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Peer Motivational Climate in Youth Sport: Measurement Development and Validation

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The influence of the peer group on young people's achievement motivation has been highlighted in the literature as an area that needs examination (e.g., Harwood & Swain, 2001). To this effect, a new measure of youngsters' perceptions of the peer motivational climate (Peer Motivational Climate in Youth Sport Questionnaire; PeerMCYSQ) was developed and tested across three studies. In Study 1, exploratory and confirmatory factor analyses (CFA) with 431 athletes between the ages of 11 to 16 years suggested that the PeerMCYSQ had 6 factors that could also be subsumed into 2 higher order factors (Task-Involving climate: improvement, relatedness support, effort; Ego-Involving climate: intra-team competition, normative ability, intra-team conflict). In Studies 2 and 3 the 6-factor solution and the corresponding hierarchical one were tested using CFA with two independent samples (N = 606 and 495, respectively) of similar age. The results showed that the 6-factor model was problematic and that a 5-factor solution should be preferred instead. Further support to the 5-factor model was provided with hierarchical and multilevel CFAs. Suggestions for further research on peer motivational climate are discussed.

Key Words: peer influence, scale development, confirmatory factor analysis, achievement goal theory

Youth sport involves the participation of young people in sport activities organized and/or supervised by adults. Such activities are considered as some of the most pervasive and popular pursuits for boys and girls in many countries around the world. Peer interactions and relationships are particularly important in youth sport and can contribute to the quality of youths' overall experiences in this context (Smith, 2003). The literature on peer relationships in youth sport has rapidly increased in size and diversity (for comprehensive overviews of the literature, see Brustad, Babkes, & Smith, 2001; Smith, 2003). Issues such as peer acceptance and its relationship to physical competence, friendship in sport, information sources for competence evaluation, and the links between peer relationships with affect and moral development are some of the topics that have attracted research interest in this area. For example, research has shown that peers become progressively

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more important as significant others as children grow older. Young children under 10 years of age rely more on adult feedback to judge their competence compared to those in late childhood and early adolescence, whose central source of competence information is peer comparison and feedback (Horn & Weiss, 1991).

Research on how peer interactions affect children's motivation in youth sport is limited. Studies have shown that peer acceptance and friendship are related to correlates of motivation, such as high levels of commitment and enjoyment and lower levels of anxiety (e.g., Kunesh, Hasbrook, & Lewthwaite, 1992; Weiss & Smith, 2002). However, only a handful of studies have examined how peer influence transmits and fosters achievement related criteria for success and failure. Therefore, the purpose of the present study was to develop an instrument that can be used to assess the impact of peers on children's achievement motivation in youth sport.

Achievement goal theory offers a theoretical framework that can help us understand children's achievement motivation in sport. According to this theory (e.g., Ames, 1992; Duda & Hall, 2001; Nicholls, 1989), individuals' motivation in an achievement context (e.g., classroom, sport) is mainly determined by their achievement goals and the motivational climate in operation. Nicholls (1989) proposed a task and an ego achievement goal orientation which correspond to whether individuals process their ability in a self-referenced or a comparative manner (i.e., developing and improving vs. displaying and proving one's ability). The term *motivational climate* refers to perceptions of situational motivational cues and expectations that encourage a particular goal orientation and, at a given point in time, induce a certain goal involvement state (Ames, 1992).

In physical activity research the term motivational climate has been traditionally operationalized in terms of coach, physical education teacher, or parental influence. Two types have been proposed by Ames (1992): an *ego-involving* (or performance) motivational climate which fosters social comparison and emphasizes normative ability, and a *task-involving* (or mastery) motivational climate that encourages effort and rewards task mastery and individual improvement. In a task-involving motivational climate, athletes derive satisfaction from personal progress, perceive that significant others emphasize personal skill improvement, and regard errors as part of learning. Therefore a task-involving climate is usually associated with positive motivational outcomes such as enjoyment, interest, performance improvement, and performance satisfaction (e.g., Balaguer, Duda, Atienza, & Mayo, 2002; Seifriz, Duda, & Chi, 1992). On the other hand, in an ego-involving motivational climate the emphasis is on interpersonal comparison, the demonstration of normative ability, and competition with teammates. Such emphasis can result in feelings of anxiety, dysfunctional attributions, reduced effort, and other maladaptive outcomes (e.g., Papaioannou & Kouli, 1999; Pensgaard & Roberts, 2000; Treasure & Roberts, 1998).

Besides adults, peers might also affect young people's achievement motivation by creating a particular motivational climate. This possibility has largely been overlooked in the literature on motivational climate, but there is some evidence to support it. For instance, Wentzel (1999) reviewed evidence which shows that the larger peer group exerts a significant influence on children's motivation, greater than that exerted by dyadic friendships. For example, through cooperative learning activities, peers hold each other accountable for certain behaviors such as offering help and sharing knowledge and expertise. Such behaviors are often encountered in a task-involving climate wherein students engage in cooperative learning (Ames & Archer, 1988). Furthermore, Wentzel argued that peers specify sets of goals they would like and expect each other to achieve and which are related to peer approval.

It is reasonable to argue that athletes will perceive a strong ego-involving climate when peer acceptance is based on the goal of demonstrating normative ability. The role of peers in affecting children's achievement motivation was also highlighted by Pintrich, Conley, and Kempler (2003). They argued that when students work toward specific task goals in the classroom, their achievement goals can be influenced through interactions with peers who may have a "distinct approach" from the teacher toward engaging in the task. Pintrich et al. suggested that researchers should examine how peers may evoke goals that are distinct from those encouraged by the teacher.

In educational psychology, parents, teachers, and peers have been studied as distinct sources of influence on student motivation. In sport, Harwood and Swain (2001) took a similar approach in examining the distinct influence of coaches, parents, peers, and the Tennis National Governing Body on the development of achievement goals of young elite British tennis players. Using interviews, Harwood and Swain identified a higher order theme they called "ego-oriented attitudes of peer group." This theme referred to the excessive emphasis that peers place on winning. Another higher order theme identified in this study was of a task-involving nature and referred to peer emphasis on skill development and refinement. Harwood and Swain (2001) concluded that it is important for researchers to appraise the importance of each significant social agent, including peers, and to measure the relative influence exerted by each of them on young athletes' motivation related responses.

