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Parental and Peer Influences on Physical Activity Among Scottish Adolescents: A Longitudinal Study

Joanna Kirby, Kate A. Levin, and Jo Inchley

Background: This study investigated parental and peer influences on physical activity, examining gender and developmental differences during early-mid adolescence. **Methods:** A 5-year longitudinal study tracking physical activity (measured by PAQ-C) among adolescents ($n = 641$) from final year of primary (P7) to fourth year of secondary school (S4). Peer support, peer socializing, parental support, and independent play were assessed. Logistic regression predicted physical activity, by year and gender, in relation to social influences. **Results:** Boys reported higher physical activity, peer support, paternal support, and independent play than girls. Among both genders, peer, paternal, and maternal support decreased with age, whereas independent play increased. Time with friends was particularly important. Among high socializers (P7), odds of being active were over 3 times those of low socializers [boys: 3.53 (95% CI 1.77, 7.04), girls: 3.27 (95% CI 1.80, 5.92)]. Baseline physical activity was also a strong predictor among early secondary boys (OR 3.90 95% CI 2.10, 7.24) and girls (OR 4.15, 95% CI 2.00, 8.62). Parental support was less important than peer influences; only same-sex parental support remained significant in multivariable models. **Conclusions:** Parents and peers have important influences on adolescent physical activity. Significant gender and developmental effects are apparent through early-mid adolescence.

Keywords: parents, socializing, active

Regular physical activity provides adolescents with important physical, mental, and social health benefits.¹ Current international guidelines, adopted in Scotland,² recommend that adolescents should engage in a minimum of 60 minutes of at least moderate intensity physical activity each day. However, as in other developed countries, many adolescents in Scotland are not active enough to benefit their health fully.³ Understanding the factors that influence physical activity is important in designing more effective interventions aimed at increasing participation. Furthermore, it is useful to identify these factors at different developmental stages of adolescence to target different populations appropriately.

The social environment may influence behavior in a number of ways, through socialization processes, social integration, interpersonal relationships, and social support. Social influences are often understood within the context of Social Learning Theory⁴ whereby health-related behaviors are acquired and modified through observational learning and direct learning experiences involving interactions with significant others. A range of social factors have been shown to be associated with physical activity among children and adolescents.⁵ These include parental physical activity,^{6,7} parental support,^{8,9} having physically active friends,⁹ peer socialising,¹⁰ family cohesion,¹¹ and parent-child communication.¹¹

Interpersonal relationships can influence physical activity by providing social support and establishing social norms that constrain or enable health promoting behaviors.^{12,13} The provider and type of social support may have varying effects on physical activity among adolescents. Furthermore, those who influence adolescents tend to change over time.¹⁴ Early in life, young people refer to their immediate family members to provide positive attitudes and behaviors, with parental influence having the greatest impact. Indeed, the family is considered a primary agent of socialization, through which children develop their own identity and learn the norms of the society in which they live.¹⁵ Greendorfer & Lewko¹⁶ showed parents to be a more significant influence than siblings for early adolescent boys and girls aged 8 to 13 years. Furthermore, for both genders, fathers were the most significant family member influencing sport involvement. Among young women, the family has been shown as a highly significant social influence on physical activity participation. The vast majority of adolescent girls who have always participated in sport report living in an 'active' household, in which parents and siblings also frequently participate in sport and physical activity.¹⁷ Linder¹⁸ suggests that parents who show interest in their children's activity levels will increase the likelihood of their children's prolonged involvement in physical activity.

As young people move through adolescence, they spend increasingly large amounts of time with their

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friends and from preadolescence onwards will tend to spend more time with friends than with parents.^{19,20} The majority of research concerning peer influence on health behaviors has focused on the risk resulting from engagement in peer groups,²¹ but peer contact is also important for the development of protective factors such as participation in physical activity and socializing through, for example, youth club membership.¹⁰ Voorhees et al²² found higher levels of physical activity with friends to be related to self-reported physical activity among adolescent girls. Friendship groups have also been identified as a primary influence for participation in physical activity among girls in the UK.¹⁷

To date, the majority of research investigating the role of social influences on adolescent physical activity has been cross-sectional, and longitudinal studies have often focused on one area of social influence.¹¹ There is a lack of longitudinal research investigating multiple social influences and the way in which their influence changes over time. Therefore, drawing on findings from a longitudinal study in Scotland, the Physical Activity in Scottish Schoolchildren (PASS) study; the aim of this paper is to investigate parental and peer influences on physical activity participation among adolescents in Scotland as they make the transition from primary to secondary school and through the early secondary school years.

