Initial validation of the teacher-created Empowering and Disempowering Motivational Climate Questionnaire in PE (EDMCQ-PE)

Keywords: achievement goal theory; self-determination theory; ESEM

Abstract

Purpose: Guided by Duda's (2013) hierarchical conceptualization of the motivational climate that draws from self-determination and achievement goal theories, this study provides initial evidence of the psychometric properties of the Empowering and Disempowering Motivational Climate Questionnaire-PE (EDMCQ-PE).

Method: Questionnaire-based with two samples of Welsh secondary school pupils.

Results: Exploratory structural equation modelling (ESEM) provided a better fit of the data to the hypothesised model than confirmatory factor analysis. Moreover, a two factor composite (i.e., empowering and disempowering) lower-order model provided an acceptable fit and clear parameter estimates. This two factor model also demonstrated scalar gender measurement invariance.

Discussion: The evidence from this study suggests the EDMCQ-PE is a promising scale for the assessment of secondary school pupils' perceptions of the empowering and disempowering features of the motivational climate created by their physical education (PE) teachers. Moving forward, the statistical approach employed in this paper can inform future studies that develop questionnaire methodology in physical education (PE) and from an applied perspective, the EDMCQ-PE can be used by researchers and teachers to assess the motivational climate in PE and help inform the pedagogy underpinning teachers' classes.

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Despite the many benefits of Physical Education (PE), not all pupils have an empowering experience in PE. For example, 35% of Welsh children do not enjoy school sport and PE (Sport Wales, 2015). Over 20 years of research confirms that a key determinant of the quality of a pupil's experience in PE is the teacher-created motivational climate (Duda, Papaioannou, Appleton, Quested & Krommidas, 2014). Recently, Duda (2013; Duda & Appleton, 2016) suggested a hierarchical and multidimensional conceptualization of the coach-created motivational climate that integrates the major social environmental dimensions emphasized within achievement goal theory (AGT; Ames, 1992; Nicholls, 1989) and self-determination theory (SDT; Deci & Ryan, 1985, 2000). Duda's conceptualization suggests the motivational climate created is multidimensional and can be more or less 'empowering' and 'disempowering.' Given the motivational climate created by teachers in PE has received considerable attention in previous research from an AGT or SDT perspective, and holds important pedagogical implications for students' motivation (Braithwaite, Spray & Warburton, 2011), the quality and quantity of their engagement and learning (Reeve, 2012), levels of moderate-to-vigorous physical activity, and psychological responses in PE (Van den Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2014), future research on the PE teacher-created motivational climate may benefit from adopting Duda's theoretically integrated model.

In order to examine the PE teacher created motivational climate as conceptualised within Duda's model, an initial step is the development of a valid and reliable questionnaire. Therefore, the primary aim of this study was to provide an initial examination of the psychometric properties of the Empowering and Disempowering Motivational Climate Questionnaire-PE (EDMCQ-PE). Establishing the EDMCQ-PE as a psychometrically sound measure would make a significant contribution to the PE literature by: (a) providing researchers with a valid and reliable questionnaire that captures empowering and disempowering strategies employed by PE teachers, (b) allowing for an examination of the

correlates and antecedents of these motivation-related teaching climates, and (c) evaluating interventions that seek to change the motivational strategies employed by PE teachers. Moreover, from a pedagogical perspective, establishing the EDMCQ-PE as a valid and reliable questionnaire will enable teachers to determine the extent to which their own communication and behaviors (using self-report data and student's perceptions) in class are more or less empowering and disempowering.

AGT: Task- and Ego-involving Motivational Climates

AGT proposes that the motivational climate is the social environment surrounding pupils and is a function of what teachers say and do, how they organise, communicate, try to motivate, and use praise and feedback following desirable performance or mistakes (Duda, 2001). A main assumption of AGT is that the teacher-created motivational climate can shape pupils' perceptions of competence in PE by emphasizing a task- and/or ego-involving criteria (Ames, 1992). A task-involving criteria of competence centres on personal progress, effort, task mastery and learning new skills. In contrast, ego-involving criteria revolves around the demonstration of superior, comparative ability with minimal effort (Nicholls, 1989). A task-involved conception of competence is promoted within an environment where the teacher values hard work, effort, skill development and pupils working together (i.e., a task-involving climate; Ames, 1992). An ego-involved conception of competence is assumed to be more likely to emerge when a teacher criticises pupil mistakes and recognises and rewards only the most able performers (i.e., an ego-involving climate; Ames, 1992). Research (for a summary see Liu, Xiang, Lee & Li, 2017) shows that pupil perceptions of a task-involving climate predicts more adaptive motivational processes and outcomes in PE, whereas an ego-involving climate in PE predicts maladaptive motivational processes and negative outcomes in pupils. Although the literature that has adopted AGT to examine the motivational climate created by PE teachers has been psychological in nature, Morgan (2017) recently explained that the

achievement-related structures inherent to task- and ego-involving climate can also be understood from a pedagogical perspective which holds direct implications for how PE teachers teach.

SDT: Autonomy Supportive, Socially Supportive, and Controlling Environments

SDT is concerned with the study of human motivation and personality (Deci & Ryan, 2000) and predicts that the satisfaction of three psychological needs (i.e., autonomy, competence and relatedness) will promote more autonomous motivation (e.g., participating in PE because one enjoys it and/or values the benefits) resulting in sustained behavior, quality engagement, and well-being. Conversely, unsatisfied and/or thwarting of the three psychological needs leads to controlled motivation (e.g., participating in PE out of fear, guilt or pressure, or to receive rewards/ praise). In this case, student disengagement, undesirable behaviors and ill-being are expected outcomes (Deci & Ryan 1985, 2000). Key motivational climate dimensions within SDT are autonomy support, social support, and controlling teaching. An autonomy-supportive PE teacher recognises pupils' preferences and provides meaningful choices. Decisions made about learning and mastery are pupil-centred, and a rationale is provided with requests (Cheon & Reeve, 2013). Within a socially-supportive environment every pupil matters, feels valued and cared for as a student and person (Mageau & Vallerand, 2003). In contrast, controlling teachers pressure pupils to behave, think and feel in a specific way (Reeve & Jang, 2006). Research evidence (for a summary, see Sun, Li & Shen, 2017) supports a positive relationship between autonomy- and socially-supportive climates in PE with the satisfaction of pupils' psychological needs, autonomous motivation, well-being, and effective functioning. In contrast, controlling climates positively predict students' unsatisfied and thwarted psychological needs, controlled motivation, ill-being and disengagement in PE. This evidence suggests that, as per AGT, the motivational climate according to SDT holds significant pedagogical implications for teachers that allow pupils to thrive (or not) in PE (Curran & Standage, 2017).

