

P.-A. Michaud · A. Jeannin · J.-C. Suris

## Correlates of extracurricular sport participation among Swiss adolescents

Received: 14 October 2005 / Revised: 12 February 2006 / Accepted: 14 February 2006 / Published online: 7 April 2006  
© Springer-Verlag 2006

**Abstract** *Background:* Based on a large national survey on the health of adolescents, this paper focuses on the socio-demographic and lifestyle correlates of sport practice among Swiss adolescents. The SMASH2002 database includes 7428 vocational apprentices and high school students between the ages of 16 and 20 who answered a self-administered anonymous questionnaire containing 565 items targeting perceived health, health attitudes and behaviour. Weekly episodes of extracurricular sport activity were measured by a four-category scale, and the sample was dichotomised between active ( $\geq$ two episodes of sport/week) and inactive ( $<$ two episodes of sport/week) respondents. Thirty percent of female respondents and 40.2% of male respondents reported engaging in sport activity at least two to three times a week; another 9.7% of the female and 19.4% of the male respondents reported participating in at least one sport activity each day ( $p<0.01$ ). The percentage of active respondents was higher among students than among vocational apprentices ( $p<0.01$ ), and the rates of sport activity decreased more sharply over time among the apprentices than among the students ( $p<0.01$ ). Most active adolescents reported having a better feeling of well-being than their inactive peers [among male students: odds ratio (OR): 3.13; 95% confidence interval (95%CI): 1.28–7.70]. The percentage of active females who reported

being on a diet was high, and female apprentices exhibited higher involvement in dieting than their inactive peers (OR: 1.68; 95%CI: 1.32–2.14). Relative to the inactive male respondents, the proportion of active male respondents smoking was lower; however, a lower proportion of the latter group did not report drunkenness, and the percentage of those who reported lifetime cannabis consumption was higher among active than inactive students (females, OR:1.57; 95%CI:1.09–2.25; males, OR:1.80; 95%CI: 2.0–2.69). *Conclusion:* Organised sport activities should be better tailored to the work schedules of apprentices. Practitioners should be aware of the potential for problematic behaviour in the area of dieting and substance use among a subset of sport-oriented adolescents.

**Keywords** Adolescent behaviour · Correlates · Health behaviour · Inactivity · Lifestyles · Sports · Survey

### Introduction

There is increasingly more evidence that physical activity has a protective effect against cardiovascular disease [6, 45]. The issue of physical activity among children and adolescents is thus becoming more and more critical because of its impact on current and future health. Indeed, as engaging in regular sport activity is an important means to achieving regular moderate/high intensity physical activity [18, 28, 46, 47], it is important to study trends and correlates of sport activity during adolescence, a period of life during which many individuals engage in health habits which will last throughout adulthood [5, 19, 28, 43, 52].

In many countries, the number of children and adolescents engaging in physical and sport activity has decreased over the last decades [1, 4, 23, 25, 51, 56], contributing to the current epidemic of obesity among children and adolescents [8, 21]. Moreover, we also have evidence indicating that the total numbers of this age group engaged in physical and sport activity tend to decrease during adolescence [2, 5, 25, 32, 33, 54]. This trend may be

---

Adapted from a contribution made at the '23rd Paediatric Work Physiology Meeting', Thun, September 22–25, 2005. The SMASH survey was carried out with the financial support of the Swiss Federal Office of Public Health (contract 00.001721/2.24.02.-81) and the participating cantons.

---

P.-A. Michaud · A. Jeannin · J.-C. Suris  
Multidisciplinary Unit for Adolescent Health and Research  
group on Adolescent Health, University Hospital,  
Lausanne, Switzerland

P.-A. Michaud (✉)  
UMSA, CHUV,  
1011 Lausanne, Switzerland  
e-mail: Pierre-Andre.Michaud@hospvd.ch  
Tel.: +41-21-3143760  
Fax: +41-21-3143769

particularly pertinent among adolescents who leave school and engage in some type of working activity. In Switzerland, from the age of 16, which marks the end of mandatory school, around two-thirds of all adolescents undertake an apprenticeship, a dual training system in which they study theoretical matters 1 day a week in professional schools and work the rest of the time in various firms and offices. Their time schedule may thus be incompatible with regular team sport activities.

While some research has tackled the question of correlates of physical activity in general among children and adolescents [26, 27, 47, 55], several studies have specifically focused on the correlates of sport activity [14, 16, 20, 22, 49, 53]. They usually include socio-demographic, attitudinal and also behavioural factors. For instance, in an earlier study, Gottlieb found that the father's occupation as well as parental exercise was positively associated with higher sport activity among children of the 7th and 8th grade [20]. To what extent sport activity contributes to good school grades is still open to debate [16, 22]. The most solid evidence is to be found in the area of health and health behaviour [14, 22, 49]. Sport activity is usually associated with a feeling of positive well-being, better mental health and a lower engagement in health-threatening behaviour such as substance use. However, although active adolescents tend to smoke in lower proportions than their inactive peers [1, 15, 38, 41, 42], the link with the use of alcohol and illegal drugs is more controversial as there is some evidence that young people engaged in team competition tend to use alcohol as often or even more often than those who do not [3, 14, 38]. Also, while there is some evidence that sport practice may in some instances improve self esteem and body image [14, 26, 35], it is also currently recognised that among vulnerable adolescents, especially females, sports activity can be associated with body image concerns and eating disorders [9]. Finally, as females usually tend to be less physically active and sport-oriented than males [12, 14, 56], some of the correlates of sport activity may not be the same among females and males [53] and may also differ between apprentices and students.

