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Peer relationships and adolescents' academic and non-academic outcomes: Same-sex and opposite-sex peer effects and the mediating role of school engagement

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Background. The literature has documented theoretical/conceptual models delineating the facilitating role of peer relationships in academic and non-academic outcomes. However, the mechanisms through which peer relationships link to those outcomes is an area requiring further research.

Aims. The study examined the role of adolescents' perceptions of their relationships with same-sex and opposite-sex peers in predicting their academic performance and general self-esteem and the potentially mediating role of school engagement in linking these perceived peer relationships with academic and non-academic outcomes.

Sample. The sample comprised 1,436 high-school students (670 boys, 756 girls; 711 early adolescents, 723 later adolescents).

Method. Self-report measures and objective achievement tests were used. Structural equation modelling (SEM) was performed to test the hypothesized model and its invariance across gender and age groups.

Results. Perceived same-sex peer relationships yielded positive direct and indirect links with academic performance and general self-esteem. Perceived opposite-sex peer relationships yielded positive direct and indirect links with general self-esteem and an indirect positive link with academic performance, but mediation *via* school engagement was not as strong as that of perceived same-sex peer relationships. These findings generalized across gender and age groups.

Conclusion. Adolescents' same-sex and opposite-sex peer relationships seem to positively impact their academic performance and general self-esteem in distinct ways. It appears that school engagement plays an important role in mediating these peer relationship effects, particularly those of same-sex peer relationships, on academic and non-academic functioning. Implications for psycho-educational theory, measurement, and practice are discussed.

Each day at school, students strive to cope with a variety of academic and social challenges. Accordingly, school is often positioned as a context in which students'

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academic and social domains interact to affect important psycho-educational outcomes (Boekaerts, de Koning, & Vedder, 2006; Ford & Smith, 2007; Urdan & Maehr, 1995; Wentzel, 1999). Indeed, a number of theoretical/conceptual models have been proposed to elucidate the role of social dynamics in facilitating academic performance and emotional well-being (e.g., Berndt, 1999; Ford & Smith, 2007; Juvonen, 2006, 2007; Martin & Dowson, 2009; Patrick, 1997; Ryan, 2000; Schunk, 1999; Weiner, 1994; Wentzel, 1999). With a view to furthering current understanding of the social influences on students' capacity to function effectively in academic and non-academic domains, the present study examines the role of adolescents' perceived relationships with peers in their school engagement, academic performance, and general self-esteem. It does so by extending recent research and analyses by Martin, Marsh, McInerney, and Green (2009) that shed informative light on how key interpersonal relationships in students' lives (with parents, teachers, and peers) are differentially associated with academic and non-academic outcomes. These extensions take two forms in the present investigation.

First, it tests the differential role of perceived relationships with same-sex and opposite-sex peers in predicting school engagement, academic performance, and general self-esteem. Given the plausible differentiated effects of same-sex and opposite-sex peer relationships on adolescents' school adjustment (Berndt, 1999; Juvonen, 2006, 2007; McDougall & Hymel, 2007; Shaffer-Hand & Furman, 2008), differentiating same-sex from opposite-sex peer relationships is expected to lend greater clarity to the issue. Moreover, as opposite-sex peer interactions begin to emerge more frequently in adolescence (Feiring, 1999; Maccoby, 1998), the examination of sex-differentiated peer effects is even more critical. Second, it seeks to examine the extent to which school engagement (operationalized *via* valuing school, enjoyment of school, participation, academic intentions, and disengagement measures) mediates the predictive role of perceived peer relationships on academic performance and general self-esteem. Using school engagement as a mediator, we aim to test theoretical arguments that adolescents' positive interactions with peers are associated with enhanced alignment with school and that this alignment is linked to heightened academic and non-academic outcomes (Juvonen, 2006, 2007; Martin & Dowson, 2009; Wentzel, 1999). As a secondary analysis, the study also explores whether these peer effects are generalizable across gender and age. This is done as reviews of past studies (e.g., Berndt, 1999; McDougall & Hymel, 2007) suggest that the strength of peer influences may vary with age and gender. In sum, the present investigation seeks to conduct a full test of direct and indirect effects of adolescents' perceived relationships with same-sex and opposite-sex peers on academic (literacy and numeracy) and non-academic (general self-esteem) functioning.

Peer relationships and school engagement

There is general agreement across theorists on the benefits of positive peer relationships for adolescents' academic and non-academic functioning (e.g., Ford & Smith, 2007; Juvonen, 2006, 2007; Martin & Dowson, 2009; Patrick, 1997; Ryan, 2000; Wentzel, 1999). Findings tend to show that adolescents who engage in positive interactions with peers also reflect higher academic motivation (e.g., Berndt, Laychak, & Park, 1990; Furrer & Skinner, 2003), academic engagement (e.g., Keefe & Berndt, 1996; Ladd, 1990; Ladd & Price, 1987), general self-esteem (e.g., Furrer & Skinner, 2003; Keefe & Berndt, 1996; Ryan, Stiller, & Lynch, 1994), and academic performance (e.g., Berndt & Keefe, 1995; DuBois, Felner, Brand, Adan, & Evans, 1992; Liem, Lau, & Nie, 2008). It is important to note that in understanding the peer relationship effects on these outcomes, studies

have employed a variety of methods including, *inter alia*, sociometric status (e.g., Wentzel & Asher, 1995), self-report measures (e.g., Liem *et al.*, 2008), or interviews (e.g., Shaffer-Hand & Furman, 2008). Using a self-report questionnaire, the present study measures adolescents' perceptions of their peer relationships. It is believed that what adolescents think and perceive of their relationships with peers can be as important and informative as the actual relationships – as indicated through more objective measures such as sociometric status or a number of friends. As argued by Ryan (2000, 2001), adolescents' self-perceptions of their peer relationships are vital to understanding the peer socialization influence on motivation, engagement, and achievement.

The positive effects of peer relationships on school engagement can be explicated from motivational perspectives. That is, positive peer relationships are likely to promote school engagement through their energizing effects, promotion of students' sense of fulfillment, and the satisfaction of their need for belonging and relatedness (Ford & Smith, 2007; Juvonen, 2007; Martin & Dowson, 2009; Ryan, 1993; Wentzel, 1999). Theorizing along these lines suggests that individuals have generalized basic needs to establish and maintain interpersonal connectedness (Baumeister & Leary, 1995; Connell & Wellborn, 1991; Ryan & Deci, 2000). When the need for belonging is satisfied, individuals experience a positive sense of self that is important for adaptive functioning (Baumeister & Leary, 1995; Connell & Wellborn, 1991; Ryan & Deci, 2000). Extending this to the school context, adolescents' positive relationships with peers are expected to energize their academic functioning, including their engagement with school activities (Furrer & Skinner, 2003; Martin & Dowson, 2009; Meyer & Turner, 2002).