Methods

Study Design

The Physical Activity in Scottish Schoolchildren (PASS) study is a 5-year longitudinal study tracking physical activity participation in a cohort of adolescents, between the ages of 11 to 15; the final year of primary school (P7) to the fourth year of secondary school (S4). The overall aim of the PASS study is to investigate the key determinants of physical activity among Scottish adolescents during the transition from primary to secondary school and across the early secondary school years. Eight school clusters (8 secondary schools and 52 associated primary schools) took part in the study; 2 from each of 4 local authority areas across Scotland (Angus, Fife, Glasgow City and West Lothian). Schools were selected according to school size and catchment area to allow for a varied socioeconomic profile across the whole sample. Ethical approval was gained from the Moray House School of Education Research Ethics Committee. All P7 pupils in participating schools in 2002 were recruited to the study ($n = 1632$). Information sheets and consent forms were sent out to all parents of P7 pupils in the first year of the study, and to parents of new pupils in subsequent years. Pupils were also provided with information sheets and consent forms on the day of the survey and were able to withdraw from the study if they did not wish to take part.

Data were collected through questionnaire survey in the Autumn Term each year, administered in the classroom by a teacher or researcher. A team of fieldworkers

were recruited for the study to administer the questionnaire in primary schools. All were fully trained by the lead researcher in advance and followed a standard protocol for administration. In secondary schools, questionnaires were administered by teachers following the same standardized protocol. Specific instructions were issued to teachers before survey administration. Additional assistance by trained researchers was available to schools if requested.

The final longitudinal sample comprised 641 pupils who completed a questionnaire in all 5 survey years (2002–2006). This represents a final response rate of 39.3%, which compares favorably with other longitudinal studies over a similar time period.^{23–25} Loss to follow-up occurred for various reasons, including parental withdrawal, pupil withdrawal, absence on the day of the survey, moving to another school, an incomplete or missing questionnaire, or another unspecified reason. The majority of pupil loss to follow-up occurred during the primary-secondary school transition due to study participants moving to other schools. The longitudinal sample were more likely to report living with both parents in P7 (75.4% compared with 61.5%, $\chi = 35.5$, $P < .001$) and come from high affluent families (23.9% compared with 19.7%, $\chi = 9.75$, $P < .01$) but did not differ by gender or other key variables. Of those included in the final sample, 48.8% were male and 51.2% were female, and 96.7% described themselves as white.

Measures

Physical Activity. Physical activity was measured using the Physical Activity Questionnaire for Older Children (PAQ-C). This instrument uses 9 items to assess physical activity during the last 7 days in a variety of contexts (eg, school, physical education (PE) classes, break times, after school, evenings, and weekends). Each of the items is scored on a 5-point Likert scale, and the average of the items is used to reflect overall physical activity level. The PAQ-C has demonstrated good reliability and validity in previous studies.^{26–28} Furthermore, findings within a Scottish population have been comparable to previous research using the PAQ-C.²⁹ Participants were categorized as ‘active’ or ‘low active,’ based on a binary variable created using the PAQ-C median score.

Five areas of social influence were investigated, namely, peer support, peer socializing, paternal support, maternal support, and independent play (being allowed to play out in the local area without an adult present). Based on their survey responses, participants were grouped into ‘high’ or ‘low’ groups. Cut-offs were determined using data on frequencies and median values.