In order to better understand how peers affect children's motivation in sport, Vazou, Ntoumanis, and Duda (2005) recently conducted a qualitative study with young athletes ages 12 to 16 years from both individual and team sports. In-depth interviews offered considerable insight into how young athletes perceive a peer motivational climate. The interview guide was based on the peer literature but also included questions based on items from existing sport and physical education (PE) motivational climate measures (i.e., Biddle, Cury, Goudas, et al., 1995; Goudas & Biddle, 1994; Newton, Duda, & Yin, 2000; Papaioannou, 1994). Using both inductive and deductive content analyses, they identified 11 dimensions of peer climate from the interviews: emphasis on individual improvement, equal treatment of teammates, relatedness support, cooperation, and emphasis on maximum effort (dimensions of a task-involving motivational climate); intra-team competition, intra-team conflict, and preference for normative ability (dimensions of an ego-involving climate); extent of autonomy support, reaction to mistakes, and criteria for evaluation of competence (dimensions having aspects of both task- and ego-involving climates).

More specifically, the improvement dimension was defined as encouraging and providing feedback to teammates to improve. Equal treatment referred to the extent to which everyone has an important role in the team. Cooperation referred to working together in order to learn new skills. Effort measured the degree to which peers emphasize to their teammates that they should try their hardest. Intra-team competition was defined as the promotion of inter-individual competition by the peer group. Intra-team conflict referred to negative and unsupportive behaviors (e.g., criticizing teammates when they make mistakes). Normative ability measured peer preference for the most competent players.

The relatedness and autonomy support dimensions that emerged in the study were deductively extracted using the self-determination theoretical framework (Deci & Ryan, 2000); however, they are also evident in the grouping and authority TARGET structures (see Ames, 1992). Relatedness support was defined as fostering the feeling of being part of a group as well as the creation of a friendly atmosphere in the team. Autonomy support referred to whether athletes felt that their peers allowed them to have input in decision-making and freedom in the way they played, or whether their peers acted in a controlling manner. A task-involving motivational climate promotes athlete cooperation (grouping dimension of TARGET) and encourages individual initiative (authority dimension), therefore it is an environment that supports autonomy and relatedness. In contrast, an ego-involving climate limits task choice and athlete initiative, and thus it does not support athlete autonomy (Ames, 1992).

The mistakes dimension referred to both positive and negative reactions from peers when their teammates made mistakes. Finally, evaluation of competence referred to whether peers used normative or self-reference criteria to evaluate their teammates' competence. Most of the dimensions (e.g., effort, improvement) that emerged in the interviews conducted by Vazou et al. (2005) have been previously identified as dimensions of an adult-created motivational climate. Nevertheless, new dimensions emerged that had not previously been tapped by existing motivational climate questionnaires (e.g., intra-team conflict, relatedness support).

Some researchers have recommended that social goals, such as social affiliation and acceptance, should be examined in achievement motivation research in the physical domain (e.g., Allen, 2003; Stuntz & Weiss, 2003). For example, athletes might actively seek to be part of a popular group or to validate themselves through peer recognition (Allen, 2003). However, whether there is a social motivational climate that transmits such social goals independent of task and ego goals is unknown. Our position is that different social goals can be fostered in both task- and ego-involving climates. For example, according to Ames (1992), a task-involving climate can provide opportunities for cooperative group learning and peer interaction which are important for those who seek social affiliation goals. Also, since in an ego-involving climate normative ability is highly valued (Ames & Archer, 1988), children might seek social acceptance goals by demonstrating normative ability to their peers. In fact, Weiss and Duncan (1992) have shown that levels of physical competence are related to the degree of peer acceptance in youth sport.

Instruments that measure the motivational climate created by PE teachers (Biddle et al., 1995; Papaioannou, 1994), coaches (Newton et al., 2000), parents (White, 1996), and sport heroes (Carr & Weigand, 2001) have been developed and published. However, at present there are no measures of peer influence in terms of transmitting task-involving or ego-involving motivational climate cues. Exceptions are two studies by Carr and her colleagues (Carr, Weigand, & Hussey, 1999; Carr, Weigand, & Jones, 2000) which examined the relative influence of parents, teachers, peers, and sport heroes on children's achievement motivation in PE and sport. In these studies peer influence was measured by rephrasing the items of the PE Class Climate Scale (Biddle et al., 1995) and the Parent Initiated Motivational Climate Questionnaire-2 (White, 1996). However, by simply rewording PE teacher and parental climate measures, it is possible to overlook some unique aspects of peer influence. Thus it is important that a valid and reliable measure of the peer motivational climate be developed, since both adults and peers serve as significant others in creating a motivational climate in youth sport (Harwood & Swain, 2001; Pintrich et al., 2003).

To this effect, we conducted three studies in order to develop and validate a measure of the peer motivational climate in youth sport. By peers we refer to all teammates, rather than to dyadic best friends or nonsport peers. Items for the new questionnaire (Peer Motivational Climate in Youth Sport Questionnaire; PeerMCYSQ) were developed in Study 1 based on the results of the in-depth interviews by Vazou and colleagues (2005). The content and factorial validity of the scale were also tested in Study 1. In Study 2 we sought to confirm the factor structure of the scale obtained in Study 1 with data collected from an independent sample. Finally, the purposes of Study 3 were to further test and confirm the factor structure of the scale with a third sample, to test its tenability at the between- and within-team levels, and to examine its test-retest reliability.

Study 1

The purpose of Study 1 was to develop a sport-specific measure of the peer motivational climate and to examine its content and factorial validity.

Method

Participants. The sample (N = 431) consisted of 280 boys and 151 girls from the Midlands region of England, with ages ranging from 11 to 16 years (M = 13.89, SD = 1.44). Children above the age of 11 were selected because most children at this developmental stage are able to at least partially distinguish between effort and ability, and thus are capable of differentiating between ego- and task-involving achievement criteria (Nicholls, 1989). The participants were recruited from different school, club, and county teams. They were involved in both team (n = 366) and individual sports (n = 65) such as rugby, soccer, netball, basketball, hockey, cricket, athletics, martial arts, gymnastics, and swimming. Sport participation history ranged from 1 month to 11 years (M = 3.88, SD = 2.43). All participants were involved in organized sport. We recruited widely in order to ensure variability in sport experience and participation level.

Measure and Procedure. A list of 81 items was developed representing the higher order and lower order themes of the 11 peer motivational climate dimensions identified by Vazou et al. (2005). No further items from existing motivational climate questionnaires were included, since those that could be relevant to the peer climate had already been included in the interview guide developed by Vazou et al. The items were then submitted to a panel of four individuals who had extensive research background on motivation in sport. The experts were asked to review all the items and comment on their clarity, content, and age appropriateness (i.e., whether they were suitable for children ages 11 to 12). The items were presented randomly to the experts and were not categorized into the dimensions that emerged from the interviews. Following suggestions by the four individuals, the item pool was reduced to 64 items and the wording of several items was revised.