In a similar vein, Martin and Dowson (2009) maintain that positive peer relationships influence school engagement through their direct influence on adolescents' internalized motivational beliefs. That is, through ongoing positive and supportive social interactions with peers, adolescents come to internalize academic-related beliefs, goals, values, and expectations that are consistent with those of their peers. In other words, peers function as socializers of achievement-related beliefs and behaviour (Martin & Dowson, 2009; Wentzel, 1999). This is to say that the greater the sense of connectedness between students and their peers, the more powerful the process of socialization and internalization of motivational beliefs, and the greater the scope of peer relationships in affecting school engagement and achievement. Accordingly, we hypothesize a positive link between adolescents' favourable perceptions of their peer relationships and school engagement (see Figure 1).

Peer relationships, academic performance, and self-esteem

Importantly, it has also been found that peer relationships can have direct effects on academic and non-academic outcomes. Of particular interest, the present study examined academic performance and general self-esteem as indicators of academic and non-academic outcomes, respectively. A number of theoretical frameworks have underlined the importance of supportive social interactions in students' academic accomplishment (e.g., Ford & Smith, 2007; Juvonen, 2006, 2007; Martin & Dowson, 2009; Wentzel, 1999) and general self-esteem (e.g., Baumeister & Leary, 1995; Connell & Wellborn, 1991; Ryan & Deci, 2000). For example, adopting a goal content and striving perspective, Wentzel (1999) proposed that students' academic achievement can be accounted for by their pursuit of social and task-related goals. Of particular relevance to the present study, Wentzel (1999) made a case that the pursuit of social goals may manifest in positive social interactions with peers, which then facilitate the development of cognitive and intellectual skills that, in turn, promote academic performance. This

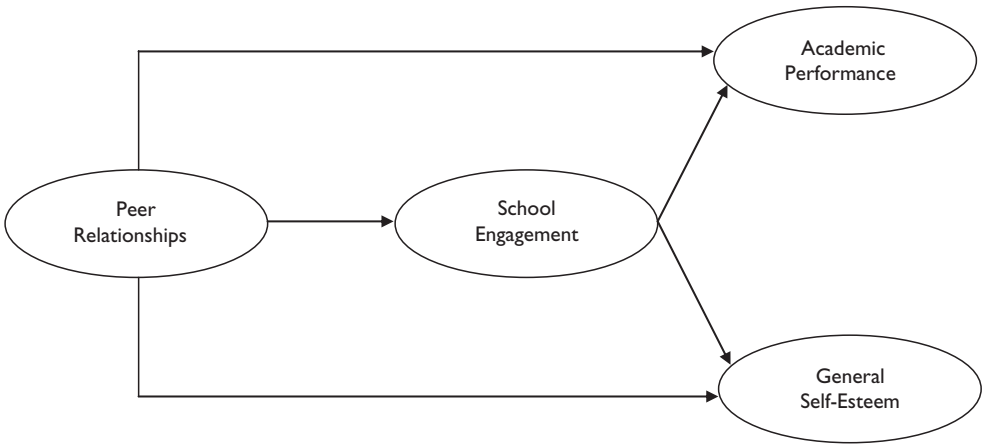

Figure 1. Hypothesized model predicting academic performance and general self-esteem.

is consistent with socio-constructivist theories of cognitive development (e.g., Hickey & Granade, 2004) that emphasize the importance of social environment (i.e., peers, teachers) in adolescents' academic lives in the construction of meaning in learning. Indeed, a bulk of research has suggested the benefits of cooperative and supportive interactions with peers on academic accomplishments (e.g., Furrer & Skinner, 2003; Liem *et al.*, 2008; Wentzel, 1991, 1993; see also Qin, Johnson, & Johnson, 1995; Slavin, 1987 for reviews). Hence, we predict that adolescents' favourable perceptions of their relationships with peers will be positively related to their academic performance (Figure 1).

Personality and social psychology theorists have also noted the benefits of positive interpersonal relationships for healthy human functioning (Baumeister & Leary, 1995; Connell & Wellborn, 1991; Ryan & Deci, 2000), including self-esteem (Leary, 2006; Moller, Friedman, & Deci, 2006; Solomon, Greenberg, & Pyszczynkski, 1991) especially during late childhood and adolescence (Bowlby, 1973; Erikson, 1968; Sullivan, 1953). In early work, Sullivan (1953) maintained that high-quality interactions with peers, characterized by feelings of mutual acceptance and intimate self-disclosure, contribute to enhanced self-esteem. Sullivan's argument is supported by more contemporary theories of human functioning such as self-determination theory (Moller *et al.*, 2006; Ryan & Deci, 2000) that postulates the substantial role of interpersonal processes, particularly interpersonal acceptance and rejection, as a determinant of individuals' self-esteem. In educational settings, the effects of peer interactions on self-esteem have been well documented (e.g., Berndt & Keefe, 1995; Bishop & Inderbitzen, 1995; Bolger, Patterson, & Kupersmidt, 1998; Gilman & Anderman, 2006; Harter, 1996; Ryan *et al.*, 1994). In general, these studies suggest that adolescents involved in quality friendships have higher general self-esteem than those without friends or those involved in low-quality friendships. Accordingly, we predict that adolescents' favourable perceptions of their relationships with peers will be positively related to general self-esteem (Figure 1).

Same-sex and opposite-sex peer relationships

One of the main purposes of the present study is to disentangle the roles of same-sex and opposite-sex peer relationships. Notwithstanding the benefits of peer relationships reviewed above, some literature (e.g., Berndt, 1999; Juvonen, 2006, 2007) has also

documented potentially less adaptive effects of peer influences on academic, social, and emotional outcomes, including lower academic achievement (e.g., Bishop, 1989) and school motivation (e.g., Ryan *et al.*, 1994), higher drop-out (e.g., Veronneau, Vitaro, Pedersen, & Tremblay, 2008), peer victimization (e.g., Hoglund, 2007), and bullying (see e.g., Juvonen & Gross, 2005 for a review). Moreover, another line of research has demonstrated non-significant effects of peer relationships on diverse indicators of school adjustment, delinquent behaviour, substance abuse, and academic achievement (e.g., Dobkin, Tremblay, Masse, & Vitaro, 1995; Tremblay, Masse, Vitaro, & Dobkin, 1995; Wentzel & Caldwell, 1997). There is, then, some variability in findings relating to peer relationship effects.