In this article we using secondary analyses of a large national survey to present the trends in sport activity of students and apprentices from age 16 to age 20 years as well as some of the psychosocial correlates. We assumed that males would engage in sport activities at a higher rate than females and that a higher proportion of students, in comparison with apprentices, would engage in regular sport activity. We hypothesised that there would be a downward trend in sport activity throughout adolescence, i.e. from 16 to 20 years of age. We wanted to assess whether sport activity was correlated with the family's socio-economic level, with school grades and with the perception of the school climate. We expected that sport activity would correlate positively with health perceptions and mental health. Finally, regarding conflicting results in the field of sports and substance use, we wanted to explore this relationship without expecting specific results.

## Methods

The second SMASH02 (Swiss Multicenter Adolescent Survey on Health) study was conducted during 2002 among a large representative sample of students and apprentices across the three language areas of Switzerland. The main goal of the survey was to investigate the health needs, perceptions and behaviours of 16- to 20-year-old adolescents. A detailed description of the methods can be found elsewhere [24]. All public educational institutions – vocational training schools and high schools – were included in a two-stage cluster sampling (a complex iterative random cluster sample of classes was drawn without replacement, with the classes as primary sampling units). Ultimately, 586 classes (97.7% of the selected sample) participated, and only 16 persons refused to participate. Around 5% of the questionnaires had to be discarded due to incomplete data, so that the final weighted number of adolescents included in the present analysis was 7428 (3384 females and 4044 males). The survey was approved by the ethical committee of the Faculty of Medicine of Lausanne.

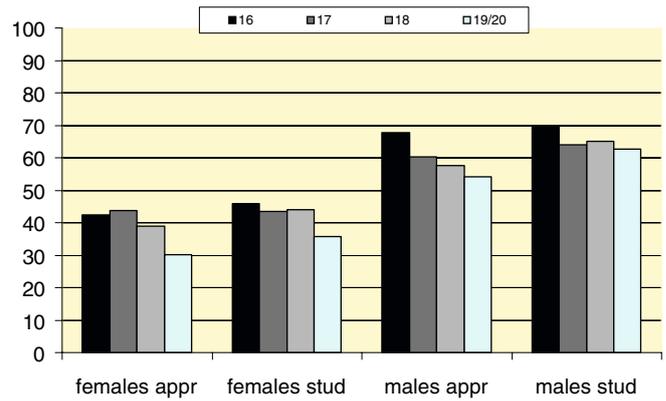
The questionnaire, a self-administered anonymous survey of 565 items, focuses on socio-economic background, health status, representation of one's health, well-being and self-image, perceived health needs, functional symptoms, perceived physical and mental health, disability and chronic conditions. It also includes items pertaining to health behaviour patterns, such as sexual behaviour, substance use, eating disorders, violent or law-breaking behaviour and suicidal events. For the assessment of extracurricular sport activity (outside of school gym sessions), which was the main dependant variable, respondents were provided four exclusive categories: daily, two to three times a week, once a week or less and no regular sport practice. The variable was dichotomised into: twice a week or more (including the first two categories and coded as 0) and once a week or less (including the two last categories and coded as 1), as had been done in a previous Swiss study [14]. Taking into account the results of the literature, we selected from the many variables available in the survey only those which would allow us to support or reject our hypotheses: self-reported socio-demographic variables such as nationality, living conditions (rural versus city) and parents' level of education (as a proxy for socio-economic level). School variables included self-reported grade/number of repeated grades and good versus average/low perceived school climate. Global and mental health perceptions as well as satisfaction with one's own body and dieting patterns were also dichotomised from a 4-category scale (never/seldom/often/very often). Also of interest were current daily smoking habits, at least one episode of drunkenness over the last month (as an indicator of alcohol misuse) and use of cannabis at least once over the last month (as an indicator of "regular" cannabis use). A version of the original questionnaire is available in French and German on our website (<http://www.umsa.ch>).

All analyses were conducted with SPSS (SPSS Inc., 11th version, Chicago, Ill.). Differences in the level of sport

activity between females and males and between apprentices and students were calculated using chi-square at a level of 0.05. As far as the correlates of sport activity are concerned, bivariate analyses were first performed. In a second step, all variables significantly related to sport activity were entered in a multiple stepwise regression. The analyses were conducted separately by academic track (apprentice/student) and gender. The results are expressed as adjusted odds ratios (OR) with 95% confidence intervals (95%CI).

**Results**

Table 1 presents the main socio-demographic characteristics of the sample as well as the extracurricular sport activity of the respondents. There are no major differences between males and females or between apprentices and students with respect to the composition of the sample. Globally, 39.6% of the females and 59.6% of the males ( $p<0.001$ ) reported engaging in sport activity at least two to three times a week. This gender difference is found both among both students and apprentices. A lower proportion of apprentices than students tended to engage in sport activity across both genders, the gap being, however, greater among males. As shown in Fig. 1, there is a



**Fig. 1** Rate of adolescents engaging in sport activity more than once a week, by age, gender and academic track

downward trend in the level of sport activity from the age of 16 to 20 years. This decrease in the rates of adolescents engaging in sport activity more than once a week is significant for all groups ( $0.05<p<0.01$ ). It is higher among apprentices than among students (among male students, the decrease does not attain significance).