Integrating SDT and AGT: Empowering and Disempowering Motivational Climates

Building upon research concerning the motivational climate from a SDT or AGT perspective, Duda (2013) proposed that it is possible to simultaneously examine an interconnected array of facets of the social environment proposed in both theories. Specifically, based on the tenets of SDT and AGT and previous research, Duda suggests there are more empowering (i.e., those which are more task-involving, autonomy- and socially-supportive) and disempowering (i.e., they are more ego-involving and controlling/relatedness thwarting) climates. In integrating the climate dimensions from AGT and SDT, Duda's (2013) framework highlights that each climate dimension is important in predicting basic psychological need satisfaction and thwarting, motivation regulations and outcomes (see Duda & Appleton, 2016). That is, although there is theoretical (and often statistical) overlap between the climate dimensions proposed by AGT and SDT, no dimension is redundant within Duda's perspective (Appleton, Ntoumanis, Quested, Viladrich & Duda, 2016). To date, Duda's (2013) framework has informed an examination of the motivational climate and its correlates in youth sport. Smith et al. (2016), for example, reported that athletes who perceived the environment to be more empowering reported more autonomous motivation. Conversely, a perceived disempowering environment was associated with higher scores on controlled motivation and amotivation.

Although it is important to recognise that young people may have different reasons for participating in youth sport (i.e., where participation is generally voluntary) compared to PE (i.e., where participation is generally compulsory for all students), creating an empowering learning environment (and reducing disempowering environments) in both contexts are equally important (Mayorga-Vega, & Viciana, 2014). Regardless of the young person's achievement level in sport or PE, research concerning the motivational climate suggests that teachers and coaches who are more empowering will foster enjoyment, commitment, persistence and increase intrinsic motivation in all young people (Duda et al., 2014).

Conversely, teachers and coaches who adopt more disempowering strategies increase the extent to which young people experience anxiety, drop out, avoidance and decreases in effort (Duda et al., 2014) in sport or PE. Thus, Duda's (2013) model seems to offer equal potential for investigating the motivational climate in both youth sport and PE. Adopting Duda's model in PE is also advantageous because, in contrast to previous research on the teacher-created motivational climate in PE which has generally adopted AGT or SDT, it integrates and considers in a more comprehensive way the features of the motivational climate (based on AGT and SDT) which have pedagogical significance.

Given the prominence of SDT and AGT research to an understanding of the nature and implications of the PE teacher-created motivational climate, it seems reasonable to suggest that Duda's (2013) integrated framework could also inform future research in PE. However, such work requires a valid and reliable measure of the degree to which PE teacher-created motivational climates are empowering and disempowering. Soini et al.'s (2014) Motivational Climate in Physical Education Scale (MCPES) is one measure which evaluates task- and ego-involving, and autonomy and socially supportive climates as created by PE teachers. However, the MCPES does not capture controlling teaching and the items for the MCPES were derived from scales based purely within AGT. Thus, it is possible that the SDT-based climate dimensions are not accurately defined nor sufficiently captured in the MCPES.

Recently, Appleton et al. (2016) adopted Duda's framework to inform the development and initial validation of the EDMCQ; a scale that draws from AGT and SDT to capture empowering and disempowering motivational climates. An initial study by Appleton et al. (2016) suggested that Exploratory Structural Equation Model (ESEM) (compared to confirmatory factor analyses; CFA) solutions of the EDMCQ multidimensional, higher-order structure provided a best fit in multiple groups of youth athletes. However, inspection of the factor loadings revealed that many autonomy-supportive and some controlling and socially-supportive items failed to load significantly on their intended factor and demonstrated

elevated and significant factor loadings on non-intended dimensions (i.e., autonomy- and socially-support items loaded onto the task-involving dimension; controlling items loaded onto the ego-involving dimension). Appleton et al's (2016) findings suggest that, rather than a hierarchical structure representing five lower-order and two higher-order factors, the EDMCQ in its current format may be best represented by two composite factors whereby task-involving, autonomy- and socially-supportive items load onto an empowering factor, and ego-involving and controlling items load onto a disempowering factor. However, Appleton et al. (2016) did not test the fit of the two factor model nor compare its fit against a hierarchical model.

Present Study

Guided by Duda's framework (2013), the aim of this study was to examine the psychometric properties of an adapted EDMCQ that captured secondary school students' perceptions of the empowering and disempowering features of the PE teacher-created motivational climate (EDMCQ-PE). Aligned with Appleton et al. (2016), the current study sought to identify the best approach to modeling the factor structure of the EDMCQ-PE and establish the internal reliability of pupils' scores. Consistent with Appleton et al., ESEM (compared to CFA) models were expected to provide the best approach to modeling the scale's factor structure. A two factor composite model was also expected to provide the best modeling approach. Extending the analyses of Appleton et al., and to further establish the psychometrics of the scale, gender measurement invariance was also tested.

Methods

Participants

A total of 1662, 12-15 year old (*M* = 13.74; *SD* = 0.81) Welsh pupils participated in this study. Group one (*N*= 826) comprised 50.12% males (*M* age = 13.77 years; *SD* = 0.95 years) who received 2.5 to 4 hours of PE lessons per week. Group two (*N* = 836) comprised

53.71% males (*M* age = 13.72 years; *SD* = 0.66 years) who received 3 to 4 hours PE per week.

Climate Measures

After at least 12 weeks of PE lessons, pupils completed the EDMCQ-PE. The 34 items from the EDMCQ-C were adapted from sport to a PE context (e.g., "my coach encouraged players to try new skills" adapted to "my teacher encouraged pupils to try new skills"). The terminology in each item that made reference to the theoretical concepts was not changed. Responses were provided on a 5-point scale (i.e., 1 = "strongly disagree" to 5 = "strongly agree"). The average Flesch-Kincaid reading level was 6.0, suggesting items were suitable for the target age group.

The EDMCQ-C includes 16 items from the Perceived Motivational Climate in Sport Questionnaire-2 (Newton, Duda & Yin, 2000) which capture task- (nine items) and ego- (seven items) involving climate features. These features included cooperative learning (e.g., "My teacher encouraged pupils to really work together in class"), important role (e.g., "My teacher made sure everyone had an important role in the class"), effort improvement (e.g., "My teacher encouraged pupils to try new skills"), punishment for mistakes (e.g., "My teacher yelled at pupils for messing up") and unequal recognition (e.g., "My teacher had his or her favourite pupils").

Pupils' perceptions of autonomy-support were assessed using five items (e.g., "My teacher gave pupils choice and options") taken from Reinboth, Duda and Ntoumanis's (2004) adapted version of the Health Care Climate Questionnaire (Williams, Grow, Freedman, Ryan, & Deci, 1996) and Reeves (2006) proposals on autonomy supportive climates emphasizing participating for intrinsic reasons (e.g., "My teacher thought it important for students to participate in PE because the pupils enjoy PE").