Peer Influences. Peer support was measured using 2 items; encouragement to be physically active, and being physically active with peers,³⁰ using the following question format: *How much do your friends do these things?* Answers were based on a 4-point Likert Scale ranging from *a lot* to *not at all*. Peer socializing was also

measured, quantified by the amount of time spent with friends 'after school' and in the 'evenings' during the school week.³¹ Participants were asked *How many days a week do you usually spend with friends after school?* and *How many evenings during the school week do you usually spend time with friends?*

Parental Influences. Perceived paternal and maternal support were assessed separately using a 5-item scale based on the following question format: *How much does your mother/father do these things?* Responses were based on a 4-point Likert Scale ranging from *a lot to not at all* and related to encouragement to be physically active, support for being physically active (eg, providing transport, watching, and praising physical activity), and being physically active with their child.³⁰

Independent Play. Independent play was measured using 1 item which was developed specifically for the study. Participants were asked how often they were allowed to play out in the local streets or park without an adult. Responses were *whenever I want, only at certain times, or never*. Responses were recoded into 2 categories: unrestricted play (whenever I want) and restricted play (at certain times or never).

Other Covariates. Socioeconomic status was measured using the Family Affluence Scale (FAS).³² This measure is based on a set of questions on the material conditions of the households in which young people live, comprising car ownership, bedroom occupancy, and holidays. The questions are easy for children and young people to answer, resulting in lower nonresponse rates when compared with questions relating to parental occupation. A composite FAS score was calculated for each young person based on his or her response to the 3 items. A 3-point ordinal scale was composed for the analysis, in which a score of 0 to 3 = low affluence; 4, 5 = middle affluence; and 6, 7 = high affluence.

Data Analysis

All analyses were conducted using the statistical software package SPSS 14,³³ using the Complex Samples for Survey Analysis package, to take account of the clustered nature of the data. Gender differences in proportions and associations between physical activity and explanatory social variables were analyzed using chi-square tests. Temporal trends between P7 and S4 were assessed using the chi-squared test for linear trend, taking account of the effect of school clustering on the precision of the estimates presented. Logistic regression analysis was used to investigate the way in which different social influences were associated with young people's physical activity levels (active versus low active) at each age group.

To assess the potential for multicollinearity in the final models, Pearson's correlations were calculated for the social influence variables, within each year and gender. Aside from correlations between maternal and paternal support (which ranged from 0.4–0.6), these were

found to be low, for the most part being less than 0.2. Multivariable logistic regression models were then run for boys and girls in P7, S2, and S4 separately, using the enter method, including only those independent variables with $P < .05$ in the univariate regression analyses. The multivariable models adjusted for baseline physical activity (physical activity in P7). Odds ratios and confidence intervals are presented for each independent variable.

Although most variables saw only a small number of missing data (less than 5%), maternal and paternal support variables had a particularly high number of missing data (up to 19%). For this reason, all available data were included in the separate univariate regression analyses. Missingness in parental support was partly due to absent parents. The models were rerun using 3-category parental support variables with an additional category of 'don't have mother/father' (results not shown). This made little difference to the effect sizes and no difference to significance. Furthermore, excluding maternal and paternal support from the study, and therefore increasing the sample included in each of the multivariable analyses did not alter the results for the remaining social influence variables.

Data are presented for the final year of primary school (P7), and the second and fourth years of secondary school (S2 and S4, respectively). These years cover the onset of adolescence and middle adolescent years, thus representing key developmental stages.

Results

Table 1 shows the proportion of active pupils from the final year of primary (P7) across the early secondary years. The proportion of active boys and girls decreased between P7 and S4 and a higher proportion of boys than girls were active in each year.

Table 2 represents levels of reported social influences by gender and year. Support from peers showed significant gender differences across all years. Among both boys and girls there was an overall decrease in peer support between P7 and S4 but this decline was greater among girls. Boys reported higher levels of peer socializing than girls in P7 only. There were no significant changes in peer socializing over time for boys or girls. In relation to parental support, boys reported higher levels of support than girls in the later secondary years. There was a decrease in paternal support among boys between S2 and S4 and a decrease among girls occurring earlier, across the primary-secondary school transition. Maternal support decreased during the secondary years among both genders, but a gender difference was only evident in S4. Among both boys and girls, there was an increase in reported independent play with age. However, boys reported higher levels of unrestricted play than girls in P7 and S2.