Table 2 displays the socio-demographic and health correlates of higher versus lower involvement in extracurricular sport activity for female apprentices and

**Table 1** Main characteristics of the SMASH sample, by gender and academic track

Characteristics	Apprentices		Students		Total		
	Females	Males	Females	Males	Females	Males	Total
Numbers	2131	3183	1252	861	3384	4044	7428
	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage	Percentage
<b>Age</b>							
16 years	9.3	11.2	12.9	15.8	10.7	12.2	11.5
17 years	28.0	24.1	33.1	30.1	29.8	25.4	27.4
18 years	34.7	29.4	28.4	28.1	32.4	29.1	30.6
20 years	28.0	35.3	25.6	26.0	27.1	33.3	30.5
<b>Nationality</b>							
Swiss	83.4	82.3	89.6	89.9	85.7	83.9	84.7
Other	16.6	17.7	10.4	10.1	14.3	16.1	15.3
<b>Residence</b>							
City	39.3	40.4	46.0	53.0	41.8	42.8	42.3
Rural	59.5	58.4	53.6	45.8	57.3	55.8	56.5
<b>Family situation</b>							
Parents together	73.7	76.6	77.6	80.8	75.1	77.5	76.4
Parents separated/divorced	21.2	18.9	16.5	15.3	19.4	18.2	18.8
Father/mother deceased	4.6	4.1	5.8	3.6	5.1	4.0	4.5
<b>Sports activity<sup>a,b,c,d,e</sup></b>							
Daily or almost daily	9.2	18.2	10.5	24.0	9.7	19.4	15.1
2–3 times a week	28.9	40.0	31.5	40.8	29.9	40.2	36.9
Once a week	29.1	20.0	30.6	18.4	29.6	19.7	23.6
No regular sports activity	32.8	21.7	27.5	16.8	30.8	20.7	24.4

<sup>a</sup> $p<0.05$  between apprentice and student females  
<sup>b</sup> $p<0.01$  between apprentice and student males  
<sup>c</sup> $p<0.01$  between female and male apprentices  
<sup>d</sup> $p<0.01$  between female and male students  
<sup>e</sup> $p<0.01$  between males and females

students, while similarly, Table 3 provides these correlates for male apprentices and students. In all four groups, sport club membership appears to be the strongest predictor of sport activity, especially among students. In the bivariate analyses, Swiss nationality seems to be positively correlated with involvement in sport activity among females, while the reverse is true among males. A higher level of education of the parents – especially of the mother – and, to a lower extent, the fact that the parents live together, tend to be positively correlated with involvement in sport activity, especially among apprentices.

Various indicators of perceived health (including “not feeling tired”) are positively associated with involvement in sport activity among males and females as well as among apprentices and students. Various indicators of satisfaction with school/professional life (self-reported climate, grades, not having repeated a grade) are also positively correlated with a higher level of sport activity. The percentages of participants having indicated that they wanted to lose weight and/or having been on a diet at least once in their life is much higher among females than among males. Among apprentices, the correlation between dieting and sport activity are remarkable: the rate of respondents who reported having engaged in dieting at least once is higher among active than among inactive females while it is lower among active males in comparison with their inactive peers. In all four groups, the percentage of daily smokers is higher among inactive adolescents. The rate of females who reported having been drunk at least once during the 30 days preceding the survey is lower among those engaging in sport activity; this trend is reversed among male students, however, it is non-statistically significant. Finally, cannabis use over the 30 days preceding the survey is positively associated with sport activity among male and female students, but not among apprentices.

---

## Discussion

This paper presents the relationship between sport activity and various psychosocial, health and lifestyle attributes in a large representative sample of 16- to 20-year-old adolescents. One original feature of this study is that it involves not only students for whom sport at school is part of their schedule, but also apprentices who are working most of the time. Our results confirm most of the hypotheses: first, males do engage in sport activity at a much higher rate than females. Second, a higher proportion of students, in comparison to apprentices, participate regularly in sport activity. Third, in both groups, there is a downward trend in sport activity with age, but the trend is more marked among apprentices. Finally, sport activity is related to various demographic and environmental characteristics as well as health perceptions and behaviour. Of special note is the finding that sport activity is not always linked with positive health outcomes: we found that some sport-oriented adolescents, depending on their gender and academic track, display problematic behaviour in the area of dieting and cannabis use.

There are some limitations to the present contribution. The answers for any of our questions, including our dependent variable, may be biased by recall problems or social desirability factors. Also, the cross-sectional design of the study does not allow for inference about the direction of the associations we found. For instance, it is difficult to assess whether it is their sport activity which gives our respondents the feeling of being in good health or if it is those who feel at ease with their health who engage more easily in sport activity, or if there are some basic developmental or psychological characteristics which influence both. Other limitations linked with the sampling methods and the reliability and validity of the items used in the questionnaire have been discussed elsewhere [24]. Another limitation has to do with the type of measurement used. In such a large national survey as ours, encompassing many different health aspects and lifestyles, we decided to use a simple four-point scale measure of sport with a cut-off between active and inactive adolescents at two episodes of extracurricular episodes per week. Taking into account that most respondents have at least one period of sport activity per week in school, this cut-off corresponds to some extent to a norm of three episodes per week [11]. Even though 10 years ago, experts in the field recommended a higher level of activity as the optimum [37] (“every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week”), our analyses suggest that only a minority of youth meet these criteria, and we have thus decided to focus on a broader definition of regular sport activity. Importantly, while our decision to analyse the four groups separately allowed us to define interactions between gender and academic track, the reduction of the sample size – and thus the statistical power – of each analysis might have prevented us from detecting some significant, but weak, associations. In other words, the size of the student sample (especially males) being smaller than that of the apprentices may explain why some correlations are statistically significant for apprentices only (i.e. socio-economic level or mother’s education).