A further step in preparing the measure was to pilot test it with 11- to 12-year-old athletes (n = 6) in order to test the difficulty of the items and obtain feedback on their age appropriateness and wording. Participants were instructed to read all items of the questionnaire carefully and to respond on a 5-point scale rating how clear (1 = *not clear at all*; 5 = *very clear*) they found each item. After the questionnaire was completed, the second author met with each athlete separately to discuss the meaning of each item, especially items with a rating of 3 or less. Based on the feedback of these young athletes, some final modifications were made to the wording of some items. Finally, each item was assigned a 7-point rating scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. The anchors for the remaining responses were 2 = *disagree*, 3 = *slightly disagree*, 4 = *neutral*, 5 = *slightly agree*, and 6 = *agree*. The stem used in the questionnaire was "On this team, most athletes…." The instructions at the beginning of the questionnaire were: "Select the main team that you play for and answer the following questions thinking about the environment in this team and the relationships among your teammates."

The third step of the measurement development process was distribution of the questionnaire to a large sample in order to test its factorial validity. The first visit to the teams was arranged after prior agreement with the coach or PE teacher, in order to inform the athletes about the nature and purposes of the study. In the same visit, athlete, coach/PE teacher, and parental consent forms were distributed. Data collection was conducted on the second visit. All athletes who had returned the parental consent forms and had completed the athlete consent form were asked to complete the questionnaires under the supervision of the second author. They were reminded that their responses would be kept confidential and that they could end their participation at any time. This study, as well as the other two reported in this paper, had the approval of the ethics subcommittee of a British university.

Results of Study 1

Exploratory Factor Analysis (EFA). Principal-axis factor analysis with oblimin rotation (because the factors were assumed to be correlated) was employed in order to examine whether the 64 items could be represented by a small number of factors. Principal-axis factoring method was chosen because, unlike principal-components analysis, it distinguishes between common and error variance in the items. The criterion for factor extraction was that factors should have eigenvalues greater than 1.0. In terms of interpreting the extracted factors, item loadings of .32 and above were considered interpretable (Tabachnick & Fidell, 2001). All items with high cross-loadings were deleted, and only items whose primary loadings were large and their secondary loadings were relatively small (below .30) were retained. In such cases, there was a .10 difference or greater between the loadings on the primary and secondary factors.

An EFA with the whole sample[1] produced 9 factors that accounted for 41.05% of the variance of the 64 items. Following the aforementioned criteria for factor extraction, 30 items were deleted in a sequence of 7 factor analyses. That is, items were initially deleted when they did not load on any factors with eigenvalues greater than 1.0. Next, items that had high loadings on 2 or more factors were excluded as well as items with primary factor loading less than .32. Then, in subsequent EFAs, items that comprised single-item factors were removed. The final EFA contained 34 items grouped into 6 factors that accounted for 43.87% of the item variance (see Table 1).

Table 1 Final Exploratory Factor Analysis With Oblimin Rotation in Study 1

Factor/Item — *On this team, most athletes…*	1	2	3	4	5	6
Improvement						
Encourage their teammates to improve the weak points in their performance	–.707	–.138	–.152	–.033	–.120	–.096
Teach their teammates new things	–.566	.131	–.070	–.023	.021	–.061
Advise their teammates how to improve after mistakes	–.544	.120	.053	.152	.086	.068
Work together to improve the skills they don't do well	–.416	.223	–.071	.049	–.034	–.124
Help each other improve	–.389	.299	–.123	.085	–.067	–.047
Offer to help their teammates develop new skills	–.327	.098	–.077	.132	.112	–.237
Relatedness/Autonomy Support						
Feel like their teammates allow them to play as they would like	.023	.561	–.068	.092	–.067	.097
Find positive things to say to everyone	–.171	.500	–.049	–.115	–.078	–.264
Try to get to know their teammates	–.006	.495	–.197	.064	.024	–.076
Feel comfortable with their teammates	–.084	.486	–.299	.008	–.071	–.057
Care about everyone's opinion	–.245	.486	.126	–.115	–.066	.097
Make their teammates feel valued	–.072	.439	–.133	.014	.032	–.213
Make their teammates feel accepted	–.164	.418	–.217	–.018	–.206	–.126
Effort						
Set an example on giving forth maximum effort	–.178	.160	–.552	–.088	–.096	–.000
Praise their teammates who try hard	.010	–.046	–.532	.041	.111	–.062
Are pleased when their teammates try hard	–.001	.063	–.472	.033	–.025	–.104
Feel free to express their opinion to their teammates	–.011	.124	–.388	–.008	.039	.079

(*continued*)

Table 1 ***Cont.***

Factor/Item *On this team, most athletes…*	1	2	3	4	5	6
Encourage their teammates to try their hardest	–.253	.015	–.383	–.029	–.032	.035
Encourage their teammates to keep trying after they make a mistake	–.256	.001	–.372	–.014	–.173	–.236
Intra-Team Competition						
Try to do better than their teammates	.053	.010	–.003	–.668	.164	–.035
Encourage each other to outplay their teammates	–.039	.032	.152	–.578	.057	.048
Look pleased when they do better than their teammates	.092	.032	–.166	–.470	–.067	.168
Normative Ability						
Want to play the most able teammates more	.047	–.071	–.124	–.149	.563	.016
Praise the most able teammates	–.030	–.266	–.172	–.146	.537	.059
Care more about the opinion of the most able teammates	.034	.070	.006	.013	.480	–.047
Think that good teammates are those who perform a task successfully	–.208	–.079	–.101	–.077	.420	.220
Feel pressure to play according to how most able players want them to play	–.035	–.040	.130	–.063	.412	.122
Want to be with the most able teammates	–.010	–.172	–.107	–.099	.334	.235
Intra-Team Conflict						
Make negative comments that put their teammates down	.105	.061	.058	–.073	.018	.732
Criticize their teammates when they make mistakes	.031	–.009	–.030	–.098	–.022	.714
Put pressure on their teammates in terms of how they expect them to perform	–.099	–.026	–.039	–.020	.040	.706
Laugh at their teammates when they make mistakes	.005	–.079	.140	–.076	–.003	.501
Complain when the team doesn't win	.197	–.008	.013	–.058	.164	.467
Make nasty comments to the less able teammates	.066	–.103	.066	–.153	.130	.417

Factor 1, Improvement, comprised 6 items that assess peers' provision of help and encouragement to their teammates to improve (e.g., "offer to help their teammates develop new skills"). Factor 2 was labeled Relatedness/Autonomy Support and consisted of 7 items, of which 6 reflected support for the need of relatedness (e.g. "make their teammates feel valued"), and 1 item reflected support for the need of autonomy (i.e., "feel like their teammates allow them to play as they would like"). Factor 3, Effort, consisted of 6 items and assessed whether peers emphasize to their teammates the importance of exerting effort and trying their hardest (e.g., "praise their teammates who try hard"). The first 3 factors conceptually comprise a task-involving climate which places emphasis on personal skill improvement and effort, and which provides opportunities for cooperative group learning and autonomy.