Table 3 shows the associations between social variables and physical activity for boys and girls by school year. There was a positive relationship between peer support and physical activity in each year. Similarly, a

Table 1 Proportion of Active Pupils by School Year and Gender

	% Active pupils ^a			Time trend
	P7	S2	S4	
Boys	82.1	62.9	41.9	<i>P</i> < .001
Girls	61.1	30.5	16.6	<i>P</i> < .001
Gender difference	<i>P</i> < .001	<i>P</i> < .001	<i>P</i> < .001	

^a A binary variable was created based on PAQ-C mean score. Pupils with a mean score of < 3.00 were classified as 'low active' and pupils with a mean score of ≥ 3.00 were classified as 'active.'

Table 2 Social Factors by School Year and Gender

	P7	S2	S4	Time trend
Peer support (% high)				
Boys	80.4	76.2	69.7	<i>P</i> < .001
Girls	69.5	60.0	41.0	<i>P</i> < .001
Gender diff	<i>P</i> = .006	<i>P</i> < .001	<i>P</i> < .001	
Peer socializing (% high)				
Boys	53.2	60.3	53.8	<i>P</i> = .567
Girls	44.3	53.8	46.6	<i>P</i> = .754
Gender diff	<i>P</i> = .028	<i>P</i> = .108	<i>P</i> = .082	
Paternal support (% high)				
Boys	65.8	66.4	54.8	<i>P</i> = 0.016
Girls	60.1	33.6	35.5	<i>P</i> < .001
Gender diff	<i>P</i> = .195	<i>P</i> = .001	<i>P</i> < .001	
Maternal support (% high)				
Boys	54.8	54.0	42.5	<i>P</i> = .002
Girls	58.0	52.7	33.1	<i>P</i> < .001
Gender diff	<i>P</i> = .481	<i>P</i> = .750	<i>P</i> = .019	
Independent play (% unrestricted)				
Boys	58.9	80.4	84.6	<i>P</i> < .001
Girls	40.1	69.1	80.3	<i>P</i> < .001
Gender diff	<i>P</i> < .001	<i>P</i> = .007	<i>P</i> = .168	

greater proportion of high socializing boys were active compared with low socializing boys at all ages. Among girls, a significant association between peer socializing and physical activity was only found in P7.

The relationship between parental support and physical activity varied by age and gender. Among S4 boys and girls, a greater proportion of those reporting high levels of paternal support were active compared with those reporting low levels of support. This was also the case for girls in P7, but not in S2. In relation to maternal support, a positive association was found among younger girls (P7 and S2) and among older boys (S4). Freedom to play independently was positively associated with physical activity among P7 boys and S2 girls only. There was no association between independent play and being active for either gender in S4.

Results from univariate and multivariable logistic regression analyses are shown for boys and girls separately (Tables 4 and 5, respectively). Socioeconomic status, as measured by the Family Affluence Scale (FAS) was not significant in the univariate models for boys or girls. However, previous literature has consistently shown socioeconomic status to be a confounding variable in physical activity participation, and FAS was therefore adjusted for in the multivariable models. Initial univariate analyses showed that, for P7 boys, peer support, peer socializing, and independent play were associated with being active. Among boys in S2 and S4, physical activity at baseline, peer support, peer socializing, and paternal support were significant, with maternal support also significant by S4. Among girls, peer support, peer socializing, paternal support, and maternal support were

Table 3 Associations Between Social Factors and Physical Activity by School Year and Gender