Most, if not all, studies on child and adolescent sport activity stress the differences between females and males: in a recent meta-analytic review of 108 studies, Sallis et al. found that this difference was almost universal and, more importantly, that this difference persists throughout adolescence and adulthood [7, 13]. One study [12] suggests that this disparity may be linked with a different perception in females, in comparison to males, of the meaning of being physically active or sport-oriented, with this difference preceding the emergence of actual divergent rates of activity. It should be stressed that only one out of ten females and one out of ten males meet the criteria of one episode of daily sport activity, as recommended by a panel of experts some 10 years ago [37]. Our results show that the involvement in sport activity decreases with age, as others have already demonstrated [2, 33, 35]. In fact, this trend towards a lower level of activity may even begin before the age of 16 [32]. With the emergence of other activities, such as going out and engaging in part-time jobs, and taking into

**Table 2** Bivariate and multivariate analyses showing the socio-demographic and health correlates of lower versus high sport practice by academic track among females

	Female apprentices ( <i>n</i> =2131)			Female students ( <i>n</i> =1252)				
	≥ twice per week	≤ once per week	OR (95%CI)	Adjusted OR (95%CI)	≥ twice per week	≤ once per week	OR (95%CI)	Adjusted OR (95%CI)
<b>Socio-demographic</b>	<i>n</i> =800	<i>n</i> =1296			<i>n</i> =522	<i>n</i> =722		
Age	17.78±1.07	18.00±1.12	<i>p</i> <0.001	0.87 (0.79/0.96)	17.65±1.09	17.80±1.13	<i>p</i> =0.024	0.95 (0.83/1.08)
Swiss born	89.6	85.3	1.49 (1.13/1.96)	0.78 (0.56/1.09)	93.7	88.1	2.01 (1.32/3.05)	1.43 (0.86/2.38)
Rural habitat	65.8	55.8	1.52 (1.27/1.83)	1.15 (0.93/1.43)	52.0	54.9	0.89 (0.71/1.12)	0.77 (0.58/1.03)
Parents together	77.2	71.3	1.37 (1.11/1.67)	1.02 (0.80/1.30)	81.2	75.1	1.44 (1.09/1.90)	1.35 (0.96/1.90)
Father's education (>mandatory)	82.0	67.4	2.20 (1.78/2.73)	1.47 (1.12/1.95)	87.9	81.4	1.66 (1.20/2.29)	1.08 (0.71/1.66)
Mother's education (>mandatory)	77.4	62.3	2.06 (1.69/2.52)	1.47 (1.13/1.91)	82.4	74.8	1.58 (1.19/2.09)	1.23 (0.84/1.79)
Belongs to sport club	59.8	17.3	7.10 (5.81/8.69)	6.82 (5.51/8.45)	73.9	21.3	10.47 (8.04/13.6)	10.04 (7.63/13.21)
<b>Health variables</b>								
Health perception (good)	95.2	91.0	1.97 (1.35/2.87)	1.36 (0.89/2.07)	96.9	92.4	2.61 (1.48/4.61)	1.81 (0.92/3.54)
Not depressed	70.1	58.0	1.70 (1.41/2.04)	1.51 (1.20/1.91)	68.2	57.5	1.59 (1.25/2.01)	1.22 (0.90/1.65)
Not tired	55.4	45.9	1.46 (1.23/1.75)	1.35 (1.09/1.66)	44.8	36.0	1.44 (1.15/1.82)	1.25 (0.93/1.67)
<b>School variables</b>								
Not too old for grade	85.5	79.5	1.52 (1.19/1.93)	1.22 (0.92/1.62)	84.3	73.1	1.97 (1.48/2.63)	1.24 (0.86/1.78)
Class climate (good)	90.6	86.3	1.53 (1.15/2.03)	1.31 (0.95/1.82)	84.1	82.3	1.14 (0.84/1.54)	1.05 (0.73/1.51)
Grades (good)	81.8	74.8	1.51 (1.21/1.88)	1.21 (0.94/1.57)	83.0	75.2	1.60 (1.21/2.13)	1.19 (0.84/1.70)
<b>Self-image/body variables</b>								
Satisfied with body	69.0	69.1	1.00 (0.82/1.20)	0.85 (0.67/1.08)	78.0	74.2	1.23 (0.94/1.61)	1.05 (0.74/1.49)
Wants to lose weight	73.1	65.1	1.46 (1.20/1.77)	1.31 (1.03/1.67)	65.0	65.0	1.00 (0.79/1.27)	1.26 (0.92/1.71)
Been on a diet	33.7	27.8	1.32 (1.09/1.60)	1.68 (1.32/2.14)	21.8	22.4	0.97 (0.74/1.27)	1.09 (0.76/1.56)
<b>Substance use variables</b>								
Daily smoker	32.0	38.4	0.75 (0.63/0.91)	0.97 (0.76/1.24)	12.3	23.8	0.45 (0.33/0.61)	0.47 (0.31/0.71)
Drunk at least once (30 days)	16.0	20.8	0.72 (0.57/0.91)	0.72 (0.54/0.96)	14.9	17.2	0.85 (0.62/1.16)	0.79 (0.53/1.18)
Cannabis at least once (30 days)	24.0	28.9	0.78 (0.63/0.95)	1.03 (0.79/1.34)	25.7	24.4	1.07 (0.83/1.39)	1.57 (1.09/2.25)