Factor 4 was named Intra-Team Competition and consisted of 3 items assessing the degree to which there was a peer emphasis on doing better than others (e.g., "encourage each other to outplay their teammates"). Factor 5, Normative Ability, had 6 items that reflected peer preference for the most competent teammates (e.g., "care more about the opinion of the most able teammates"). Finally, Factor 6, Intra-Team Conflict, comprised 6 items that tapped negative behaviors toward teammates (e.g., "laugh at their teammates when they make mistakes"). The last 3 factors conceptually comprise an ego-involving climate that emphasizes demonstration of normative ability and competition among teammates, factors which can result in intra-group conflict. A second-order EFA with the 6 factors of PeerMCYSQ confirmed the hierarchical structure of the questionnaire with task- and ego-involving climate as the two higher order factors.

Item Analysis. Having conducted exploratory factor analysis to determine the factors that were representative of peer motivational climate in youth sport, we carried out item analysis in order to assess the homogeneity of the items comprising each factor (DeVellis, 1991). Item analysis followed the factor analysis because the study was exploratory and we wanted to identify first the peer climate factors before we tested their reliability. For each factor the following criteria were used: (a) an inter-item correlation between $r = .20$ and $r = .70$, (b) a minimum corrected item-total correlation coefficient of $r = .40$, and (c) a coefficient alpha above .70. Inter-item correlations, item-total correlations, and Cronbach alphas are indicative of the internal reliability of a scale (Kidder & Judd, 1986).

Item analysis resulted in the elimination of one item from the Effort factor that did not meet the above criteria ("feel free to express their opinion to their teammates"); all other items satisfied these criteria. Cronbach coefficient alphas were above .70 for most factors: improvement, $\alpha = .81$; relatedness/autonomy support, $\alpha = .84$; effort, $\alpha = .72$; normative ability, $\alpha = .72$; intra-team competition, $\alpha = .69$; intra-team conflict, $\alpha = .85$. The coefficient alpha for intra-team competition was just below the acceptable threshold of .70. However, we kept this factor because, being at an early stage of the psychometric testing, it would have been premature to remove a factor that nearly reached the .70 criterion.

We also assessed the normality of all items. The skewness and kurtosis values were small to moderate, with scores ranging from –1.41 to –0.10 ($M = –0.51$) for skewness, and from 1.02 to 2.88 ($M = 0.03$) for kurtosis. Finally, a frequency analysis indicated that the participants employed the entire response range for all items.

Confirmatory Factor Analysis (CFA). A further step in developing the questionnaire was to conduct a CFA using the same sample. Using CFA after EFA with the same data set constitutes a logical progression in exploratory modeling. This is because CFA offers a stringent test of the tenability of the factor structure since, unlikely EFA, it forces cross-loadings to be zero, takes into account measurement error, and produces modification indices and indices of overall model fit to the data (Kline, 1994). However, because the EFA and CFA solutions are obtained with the same sample, there is a risk for capitalizing on chance by producing solutions that do not generalize to other samples. Therefore the obtained solutions were viewed with caution and were subsequently cross-validated with an independent sample in Study 2.

The CFA was carried out using EQS 6.1 (Bentler & Wu, 2002). Given that the normalized estimate of Mardia's coefficient of multivariate kurtosis was high (55), the robust maximum likelihood (ML) estimation procedure was utilized. According to Bentler and Wu (2002), this analysis offers more accurate standard errors, chi-square values, and fit indices when the data are not normally distributed. The overall fit of each tested model to the data was examined via the Satorra-Bentler scaled chi-square test (χ^2) and other fit indices provided by EQS 6.1. These were the Robust Comparative Fit Index (CFI), the Robust Non-Normed Fit Index (NNFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). Based on the criteria advanced by Hu and Bentler (1999), a good model fit is obtained when the CFI and the NNFI values are close to .95, the SRMR is close to .08, and the RMSEA is close to .06. Moreover, to compare competing models, the Consistent Akaike Information Criterion (CAIC) was used. The CAIC does not have a specified range of acceptable values but, among competing models, the one with the lowest CAIC value (which could be a large negative value) is preferred (Hair, Anderson, Tatham, & Black, 1998).

A 6-factor measurement model was tested using 33 items. The ratio of sample size to free parameters in the model was somewhat greater than 5:1, a ratio considered acceptable by Bentler and Wu (2002). The results showed there was room for improvement in the model fit (row 1, Table 2). Inspection of the modification indices and the standardized residual matrix revealed that 6 items were problematic. These items were excluded and the data were reanalyzed via CFA. The results showed marked improvement in the fit indices (row 2, Table 2). However, since it was possible that the good model fit might be sample-specific, the excluded items were retained in the second study in order to be further tested with an independent sample. The factor loadings of the 27-item solution ranged from .41 to .81 (median factor loading = .63). All correlations among the factors were significant but below .70, with the exception of the correlations between improvement and relatedness support (r = .79) and improvement and effort (r = .83). However, note that these correlations are larger than Pearson's correlations because they are not attenuated by measurement error.

Second-Order CFA. The second stage in the model validation procedure was to compare the 6-factor first-order model with a second-order or hierarchical model. The latter model comprised 2 higher order factors, each of which was underpinned by 3 lower order factors (task-involving: improvement, relatedness support, effort; ego-involving: intra-team competition, normative ability, intra-team