	% Pupils reporting being physically active					
	P7		S2		S4	
	Boys	Girls	Boys	Girls	Boys	Girls
Peer support (%)						
High support	86.2	66.5	70.1	36.7	52.0	25.4
Low support	63.2	50.5	41.2	20.5	20.0	10.9
	<i>P</i> < .001	<i>P</i> = .035	<i>P</i> = .005	<i>P</i> = .013	<i>P</i> < .001	<i>P</i> = .002
Peer socializing (%)						
High social	90.6	76.1	73.3	35.1	56.4	20.6
Low social	70.8	50.3	46.4	25.9	25.9	13.3
	<i>P</i> < .001	<i>P</i> = .001	<i>P</i> = .002	<i>P</i> = .239	<i>P</i> < .001	<i>P</i> = .065
Paternal support (%)						
High support	84.1	69.9	70.3	38.2	51.1	24.5
Low support	75.6	53.6	53.7	23.9	29.7	14.0
	<i>P</i> = .126	<i>P</i> = .023	<i>P</i> = .107	<i>P</i> = .072	<i>P</i> = .005	<i>P</i> = .007
Maternal support (%)						
High support	84.5	70.6	72.4	38.8	55.5	19.6
Low support	79.7	48.8	55.3	22.3	31.6	14.9
	<i>P</i> = .321	<i>P</i> = .004	<i>P</i> = .132	<i>P</i> = .011	<i>P</i> = .003	<i>P</i> = .365
Independent play (%)						
Unrestricted	87.4	62.7	65.3	36.2	42.9	17.6
Restricted	74.8	59.9	57.7	16.9	45.2	12.9
	<i>P</i> = .012	<i>P</i> = .684	<i>P</i> = .422	<i>P</i> = .002	<i>P</i> = .807	<i>P</i> = .237

significantly associated with being active in P7. Results were similar in S2, although peer socializing was no longer significant, whereas independent play was. In S4, with the exception of maternal support and independent play, all variables were significantly associated with being active.

Variables which were significant at the 95% level in univariate analyses were entered into the multivariable models. Among boys in P7, all 3 variables remained significant; high levels of peer support, peer socializing, and independent play were independently associated with greater odds of being active. For girls in P7, only peer socializing remained significant, with high socializers being over 3 times as likely to be active than low socializers.

The analyses of S2 and S4 pupils controlled for physical activity level at baseline (ie, P7). Baseline physical activity was the strongest predictor of being active in S2 for both boys and girls, with active P7 pupils being around 4 times as likely to be active in S2. However, baseline physical activity was not significant in predicting being active among boys in S4. For S2 boys, peer support was no longer significant. Peer socializing and paternal support remained significant; S2 boys who displayed high levels of peer socializing were over 2 times as likely to be active, and those who had high levels of paternal

support also had increased odds of being active. In S4, both peer and paternal support remained independently significant in the multivariable model alongside peer socializing. For girls in S2, maternal support and independent play remained in the multivariable model once baseline physical activity had been controlled for. Girls who were allowed to play outside without adult supervision were over 4 times as likely to be active. Likewise, those who received high levels of support from their mothers were more likely to be active. By S4, maternal support and independent play were no longer significant, with being active explained by high levels of peer support and peer socializing once baseline physical activity was accounted for.

Discussion

The purpose of this study was to examine longitudinally the relationship between parental and peer influences and physical activity participation during early to mid adolescence. The findings indicate that social influences vary by both gender and age, thus highlighting important developmental differences.

In keeping with previous research,^{3,34} girls in the current study reported significantly lower levels of physical

Table 4 Univariate and Multivariable Analyses of Perceived Social Support to Be Physically Active Among Boys: OR (95% CI)

Outcome measure: Active (ref: low)	P7		S2		S4	
	Univariate	Multivariable	Univariate	Multivariable	Univariate	Multivariable
Baseline activity (active)	–	–	3.87* (1.87, 8.01)	3.90* (2.10, 7.24)	3.00* (1.47, 6.09)	2.34 (0.87, 6.26)
Peer support (high)	3.63* (1.97, 6.71)	3.02* (1.58, 5.77)	3.36* (1.48, 7.60)	2.37 (0.88, 6.38)	4.34* (2.66, 7.09)	2.65* (1.35, 5.22)
Peer socializing (high)	3.98* (2.07, 7.67)	3.53* (1.77, 7.04)	3.36* (1.48, 7.60)	2.67* (1.21, 5.92)	3.70* (2.02, 6.75)	3.26* (2.23, 4.77)
Paternal support (high)	1.71 (0.81, 3.63)		2.04* (1.35, 3.08)	1.97* (1.07, 3.61)	2.47* (1.67, 3.65)	1.94* (1.12, 3.42)
Maternal support (high)	1.39 (0.70, 2.76)		2.12 (0.68, 6.63)		2.70* (1.44, 5.07)	1.46 (0.68, 3.13)
Independent play (unrestricted)	2.34* (1.13, 4.86)	2.44* (1.10, 5.41)	1.38 (0.58, 3.30)		0.91 (0.53, 1.54)	