**Table 3** Bivariate and multivariate analyses showing the socio-demographic and health correlates of lower versus high sport practice by academic track among males

	Male apprentices ( <i>n</i> =3183)			Male students ( <i>n</i> =861)				
	≥ twice per week	≤ once per weeks	OR (95%CI)	Adjusted OR (95%CI)	≥ twice per week	≤ once per week	OR (95%CI)	Adjusted OR (95%CI)
<b>Socio-demographic</b>	<i>n</i> =1824	<i>n</i> =1309			<i>n</i> =551	<i>n</i> =299		
Age	17.95±1.22	18.16±1.21	<i>p</i> <0.001	0.91 (0.85/0.98)	17.67±1.14	17.79±1.18	<i>p</i> =0.15	0.93 (0.80/1.09)
Swiss born	83.8	86.7	0.79 (0.65/0.97)	0.65 (0.51/0.83)	88.9	93.0	0.61 (0.36/1.01)	0.53 (0.29/0.97)
Rural habitat	57.8	59.4	0.93 (0.81/1.08)	0.75 (0.63/0.89)	44.3	49.0	0.83 (0.62/1.10)	0.72 (0.51/1.02)
Parents together	78.1	74.9	1.20 (1.01/1.42)	1.01 (0.83/1.23)	81.7	79.3	1.16 (0.82/1.65)	1.21 (0.77/1.88)
Father's education (>mandatory)	77.0	71.4	1.35 (1.14/1.58)	1.05 (0.84/1.30)	84.9	84.9	1.00 (0.67/1.48)	1.08 (0.63/1.85)
Mother's education (>mandatory)	69.1	60.5	1.46 (1.26/1.70)	1.73 (1.41/2.12)	78.4	83.3	0.73 (0.51/1.05)	0.85 (0.52/1.38)
Belongs sport club	70.0	22.7	7.93 (6.74/9.34)	8.22 (6.92/9.75)	76.4	24.7	9.89 (7.13/13.73)	9.98 (7.07/14.09)
<b>Health variables</b>								
Health perception (good)	94.6	91.4	1.65 (1.24/2.18)	1.12 (0.81/1.56)	98.4	91.3	5.74 (2.65/12.41)	3.13 (1.28/7.70)
Not depressed	77.6	75.3	1.14 (0.96/1.34)	0.85 (0.69/1.04)	83.3	76.0	1.58 (1.11/2.23)	1.39 (0.89/2.17)
Not tired	59.5	52.9	1.31 (1.13/1.51)	1.18 (1.00/1.40)	47.9	44.3	1.16 (0.87/1.53)	1.06 (0.75/1.50)
<b>School variables</b>								
Not too old for grade	80.3	75.2	1.34 (1.13/1.59)	1.31 (1.07/1.61)	74.0	73.6	1.03 (0.74/1.41)	0.93 (0.62/1.41)
Class climate (good)	89.6	88.8	1.09 (0.86/1.37)	0.97 (0.75/1.27)	85.7	79.3	1.56 (1.08/2.25)	1.83 (1.17/2.88)
Grades (good)	78.7	74.3	1.27 (1.08/1.51)	1.10 (0.91/1.34)	74.8	75.6	0.96 (0.69/1.33)	0.82 (0.55/1.22)
<b>Self-image/body variables</b>								
Satisfied with body	85.1	81.9	1.27 (1.05/1.53)	0.97 (0.77/1.21)	89.5	85.0	1.50(0.99/2.28)	1.06 (0.62/1.80)
Wants to lose weight	24.3	29.5	0.77 (0.65/0.90)	0.74 (0.61/0.90)	20.5	25.0	0.78 (0.56/1.08)	0.93 (0.60/1.43)
Been on a diet	6.0	6.0	0.99 (0.74/1.34)	1.22 (0.85/1.75)	5.1	6.3	0.79 (0.43/1.44)	1.17 (0.56/2.46)
<b>Substance use variables</b>								
Daily smoker	32.6	43.4	0.63 (0.55/0.73)	0.75 (0.62/0.90)	19.1	24.0	0.75 (0.53/1.05)	0.68 (0.43/1.09)
Drunk at least once (30 days)	40.6	40.7	1.00 (0.86/1.15)	1.04 (0.87/1.24)	36.5	31.8	1.23 (0.91/1.66)	1.16 (0.79/1.72)
Cannabis at least once (30 days)	37.8	43.3	0.80 (0.69/0.92)	1.04 (0.86/1.25)	40.7	35.1	1.27 (0.95/1.70)	1.80 (1.20/2.69)

account the burden which higher studies or professional duties represent, it is not surprising that sport activity becomes less of a priority for a fringe of the adolescent population. In a longitudinal survey run in Finland, the authors found a progressive shift of many of their subjects from higher into lower categories of sport involvement [2]. They found indeed, as we did, that physically active adolescents tend to be engaged in organised sport activity and concluded that “those who participated in organised sports were more often persistent exercisers than those who did not...and were more often persistently fit.” so that “adolescents are recommended to participate in and try different types of sports... which would appear to favour long-term maintenance of leisure-time physical activity”.