Table 2 Fit Indices for All CFA Models

Model	Scaled χ^2	df	Rob. CFI	Rob. NNFI	SR-MR	RM-SEA	CAIC
Study 1 (S1)							
1. S1, M1a, 33 items	736.44	480	.92	.92	.06	.04	–2389.0
2. S1, M1b, 27 items	460.06	309	.94	.93	.06	.04	–1663.4
3. S1, 2nd order, M1b	500.62	317	.93	.92	.06	.04	–1677.8
Study 2 (S2)							
4. S2, M1c, 38 items	1348.05	650	.90	.89	.06	.04	–3466.4
5. S2, M1d, 22 items	345.69	194	.95	.95	.04	.04	–1091.2
6. S2, M2, 21 items	342.02	179	.95	.94	.04	.04	–983.81
7. S2, 2nd order, M1d	442.69	203	.93	.92	.06	.04	–1060.9
8. S2, 2nd order, M2	374.58	184	.94	.94	.05	.04	–988.29
Study 3 (S3)							
9. S3, M1d, 22 items	282.47	194	.95	.94	.05	.03	–1078.7
10. S3, M2, 21 items	274.25	179	.95	.94	.04	.05	–984.23
11. S3, 2nd order, M2	301.15	184	.94	.93	.04	.06	–992.49
12. S3, Multilevel (step 3), M2	375.07	179	.95	.94	.04	.04	–1004.0
13. S3, Multilevel (step 4), M2	428.82	358	1.00	1.00	.03	.02	–2279.5
14. S3, Multilevel (step 4), 2nd order, M2	520.31	368	.99	.99	.11	.02	–2263.7
15. S3, M3	372.49	186	.89	.88	.04	.06	–935.22
16. S3, M4	388.78	183	.89	.87	.05	.07	–897.84
17. S3, M5	479.74	188	.84	.82	.06	.07	–842.02
18. S3, M6	317.33	183	.93	.92	.06	.04	–969.28

Note: CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index, SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CAIC = Consistent Akaike Information Criterion; Rob = Robust.

M1 = 6-factor model (subscripts refer to different number of items); M2 = 5-factor model; M3 = a first-order task-involving factor with 2 ego-involving factors; M4 = a first-order ego-involving factor with 3 task-involving factors; M5 = 2 first-order task-involving and ego-involving factors; M6 = 3 second-order factors: task-involving, ego-involving, and social-involving climate.

For the multilevel CFAs, the chi-square and fit indices are from normal ML analysis.

For all chi-square values, $p < .001$

conflict). The fit of a second-order model can never be better than the fit of the corresponding first-order one (see Marsh, 1987). However, if the fit of the hierarchical model is not much worse compared to the fit of the first-order model, the former should be preferred because it is more parsimonious (i.e., has more degrees of freedom; see Marsh, 1987). In our case the fit[2] of the second-order model was very close to the fit of the corresponding first-order model (row 3, Table 2). This was also evident by their very similar CAIC values.[3] The correlation between the task-involving and ego-involving higher order factors was $r = -.67$.

Discussion, Study 1

The purpose of this study was to develop and test a new measure of the peer motivational climate in sport following a series of procedures involving item adaptation from interview analysis, feedback from four individuals with extensive research background on motivation, pilot testing, exploratory factor analysis, item analysis, and confirmatory factor analysis. The results supported a 6-factor solution in which 3 factors tapped a task-involving climate (improvement, effort, relatedness support) and 3 other factors underpinned an ego-involving climate (normative ability, intra-team competition, intra-team conflict). This factor solution represents a parsimonious set of peer motivational climate factors based on the 11 peer climate dimensions that emerged from Vazou et al.'s (2005) qualitative work.

In the General Discussion we present some conceptual and methodological reasons that may explain why not all 11 dimensions emerged from the factor analyses. Some of the extracted factors (e.g., effort, improvement) have been previously identified as aspects of an adult-created motivational climate. However, other factors (e.g., intra-team conflict and relatedness support) are not measured by existing motivational climate questionnaires. Based on the results of Study 1, we made two decisions before testing the factor structure of the questionnaire in the next study. First, because the intra-team competition factor consisted of only 3 items, 2 new items were written and included in Study 2. Second, because the relatedness/autonomy support factor contained only 1 item tapping autonomy support and 6 items assessing relatedness support, 3 new autonomy support items were written. Thus we ended up with a 38-item (33 existing and 5 new) measure of the peer motivational climate in sport, the factor structure of which we sought to confirm in the next study.

Study 2

The purpose of Study 2 was to confirm the factor structure of the scale that was obtained in Study 1 with an independent sample.

Method

Participants. The criteria for selecting participants were the same as those for Study 1. A total of 606 British athletes participated in the study, of whom 349 were boys and 257 were girls, with ages ranging from 12 to 16 years ($M = 13.91$, $SD = 1.14$). Participants were recruited from different school, club, and county teams. They were involved in both individual ($n = 102$) and team sports ($n = 489$), similar to the sports sampled in Study 1 (15 athletes did not specify their sport). Sport participation history ranged from 3 months to 13 years (M = 3.54, SD = 2.48).

Measure and Procedure. The PeerMCYSQ, as designed in Study 1, was administered. The scale consisted of 38 items representing the 6 factors of improvement, effort, relatedness/autonomy support, normative ability, intra-team competition, and intra-team conflict. The data collection procedure and instructions for completing the questionnaire were similar to those used in the first study.

Results of Study 2

Exploratory Factor Analysis. An EFA was conducted to test whether the 6-factor solution that emerged in Study 1 would also emerge with the new autonomy support items, or whether autonomy support and relatedness support would load on different factors (i.e., whether there would be a 7-factor solution). The results showed that the items for relatedness support and autonomy support loaded again on one factor, producing the same 6-factor solution.[4] All items carried over from Study 1 loaded on the same respective factors. We then sought to confirm this 6-factor solution with a CFA.

Confirmatory Factor Analysis. A CFA with robust ML estimation method was used. The goodness-of-fit indices that were utilized to evaluate the adequacy of the factorial structure of the questionnaire were the same as those in Study 1. The ratio of sample size to free parameters in the model was about 7:1, exceeding the minimum ratio of 5:1 recommended by Bentler and Wu (2002).

A first-order factor model was tested, with the 6 peer climate factors represented by the 38 items. The results showed an inadequate fit of the model to the data (row 4, Table 2). Since the model failed to reach an acceptable fit, some respecifications were made. The 6 items that were problematic in the first study were also problematic in this study and thus were removed. Then, 10 items (including the 5 new ones) which had large modification indices (as shown by the Lagrange Multiplier test) and/or large standardized residuals were also removed in a sequence of CFAs. A final model (M1d) with 22 items produced a 6-factor solution (improvement, relatedness support,[5] effort, intra-team competition, and normative ability) with adequate fit indices (row 5, Table 2). However, several factor correlations were high (i.e., improvement/relatedness support, r = .90; improvement/effort, r = .92; relatedness support/effort, r = .99; and intra-team competition/normative ability, r = .83). Due to the high correlation between intra-team competition and normative ability and the low internal reliabilities of these 2 factors (α = .55 and α = .69, respectively), an additional model was tested. In this second model (M2), intra-team competition and normative ability were combined into one factor (one item from the normative ability factor was removed). This resulted in a good-fitting 5-factor scale with 21 items (row 6, Table 2).