Pupils' perceptions of their teachers' controlling behaviors were measured via 10

items, including eight items from the Controlling Coaching Behaviors Scale (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010) which tapped teachers' controlling use of rewards (e.g., "My teacher mainly used rewards/praise to make pupils complete all the tasks he or she set during class"), negative conditional regard (e.g., "My teacher paid less attention to pupils if they displeased him or her"), intimidation (e.g., "My teacher shouted at pupils in front of others to make them do certain things"), and excessive personal control (e.g., "My teacher tried to control aspects of pupil's lives outside of PE"). Two further items were included in the EDMCQ-C measuring controlling use of rewards (e.g., "My teacher only allowed us to do something we like to do at the end of class if we had done well during class").

Pupils' perceptions of their teachers' social support were measured using three items (e.g., My teacher could really be counted on to care, no matter what happened) originally presented in the Social Support Questionnaire-6 (Sarason, Sarason, Shearin, & Pierce, 1987) and modified for use with coaches by Reinboth et al. (2004).

Procedures. An ethics committee of the 1st, 2nd and 3rd authors' University approved the project. The first author subsequently made contact with head teachers to introduce the project. Information letters describing the project purpose and procedures were then distributed to parents who could opt-out their child from the project. The project was also explained verbally and in writing to the pupils. Pupils who agreed to participate completed consent forms followed by an inventory which included the EDMCQ-PE. Data collection took place at 11 schools, a small team of data collectors led by the 1st author administered the questionnaires and pupils completed the inventory without discussing answers with classmates or teachers. The inventory took 20-40 minutes to complete.

Data Analysis

Testing alternative models. Structural equation modelling analyses were performed in Mplus 8.0 (Muthén & Muthén, 2017) using the procedures outlined by Morin, Arens and Marsh (2016) for CFA and ESEM. CFA and ESEM are statistical approaches to testing the

factor structure of a scale. Marsh et al.'s (2004) suggested that in preliminary analyses of a scale's factor structure, researchers should compare the findings (i.e., model fit, standardized factor loadings and factor correlations) using CFA and ESEM. CFA utilises the Independent Cluster Model where first-order factors are allowed to correlate, observed variables load only onto their intended factor, and cross loadings on non-intended factors are restricted to zero. In contrast, ESEM integrates the principles of exploratory factor analysis (EFA) within the CFA framework (Asparouhov & Muthen, 2009), items cross load onto non-intended factors which is reported to better represent (and evaluate) the factor structure of complex multidimensional structures such as the EDMCQ-PE (Asparouhov & Muthen, 2009) where factors overlap. Previous research generally supports the use of ESEM over CFA as the most appropriate approach to modeling multidimensional scale's factor structure (Marsh, Nagengast & Morin, 2013)

A higher-order ESEM model (H-ESEM), tested via an approach where lower-order factors are defined within an ESEM and CFA estimates the higher-order factors (Marsh et al., 2013), and a bi-factor (Holzinger & Swineford, 1937) ESEM model can also be tested when determining the best fitting measurement model. In a bi-factor model, the covariances among item answers can be described by a pattern matrix in which each item loads onto a general (or global) factor (e.g., empowering climate) and a group (or specific) factor (e.g., task-involving climate). Furthermore, all correlations are constrained to be zero among the group-factors and the global-factors. Although researchers have relied on an approach (B-CFA) in which items load on a global factor and only one group factor, it is now possible to test a bi-factor structure within ESEM (B-ESEM; Morin et al., 2016) where items are permitted to load on multiple factors.

In this study, we initially examined the fit of the original model tested by Appleton et al. (2016) which included the targeted five lower-order climate dimension factors via CFA and ESEM. The approach associated with the best fit (i.e., CFA or ESEM) informed the

testing of higher-order and bi-factor models. Finally, the best fitting model was compared to the fit of a simpler two factor composite (i.e., "empowering" and "disempowering") lower-order model. Models were tested based on the robust Weighted least square (WLSMV) estimator. For the ESEM, target rotation was used where all cross loadings were specified to be close to zero and the main loadings were freely estimated (Morin et al., 2016).

Invariance. Millsap and Yun-Tein's (2004) recommendations for invariance testing with categorical variables were adopted. First, we combined the samples and the findings from the "tests of alternative models" informed the model tested. The validity of the model in boys and girls was then tested via a multiple group analysis without any equality constraint (configural invariance). Measurement invariance of factor loadings and thresholds (scalar invariance; Muthén & Muthén, 2012) was then tested. Total or partial scalar invariance ensures meaningful latent mean comparisons across gender (Marsh et al., 2013).

Assessment of Model Fit. Goodness of fit was evaluated using the Comparative Fit Index (CFI), the Tucker Lewis index (TLI) and Root Mean Square of Approximation (RMSEA) with its 90% confidence interval. Hu and Bentler (1999) proposed the following cut off criteria: CFI and TLI >.90 and > .95 and RMSEA values < .08 and < .06, which are considered as indicators of acceptable and excellent fit, respectively. To allow a degree of flexibility in the cut-off criteria, the parameter estimates, statistical conformity and theoretical relevance were also consulted when evaluating and comparing model fit (Marsh, Hau, & Wen, 2004).

When comparing the fit of the structural models and nested models in the invariance process, it is advised that competing models provide a similar degree of fit to the data and the change in CFI is < 0.1 and increases in RMSEA are < 0.15. In particular, Marsh and colleagues (2009; 2010) suggested that fit indices that correct for parsimony (e.g., RMSEA) are particularly important in ESEM given the large number of estimated parameters. For this study, we also examined the WRMR when comparing the alternative models. While not

describing the fit of the models, lower WRMR values reflect better fit.

Internal reliability was tested using Cronbach's Alpha. An alpha above .80 constitutes a reliable measure (Clark & Watson, 1995), while .70 and .60 are generally agreed as the lower limits for scales with 10 or more and less than 10 items, respectively (Hair et al., 2010).

Results

Testing Alternative Models in Group One

CFA versus ESEM. CFA provided a poor fit, and the ESEM an excellent fit, to the data for the five-factor lower-order model, respectively (see Table 1). ESEM also resulted in lower factor correlations ($|r|$ = -0.448 to $|r|$ = .506) than the CFA ($|r|$ = -.699 to $|r|$ = .939), providing further support for the use of ESEM over CFA (see Table 2; Marsh et al., 2009).