Whereas most of the surveys performed among adolescents focus exclusively on students, the interest of our results is that they include apprentices, which allows for the assessment of the impact of the transition from school into work. For instance, while the amount of sport involvement remains fairly stable among students, especially among males, there is a quite sharp decrease in the activity of both male and female apprentices. The decrease is higher among female apprentices than among female students. We could not assess to what extent this decrease in sport activity among apprentices is linked with a physically demanding occupation, as our questionnaire does not ask the type of work which they perform. However, only 25% of the males and 11% of the females stated that they did not practice sport because of a physically demanding job [34]. Our data rather suggest that a progressively higher involvement in professional duties and responsibilities and a more extensive work timetable which conflicts with formal sport training schedules lead many apprentices to abandon regular, organised sport activity. Indeed, the strongest correlate of sport activity, in all four groups, is sport club membership. Although this result is not totally unexpected, it highlights the potential influence a structured activity can have on health habits. But at the same time, it also points out the limitations of this influence when young people have a tight work schedule. The fact that most sport-oriented adolescents are active because of their inclusion in a club may explain why the decrease in activity is higher among apprentices than among students. This difference between students and apprentices is all the more distressing because, while the Swiss federal regulations state that apprentices should get two hours of compulsory physical education per week (as the students do), this is often not the case because of the lack of appropriate facilities in many professional schools.

Sport activity is correlated with several psychosocial and health characteristics which differ to some extent in the way they apply to males, females, apprentices and students, respectively. Bivariate analyses show that sport activity is related to the socio-economic level of the family, as assessed by the level of education the mother or father has received. Some studies have stressed the positive impact that the parents' level of education can have on their children's physical and sport activity [18, 20]. For instance,

Gordon-Larsen et al. [18] found that in a large nationally representative sample of U.S. high school pupils, low, moderate and vigorous activity were correlated with maternal level of education, and a high family income was directly correlated with the degree of sport involvement. Indeed, the inverse correlation between socio-economic status and overweight is well known [36]. On similar lines, the results of our bivariate analyses suggest that sport activity is more prevalent among children coming from intact families: this association has also been described in other similar studies [14, 29]. Finally, immigrant males seem to engage in a higher rate in regular sport activity, while the reverse is true among females. One hypothesis which is, to our knowledge, not supported by formal research, is that this difference may be linked with cultural factors. While in the Swiss culture, sport activity is equally valued for both males and females, in other cultures, sport activity may be more encouraged among males than among females.

School variables (good grades, perceived quality of the school climate) were also globally associated with sport activity more among males than among females. While some authors have not found any such relationship [16] this link has also been described in other papers [15, 38, 48]. What is not known is whether good grades and the perception of a good school climate is a cause or a consequence of higher involvement in sport: indeed, Koivusilta et al. [27] have shown in a cohort study that adolescents engaging in healthy habits tended to attain a higher level of professional degree later in life.

As in other studies [14, 16, 39, 49, 53], sport-oriented adolescents report feeling well (health perceived as good, seldom/never feeling tired or depressed) in a higher proportion among both genders and academic track. It must, however, be stressed that the connections with self-image are more complex. Whereas some authors report a better body image among physically active adolescents [14, 53], several papers have stressed the role of physical and sport activity in one's desire to lose weight, especially among females [10, 31]. The type or correlation between dieting or expressed desire to lose weight and sport activity which we found is clearly gender specific, the rates of those engaging in weight control attitudes/behaviour being higher among active females and lower among active males. Thus, sport may represent for some girls a means to slim their bodily shape, while amongst boys, sport most of the time constitutes one way to enjoy one's body or even to increase one's muscle size! We were impressed by the percentage of our active female respondents (one out of three apprentices, two out of five students) who expressed a desire to lose weight. Although in some instances such an objective may be desirable, in a society which currently witnesses a large increase in concerns related to body image and an epidemic of eating disorders, especially among young people [9], such a high level of preoccupation calls for some in-depth research. The high level of typical and atypical eating disorders among female athletes has already been stressed in other publications [50].

Nearly all surveys have found an inverse correlation between sport activity and cigarette smoking; that is, active adolescents smoke at a lesser rate than their inactive counterparts [14, 39, 42, 53]. To what extent this relation is a direct one or is mediated by other mental health characteristics is still open to debate [38]. In the bivariate analyses of our study, the relationship was significant for all the four groups considered. The relationship with alcohol misuse is more subtle: we did not find a clear relationship between sport activity and the occurrence of drunkenness, except for female apprentices, among whom sport activity seems to exert a protective effect in the area of drunkenness. Indeed, although it does not attain statistical significance, the percentages found among male students suggest a possible direct relationship between sport activity and drunkenness. While some studies suggest a protective effect of sport activity in the area of alcohol use [14, 22, 39], others do not establish such a clear relationship [41, 53]. This may be linked with the fact that, at least in Switzerland, in many team sports such as football or hockey, it is customary to celebrate victory (or to forget about defeat...) and indulge liberally! In other terms, the regular use of alcohol may be negatively correlated with the degree of sport activity, while the occurrence of binge drinking and drunkenness may be positively correlated.