* Significant variable ($P < .05$).**Table 5 Univariate and Multivariable Analyses of Perceived Social Support to Be Physically Active Among Girls: OR (95% CI)**

Outcome measure: Active (ref: low)	P7		S2		S4	
	Univariate	Multivariable	Univariate	Multivariable	Univariate	Multivariable
Baseline activity (active)	–	–	3.78* (2.03, 6.98)	4.15* (2.00, 8.62)	2.44* (1.24, 4.82)	2.27* (1.11, 4.65)
Peer support (high)	1.94* (1.24, 3.05)	1.31 (0.68, 2.53)	2.24* (1.26, 4.00)	1.51 (0.78, 2.90)	2.78* (1.35, 5.73)	2.86* (1.55, 5.27)
Peer socializing (high)	3.15* (1.71, 5.80)	3.27* (1.80, 5.92)	1.55 (0.68, 3.52)		1.70* (1.19, 2.42)	1.57* (1.03, 2.40)
Paternal support (high)	2.02* (1.13, 3.60)	1.58 (0.82, 3.07)	1.97* (1.08, 3.59)	1.11 (0.53, 2.34)	1.98* (1.06, 3.71)	1.48 (0.72, 3.03)
Maternal support (high)	2.52* (1.41, 4.5)	1.80 (0.83, 3.93)	2.21* (1.32, 3.70)	1.70* (1.11, 2.61)	1.39 (0.54, 3.58)	
Independent play (unrestricted)	1.13 (0.74, 1.72)		2.80* (1.56, 5.03)	4.50* (1.95, 10.4)	1.44 (0.64, 3.25)	

* Significant variable ($P < .05$).

activity than boys. As well as being more active, boys reported higher levels of peer support in all 3 years, suggesting that they are more likely than girls to have friends to be active with. The longitudinal nature of this study has highlighted the significant decrease in physical activity participation across the primary/secondary school transition and across the secondary school years, among both boys and girls. Furthermore, the level and type of social support changed during this time, particularly among girls. The detrimental impact of life transitions on girls' and young women's participation in physical activity has previously been shown, revealing the friendship group as the primary influence over participation in physical activity.¹⁷

Physical activity at baseline (P7; final year of primary school) was shown to be a strong predictor of being physically active in the early secondary school years. Such findings highlight the importance of establishing physical activity participation during the primary years as well as ensuring levels are maintained across the primary-secondary school transition. Other longitudinal studies have reported similar findings.³⁵

In the current study, multivariable analyses showed that, compared with peer influences, parental support was less likely to be associated with being active among adolescents. However, where parental support was apparent, being active was associated with support from the same-sex parent. Among girls in S2, having high maternal support increased the odds of being active by just over one-and-a-half times, whereas S2 and S4 boys with high paternal support were almost twice as likely to be active. King et al⁹ found that adolescents who had a parent encourage them to exercise were significantly more likely to report higher physical activity levels than those who did not have parental encouragement, both in relation to vigorous and moderate physical activity. In this case, younger adolescents appeared to be especially influenced by their same-sex parent.³⁶ Further gender and developmental differences have been reported previously. Bauer et al³⁶ also found that male and females are not influenced equally by both of their parents, and Beets et al³⁷ showed that boys report greater social support than girls and that maturation and age exhibit unique effects on social support. The findings suggest it may be appropriate for physical activity interventions to involve parents and their children, although a recent review reported inconclusive evidence for the effectiveness of family-based interventions among adolescents.³⁸