ESEM parameter estimates (see Table 3) revealed well defined factors for task-involving and controlling dimensions due to substantial target factor loadings (task involving $|\lambda|$ = .207 to .783; controlling $|\lambda|$ = .222 to .475). Autonomy support ($|\lambda|$ = .357 to .680) and ego-involving ($|\lambda|$ = .350 to .923) factors were fairly well defined, although both factors had two items which did not load as intended (autonomy support item 16 $|\lambda|$ = -.001, item 22 $|\lambda|$ = .098; ego-involving item 5 $|\lambda|$ = -.130, item 10 $|\lambda|$ = .033). Finally, the social support items did not load on their intended factor ($|\lambda|$ = .040 to .132). In total, four items did not load significantly onto their intended factor and a number of items cross-loaded (and in some cases had higher loadings) onto non-intended factors. Two task-involving items (Item 1 $|\lambda|$ = .476; Item 4 $|\lambda|$ = .349) cross loaded on the autonomy support factor, and two autonomy support items (Item 16 $|\lambda|$ = .502; Item 22 $|\lambda|$ = .463) and three social support items (Item 8 $|\lambda|$ = .339; Item 14 $|\lambda|$ = .421; Item 27 $|\lambda|$ = .476) cross loaded on the task-involving factor. Likewise, two ego-involving items (Item 5 $|\lambda|$ = .426; Item 10 $|\lambda|$ = .489) loaded onto the controlling factor. Overall, although the results supported the ESEM solution, social support items did not load onto their intended factor and cross-loaded onto the task-involving factor, and a number of other items loaded onto non-intended factors.

ESEM versus H-ESEM and B-ESEM. The H-ESEM solution provided an excellent fit (see Table 1). The higher-order factors had a significant negative correlation of |*r*|= -.913; however, none of the lower-order factors had significant ($p < 0.05$) factor loadings on the higher order factors (TI: |λ| .404; AS: |λ| .479; SS: |λ| -.934; CO: |λ| .695; EI: |λ| .765). For the B-ESEM, an orthogonal bi-factor target was employed when estimating the model (Reise et al., 2011). The B-ESEM model provided an excellent fit (see Table 1) that was superior to all the other models. Results from the B-ESEM solution (see Table 3) revealed a well-defined empowering G-factor with significant loadings on all 17 items (|λ| = .213 to .539). In contrast, the disempowering G-factor was less well defined with five significant factor loadings (three ego-involving and two controlling; |λ| = -.122 to .590). Over and above the G factors, three of the items (two empowering; AS: item 16 and 22; one disempowering EI: item 5) failed to demonstrate significant target factor loadings on their S factors, and the parameter estimates also revealed multiple non-target cross loadings. Three autonomy-supportive, three socially supportive and two ego-involving items had significant factor loadings on non-intended S factors (all >.30. See Table 3). This suggests the task-involving, controlling and to a lesser extent ego-involving S factors tap into relevant specificity and add information to the G factors. The autonomy and social support S factors, however, appear to be less well defined.

In sum, ESEM models best fit the data in group one and although all three ESEM model provide an excellent fit, the B-ESEM had the best fit. However, parameter estimates revealed that the ESEM solutions failed to align to the theory underpinning the model.

Re-testing the ESEM-related Models in Group Two

All three ESEM models provided an excellent fit to the data (see Table 1) in group two, with the B-ESEM providing the best fit. The ESEM produced correlations in keeping with the theoretical assumptions of the model (|*r*| = .47 to .43, see Table 2). The lower-order empowering factors correlated with each other positively but were negatively associated with the disempowering factors. The lower-order disempowering factors correlated

with each other positively but negatively with the empowering lower-order dimensions. The parameter estimates (see Table 4) revealed well defined factors for task-involving, controlling and, to a lesser extent, ego-involving climate dimensions due to substantial target factor loadings (varying from $|\lambda|$ = .29 to .90). There were two ego-involving items that did not load substantially on the intended factor (items 5 and 10, $\lambda|$ = -.20 and -.07, respectively). The parameter estimates for autonomy- and social-support were less well defined with many items failing to load on their intended factor but loading significantly on the task-involving factor.

Regarding the H-ESEM, the factor correlations showed that the lower-order factors loaded ($|r|$ = .30 to .65) non-significantly ($p > 0.05$) onto the higher-order dimensions. In addition, the higher-order factors of empowering and disempowering showed a level of multi collinearity ($|r|$=1.21). For the B-ESEM, there were some inconsistencies with the G factor where both the empowering and disempowering target loadings were not well defined. The empowering G factor had only five significant factor loadings ($|\lambda|$ = -.23 to .29; see Table 4) with three task-involving, one autonomy-supportive and one socially-supportive items loading significantly. The disempowering G factor had nine significant factor loadings ($|\lambda|$ = -.235 to .368) including five ego-involving and four controlling items.

Over and above the G factors, four items failed to demonstrate significant target factor loadings on their respective S factor. All nine task-involving and 10 controlling items loaded significantly on the target factor, and five of the seven ego-involving factors loaded significantly on the intended factor. This finding is in keeping with S factor results from group one. There were also similarities with the S factors of autonomy-support and social-support; however, for group two, all the items failed to load on their intended factor and loaded significantly on the task-involving S factor. Also similar to group one, the same two ego involving items cross-loaded significantly onto the controlling factor (items 5 and 10 $\lambda|$ = -.47 and .69). This suggests that task-involving, controlling and to a lesser extent ego-

involving S factors tap into relevant specificity and add information to the G factor. The autonomy- and socially-supportive S factors, in contrast, appear to be less well defined.

In summary, the fit to the data of all three ESEM models was excellent, with the B-ESEM model having the best fit. Parameter estimates, particularly in the case of autonomy support and social support, were problematic, however. Overall, the results based on the responses to the scale provided by group two were similar with the findings from group one.

Two-factor Composite Model: In both groups, an ESEM model with two lower-order factors (i.e., empowering and disempowering) provided a reasonable fit to the data (see Table 1). Investigation of the parameter estimates (see Table 5) revealed that items loaded significantly ($p < .001$) onto their intended factor. In addition, the parameter estimates revealed a well-defined factor for the empowering climate due to substantial target factor loadings (group one: $|\lambda| = .29$ to .90; group two: $|\lambda| = .50$ to .73). For the disempowering climate, the majority of target factor loadings were consistent with the underlying conceptual model (group one: $|\lambda| = .30$ to .83; group two: $|\lambda| = .20$ to .67) with the exception of controlling coaching items 15 and 29 which loaded more strongly onto the empowering factor in both groups, and controlling coaching item 20 which loaded more strongly onto the empowering factor in group one. Standardised correlations were keeping with the theoretical assumptions of the model (group one: $|r| = -0.48$; group two: $|r| = -0.51$).

In sum, the fit of a two factor composite model was not as strong as the other ESEM models, albeit the fit was still acceptable in both groups and the majority of the items loaded as intended in the two factor model (which was not the case for the other ESEM models). As a result, the two-factor model was adopted when testing for gender measurement invariance.

Internal Reliability

Cronbach's alphas for group one were: task-involving α = .86; autonomy support α = .67; social support α = .65; ego-involving α = .78; controlling α = .64; empowering α = .90; disempowering α = .82. Group two's Cronbach's alphas were: task-involving α = .86;

autonomy support α = .71; social support α = .68; ego-involving α = .76; controlling α = .68; empowering α = .91; disempowering α = .82.