To better understand the reasons for this variability, some scholars have argued that peer influences on adolescents' academic functioning and emotional well-being are (in part) determined by the characteristics of adolescents' peers (Berndt, 1999, 2002) and their social behaviours (Juvonen, 2006, 2007). That is, the yields of peers' influence can be either positive or negative based on particular aspects of peers and their behaviours. Most research has examined the effects of the quality and stability of peer relationships on functioning (e.g., Berndt, 1999, 2002; Kindermann, McCollam, & Gibson, 1996). However, one relatively under-studied factor relevant to peer relationships is whether it is a same-sex or opposite-sex peer interaction and the relative quality of each in potentially affecting academic and non-academic outcomes. This is another focus of the present study and an extension on prior research.

Studies on the relative effects of same-sex and opposite-sex peer relationships in adolescence have identified similarities and differences in terms of self-esteem and other psychosocial benefits and costs of each relationship (see e.g., Lempers & Clark-Lempers, 1993; McDougall & Hymel, 2007; Shaffer-Hand & Furman, 2008). Researchers agree that both same-sex and opposite-sex peer relationships share functional importance by affording avenues for adolescents in meeting their psychosocial needs, such as providing sources of ego support, self-esteem, and affirmation of competence (Darling, Dowdy, Horn, & Caldwell, 1999; Lempers & Clark-Lempers, 1993). As such, we hypothesize that adolescents' favourable perceptions of their same-sex and opposite-sex peer relationships will be positively linked with their general self-esteem.

As reviewed above, through their motivational effects peer relationships are likely to have positive influences on educational outcomes including school engagement (e.g., Furrer & Skinner, 2003; Martin & Dowson, 2009; Wentzel, 1999) and academic performance (Liem *et al.*, 2008; Wentzel, 1991, 1993). Less frequently studied, however, are the relative effects of same-sex and opposite-sex peer relationships on these educational outcomes. Given the theoretical/conceptual reviews and empirical findings suggesting positive effects of general peer relationships (i.e., regardless of the peer gender) on educational outcomes, there are reasons to believe that both same-sex and opposite-sex peer relationships would also be positively associated with school engagement and academic performance.

However, many developmental psychology studies have shown that the positive influences that opposite-sex peers bring into adolescents' developmental trajectory are not as strong as those of same-sex peers (Lempers & Clark-Lempers, 1993; McDougall & Hymel, 2007; Shaffer-Hand & Furman, 2008). This is not surprising as individuals tend to interact and develop friendships with same-sex peers in their childhood and early adolescence, and that opposite-sex friendships only gradually appear in late adolescence (Bukowski, Sippola, & Hoza, 1999; Feiring, 1999; Kovacs, Parker, & Hoffman, 1996; Maccoby, 1998; Maccoby & Jacklin, 1987). Furthermore, having opposite-sex peers can

be a source of misunderstanding and confusion in defining the nature of the relationship (Reeder, 2000; Shaffer-Hand & Furman, 2008). That is, adolescents can be concerned that their opposite-sex interaction is misjudged by others as romantic relationships when it is not or that their opposite-sex friendships are ruined in the case that the opposite-sex peer might like them and there is not mutual liking (Shaffer-Hand & Furman, 2008). Given that having opposite-sex peers requires social adjustment and may potentially be a source of distraction, we expect that the adaptive effects of opposite-sex peer relationships on adolescents' academic and non-academic outcomes may not be as strong as those of same-sex peer relationships.

School engagement as a mediator

Most of the studies reviewed above examined direct relationships between positive interactions with peers on school engagement, academic achievement, and self-esteem. A small but growing number of empirical studies supports the potentially meditating role of school engagement in predicting academic and non-academic outcomes in the context of adolescents' relationships with significant others (see e.g., Furrer & Skinner, 2003; Hughes & Kwok, 2006; Hughes, Luo, Kwok, & Loyd, 2008; Li, Lerner, & Lerner, 2010; Lubbers, Van Der Werf, Snijders, Creenersm, & Kuyper, 2006). The role of school engagement as a mediating factor is consistent with Connell and Wellborn's (1991) self-system model. This model posits that all individuals have generalized need for relatedness, and when this need is fulfilled through the individuals' interactions with others, they would feel a sense of relatedness which then affects positive outcomes (e.g., performance, wellbeing) through its catalyzing and energizing effects on engagement.

Further, the positioning of school engagement as a mediator also supports the centrality of school engagement as an antecedent for other desirable educational and psychological outcomes and as a valued outcome in its own right (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004; Furrer & Skinner, 2003; see also Schunk, Pintrich, & Meece, 2008). That is, the quality of school engagement can directly contribute to the quality of academic outcomes students produce (see Appleton *et al.*, 2008; Fredricks *et al.*, 2004 for reviews). Similarly, school engagement can also be directly linked to subsequent general self-esteem. For example, school engagement encompasses beliefs that school is useful and important and this can give rise to a sense of purposefulness in adolescents that is critical for nurturing and maintaining self-esteem (Branden, 2006). Thus, consistent with Connell and Wellborn's (1991) self-system model and various engagement models (e.g., Fredricks *et al.*, 2004) that consider school engagement as having a direct effect on academic and non-academic outcomes, we explore the extent to which school engagement mediates the association between adolescents' perceived positive peer relationships and their academic performance and general self-esteem (see Figure 1).

Also consistent with Fredricks *et al.* (2004; see also Glanville & Wildhagen, 2007), we conceptualize school engagement as a '"meta" construct' (p. 60) comprising a 'fusion' (p. 61) of multiple dimensions that 'provide a richer characterization of children than is possible in research on single constructs' (p. 61). In implementing school engagement in the present study, we draw on work by Guthrie and Wigfield (2000) suggesting that engagement ought to refer to a construct in which numerous components are present and work by Martin (e.g., 2007, 2009) who has dealt with engagement through various combinations of valuing school, enjoyment of school, participation, academic intentions, and disengagement. Taken together, on the basis of Fredricks *et al.*, Guthrie and Wigfield, and Martin, we operationalize school engagement as a higher order factor

comprising valuing school, enjoyment of school, participation, academic intentions (positive indicators) and disengagement (a negative indicator).

Aims of the study

In summary, the purpose of this study is to examine associations between adolescents' perceived peer relationships and their school engagement, academic performance, and general self-esteem. Extending previous research (e.g., Furrer & Skinner, 2003), we disentangle the potentially differential roles of same-sex and opposite-sex peer relationships in these academic and non-academic outcomes. We also extend prior research (Martin *et al.*, 2009) by testing a model that posits a mediating role for school engagement in linking adolescents' perceptions of peer relationships with their academic performance and general self-esteem (Figure 1). Thus, we aim to conduct a study that integrates academic and non-academic outcomes in a bid to more fully assess the unique and complementary roles of peer relationships and school engagement. Finally, for completeness we investigate the extent to which the proposed model is generalizable across gender and age.