Second-Order CFA. Second-order factor analyses were conducted for both the 5- and 6-factor models in order to examine the hierarchical structure of PeerMCYSQ. In both models the 2 higher order factors were the task-involving and ego-involving climates. The fit indices of both models were acceptable and are presented in Table 2 (rows 7 and 8). The correlation between the task-involving and ego-involving higher order factors was r = –.64 and r= –.74 in M1d and M2, respectively.

Discussion, Study 2

Study 2 tested two first-order models. The 6-factor model (M1) was initially developed in Study 1 and was further tested in this study. Its weakness was the low internal reliability of the intra-team competition and normative ability factors, as well as the high correlations among most of its factors. M2 had a 5-factor structure by combining the intra-team competition and normative ability factors. Its weakness was the high correlations between all the task-involving factors. The hierarchical structure of the models was also tested and was found to fit only slightly worse compared to the fit of the corresponding first-order models. This suggests that the peer motivational climate factors can be represented by a task-involving and an ego-involving second-order factor. Construct validation is an ongoing process, and thus it was deemed important to continue testing the construct validity of PeerMCYSQ with another sample. Moreover, because some factor correlations were higher than those found in Study 1, a third study was needed to test the magnitude of the correlations among the questionnaire factors with an independent sample.

Study 3

The purpose of Study 3 was to test the two first-order models examined in Study 2 with an independent sample. Furthermore, since perceptions of motivational climate can vary within and between teams, it was deemed important to test the factorial structure of the questionnaire using multilevel CFA. A last objective of Study 3 was to examine the temporal stability of the questionnaire over a 4-week period.

Method

Participants. The criteria for selecting participants were the same as those used in the previous two studies. The sample (N = 493) consisted of 124 girls and 369 boys, ages 12 to 17 years (M = 14.08; SD = 1.29). The athletes were recruited from rugby, soccer, basketball, hockey, netball, and swimming. For the multilevel factor analysis we pooled the samples from Studies 2 and 3 (we excluded teams with less than 3 athletes) because, as Heck (2001) showed, large numbers of groups are required for more accurate estimates of parameter coefficients, standard errors, and error variances. The data pooling produced a sample of 816 athletes at the individual level and 83 teams at the group level (average n of athletes per team = 8.45). The participants and teams in Study 2 were different from those in Study 3. For the purpose of testing the test-retest reliability of the questionnaire, we asked a subsample of 55 young athletes (M age = 14.9, SD = 1.41) to complete the PeerMCYSQ twice in 4 weeks.

Measure and Procedure. The PeerMCYSQ, with 21 items, was administered. The data collection procedures and instructions for completing the questionnaire were similar to those used in the previous two studies.

Results of Study 3

Confirmatory Factor Analysis. Similar to the previous two studies, a CFA with robust ML was used. The results showed good fit for both first-order models (rows 9 and 10, Table 2). The correlations among all factors were substantially smaller in both models ($r < .80$) compared to those in Study 2. However, for M1 the internal reliability coefficients for intra-team competition and normative ability were again not acceptable ($\alpha = .62$ and $\alpha = .56$, respectively). For M2 the internal reliability coefficients were acceptable for all peer motivational climate factors except for the combined intra-team competition/ability factor, whose reliability coefficient was marginal (improvement $\alpha = .77$; relatedness support $\alpha = .73$; effort $\alpha = .70$; intra-team competition/ability $\alpha = .69$; intra-team conflict $\alpha = .73$). In view of the unacceptably low Cronbach alphas for intra-team competition and normative ability found in Studies 2 and 3, and despite the comparable fit of the two models, we rejected M1 and tentatively accepted M2 (Table 3).

At the request of an anonymous reviewer, we tested three alternative models. These were M3 which postulated 3 factors (a first-order task-involving factor, competition/ability, and intra-team conflict), M4 which proposed 4 factors (a first-order ego-involving factor, improvement, relatedness support, and effort), and M5 which postulated 2 factors (first-order task-involving and ego-involving factors). As shown in Table 2 (rows 15–17), these models fitted significantly worse than M2, underlining the importance of maintaining distinct subscales despite some high factor intercorrelations, in particular among the task-involving climate factors.[6]

Second-Order CFA. A hierarchical version of M2 was also tested that comprised 2 higher order factors which were underpinned by 3 and 2 lower order factors, respectively (task-involving: improvement, relatedness support, effort; ego-involving: intra-team competition/ability, intra-team conflict). Although the fit of the hierarchical model was slightly worse than the fit of the corresponding first-order model (M2), it was deemed acceptable (row 11, Table 2). This suggests that the peer motivational climate factors can be adequately represented by task-involving and an ego-involving second-order factors, a finding which is consistent with achievement goal theory (Ames, 1992). The correlation between the task-involving and ego-involving higher order factors was $r = -.67$. At the request of an anonymous reviewer, we tested an alternative model (M6) which included a social-involving factor (task-involving: improvement, effort; ego-involving: intra-team competition/ability; social-involving: relatedness support, intra-team conflict), but the fit of the model was worse than the fit of the hierarchical version of M2 (row 18, Table 2). Furthermore, the correlation between the task and social higher order factors was very high ($r = -.94$).

Multilevel CFA. Multilevel CFA allows the researcher to investigate simultaneously the within-team and between-group factor structure of a questionnaire. Treating individuals as if they were independent of their groups (teams in this case) ignores the complexity inherent in the data and can produce potentially biased estimates of model parameters, standard errors, and fit indices (Heck, 2001). Therefore we examined whether there were variations in the perceptions of the peer climate within and between teams, and whether such potential variations had an impact on the factorial structure of the PeerMCYSQ at the within- and between-team levels. To this effect we conducted multilevel CFA testing of the 5-factor model (M2). The Bentler-Liang ML estimation method was used, which is available in EQS 6.1.

The four steps for multilevel CFA outlined by Mûthen (1994) were followed. In Step 1, a single-level model (M2, as described in the previous section) was

Table 3 CFA Factor Loadings, Uniqueness Terms, and Factor Correlations of 5-Factor PeerMCYSQ in Study 3

Factor/Item	*On this team, most athletes…*	1	2	3	4	5	Uniqueness
1. *Improvement*							
	1. Help each other improve	.679					.734
	3. Offer to help their teammates develop new skills	.747					.665
	6. Work together to improve the skills they don't do well	.603					.797
	10. Teach their teammates new things	.603					.798
2. *Relatedness Support*							
	5. Make their teammates feel valued		.706				.708
	13. Make their teammates feel accepted		.713				.701
	18. Care about everyone's opinion		.637				.771
3. *Effort*							
	11. Encourage their teammates to try their hardest			.577			.817
	15. Praise their teammates who try hard			.553			.833
	17. Are pleased when their teammates try hard			.594			.804
	19. Set an example on giving forth maximum effort			.473			.881
	21. Encourage their teammates to keep trying after they make a mistake			.622			.783

(*continued*)

Table 3 Cont.