Measurement Invariance across Gender for the Two-factor Model

Indices of fit for configural invariance were CFI=.91, TLI=.90, RMSEA=.06, 90CI%=0.06-0.06, WRMR=2.13 and scalar invariance CFI=.91, TLI=.92, RMSEA=.06 90%CI= 0.054-0.058, WRMR=2.49, offering support for scalar invariance. Non-standardised factor loadings were statistically invariant across gender, thus only standardised factor loadings for the boys are reported. Standardised factor loadings (see Table 5) revealed the majority of empowering and disempowering items for the boys positively and more strongly loaded on their intended factor (than on the non-intended factor), except for controlling coaching items 15, 20 and 29 which loaded more strongly onto the empowering factor. For the non-reference (girls) group, standardised factor loadings for empowering items ranged from .53 to .74 ($p < .001$) on the empowering factor and -.13 to .20 on the disempowering factor. The standardised factor loadings for the disempowering items ranged from .19 to .74 ($p < .001$) on the disempowering factor and -.23 to .47 on the empowering factor. Again, controlling items 15, 20 and 29 loaded positively and more strongly onto the empowering compared to the disempowering factor. Finally, the correlation between the empowering and disempowering factor was -.46 ($p < .001$) in the boys and -.60 ($p < .001$) in the girls.

Discussion

This study identified the best approach to modeling the EDMCQ-PE's factor structure, established the internal reliability of pupils' scores on the scale, and confirmed gender measurement invariance in two groups of Welsh students. Aligned with Appleton et al.'s (2016) findings in youth sport, the ESEM solution provide a better fit compared to CFA solution for the scale's structure. Further support for the ESEM over the CFA solution was gleaned via the reduced correlations between the five climate dimensions. These findings replicate earlier studies (e.g., Myers, Chase, Pierce & Martin, 2011) which evidenced the

superiority of ESEM, and provide further support for its use when examining the factor structure of complex, multidimensional scales.

From a theoretical perspective, there is a clear overlap between items tapping task-involving, autonomy- and socially-supportive (empowering) climates, and between items capturing controlling and ego-involving (disempowering) climates (Appleton et al., 2016). It is therefore unsurprising that ESEM outperformed CFA when modeling the EDMCQ-PE. This is because when conducting CFA, items cannot cross loading onto non-intended, albeit related factors and this subsequently leads to inflated factor correlations and poorer fit (Marsh et al., 2013). In comparison, ESEM permits items to load on both intended and non-intended factors. This more flexible approach resulted in a better fit and reduced correlations between the factors in the current study. Building upon Appleton et al.'s (2016) finding with the EDMCQ-C, it seems the factor structure of the EDMCQ-PE is best represented by ESEM.

Despite best fit emerging with the ESEM solutions, the parameter estimates revealed elevated cross-loadings. This suggests the ESEM solutions across both groups did not fully support Duda's (2013) theoretical model underpinning the scale. Specifically, two task-involving items had elevated and significant factor loadings on autonomy-support in group one, and many (or all) of the autonomy- and social-support items had high factor loading values on the task-involving dimension in group one and/or two. Likewise, in both groups, two ego-involving items had elevated scores on the controlling dimension. Elevated cross-loadings were also evident in the ESEM conducted by Appleton et al. (2016) when examining the psychometrics of the EDMCQ-C. Moreover, evidence of cross-loadings is consistent with the assumption of ESEM that complex, multidimensional structure scales will rarely have indicators that are "pure" indicators of one factor (Marsh et al., 2013). As Appleton et al. (2016) explained, the cross-loading of task-involving, autonomy- and social-support items onto non-intended lower order factors is understandable given the theoretical overlap between the key features of these empowering climate dimensions. For example, it is likely that in

encouraging a task-focused approach to competence, PE teachers will provide their students with meaningful choices and rationales during the lessons, welcome pupils' input during activities and teamwork, and take a socially-supportive approach when correcting mistakes and errors. In contrast, a controlling PE teacher who conveys negative conditional regard and intimidates the pupils will likely be ego-involving by responding to students' mistakes with criticism. Despite permitting items to cross-load onto a non-intended factor in ESEM, however, it is expected that items load most strongly (and significantly) onto their intended factor – this was not the case in this study for a number of the items.

The failure of some items to load most strongly (and in some case, significantly) onto their intended factor was also evident in the B-ESEM. The B-ESEM was associated with the best model fit in both groups, yet only five items (from 17) loaded significantly onto the G disempowering factor in group one. In group two, only five items loaded significantly onto the G empowering factor and nine items loaded significantly onto the G disempowering factor. Moreover, replicating the findings from the ESEM, a number of items failed to load significantly and most highly on their intended S factor in both groups. The findings relating to the B-ESEM model are thus generally consistent with those reported by Appleton et al.'s (2016) examination of the EDMCQ-C's factor structure and reinforce their conclusion that despite being associated with the best fit, the B-ESEM solution does not accurately represent Duda's (2013) multidimensional, hierarchical model of the motivational climate.

The findings associated with the ESEM solutions are noteworthy because Marsh et al. (2010) suggested that the appropriateness (and adoption) of a particular model should not be based on fit indices alone, and parameter estimates should be consulted. In contrast to the five lower-order factors ESEM and B-ESEM solutions, the fit indices for the two factor composite model were lower. Importantly, however, the model fit was still acceptable and the parameter estimates were less problematic across both groups. Specifically, all the task-involving, autonomy and social support items loaded significantly and most strongly onto one

(empowering) factor, and all the ego-involving items and the majority of controlling items loaded significantly and strongly onto a second (disempowering) factor. The cross-loading of a number of controlling items onto the empowering factor was consistent in both groups and was invariant across boys and girls. Despite these cross-loading items, and departing from Duda's (2013) proposed hierarchical model of the motivational climate, the two factor model seems to offer a cleaner solution compared to the other models tested in this (and Appleton et al's) study. The adoption of a two factor model is also partly reinforced by the findings testing the other ESEM models in this study and in Appleton et al. (2016), where many empowering items loaded most strongly onto one factor and a number of ego-involving items loaded most strongly onto a second factor with the controlling items. Thus, researchers adopting the EDMCQ-PE (and EDMCQ-C) may wish to proceed by adopting this less complex two-factor structure. Doing so would enable researchers to capture empowering and disempowering teacher-created motivational climates in PE, and would reduce the complexities associated with establishing the psychometrics of the scale in other samples.