Although parents and family are important, adolescents are increasingly influenced by their peers as they get older. Support from friends has been associated with more physical activity among youth.³⁹ The current study supports this view, particularly at the older ages with peer support increasing the odds of being active in S4 by over 2.5 times for boys and girls, over and above activity at baseline. This study also highlights the importance of time spent with friends in relation to physical activity levels. With the exception of girls in S2, high levels of peer socializing were consistently associated with being

active. The importance of peer socializing in the final year of primary school suggests that time spent with friends at this age is likely to be spent engaging in physical activities. Peer socializing remains independently associated with active boys in early secondary (S2) after adjustment for baseline activity. However, this is not the case for girls. At this age perhaps girls are likely to spend time doing more 'nonactive' activities with their friends. It is interesting therefore, that by S4, peer socializing once again predicts physical activity among girls, although the effect is smaller than that of peer support. Despite decreasing levels of physical activity as girls get older, these findings suggest that girls who remain physically active by S4, may tend to socialize with friends who are similarly active. Female social groups containing physically active girls may encourage others to be physically active, thus highlighting the importance of social context within physical activity initiatives. In another study of physical activity in adolescent girls and the role of peer social networks,²² physical activity with friends was significantly related to self-reported physical activity in multivariable analyses. In light of this, it has been suggested that interventions should teach adolescents the skills necessary to maintain and develop supportive social networks for physical activity.⁴⁰

There has been a significant loss of independence among young people in the UK in recent years with, for example, a decline in the proportion of 10- to 11-year olds allowed to travel around local areas unaccompanied.⁴¹ Indeed, parents are important gatekeepers of their children's physical activity and it may be that such opportunities are restricted due to parental concerns regarding safety and other factors.⁴² Adolescents are subject to fewer restrictions as they become older and attain greater levels of autonomy and responsibility. This was evident from findings in the current study, with proportions of boys and girls reporting unrestricted play increasing over the 5 years of the study. In P7 and S2, boys had significantly higher levels of unrestricted play in each school year, indicating that younger girls may be subject to greater mobility restrictions than their male counterparts. The potential negative effect of such restrictions is underlined by the finding that S2 girls reporting unrestricted play were four-and-a-half times more likely to be active compared with those reporting restricted play. Similarly, the significance of time spent with friends in relation to physical activity behavior also reflects the importance of adolescents having the freedom to play independently with their friends.

This study adds to the existing evidence base in this area by presenting longitudinal data from a 5-year study in Scotland. It focuses specifically on the period between the final year of primary school to the fourth year of secondary school, a stage during which critical changes in social relationships occur and many health-related behavioral habits are established.⁴³ Furthermore, a range of social variables were examined, with the use of multivariable regression modeling allowing for the simultaneous analysis of parental and peer influences

and their relative contributions to explaining variance in physical activity participation.

The study was subject to a number of limitations. Findings are likely to be context specific and further examination of these relationships in different countries and among different cultural groups would be beneficial. The PAQ-C questionnaire, although validated, has had limited use within a Scottish adolescent population. Previous Scottish results have been comparable²⁹ but further validation within this specific population would be beneficial. The primary limitation to this study is the low response rate among the final longitudinal sample. However, this is comparable to other longitudinal studies over a similar time period.^{23–25} In a study of this nature, some loss-to-follow-up is inevitable, especially as children move from primary to secondary school, which accounted for the majority of attrition. For logistical reasons, it was not possible to follow up those adolescents who moved to other schools during the study period. This said, although those in the longitudinal sample were more likely to come from high affluent, 2-parent families than those lost to follow up, there was no significant difference in gender, physical activity or levels of social support. Family affluence was controlled for in all analyses and further tests showed no association between physical activity and family type. Despite the longitudinal nature of this study, the causality of the relationship between social influences and physical activity cannot be determined and therefore should be interpreted with caution. While the source of social support is identified (eg, maternal, paternal, peer), the results are based on a mean score of combined scale items and therefore the relative influence of specific types of support (eg, encouragement, transportation) is not known. Future research should examine types of support for physical activity experienced by individuals and how this differs by gender and age group.

Conclusions

This study has added to the growing evidence base on social influences on young people's physical activity levels by showing how these influences change over time during the early adolescent years. The findings are of key importance for the development of interventions aimed at increasing physical activity in adolescents, specifically in relation to understanding how social contexts vary for boys and girls respectively, and how such contexts also change with age. Identifying the social influences on physical activity which are pertinent to specific genders and age groups will allow for the development of more specific, context-relevant physical activity interventions.

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