Among male and female students, sport participation is linked with a higher rate of cannabis use over the preceding 30 days. Several recent reports have stressed the fact that some adolescents, especially in specific disciplines such as “free-ride”(off-piste) skiing and snowboarding and other so-called “extreme” sports [40], may engage in cannabis consumption in a higher proportion than those who do not [30, 41]. “Thrill seeking in sports” among students who, possibly, can afford such costly activities more easily may become an increasingly important issue in the future. Also, the problem of doping in sport activity is a crucial one, and cannabis may be used to enhance specific sport performance [30]. We did not look at correlations with other types of illegal drugs as it appeared impossible to find meaningful differences because of the low prevalence of use of such substances in our sample.

Several lessons can be drawn from our results. The first area of concern is the decrease in sport activity during the second phase of adolescence, which is especially marked among apprentices. Our study emphasises the impact – in terms of reduced practice or outright abandon of sport activity – of the transition from school to professional life and clearly shows that the decrease in activity from ages 16 to 20 years is much higher among adolescents who have to face longer formal work schedules. Most of the time, apprentices who engage in sport on a regular basis do so while belonging to a sport club, which implies training sessions on a specific and often fixed schedule. These requirements compete more and more with their work agenda, which explains why they abandon these

activities at a much higher rate than students do. More flexible forms of leisure time sport activity have to be developed so as to adapt to the often uneven timetables of these adolescents. This is, of course, a major challenge in collective disciplines.

Furthermore, the data confirm the association between sport activity and several positive aspects of health, including perceived health and well-being. Even if our study does not highlight any causal relation, it should still support the promotion of sport among young people, on an individual and societal level. Nevertheless, there are two areas of concern which should be better addressed in the future. The first one is the issue of weight control practices, which tend to be higher among active adolescent females, especially apprentices [50]. Frequent dieting and an over-emphasis on nutrition content has become a plague over the last two decades and should not be encouraged. The second issue is the one of substance use. Although the present study did not target the issue of doping drugs, it shows that in specific subgroups, namely male students, the “regular” (over the last 30 days) use of cannabis is positively associated with sport activity. In other words, it is probably simplistic to advocate sport activity as a means to deter young people from psychoactive substance use, as was done some years ago in Switzerland with the “No Drugs – More Sports!” program [17], since for some young people, both sport activity and the use of drugs represent a means to get high and to pursue sensation seeking [40].

The present study suggests several important avenues for future research. First, the motives for reducing or abandoning sport should be thoroughly investigated, keeping in mind the fact that the reasons may differ among males and females or among students and apprentices. Indeed, we lack a good picture of how the transition from school to active professional life impacts on sport activity. Given the epidemic of obesity which is striking all developed countries, it would seem wise to have more surveys monitoring trends in healthy behaviour and level of sport/physical activity. Also, it would be useful to compare the correlates of sport activity over time: for instance, while most of the correlates which we found in the SMASH2002 survey were present in other similar studies run earlier in the country [14, 44], it is the first time that research data point to the problem of dieting and substance use among subsets of respondents, a trend which reflects societal changes and should be addressed in the future.

**Acknowledgements** The survey was run within a multicenter multidisciplinary group from the Institute for Social & Preventive Medicine in Lausanne (Véronique Addor, Chantal Diserens, André Jeannin, Guy van Melle, Pierre-André Michaud, Joan-Carles Suris), Institute for Psychology, Psychology of Development and Developmental Disorders, University of Berne, Switzerland (Françoise Alsaker, Andrea Bütikofer, Françoise Narring, Annemarie Tschumper) and the Sezione Sanitaria, Dipartimento della sanità e della socialità, Canton Ticino (Laura Inderwildi Bonivento).