The controlling items that cross-loaded onto the empowering factor in the two-factor model were 15 ("My teacher only allowed us to do something we like to do at the end of class if we had done well during class"), 20 ("My teacher only rewarded students with prizes, treats or fun activities if they performed well in PE"), and 29 ("My teacher mainly used rewards/ praise to make pupils complete all the tasks he or she sets during class"). All three items were originally included in the EDMCQ to capture the subtle use of rewards that can control behavior (and performance), as per a key assumption of SDT (and specifically cognitive evaluation theory; Deci, 1975). This key assumption applied to PE suggests that when teachers use rewards and praise in a controlling manner (e.g., to ensure pupils complete set tasks in class), pupils are more likely to have their feelings of autonomy and intrinsic motivation towards the task undermined (Deci & Ryan, 1975). However, in this study, the findings suggest that pupils did not interpret these teaching strategies involving rewards and

praise as just controlling/disempowering. Instead, the strategies were also perceived as empowering. The reason why these controlling items were perceived as empowering is unclear. One possible explanation, consistent with cognitive evaluative theory, is that the use of rewards may not have been viewed by the pupils as controlling (thus undermining feelings of autonomy), but rather as informational which enhancing of feelings of competence, and the satisfaction of the psychological need for competence is a key correlate of an empowering motivational climate (Duda & Appleton, 2016). It may also be that the rewards given in response to doing and performing well during class were interpreted by students in a task-involving manner, such as recognition for personal development, successfully executing a teaching instruction, and/or the application of effort. Future research should determine the extent to which the use of rewards as stipulated in items 15, 20 and 29 in PE are empowering over the short and long-term. For example, qualitative research with teachers and pupils may reveal the extent to which the use of rewards is task-involving and competence promoting. We recommend that until future research clarifies whether (and why) these controlling strategies are empowering, items 15, 20 and 29 should not be included in the EDMCQ-PE

Regarding measurement invariance, the findings in the current study suggest the two factor model showed scalar invariance across boys and girls. This particular finding provides further information on the psychometric properties of the scale, and suggests the EDMCQ-PE can be used to provide meaningful latent mean comparisons across boys and girls in terms of their perceptions of the overall empowering and disempowering features of the motivational climate manifested in PE classes. Such comparisons are important given the call by authors (e.g., Duda et al., 2014) for interventions that attempt to manipulate the teacher-created motivational climate in PE to enhance the empowering (and minimize the disempowering) characteristics of this environment. In addition, scalar invariance means it is possible to test, and compare across gender, theory-informed process models (see Duda & Appleton, 2016) that include PE teacher-created empowering and disempowering climates. Such research

would also contribute to the nomological validity of the EDMCQ-PE.

Limitations and Future Directions

A limitation of this study is that additional indicators of validity and reliability were not examined. This is because we wanted to first determine the best solution representing the structure of the EDMCQ-PE. In the future, researchers should consider other forms of validity (e.g., predictive validity; invariance across countries, age) and reliability to further establish the psychometrics of the EDMCQ-PE. A further limitation is that the multilevel nature of the data (i.e. pupils with classes) was not considered. This is because within the two groups of pupils, there were a limited number of classes per parameter which made it unfeasible to test the multilevel nature of the data. Future research should attempt to address this issue by recruiting pupils from a larger number of classes (and schools) and accounting for clustering effects when examining the EDMCQ-PE's factor structure (see Myers, 2013, for an example). Future research should also test EDMCQ-PE's factor structure in a range of school settings and pupils given the current study was limited to secondary school Welsh pupils. From a pedagogical and practical perspective, the EDMCQ-PE could be used by teachers and researchers to establish the empowering and disempowering climate being created in secondary/high school PE. The scale could be used, for example, to determine the extent to which teachers (based on self-report and/or students' perceptions) are (or are not) employing motivational strategies that are known to foster or hinder students' autonomous motivation, learning, engaging and psychological health. In turn, the identification of the presence and/or absence of specific motivation-related strategies could inform the content of CPD education workshops, to ensure PE teachers' future attempts to create a motivational climate in class are more empowering and less disempowering. Moreover, such CPD education workshops could enhance PE teachers' understanding of why the motivational climate and specific empowering and disempowering strategies impact on their students.

Conclusion

The evidence from this study suggests that, in its current format, the EDMCQ-PE does not replicate the hierarchical structure of the motivational climate proposed by Duda (2013). This finding is consistent in youth sport (Appleton et al., 2016) and suggests further work is required to amend the EDMCQ in order to better represent the structure of the motivational climate according to Duda's (2013) model. Such work may focus on re-writing and/or deleting items that failed to load on its intended factor and/or had elevated factor loadings on non-intended factors in this study. However, the current study does suggest the EDMCQ-PE may be used by researchers and teachers to capture the two key composite climate dimensions (i.e., empowering and disempowering) proposed by Duda (2013) and that this approach to modeling the scale's factor structure (i.e., two lower-order factors) is scalar gender invariant.

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Table 1. Goodness of Fit Statistics and Information Criteria for the Models Estimated on the EDMCQ-PE

	X2	df	CFI	TLI	RMSEA	RMSEA 90%CI	WRMR
Model (Group 1)							
CFA	2747.02*	517	.88	.87	.07	.07/.08	2.02
ESEM	944.15*	401	.97	.96	.04	.04/.04	0.85
H-ESEM	943.47*	405	.97	.96	.04	.04/.04	0.86
B-ESEM	691.25*	366	.98	.97	.03	.03/.4	0.69
Two Factor (ESEM)	1868.72*	494	.92	.92	.06	.06/.06	1.40
Model (Group 2)							
ESEM	932.71*	401	.97	.96	.04	.04/.04	0.82
H-ESEM	918.70*	405	.97	.96	.04	.04/.04	0.83
B-ESEM	772.45*	366	.98	.97	.04	.03/.04	0.73
Two Factor ESEM	2406.22	494	.91	.89	.07	.07/.07	1.58

Note. CFA= Confirmatory factor analysis; H = Hierarchical model; B = Bifactor model; ESEM = Exploratory structural equation modeling; df = Degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; WRMR = weighted root mean square residual; ESEM were estimated with target oblique rotation; bifactor-ESEM were estimated with bifactor orthogonal target rotation; * $p < .01$.

Table 2. Standardized Factor Correlations for the CFA and ESEM solutions for the EDMCQ-PE

	Task Involving	Autonomy-Supportive	Socially-Supportive	Ego-Involving	Controlling Coaching
Task Involving		.94** / .95**	.94** / .98**	-.55** / -.63**	-.68** / -.64**
Autonomy-Supportive	.51** / .43**		.87** / .96**	-.48** / -.54**	-.62** / -.61**
Socially-Supportive	.43** / .34**	.28** / .21**		-.59** / -.73**	-.7** / -.74**
Ego-Involving	-.45** / -.47**	-.23** / -.31**	-.34** / -.32**		.86** / .84**
Controlling Coaching	-.25** / -.19**	-.035/ -.28**	-.25** / .10**	.44** /.42**	

Note. CFA correlations (above the diagonal) ESEM correlations (below the diagonal). Group 1 correlations to the left and Group 2 to the right. * $p < .05$. ** $p < .01$

Table 3. Standardised Factor loadings for ESEM and B-ESEM of the EMCQ (Group 1)