Method

Participants and procedure

The sample comprised 1,436 students in Year 7 to Year 12 of their high-school education (equivalent to Year 7 to Year 12 in the American educational system, with a typical age range between 13 and 18 years).[1] Of the total sample, 670 (47%) are boys and 756 (53%) are girls; 1,339 (93.2%) are students of English-speaking background and 97 (6.8%) are students of non-English-speaking background. Based on a median split, 711 (49.6%) students who were 15 years old or below were classified as early adolescents and 723 (50.4%) who were 16 years or above were classified as later adolescents (two participants did not indicate their age). The mean age for the overall sample was 15.46 ($SD = 1.51$), whereas for the early adolescents was 14.16 ($SD = 0.77$) and for the later adolescents was 16.75 ($SD = 0.79$).

This sample was drawn from three comprehensive co-educational high schools of mixed ability that are located in the middle class areas of major capital and regional cities (i.e., urban) in Australia. This co-educational context was the focus because it constitutes a site where within-school engagement can be more directly linked to the same-sex and opposite-sex peers that students are rating – a contention supported by frame-of-reference research showing that students within the same school/class tend to be each other's salient referents (Marsh, Kong, & Hau, 2000). The three schools – one is government and two are systemic Catholic affiliated – did not screen or select students on entry by ability such that the schools comprised students with a broad range of ability levels. We contend that the large sample size and the range of ability levels of the students participating in this study provide support for the generalizability of findings to high-school students located in urban capital and regional city co-educational schools.

The administration of the survey was carried out in the middle of the school year. In each school, a designated classroom teacher was responsible for the administration of the questionnaire in a normally scheduled class. The teacher first explained the rating

[1] *In the UK, students enter Year 7 at around 11 years of age (and not around 13 years of age such as in Australia or the U.S). This should be taken into account when interpreting findings.*

scale to students and then presented a sample item. Students were instructed to complete the instrument independently and to provide only one answer for each item. Less than 5% of the data were missing, and so the Expectation Maximization (EM) algorithm was considered an appropriate procedure for imputing missing data (see Brown, 1994; Graham & Hoffer, 2000).

Measures

Peer relationship measures

Two peer relationship scales, drawn from the Self-Description Questionnaire II-Short (SDQ II-S; Marsh, 1990), were selected. The first scale, *same-sex peer relationships* (five items; e.g., 'I make friends easily with members of my own sex'), measures adolescents' perceptions of quality of relationships with students of the same sex. The second scale, *opposite-sex peer relationships* (four items; e.g., 'I have a lot of friends of the opposite sex'), measures adolescents' perceptions of quality of relationships with students of the opposite sex.

School engagement measures

We constructed a multi-dimensional set of school engagement measures from the Motivation and Engagement Scale-High School (MES-HS; Martin, 2003, 2007, 2008, 2009; Martin, Malmberg, & Liem, in press) and cognate measures highly reflective of school- or classroom-based engagement (see Martin, 2003, 2007, 2009 for validity and reliability research on the MES-HS and these cognate engagement measures). Although prior research has examined many of these factors (and their validity) individually (e.g., Martin, 2008, 2009), for the purposes of the present study, this set is designed to capture school engagement as a general construct. The first scale, *valuing school* (four items; e.g., 'Learning at school is important to me'), measures the extent to which students believe what they learn at school is useful, important, and relevant. The second scale, *class participation* (four items; e.g., 'I get involved in things we do in class'), measures the extent to which students are actively involved and engaged in class activities. The third scale, *disengagement* (four items; e.g., 'I often feel like giving up at school'), measures the extent to which students are disengaged or at risk of disengagement in particular school subjects or in school generally. The fourth scale, *enjoyment of school* (four items; e.g., 'I like school'), measures the extent to which students feel that school and schooling are pleasant and enjoyable. The fifth scale, *positive academic intentions* (four items; e.g., 'I intend to complete school'), measures the extent to which students are willing to continue with school and are positively oriented to their academic future at school. Collectively, these five scales comprise the latent construct, school engagement. To respond to items in these five scales, participants were provided with a seven-point rating scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Academic and non-academic measures

To get a sense of academic and non-academic factors following from peer relationships and school engagement, academic performance, and general self-esteem are included in the proposed model. For academic performance, an objective measure comprising literacy and numeracy items, standardized by grade level, was drawn from the Wide Range Achievement Test 3 (Wilkinson, 1993) that has been used and validated in the Australian context (e.g., Lucas, Carstairs, & Shores, 2003). Since the present study is not focused on a specific school subject (i.e., it is domain-general), the literacy

and numeracy scores were used as two manifest variables that predicted a general academic performance latent construct. Martin (2009) has demonstrated the validity of this aggregated measure of objective academic performance. For the non-academic outcome, the *general self-esteem* scale (six items, e.g., 'Most things I do, I do well') was drawn from the SDQ II-S (Marsh, 1990). This scale, rated from 1 (*false*) to 6 (*true*), measures the extent to which students perceive themselves as competent, useful, and satisfied with the way they are.

Statistical analyses

Confirmatory factor analysis (CFA) and structural equation modelling (SEM)

The main analyses involved confirmatory factor analysis (CFA) and structural equation modelling (SEM). These were performed using LISREL 8.80 (Jöreskog & Sörbom, 2006). Typically, the researcher posits an *a priori* factor structure of the measures (in CFA) or hypothesizes a model that depicts structural relationships of latent factors (in SEM). The researcher then tests the validity of a solution based on the fit of the posited factor structure or the hypothesized structural relationships by showing that: (a) the solution is well defined, (b) the parameter estimates are consistent with theory and *a priori* predictions, and (c) the subjective indices of fit are conventionally acceptable (McDonald & Marsh, 1990). Maximum likelihood was the method of estimation used for the CFA and SEM in this study as it is generally regarded as a robust method with moderate to large sample sizes (see Hoyle, 1995).

In evaluating the fit of the data to alternative models in CFA and SEM, a range of goodness-of-fit indices were assessed. Following recommendations on establishing model fit (e.g., Marsh, Hau, & Wen, 2004), the comparative fit index (CFI), the non-normed fit index (NNFI), the root mean square error of approximation (RMSEA), the χ^2 test statistic, and an evaluation of parameter estimates were used in the present research to assess model fit. The RMSEA index is less affected by sample size than the χ^2 test statistic and values at or less than .08 and .05 are taken to reflect acceptable and excellent fit, respectively (see Marsh, Balla, & Hau, 1996; Yuan, 2005). The NNFI and CFI vary along a zero-to-one continuum in which values at or greater than .90 and .95 are typically taken to reflect acceptable and excellent fit to the data, respectively (McDonald & Marsh, 1990). The CFI contains no penalty for a lack of parsimony so that improved fit due to the introduction of additional parameters may reflect capitalization on chance, whereas the NNFI and RMSEA contain penalties for a lack of parsimony (Yuan, 2005).

