had two main purposes. First, the psychometric properties of LAPOPECQ were examined in a Singapore context. Second, the network relationship between perceived motivational climate, goal orientation, perceived competence, intrinsic motivation and intentions to be physically active were tested. Initial analysis of the original LAPOPECQ revealed that there are problematic subscales and items. Specifically, the factor originally labeled as 'outcome orientation without effort' did not hold up well in the first sample. With that factor removed as well as the five problematic items that had low loadings and high error variance, the modified hierarchical measurement model of LAPOPECQ-Singapore was found to have acceptable factorial validity and acceptable reliability. The second sample supported the factor structure and the results provide strong support for the invariance of the LAPOPECQ-Singapore across gender and age. Thus, with the reduced version, it was concluded that the dimensions of mastery and performance climates in PE classes could be measured adequately making the LAPOPECQ-Singapore valid for use with Singaporean children.

This study also replicated Biddle et al.'s (1995) model which examined the relationships between perceived motivational climates, goal orientations, perceived competence, intrinsic motivation and intentions, and extended the previous study by using a full latent variable model. Consistent with other studies (Biddle et al., 1995), our results suggest that perceptions of a mastery climate are related to task orientation, and perceptions of a performance climate are linked to the adoption of an ego orientation. In turn, task orientation had a strong direct, as well as indirect effect on intrinsic motivation through perceived competence and it is noteworthy that 68.5% of the variance in intrinsic motivation was accounted for. Finally, 21.9% of the variance in 'intention to be physically active' was accounted for by the model.

In summary, our findings support the significant relationship between pupils' perceived motivational climate in PE classes and goal adoption, intrinsic motivation and intentions to be physically active. The findings also suggest that perceptions of a mastery motivational climate in PE may foster intrinsic interest and intentions to be physically active. However, there is a need to examine the discrepancy between teachers' and pupils' perceptions of motivational climate compared to the behaviourally measured structures. Understanding the differences in perception and behaviour may help to guide more effective interventions as well as to understand young people's motivational processes, and further study of this is warranted.

Although this paper provides a viable measuring instrument and supports conceptually coherent relationships between climates and motivational variables, there is much still to be done. First, as the studies reported here are cross-sectional, there is a need for prospective, longitudinal and experimental studies to test for causality. Second, as this study adopts the classic achievement goal theory, further research is needed to examine the 2×2 achievement goal approach proposed by Elliot and his colleagues (Elliot & Church, 1997; Elliot & Covington, 2001) with the addition of approach-avoidance dimensions.

Finally, the present study implies that pupils' perceived motivational climate in PE classes has a major influence on intrinsic interest and intention to be physically active. PE teachers are encouraged to develop greater diversification in task setting to cater for differentiated interests and abilities. In a typical PE class in Singapore that has forty pupils, an authoritative approach might appear more efficient to teachers for good classroom control. However, this clearly contradicts the development of mastery climate. By shifting greater autonomy to pupils, a student-centred approach can be developed for the adoption of personal goals and the enhancement of intrinsic motivation that will promote more positive and powerful intentions to be physically active. Future studies should address these concerns and build on the results presented.

References

Ames, C. (1992a). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*, 261–271.

Ames, C. (1992b). Achievement goals and the classroom motivational climate. In J. Meece & D. Schunk (Eds.), *Student perceptions in the classroom* (pp. 327–348). Hillsdale, NJ: Erlbaum.

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

Bentler, P. M., & Wu, E. (1998). *EQS for Windows (Version 5.7)*. Encino, CA: Multivariate Software.

Biddle, S., Cury, F., Goudas, M., Sarrazin, P., Famose, J., & Durand, M. (1995). Development of scales to measure perceived physical education class climate: A cross national project. *British Journal of Educational Psychology, 65*, 341–358.

Biddle, S., Soos, I., & Chatzisarantis, N. (1999). Predicting physical activity intentions using goal perspectives and self-determination theory approaches. *European Psychologist, 4*, 83–89.

Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications and programming*. Newbury Park, CA: Sage.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.

Duda, J. L. (2001). Achievement goal research in sport: pushing the boundaries and clarifying some misunderstandings. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 129–179). Champaign, IL: Human Kinetics.

Duda, J. L. & Nicholls, J. G. (1989). The task and ego orientations in sport questionnaire: Psychometric properties. Unpublished manuscript.

Duda, J. L., & Hayashi, C. T. (1998). Measurement issues in cross-cultural research within sport and exercise psychology. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 471–483). Morgantown: WV: Fitness Information Technology.

Elliot, A., & Church, M. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*, 218–232.

Elliot, A., & Covington, M. (2001). Approach and avoidance motivation. *Educational Psychology Review, 13*, 73–92.

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.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling, 6*, 1–55.

Kavussanu, M., & Roberts, G. C. (1996). Motivation in physical activity contexts: The relationship of perceived motivational climate to intrinsic motivation and self-efficacy. *Journal of Sport and Exercise Psychology, 18*, 264–281.

Ministry of Education (2006). *Physical Education Syllabus (Primary, Secondary and Pre-university)*. Curriculum Planning and Development Division: Singapore.

Papaioannou, A. (1994). Development of a questionnaire to measure achievement orientations in physical education. *Research Quarterly for Exercise and Sport, 65*, 11–20.

Papaioannou, A., Marsh, H. W., & Theodorakis, Y. (2004). A multilevel approach to motivational climate in physical education and sport settings: An individual or a group level construct? *Journal of Sport and Exercise Psychology, 26*, 90–118.

Parish, L. E., & Treasure, D. (2003). Physical activity and situational motivation in physical education: Influence of the motivational climate and perceived ability. *Research Quarterly for Exercise and Sport, 74*(2), 173–182.

Putman, R. D., & Yonish, S. (1997). New evidence on trends in American social capital and civic engagement: Are we really bowling alone? Unpublished Manuscript, Harvard University, 1997. In D.V. Shah, R. L. Holbert & N. Kwak (Ed.), *Expanding the 'Virtuous Circle' of Social Capital: Civic Engagement, Contentment, and Interpersonal Trust*, Paper presented at the annual conference of the Association for Education in Journalism and Mass Communication, New Orleans, LA, 1999.

Shanmugaratnam, T. (2004). In *Speech by the Acting Minister of Education at the 45th Annual General Meeting of the Singapore Schools Sports Councils on the 17th January*.

Shanmugaratnam, T. (2006). In *Speech by the Minister of Education at the 47th Annual General Meeting of the Singapore Schools Sports Councils on the 6th January*.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). New York: HarperCollins.

Walling, M. D., & Duda, J. L. (1995). Goals and their associations with beliefs about success in and perceptions of the purpose of physical education. *Journal of Teaching in Physical Education, 14*, 140–156.

Wang, C. K. J., & Biddle, S. J. H. (2003). Intrinsic motivation towards sports in Singaporean students: The role of sport ability beliefs. *Journal of Health Psychology, 8*, 515–523.

Whitehead, J. R. (1995). A study of children's Physical Self-Perceptions using an adapted Physical Self-Perception questionnaire. *Pediatric Exercise Science, 7*, 132–151.

Xiang, P., Lee, A., & Shen, J. (2001). Conceptions of ability and achievement goals in physical education: Comparisons of American and Chinese students. *Contemporary Educational Psychology, 26*, 348–365.