Item	CFA	ESEM						B-ESEM						
	Factor Loading	Uniq	T	A	S	E	C	Uniq	T	A	S	E	C	G-F	Uniq
1	.67**	.56**	**.21****	.48**	.1*	-.1*	-.07	.5**	**.38****	.32**	.12**	-.19**	-.14**	.44**	.49**
4	.77**	.41**	**.29****	.35**	.25**	-.09*	-.10**	.66**	**.50****	.21**	.26**	-.20**	-.21**	.4**	.62**
11	.75**	.45**	**.44****	.36**	.18**	.11**	-.15**	.68**	**.49****	.13**	.20**	-.06*	-.21**	.54**	.68**
13	.58**	.66**	**.41****	.28**	.15**	.16**	-.1*	.4**	**.4****	.08	.15**	.01	-.13**	.48**	.4**
18	.61**	.62**	**.47****	.19**	.03	-.01*	.07*	.73**	**.45****	.08*	.04	-.18**	.01	.42**	.73**
23	.70**	.51**	**.49****	.07	.06	-.31**	.13**	.51**	**.53****	.02	.07	-.35**	.02	.34**	.46**
28	.70**	.51**	**.62****	.01	.03	-.15**	.01	.56**	**.57****	-.05	.01	-.24**	-.08*	.35**	.42**
30	.73**	.47**	**.76****	-.06	.02	-.03	-.08*	.65**	**.73****	.04	-.12**	-.12**	-.16**	.21**	.6**
34	.71**	.49**	**.78****	-.01	-.06	.01	-.08**	.41**	**.67****	.03	-.17**	-.11**	-.14**	.32**	.37**
3	.58**	.66**	.13**	**.36****	.1*	-.14**	-.07	.45**	.32**	**.26****	.13**	-.2**	-.14**	.29**	.45**
6	.52**	.73**	.04	**.68****	-.02	-.01	-.03	.39**	.22**	**.55****	.02	-.08*	-.04	.43**	.36**
16	.73**	.47**	.50**	**-.01**	.23**	-.16**	.06	.47**	.62**	**.02**	.16**	-.21**	-.07	.22**	.44**
22	.62**	.62**	.46**	**.1***	.09*	-.11**	.1**	.59**	.51**	**.08**	.08	-.15**	.01	.27**	.57**
32	.51**	.75**	.32**	**.46****	-.05	.1**	.04	.52**	.35**	**.39****	-.11**	.03	.04	.41**	.52**
8	.6**	.64**	.34**	.23**	**.13****	-.02	-.06	.7**	.37**	.02	**.25****	-.12**	-.13**	.42**	.67**
14	.72**	.48**	.42**	.17**	**.04**	-.25**	.02	.5**	.49**	.08*	**.11***	-.31**	-.09*	.34**	.5**
27	.66**	.57**	.48**	.1*	**.04**	-.05	-.15**	.57**	.46**	-.03	**.10***	-.17**	-.22**	.34**	.56**
5	.31**	.90**	-.29**	.26	-.03	**-.13****	.43**	.59**	-.21**	.23**	.08	**.01**	.38**	.16	.58**
9	.78**	.39**	-.03	-.01	.0	**.61****	.24**	.28**	-.28**	.01	-.14**	**.62****	.38**	.02	.27**
10	.68**	.54**	-.07	.03	-.39**	**.03**	.49**	.68**	-.37**	-.07	-.14*	**.15***	.45**	.40**	.68**
19	.76**	.42**	.06	.06*	.1**	**.88****	.06	.72**	-.17**	.00	.04	**.80****	.17**	.15	.72**
21	.5**	.75**	.0	-.01	.06	**.35****	.3**	.64**	-.13**	.01	.01	**.39****	.31**	.16*	.64**
25	.65**	.58**	-.11*	.03	-.05	**.47****	.13**	.48**	-.33**	-.09*	.04	**.46****	.19**	.17**	.47**
33	.84**	.29**	.09**	-.01	.01	**.92****	.04	.47**	-.24**	-.07**	-.04	**.83****	.17**	.17	.36**
2	.59**	.66**	-.16**	-.01	-.04	.21**	**.36****	.63**	-.33**	-.07	-.01	.26**	**.44****	.01	.61**
7	.70**	.51**	-.17**	-.12**	-.09*	.23**	**.35****	.60**	-.43**	-.13**	-.2**	.28**	**.50****	-.12	.55**
12	.72**	.48**	-.09*	-.13**	-.02	.28**	**.48****	.60**	-.36**	-.15**	-.05	.35**	**.53****	.07	.59**
15	-.3**	.91**	.07	.11*	.39**	-.17**	**.35****	.49**	.37**	.21**	.31**	-.08*	**.22****	.01	.48**
17	.63**	.60**	-.02	-.13**	-.02	.28**	**.43****	.74**	-.27**	-.12**	-.1*	.34**	**.47****	.08	.68**
20	-.13**	.98	.08	.01	.43**	-.09*	**.47****	.41**	.3**	.1	.34**	.02	**.33****	.05	.36**
24	.60**	.64**	.02	.09*	-.42**	.12**	**.45****	.89**	-.28**	.00	-.17**	.21**	**.37****	.59**	.81**
26	.54**	.71**	-.09*	.10*	-.22**	.07	**.46****	.6**	-.28**	.00	.05	.18**	**.39****	.43**	.54**
29	-.15**	.98*	.29**	.01	.16**	-.09*	**.46****	.19**	.39**	.15**	.06	.00	**.37****	.43	.19**
31	.2**	.96**	.08	.1*	-.05	.17**	**.22****	.41**	.04	.21*	-.2**	.21**	**.24****	.43	.39**

Note. Bold signifies items on their intended factor – Note T= Task-involving; A= Autonomy Support; S= Social Support; E= Ego-involving; C = Controlling *p < 0.05, **p < 0.001.

Table 4. Standardised Factor loadings for ESEM and B-ESEM of the EMCQ (Group 2)