The purpose of the present study is to test fundamental associations between theoretical constructs. Essentially, then, it emphasizes parsimony in a bid to explore the various theoretical contentions described earlier. Hence, the primary analytical approach utilizes a higher order technique. In the higher order CFA and SEM, school engagement was represented by a higher order latent factor comprising five first-order latent variables of valuing school, disengagement, class participation, enjoyment of school, and positive academic intentions. As shown in Figure 1, the proposed SEM is one in which: (a) peer relationships (same sex or opposite sex) predict school engagement, academic performance, and general self-esteem and (b) school engagement predicts academic performance and general self-esteem.

Multi-group SEM

When analysing data and covariance matrices, inadequate attention is typically given to the invariance of derived relationships in proposed models. The implications of this issue

are substantial. Without demonstrating invariance across key groupings such as gender and age, effects may be confounded with attributes of these groups. Hence, unless there is reasonable support for the invariance of key relationships across key groupings, it may not be justified to pool responses across groups or draw broad conclusions. Such concerns about structural invariance are most appropriately evaluated by using SEM to determine whether – and how – the relationships amongst central factors varies according to group membership (see Byrne & Shavelson, 1987; Hattie, 1992; Marsh, 1993). It was therefore of interest to determine factor invariance across gender and age for the proposed model (Figure 1). Testing for invariance essentially involves comparing a number of models in which structural parameters (betas) are systematically held invariant across groups and assessing fit indices when elements of these structures are constrained. Relatively invariant fit indices are indicative of invariant relationships amongst central factors, and by implication, invariance in inter-factor relationships as a function of gender and age. When this is the case, researchers are better placed to conclude that the derived model is generalizable across gender and age.

Results

Descriptive statistics, psychometric properties, and preliminary correlations

Descriptive statistics (mean, standard deviation), distributional properties (skewness, kurtosis), reliability coefficients (Cronbach's α), and the summary of factor loadings for each of the subscales used in the study are presented in Table 1. The distributional properties of subscales approximate a normal distribution as indicated by relatively low skewness and kurtosis values. As can be seen in the table, all the multi-item subscales were reliable. A somewhat low alpha for the academic performance measure ($\alpha = .62$) was not unexpected as the computation of alpha for this outcome measure involved only two scores (numeracy and literacy). Taken together, the psychometric properties of the factors under study are sound and provide a robust measurement basis upon which to conduct statistical analyses aimed at addressing the substantive questions central to the study.

Table 1. Descriptive statistics, Cronbach's αs, and CFA loadings of the subscales

	Mean	*SD*	Skew	Kurtosis	Cronbach's α	CFA loadings range (mean)
Peer relationships						
Same-sex peer relationships	4.95	.89	−1.00	1.21	.80	.58–.76 (.66)
Opposite-sex peer relationships	4.59	1.05	−.79	.63	.80	.59–.85 (.72)
School engagement						
Valuing school	5.73	1.00	−1.03	1.22	.79	.56–.77 (.70)
Disengagement	2.53	1.29	.89	.26	.82	.63–.82 (.73)
Class participation	5.05	1.25	−.62	.26	.90	.77–.90 (.84)
Enjoyment of school	4.71	1.43	−.54	−.24	.90	.73–.87 (.84)
Positive academic intentions	5.39	1.27	−.91	.51	.83	.74–.84 (.75)
Higher order school engagement loadings: range = .61–.88; mean = .78						
Academic performance	99.42	11.43	−.62	.91	.62	.65–.70 (.68)
General self-esteem	4.72	.89	−.99	1.44	.85	.54–.80 (.71)

A first-order CFA was first conducted to test the robustness of the dimensionality and factor structure of the subscales used. In this analysis, school engagement dimensions were reflected as distinct and independent first-order factors. The analysis showed a very good fit of the model to the data, $\chi^2 = (594, N = 1{,}436) = 3146.02$, CFI = .97, NNFI = .97, RMSEA = .06. All factor loadings were significant at $p < .001$, and as presented in Table 1, the ranges and means of the loadings were acceptable. We then conducted a higher order CFA in which school engagement was represented as a higher order latent factor predicted by its five first-order dimensions. This analysis also yielded an excellent fit of the model to the data, $\chi^2 = (615, N = 1{,}436) = 3513.82$, CFI = .97, NNFI = .96, RMSEA = .06. All factor loadings of the higher order latent factor were significant at $p < .001$, and the ranges and means of the loadings were also acceptable. Correlations generated from the first-order and higher order CFAs are presented in Table 2. These preliminary correlations support relationships proposed in the model – and justify further investigation in the SEM that controls for shared variance amongst predictors.

Structural equation modelling

Same-sex peer effects

We then sought to examine the fit of our data to the hypothesized model in which: (a) same-sex or opposite-sex peer relationships predict school engagement, academic performance, and general self-esteem and (b) school engagement predicts academic performance and general self-esteem (Figure 1). We first tested the same-sex peer relationship model. This model fit the data well: $\chi^2 = (485, N = 1{,}436) = 2268.77$, CFI = .98, NNFI = .97, RMSEA = .05 (see Model 1, Figure 2). The solution was well defined and all beta coefficients were in the expected ranges and directions that did not deviate from their correlations (i.e., there was no apparent multi-collinearity or suppression effect). Same-sex peer relationships were found to be a significant predictor of school engagement ($\beta = .32, p < .001$), which in turn significantly predicted academic performance ($\beta = .24, p < .001$) and general self-esteem ($\beta = .45, p < .001$). As shown in Figure 2, same-sex peer relationships also had direct links to academic performance ($\beta = .22, p < .001$) and general self-esteem ($\beta = .36, p < .001$) even after the association between school engagement and these two outcomes were accounted for. This suggests that school engagement partially mediates the link between same-sex peer relationships and academic performance and general self-esteem (see Table 3). It is important to note that (a) a conservative $p < .001$ significance level was set to avoid capitalizing on chance in the context of the multiple parameters being estimated and the large sample and (b) that these obtained β coefficients can be interpreted in the manner of traditional effect sizes, such that a change of 1 *SD* in the independent variable will result in a change of *.zz SD* in the dependent variable (where *.zz* is the completely standardized beta coefficients).