Factor/Item	*On this team, most athletes…*	1	2	3	4	5	Uniqueness
4. *Intra-Team Competition/Ability*							
	2. Encourage each other to outplay their teammates				.450		.893
	4. Care more about the opinion of the most able teammates				.410		.912
	8. Try to do better than their teammates				.673		.740
	12. Look pleased when they do better than their teammates				.609		.793
	14. Want to be with the most able teammates				.599		.801
5. *Intra-Team Conflict*							
	7. Make negative comments that put their teammates down					.721	.693
	9. Criticize their teammates when they make mistakes					.636	.771
	16. Complain when the team doesn't win					.570	.821
	20. Laugh at their teammates when they make mistakes					.575	.818

Factor correlations	1	2	3	4	5
1. Improvement					
2. Relatedness Support	.77				
3. Effort	.70	.78			
4. Intra-Team Competition/ Ability	–.25	–.31	–.10		
5. Intra-Team Conflict	–.45	–.65	–.50	.59	

Note: The numbers preceding the items indicate the order of each item in the PeerMCYSQ.

tested providing satisfactory fit indices (row 10, Table 2). In Step 2, intraclass correlation coefficients for the observed indicators were examined. The intraclass correlation summarizes the proportion of the total variation in the climate factors that lies between teams. The results revealed some variation in athletes' perceptions of most PeerMCYSQ factors, with intraclass correlations ranging from .09 to .19. In Step 3 we estimated M2 using the pooled within-team covariance matrix (which excludes any between-team variation), resulting in a good model fit (row 12, Table 2). Finally, in Step 4 we tested M2 simultaneously at the within- and between-team levels using the pooled within-team and between-teams covariance matrices.

The two-level model resulted in an excellent fit, indicating that despite some group variations in the perceptions of the peer climate (as indicated by the intraclass correlations), the factor structure of the questionnaire was the same at both the within- and between-team levels (row 13, Table 2). At the within-team level the loadings ranged from .43 to .70. The correlations among the factors ranged from –.08 to .87, with the highest correlations being among the 3 task-involving climate factors (ranging from .77 to .87). At the between-team level the factor loadings were also high, ranging from .57 to .98. Furthermore, there were substantial factor correlations ranging from –.58 to .96, suggesting that perhaps 2 factors could be enough to capture the between-team variation. However, subsequent testing of 2 factors at the between-team level and 5 factors at the within-team level did not result in substantially different model fit. Finally, the proportion of factor variance explained ranged from 30% to 44% at the within-team level, and from 52% to 86% at the between-team level. Multilevel CFA testing of the hierarchical structure of M2 showed excellent fit indices (row 14, Table 2).

Test-Retest Reliability. In order to examine the temporal stability of the PeerMCYSQ, we calculated intra-class correlations for each of the 5 peer climate factors. The data were collected 4 weeks apart using a subsample of 55 young athletes. The intra-class correlations showed acceptable levels of stability for all peer climate factors: improvement, $r = .81$; relatedness support $r = .77$; effort, $r = .82$; intra-team conflict, $r = .74$; and intra-team competition/ability, $r = .81$.

Discussion, Study 3

This study examined the factorial structure of two competing first-order factor models. Based on the available evidence, we concluded that the 5-factor 21-item version (M2) of PeerMCYSQ demonstrated good validity and reliability and is appropriate for use in research on the peer motivational climate in youth sport. Alternative factor structures were also tested (M3–M5). The results showed that despite some relatively high inter-factor correlations, the underlying climate factors were distinct and could not be substituted by two global factors. However, measurement validation is an ongoing process, and therefore both M1 and M2 should be further tested in future research. The 5-factor model had a satisfactory hierarchical structure with task-involving and ego-involving higher order climate factors overlying the 5 factors.

The hierarchical structure of the PeerMCYSQ is consistent with achievement goal theory and with the hierarchical structures of existing motivational climate questionnaires (e.g., Newton et al., 2000; Papaioannou, 1994). The results of multilevel CFA analysis supported the factor structure of M2 and its hierarchical version at the within- and between-team levels, although a model with 2 factors at the between-team level was also tenable. Future research with a larger number of teams should further compare the 5- versus the 2-factor solutions at the between level. Test-retest reliabilities of the questionnaire factors showed acceptable temporal stability, indicating that peer climate perceptions do not change substantially over a period of 1 month. Future research should examine the degree of stability of such perceptions across a competitive season.

General Discussion

The influence of the motivational climate initiated by the peer group on children's achievement motivation has been highlighted in the literature as a topic that deserves further examination (Harwood & Swain, 2001; Pintrich et al., 2003). To this effect we present a new measurement of the peer motivational climate, the PeerMCYSQ, which was developed and validated in a series of three studies. Evidence was provided in this paper for its content and factorial validity, as well as its internal consistency and test-retest reliability. This evidence suggests that the PeerMCYSQ can be used to examine research questions related to peer motivational climate in youth sport.

The results of our psychometric testing showed that a model with 5 first-order factors, as well as its corresponding hierarchical structure, fit the data well. The factors included in the PeerMCYSQ represent a parsimonious set of peer motivational climate factors that tap most of the peer climate dimensions that emerged from Vazou et al.'s (2005) qualitative work. That is, the items comprising the 5 PeerMCYSQ factors include some from conceptually related factors. More specifically, the improvement factor includes items from the cooperation factor, and relatedness support includes items from the equal treatment factor. In addition, effort and intra-team conflict incorporate items from the mistakes factor that reflect positive and negative reactions to mistakes, respectively.

Although we wrote items for 11 factors in order to tap all 11 dimensions that emerged in Vazou et al.'s (in press) study, the results reported here show that it was not possible to extract 11 independent factors. This is not entirely surprising, given that the dimensions which emerge from content analysis might be conceptually independent but in empirical terms are often highly related. Furthermore, from a practical perspective, the 5-factor PeerMCYSQ can be more easily incorporated in a research study alongside other questionnaires as opposed to a cumbersome 11-factor version.