Item	ESEM						B-ESEM						
	T	A	S	E	C	UNIQ	T	A	S	E	C	G-F	UNIQ
1	**.65****	.02	0.02	-.06	-.09**	.48**	**.62****	.25**	-.12*	-.17**	-.11**	-.13	.49**
4	**.56****	.08	.17**	-.03	-.17**	.62**	**.65****	.24**	.04	-.16**	-.2**	-.23**	.61**
11	**.57****	.13**	.12**	-.08*	-.09**	.57**	**.74****	.09*	-.01	-.14**	-.14**	-.14	.56**
13	**.56****	.16**	.01	.03	.03	.45**	**.63****	.1*	-.09*	-.01	.007	-.07	.41**
18	**.35****	.29**	-.02	-.15**	.03	.72**	**.61****	.02	-.04	-.08*	-.07**	.13	.57**
23	**.29****	.35**	.01	-.38**	.11**	.66**	**.66****	.07	-.01	-.26**	-.07	.26**	.61**
28	**.38****	.25**	.08	-.21**	-.01	.43**	**.58****	.31**	-.01	-.23**	-.13**	.20**	.35**
30	**.36****	.3**	.15**	-.14**	-.06	.54**	**.7****	.07*	.08*	-.13**	-.17**	.08	.54**
34	**.36****	.31**	.12*	-.15**	-.02	.33**	**.68****	.07	.06	-.12**	-.13**	.11	.34**
3	.42**	**.12***	.24**	-.01	-.15**	.43**	.57**	**.2****	.12**	-.12**	-.18**	-.12	.43**
6	.53**	**.15****	.04	.08	.01	.43**	.48**	**.38****	-.06	-.01	-.02	-.10	.39**
16	.46**	**.23****	.05	-.07	-.13**	.45**	.58**	**.34****	-.04	-.13*	-.20**	.07	.44**
22	.26**	**.42****	-.08	-.07	-.05	.61**	.49**	**.23****	-.05	.01	-.17**	.29**	.58**
32	.42**	**.27****	.11**	.02	.1**	.42**	.53**	**.32****	.04	-.03	.03	.02	.41**
8	.48**	.11*	**.03**	-.14**	-.13**	.64**	.58**	.21**	**-.07**	-.2**	-.19**	.02	.6**
14	.48**	.08	**.07**	-.3**	-.07**	.51**	.66**	.14**	**-.06**	-.33**	-.17**	-.03	.49**
27	.28**	.28**	**.11***	-.15**	-.09**	.50**	.54**	.22**	**.04**	-.16**	-.2**	.17*	.49**
5	.16**	-.17**	.14	**-.2****	.49**	.62**	-.04	.36**	.05	**-.29****	.47**	.07	.6**
9	-.16**	.16**	.03	**.7****	.18**	.27**	-.38**	.02	.08*	**.61****	.32**	.17**	.27**
10	.00	-.18**	-.14	**-.07**	.69**	.62**	-.24**	-.14**	-.11*	**.03**	.69**	.08	.57**
19	.06	.04	.05	**.9****	.01	.70**	-.32**	.03	.02	**.68****	.22**	.35**	.7**
21	-.06	-.04	.07	**.41****	.2**	.63**	-.24**	-.09*	.08*	**.33****	.3**	.19**	.59**
25	.11*	-.11**	.01	**.57****	.20**	.44**	-.26**	-.04	-.04	**.41****	.35**	.31**	.42**
33	.13**	-.02	-.01	**.88****	.04	.40**	-.34**	.06	-.06*	**.65****	.25**	.37**	.36**
2	-.07	.22**	-.23**	.16**	**.47****	.55**	-.19**	.08	-.09	.32**	**.47****	-.15*	.54**
7	-.26**	.24**	-.19*	.25**	**.48****	.53**	-.34**	.01	.04	.46**	**.52****	-.24**	.50**
12	-.07	.02	-.10	.26**	**.54****	.58**	-.27**	-.11**	-.02	.33**	**.60****	.06	.57**
15	.11	-.01	.52**	-.08*	**.22***	.51**	.23**	.27**	.41**	-.25**	**.16***	.16	.46**
17	-.02	.03	-.17**	.20**	**.55****	.72**	-.22**	-.09*	-.06	.31**	**.59****	-.02	.73**
20	-.10	.13	.56**	.04	**.33****	.47**	.2**	-.06	.52**	-.04	**.29****	.18	.45**
24	.05	-.3**	-.14	-.02	**.62****	.84**	-.28**	-.2**	-.2**	.01	**.66****	.21*	.84**
26	.09	-.33**	.02	-.05	**.57****	.63**	-.25**	.02	-.09	-.114	**.59****	.25*	.62**
29	.05	.16*	.30**	-.19**	**.39****	.27**	.32**	.02	.24**	-.16**	**.28****	.04	.26**
31	.23**	.03	-.02	.07	**.35****	.5**	.11**	.09*	-.07	.06*	**.35****	.1	.48**

Note. Bold signifies items on their intended factor. T= Task-involving; A= Autonomy Support; S= Social Support; E= Ego-involving; C = Controlling. *$p < 0.05$, **$p < 0.001$.

Table 5. Standardised Factor loadings for Two Lower-Order Factor ESEM and Measurement Invariance Across Gender

	Group 1		Group 2		Gender Invariance[a]	
Item	Empowering	Disempowering	Empowering	Disempowering	Empowering	Disempowering
1	**.65****	-.10*	**.67****	-.08*	**.68****	.00
4	**.69****	.15**	**.67****	.13**	**.67****	-.08**
11	**.76****	-.12**	**.73****	-.1**	**.71****	.00
13	**.65****	.003	**.66****	-.1	**.67****	.09**
18	**.64****	.25**	**.59****	.17**	**.64****	.04
23	**.61****	-.03	**.66****	-.02	**.63****	-.11**
28	**.62****	-.12**	**.65****	-.08*	**.62****	-.10**
30	**.65****	.01	**.67****	-.04	**.63****	-.09**
34	**.67****	.09*	**.67****	.13**	**.59****	-.05*
3	**.48****	.03	**.59****	-.01	**.54****	-.04
6	**.61****	-.13**	**.62****	-.09**	**.62****	.16**
16	**.61****	-.12**	**.63****	-.08*	**.59****	-.12**
22	**.60****	-.12**	**.5****	-.09**	**.56****	.00
32	**.67****	-.06*	**.67****	-.05	**.56****	.19**
8	**.57****	-.03	**.59****	-.13**	**.58****	-.06*
14	**.59****	-.15**	**.64****	-.18**	**.61****	-.15**
27	**.53****	-.16**	**.56****	-.14**	**.53****	-.14**
5	.04	**.36****	.3**	**.40****	.12**	**.36****
9	-.06*	**.72****	-.21**	**.62****	-.10**	**.64****
10	-.14**	**.54****	-.003	**.66****	-.08**	**.60****
19	.09*	**.83****	-.14**	**.67****	.02	**.71****
21	.04	**.54****	-.14**	**.44****	-.04	**.47****
25	-.14**	**.52****	-.10*	**.57****	-.10**	**.52****
33	.01	**.84****	-.15**	**.67****	-.03	**.71****
2	-.13**	**.49****	-.01	**.54****	-.06*	**.47****
7	-.27**	**.48****	-.19**	**.57****	-.22**	**.51****
12	-.16**	**.61****	-.09*	**.67****	-.12**	**.65****
15	.44**	**.13****	.45**	**.19****	.39**	**.18****
17	-.10*	**.58****	-.04	**.65****	-.08**	**.64****
20	.39**	**.26****	.33**	**.33****	.35**	**.30****
24	-.05	**.59****	-.07*	**.63****	-.05*	**.60****
26	-.03	**.55****	.04	**.58****	.01	**.57****
29	.45**	**.30****	.46**	**.28****	.40**	**.30****
31	.15**	**.37****	.29**	**.43****	.19**	**.38****

Note. Bold signifies items on their intended factor. *$p < 0.05$, **$p < 0.001$. [a] = standardised factor loadings of reference group (boys).