Multi-group SEM

Having confirmed the good fit of this model, it was of interest to examine the extent to which the derived beta (structural) parameters are invariant across gender and age groups. To the extent that there is equivalence in beta parameters across gender and age, we can consider this as some evidence for the generality of the proposed model. This involved multi-group SEM. A first set of analyses allowed all beta parameters to be freely estimated across gender and age. A second set of analyses held all beta parameters

Table 2. Correlations among latent factors from CFA: first-order and higher order solutions

	First-order CFA correlations								
	Same-sex peer relationships	Opposite-sex peer relationships	Valuing of school	Disengagement	Class participation	Enjoyment of school	Positive academic intentions	Academic performance	General self-esteem
Same-sex peer relationships	-								
Opposite-sex peer relationships	.56	-							
Valuing of school	.24	.05	-						
Disengagement	−.25	−.05	−.73	-					
Class participation	.41	.31	.46	−.47	-				
Enjoyment of school	.27	.16	.62	−.64	.52	-			
Positive academic intentions	.20	.05	.69	−.65	.49	.81	-		
Academic performance	.29	−.03	.26	−.23	.21	.18	.35	-	
General self-esteem	.50	.36	.46	−.44	.52	.48	.42	.27	-

	Higher order CFA correlations				
	Same-sex peer relationships	Opposite-sex peer relationships	School engagement	Academic performance	General self-esteem
Same-sex peer relationships	-				
Opposite-sex peer relationships	.56	-			
School engagement	.32	.13	-		
Academic performance	.29	−.03	.31	-	
General self-esteem	.50	.36	.56	.27	-

Note. $r > |.10|$ significant at $p < .001$.

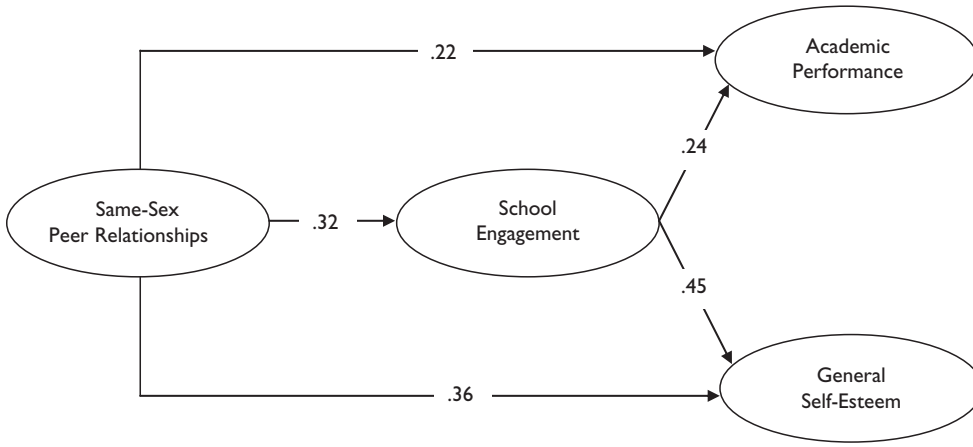

Figure 2. Standardized beta coefficients for the same-sex peer relationship model (Model 1). *Note*. All parameters significant at $p < .001$.

invariant across gender and age. We tested invariance by way of Cheung and Rensvold's (2002) recommended change of <0.01 in CFI.

The first set of analyses yielded a CFI of .97 for gender and .97 for age. The second set of analyses (i.e., holding beta parameters invariant across gender and age) also yielded a CFI of .97 for sex and .97 for age. This suggests that the beta paths in the same-sex peer relationship model are broadly congruent across boys and girls and for early and later adolescents. Hence, these data suggest that in terms of the predictive relationships between the central constructs in the same-sex peer relationship model, there are not substantial differences across gender and age.

Opposite-sex peer effects

We then tested the opposite-sex peer relationship model. This model also showed a good fit to the data, $\chi^2 = (454, N = 1{,}436) = 2144.51$, CFI = .98, NNFI = .97, RMSEA = .05 (see Model 2, Figure 3). Opposite-sex peer relationships significantly predicted school engagement ($\beta = .13$, $p < .001$; though, not as strongly as same-sex peers predicted

Table 3. Summary of direct, indirect, and total effects in predicting school engagement, academic performance, and general self-esteem

	Effects on school engagement			Effects on academic performance			Effects on general self-esteem		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Model 1									
Same-sex peer relationships	.32	-	.32	.22	.08	.30	.36	.14	.50
School engagement	-	-	-	.24	-	.24	.45	-	.45
Model 2									
Opposite-sex peer relationships	.13	-	.13	−.08	.04	−.04	.29	.07	.36
School engagement	-	-	-	.32	-	.32	.52	-	.52

Note. $\beta > |.10|$ significant at $p < .001$.

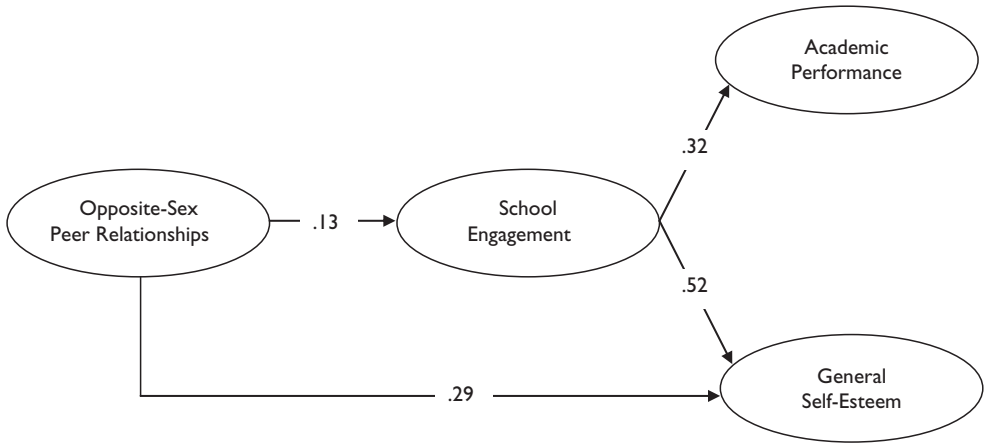

Figure 3. Standardized beta coefficients for the opposite-sex peer relationship model (Model 2). *Note.* All parameters significant at $p < .001$.

school engagement), which in turn significantly predicted academic performance ($\beta = .32, p < .001$) and general self-esteem ($\beta = .52, p < .001$). Opposite-sex peer relationships also had a direct link with general self-esteem ($\beta = .29, p < .001$). Figure 3 suggests that alongside the direct association between opposite-sex peer relationships and general self-esteem, its effect is also partially mediated by school engagement. The indirect effect of opposite-sex peer relationships on general self-esteem is lower ($\beta = .07$) than its direct effect. However, opposite-sex peer relationships did not exert a significant direct predictive effect on academic performance; nor did it predict academic performance *via* school engagement to any significant extent, $\beta = .04$ (see Table 3). Hence, opposite-sex peers seem to yield their influence in the non-academic domain.