The only dimensions from the qualitative work that are not included in the questionnaire are autonomy support and the evaluation of competence. Although some items tapping these factors were initially extracted in the factor analyses, these were eventually removed because they were problematic; i.e., they loaded on the same factor with items that were not conceptually similar, or they had high standardized residuals. These problems probably arose because both dimensions, as emerged in the Vazou et al. (2005) study, referred to two opposite situations. That is, the autonomy support dimension referred to the presence and absence of autonomy support by including items that measured both. Furthermore, the evaluation-of-competence dimension referred to the use of normative or comparative criteria for competence evaluation.

Although it is not unusual to have qualitative dimensions that refer to two opposite situations, such dimensions are unlikely to remain intact when subjected to quantitative testing. Future research should attempt to measure autonomy support by including items that focus on its presence only. With regard to the competence evaluation factor, it is possible that the participants did not differentiate between the items referring to the use of comparative criteria for inferring competence (embedded in this factor) and the items from the normative ability factor which referred to whether peers are more accepting of those children who have high normative ability. Furthermore, the self-referenced evaluation items included in the competence evaluation factor were similar to the items of the effort and improvement factors. Again, future research should attempt to test new items that will measure the degree to which peers use normative criteria only, and should clearly differentiate these items from those measuring the degree of peer acceptance based on normative ability criteria (i.e., the normative ability items).

In our measurement development effort we included aspects of social affiliation embedded within task- and ego-involving structures. For example, the improvement and intra-team competition/ability factors of the PeerMCYSQ refer to whether peers work together and offer help when needed, or whether peer social validation and acceptance depend on the demonstration of normative ability. Allen (2003) has shown that individuals seek social goals (e.g., affiliation, social status) in sport and notes that these goals should be considered in future research. However, whether the motivational climate transmits social goals independent of task and ego goals is not known. A model with a social climate factor (M6) did not fit very well, but this issue should be further researched. Regardless of whether a social climate factor exists or not, it would be interesting to examine whether young athletes (especially adolescents) who seek social goals in sport are more receptive to the peer climate as opposed to the adult-created climate.

In order to gain a better understanding of the peer motivational climate, future research should examine its origins and development in a youth sport team. We speculate that in a newly formed team the adult-created climate (mainly the coach) is the dominant one. However, with the passage of time and as athletes get to know each other, peers begin to exert an increasingly more influential role on the team. Peer influence can convey motivational cues that are compatible or incompatible with the cues promoted by the coach. Although the coach climate will still permeate throughout the team, because he or she is in charge of the team, the extent to which this climate will be filtered will depend on the pervasiveness of peer influence and the extent of the coach's authority.

The results presented in this paper show good initial psychometric properties for the new questionnaire. However, validation is an ongoing process and future studies should continue to test the validity of the PeerMCYSQ. For example, its discriminant and predictive validity should be examined. We expect that peer, coach, and parental climate (along with motivational cues transmitted by the media or other socialization agents) will be interrelated, but only moderately so. In such a case it would be interesting to look at the relative influence of the peer climate upon young athletes' achievement behavior, cognition, and affect.

In particular, the potentially important role of the peer climate in predicting fluctuations in goal involvement states (see Cernigon, d'Arripe-Longueville, Delignières, & Ninot, 2004, for a dynamical systems approach on goal involvement states) would be an interesting topic for future research. If the peer climate is shown to predict unique variance of important motivational consequences, it would be prudent for intervention studies to take this it into account when attempting to foster task-involving motivation in youth sport. Furthermore, the motivational consequences of being on a team where the coach and peer motivational climates are contradictory (e.g., the coach might emphasize individual improvement but the peers might promote inter-individual comparison) need to be explored. It is hoped that the PeerMCYSQ will allow researchers to pursue further research questions that will enhance our understanding of the different types of motivational climate operating in youth sport.

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Notes

[1] Separate factor analyses were conducted for team sports (n = 366), boys (n = 280), girls (n = 151), athletes 11–13 years old (n = 150), and athletes 14–16 years old (n = 280) in order to examine which items loaded consistently on the same factors across different subsamples. However, due to the small number of some subsamples, we decided not to take these analyses into account when making our subsequent decisions. For those interested in the findings, we can briefly state that in team sports the same number of factors emerged and the pattern of factor loadings was very similar to the pattern that emerged with the whole sample. However, this is not surprising since most participants were from team sports. In boys and older athletes the same number of factors emerged, but some items loaded on different factors. In girls and younger athletes the factor solution was somewhat different, perhaps due to the small sizes of these groups. The outputs from the analyses using the subgroups and the whole sample are available from the second author upon request.

[2] We did not use the chi-square difference test to compare the fit of the first-order and the corresponding hierarchical models because, similar to the chi-square test itself, the chi-square difference test is sensitive to sample size (Cheung & Rensvold, 2002).

[3] In fact the CAIC value for the hierarchical model was slightly lower. This might seem to contradict Marsh (1987), who stated that the fit of a hierarchical model can never be better than the fit of the corresponding first-order model. However, this statement is true only in relation to fit indices that are monotonically related with chi-square. For indices that contain a correction for parsimony, it is possible for the fit of a more restrictive model to be better than the fit of a less restrictive model. This happens when the change in "absolute fit" is very small and the change in parsimony is relatively large (H.W. Marsh, personal communication, May 11, 2005).

[4] At the request of an anonymous reviewer, we conducted a CFA to test the 7-factor solution in which autonomy support and relatedness support were treated as separate factors. The results of the CFA did not show a good fit of the 7-factor model: scaled $\chi^2(644) = 1332.52$; CFI = .89; NNFI = .88; RMSEA = .04; SRMR = .05; CAIC = –3069.70. Furthermore, the correlation between autonomy support and relatedness support was close to 1.0 ($r = .986$).

[5] All the autonomy support items were deleted.

[6] At the request of an anonymous reviewer, we briefly present the relationships between the peer climate scales and a few important motivational indices. In accordance with theoretical predictions, enjoyment (McAuley, Duncan, & Tammen, 1989) and commitment (Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993) were positively predicted by a perceived peer task-involving climate. Specifically, enjoyment was predicted by the improvement ($\beta = .19$; $p < .001$) and effort ($\beta = .15$; $p < .01$) facets of a peer task-involving climate, but not by relatedness support ($\beta = .06$; $p > .05$). Furthermore, commitment was predicted by the improvement ($\beta = .16$; $p < .01$) and relatedness support ($\beta = .12$; $p < .05$) subscales of a peer task-involving climate, but not by effort ($\beta = .02$; $p > .05$). The different beta values indicate that the task-involving subscales of PeerMCYSQ are not redundant because they relate differently to important motivational indices.

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