To examine the extent to which beta parameters in the opposite-sex peer model are invariant across gender and age groups, a series of multi-group SEMs was performed. The first set allowed all beta parameters to be freely estimated across gender and age groups, yielding a CFI of .97 for gender and .97 for age. The second held all beta parameters invariant across gender and age, also yielding a CFI of .97 for gender and .97 for age. This suggests that beta paths in the opposite-sex peer model are broadly congruent across boys and girls and for early and later adolescents. These findings suggest that in terms of the predictive relationships between the central constructs in the opposite-sex peer relationship model, there are not substantial differences across gender and age.

Comparison of same-sex and opposite-sex peer effects

We were also interested in testing the extent to which the effects of same-sex and opposite-sex peer relationships on academic and non-academic outcomes were differential. To do this, we analysed for differences in the predictive (β) paths in the same-sex peer relationship model (Model 1) and the corresponding paths in the opposite-sex peer relationship model (Model 2). We generated a series of *t*-statistics that tested for differences between parallel beta coefficients (Howell, 1997). The results showed that only the path to school engagement was statistically different ($t = 5.28, p < .001$) between the two models, whereas the paths to academic performance ($t = 0.47$, ns)

and general self-esteem ($t = 1.40$, ns) were not significantly different. Taken together, these findings indicate that although both same-sex and opposite-sex peer effects are beneficial on students' academic and non-academic outcomes, the opposite-sex peer effects are not as strong as those of same-sex peer effects.

Discussion

The central aim of the present study was to extend prior research by investigating (a) the role of adolescents' perceptions of same-sex and opposite-sex peer relationships in their academic and non-academic lives and (b) the extent to which school engagement mediates the links between each of these perceived peer relationships and academic performance and general self-esteem. Having demonstrated sound psychometric properties, SEM was conducted to test the effects of same-sex and opposite-sex peer relationships on the outcome measures. An interesting set of findings emerges. Same-sex peers, but not opposite-sex peers, directly predict academic performance; same-sex and opposite-sex peers directly predict general self-esteem; same-sex and opposite-sex peers significantly predict school engagement – but to a much greater extent for same-sex peers; and, school engagement mediates the links to academic and non-academic outcomes for same-sex peers more so than opposite-sex peers. A secondary analysis shows that the central parameters in the same-sex and opposite-sex peer relationships models are invariant across gender and age groups.

In follow-up testing that compared the three central beta parameters across same-sex and opposite-sex peer models (Models 1 and 2), both same-sex and opposite-sex peers yield a positive influence on school engagement, but same-sex peers seem to yield a more marked positive influence. In the case of academic performance, same-sex peers have a positive role, but not significantly different from that of opposite-sex peers. In the case of general self-esteem, both same-sex and opposite-sex peers are beneficial to a generally congruent extent. Taken together, it appears that same-sex peers and opposite peers play an important role in young people's capacity to flourish academically and non-academically – but they seem to positively impact in distinct ways.

Theoretical and applied implications

The present study re-affirms the proposition that positive connections with peers are critical for adolescents' academic and non-academic functioning. This is consistent with models posited by numerous researchers (e.g., Ford & Smith, 2007; Furrer & Skinner, 2003; Juvonen, 2006, 2007; Martin & Dowson, 2009; Wentzel, 1999) underscoring the importance of positive relationships with peers in the school context. The findings seem to support previous evidence that peers internalize various adaptive academic orientations that may play out in the form of greater alignment with school, measured by school engagement in the present study (Martin & Dowson, 2009). The findings are also not inconsistent with sense-of-belonging hypotheses positing that positive peer relationships promote school engagement through their energizing and relatedness functions (Juvonen, 2006, 2007). Notwithstanding this, it is also important to recognize that not all peer interactions are adaptive for school functioning (Berndt, 1999, 2002). There can be times when a sense of relatedness promotes disengagement (Juvonen, 2006). For example, given that adolescents tend to select friends who are of similar characteristics (Hallinan, 1983), affiliation with low-achieving students may de-motivate

and reinforce maladaptive academic and non-academic attributes (Dishion, Spracklen, Andrews, & Patterson, 1996).

These findings hold important applied implications. They suggest that teachers would do well to optimize positive interactions among students in the classroom, year-group and school. This can be done, for example, by assigning group projects, nurturing a cooperative spirit and collaborative learning in students, and encouraging students to be involved in extracurricular activities – all these are ways to better ensure that students interact with their peers around constructive engagements and activities (McInerney, 2000). Alongside this, teachers might also seek to build a 'caring peer culture' (Juvonen, 2007) that not only develops students' sense of emotional security and belonging but also heightens their motivation and engagement (Wentzel & Wigfield, 2007). It is also important for parents, teachers, and school counsellors/psychologists to be aware of the social networks inside and outside the school in which adolescents are immersed. Given the influence peers can have in shaping motivation and engagement, there is a need for adults to monitor the characteristics of adolescents' peers and peer groups to ensure that adaptive functioning is not being impaired and to provide the appropriate support if this is the case.

In addition to demonstrating the direct role of peer relationships in predicting school engagement, the present study also found that school engagement has a direct connection with academic performance – showing that peer relationships also have an indirect role in respect to academic and non-academic outcomes *via* school engagement. In relation to academic performance, perhaps this is not so surprising (e.g., see Appleton *et al.*, 2008; Fredricks *et al.*, 2004). However, it is heartening to see this is the case for general self-esteem as well. That is, adolescents' alignment with school can be a catalyst for developing positive self-perceptions (Branden, 2006). Taken together, these findings give support to Connell and Wellborn's (1991) self-system model maintaining that satisfying interactions with others are likely to give rise to adaptive outcomes (e.g., better performance and heightened wellbeing) through their catalyzing impacts on engagement. The findings are also consistent with recent work (see Fredricks *et al.*, 2004) highlighting the centrality of school engagement both as an antecedent for other desirable educational outcomes and as a valued outcome in its own right.

As predicted, although both same-sex and opposite-sex peer relationships facilitate adolescents' school engagement and promote their academic performance and general self-esteem, relationships with peers of the opposite sex seem to have a less markedly positive link with school engagement. By implication, mediation effects of opposite-sex peer relationships on the two key outcomes are less relevant than those of same-sex peer relationships. This finding aligns with past studies showing that the positive influences of opposite-sex peers on adolescents' developmental trajectory are not as strong as those of same-sex peers (Lempers & Clark-Lempers, 1993; McDougall & Hymel, 2007; Shaffer-Hand & Furman, 2008). This may be explained by looking at the developmental stage of our sample (i.e., adolescence). Developmental psychologists have found that children devote most of their time to same-sex peers (Maccoby & Jacklin, 1987) and more than 95% of childhood friendships are formed with peers of the same sex (Kovacs *et al.*, 1996). It is in late adolescence that individuals increasingly interact with peers of the opposite sex (Feiring, 1999). Furthermore, as demonstrated by Poulin and Pederson (2007), the growth in the proportion of opposite-sex peer relationships during adolescence varies according to gender. Specifically, the number of opposite-sex peer relationships tends to be higher for girls than boys. Importantly, the opposite-sex peers that adolescents interact with tend to be secondary friends more than best friends (Connolly, Craig, Goldberg, &

Pepler, 2004) and so opposite-sex peers may be less influential in school engagement than friends of the same sex. Of course, it may also be the case that opposite-sex peers have a distracting role and that this may lower engagement with school (Reeder, 2000; Shaffer-Hand & Furman, 2008). However, alongside this, it is important to recognize their association with school engagement is significantly positive (albeit lower than same-sex peer effects) and they have a significantly positive association with general self-esteem.

Taken as a whole, the present study found no evidence for opposite-sex peer relationships as being detrimental to adolescents' academic and psychological functioning in co-educational schools. Our findings suggest a differentiated profile such that positive relationships with same-sex and opposite-sex peers may benefit adolescents' general self-esteem and school engagement, same-sex peers may benefit academic performance, but opposite-sex peers do not significantly diminish performance. We therefore suggest that positive interactions with same-sex and opposite-sex peers are essential for academic development and psychological wellbeing during adolescence. We also suggest that the findings provide a positive and optimistic perspective on same-sex and opposite-sex peer impacts – a vital perspective given that relationships on both fronts become an increasing reality in the course of adolescent development (Feiring, 1999; Maccoby, 1998). Having said this, we point out that single-sex schools were not part of this study and that the same-sex peer evidence points to the appropriateness of single-sex environments for academic and non-academic functioning as well (see Lee & Bryk, 1986; Mael, 1998).

Methodological and measurement implications

In addition to the substantive and applied yields described above, the study re-affirms the importance of some key methodological and measurement aspects as well. First, the study underscores the importance of SEM in demonstrating mediation in a single integrative analytical model and providing information on direct, indirect, and total effects of key factors. Second, SEM enabled us to analyse theoretically hypothesized constructs at a higher level of abstraction (i.e., higher order level constructs) and this was particularly useful in developing a parsimonious model for directly testing the fundamental questions. Third, the use of multi-group SEMs allowed for tests of the generalizability of structural relationships among constructs and demonstrated the generality of the model across gender and age. Finally, the study highlights the yields of separate measurement of same-sex and opposite-sex peer connections. The effects unique to same-sex and opposite-sex peers would have been masked if peer relationship effects had not been assessed separately.

Limitations and future directions

The present study provides further information on the differential role of same-sex and opposite-sex peers in academic and non-academic functioning. There are, however, potential limitations important to consider when interpreting findings and which provide directions for future research. First, aside from the standardized performance data, all other data were self-reported. Although this is a logical and defensible methodology in its own right given the substantive focus (see e.g., Ryan, 2000, 2001 for methodological discussions related to peer relationship research), it is important to conduct studies that examine peer relationship and school engagement dimensions using data derived from additional sources – such as parents, teachers, and peers – and using different

methodological paradigms such as structured interviews (Martin, Marsh, Williamson, & Debus, 2003) or peer rating (e.g., sociometric method; Bishop & Inderbitzen, 1995) as well other multi-method approaches to the issue (Marsh, Martin, & Hau, 2006).

Second, it is also important to note that the present study was cross-sectional. Longitudinal research tracking the same students over a period of time has potential to clarify and uncover possible fluctuation in peer relationships, motivation, engagement, and self-esteem across time (Bong, 1996; Poulin & Pederson, 2007). Third, it would also be useful to model the causal ordering among variables over time to assess whether changes in peer relationships are determinants or consequences of differences in motivation, engagement, and self-esteem. This is consistent with Juvonen's (2006, 2007) contention that school engagement, academic performance, and general self-esteem might also be precursors to subsequent positive peer relationships.

Fourth, in this study we have focused on the structural relationships between adolescents' perceptions of interaction with peers and their academic and non-academic functioning. We found evidence for the invariance of these structural relationships across gender and age groups. This finding, however, does not necessarily mean that early and later adolescents, or male and female adolescents, come from the same population in terms of the levels of these perceptions. It is possible that different types of social desirability, especially in relation to opposite-sex relationships, affect their responses to some items. That is, for example, later adolescents may want to be seen as individuals who are capable of interacting with opposite-sex peers whereas early adolescents may not be so interested in reflecting this.

Fifth, the participants in the present study were drawn from three schools and so further work is needed to determine generalizability to other schools and the wider adolescent population. Following from this, the present study adopted a student-level approach to the investigation of how adolescents' peer relationships influence their effective functioning. It is recognized that class- and school-level factors are also potentially relevant. Indeed, Martin and Marsh (2005), for example, found significant classroom-level variance in teacher–student relationships. Thus, using appropriate multi-level techniques future research needs to include students from a larger number of classrooms and a wider variety of schools, including single-sex and elementary schools, to understand the effects of class- and school-level factors on peer relationships as a function of the school type and school level (see Bryk & Raudenbush, 1992; Goldstein, 2003).

Conclusion

The present study examined the role of adolescents' perceived relationships with same-sex and opposite-sex peers in their school engagement, academic performance, and general self-esteem and the extent to which school engagement mediates the associations between these perceived peer relationships and academic performance and general self-esteem. Findings demonstrated that same-sex peer relationships yielded positive direct and indirect effects, mediated by school engagement, in relation to academic performance and general self-esteem. Opposite-sex peer relationships positively predicted school engagement and yielded positive direct and indirect effects in relation to general self-esteem, but mediation *via* school engagement was not as strong as that of same-sex peers. Taken together, the findings of the present investigation hold substantive and methodological implications for researchers studying issues related to peer relationships

in adolescents' academic and non-academic lives. They are also relevant for school personnel and parents/caregivers seeking to enhance students' academic and non-academic functioning that relies very much on the extent to which students are engaged in positive, high-quality interactions with their peers.

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