## References

1. Aarnio M, Winter T, Kujala U, Kaprio J (2002) Associations of health related behaviour, social relationships, and health status with persistent physical activity and inactivity: a study of Finnish adolescent twins. *Br J Sports Med* 36:360–364
2. Aarnio M, Winter T, Peltonen J, Kujala UM, Kaprio J (2002) Stability of leisure-time physical activity during adolescence—a longitudinal study among 16-, 17- and 18-year-old Finnish youth. *Scand J Med Sci Sports* 12:179–185
3. Abel T, Broer M, Siegrist J (1992) Health behavior of young adults: empirical analysis of complex behavior patterns and their determinants. *Soz Präventivmed* 37:293–300
4. Allison K, Adlaf E (1997) Age and sex differences in physical inactivity among Ontario teenagers. *Can J Publ Health* 88:177–180
5. Anderssen N, Wold B, Torsheim T (2005) Tracking of physical activity in adolescence. *Res Q Exerc Sport* 76:119–129
6. Baranovski T, Bouchard C, Bar-Or O (1992) Assessment, prevalence and cardiovascular benefits of physical activity and fitness in youth. *Med Sci Sport Exerc* 24:S237–S247
7. Beunen GP, Lefevre J, Philippaerts RM, Delvaux K, Thomis M, Claessens AL, Vanreusel B, Lysens R, Vanden Eynde B, Renson R (2004) Adolescent correlates of adult physical activity: a 26-year follow-up. *Med Sci Sports Exerc* 36:1930–1936
8. Caprio S, Genel M (2005) Confronting the epidemic of childhood obesity. *Pediatrics* 115:494–495
9. Chamay-Weber C, Narring F, Michaud P (2005) Partial eating disorders among adolescents: a review. *J Adolesc Health* 37:416–426
10. Cheng KY, Cheng PG, Mak KT, Wong SH, Wong YK, Yeung EW (2003) Relationships of perceived benefits and barriers to physical activity, physical activity participation and physical fitness in Hong Kong female adolescents. *J Sports Med Phys Fitness* 43:523–529
11. Corbin CB, Pangrazi RP (1992) Are American children and youth fit? *Res Q Exerc Sport* 63:96–106
12. Craig S, Goldberg J, Dietz WH (1996) Psychosocial correlates of physical activity among fifth and eighth graders. *Prev Med* 25:506–513
13. Dovey SM, Reeder AI, Chalmers DJ (1998) Continuity and change in sporting and leisure time physical activities during adolescence. *Br J Sports Med* 32:53–57
14. Ferron C, Narring F, Cauderay M, Michaud PA (1999) Sport activity in adolescence: associations with health perceptions and experimental behaviours. *Health Educ Res* 14:225–233
15. Field T, Diego M, Sanders CE (2001) Exercise is positively related to adolescents' relationships and academics. *Adolescence* 36:105–110
16. Fisher M, Juszczak L, Friedman SB (1996) Sports participation in an urban high school: academic and psychologic correlates. *J Adolesc Health* 18:329–334
17. Gesundheitswesen Bf (1996) Ohne drogen - mit sport! Prevention of substance abuse through sport activities. Bundesamt für Gesundheitswesen, Eidg. Sportschule Magglingen, Bern
18. Gordon-Larsen P, McMurray RG, Popkin BM (2000) Determinants of adolescent physical activity and inactivity patterns. *Pediatrics* 105:E83
19. Gordon-Larsen P, Nelson MC, Popkin BM (2004) Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. *Am J Prev Med* 27:277–283
20. Gottlieb NH, Chen MS (1985) Sociocultural correlates of childhood sporting activities: their implications for heart health. *Soc Sci Med* 21:533–539
21. Hagarty MA, Schmidt C, Bernaix L, Clement JM (2004) Adolescent obesity: current trends in identification and management. *J Am Acad Nurse Pract* 16:481–489
22. Harrison PA, Narayan G (2003) Differences in behavior, psychological factors, and environmental factors associated with participation in school sports and other activities in adolescence. *J Sch Health* 73:113–120
23. Irving HM, Adlaf EM, Allison KR, Paglia A, Dwyer JJ, Goodman J (2003) Trends in vigorous physical activity participation among Ontario adolescents, 1997–2001. *Can J Public Health* 94:272–274
24. Jeannin A, Narring F, Tschumper A, Bonivento LI, Addor V, Butikofer A, Suris JC, Diserens C, Alsaker F, van Melle G, Michaud PA (2005) Self-reported health needs and use of primary health care services by adolescents enrolled in post-mandatory schools or vocational training programmes in Switzerland. *Swiss Med Wkly* 135:11–18
25. Kimm S, Glynn N, Kriska A (2000) Longitudinal changes in physical activity in a biracial cohort during adolescence. *Med Sci Sports Exerc* 32:1445–1454
26. Kirkcaldy BD, Shephard RJ, Siefen RG (2002) The relationship between physical activity and self-image and problem behaviour among adolescents. *Soc Psychiatry Psychiatr Epidemiol* 37:544–550
27. Koivusilta L, Rimpela A, Rimpela M (1998) Health related lifestyle in adolescence predicts adult educational level: a longitudinal study from Finland. *J Epidemiol Community Health* 52:794–801
28. Kraut A, Melamed S, Gofer D, Froom P (2003) Effect of school age sports on leisure time physical activity in adults: the CORDIS Study. *Med Sci Sports Exerc* 35:2038–2042
29. Lindquist CH, Reynolds KD, Goran MI (1999) Sociocultural determinants of physical activity among children. *Prev Med* 29:305–312
30. Lorente FO, Peretti-Watel P, Grelot L (2005) Cannabis use to enhance sportive and non-sportive performances among French sport students. *Addict Behav* 30:1382–1391
31. Lowry R, Galuska DA, Fulton JE, Burgeson CR, Kann L (2005) Weight management goals and use of exercise for weight control among U.S. high school students, 1991–2001. *J Adolesc Health* 36:320–326
32. Michaud P, Narring F, Cauderay M, Cavadini C (1999) Sports activity, physical activity and fitness of 9-to-19 year-old teenagers in the canton of Vaud (Switzerland). *Schweiz Med Wochenschr* 129:691–699
33. Narring F, Berthoud A, Cauderay M, Favre M, Michaud P (1998) Condition physique et pratiques sportives des jeunes dans le canton de Vaud Raison de santé. Institut universitaire de médecine sociale et préventive, Lausanne
34. Narring F, Tschumper A, Inderwildi Bonivento L, Jeannin A, Addor V, Bütikofer A, Suris J, Diserens C, Alsaker F, Michaud P (2003) Santé et styles de vie des adolescents âgés de 16 à 20 ans en Suisse - SMASH 2002. Institut universitaire de médecine sociale et préventive, Lausanne
35. Neumark-Sztainer D, Story M, Hannan PJ, Tharp T, Rex J (2003) Factors associated with changes in physical activity: a cohort study of inactive adolescent girls. *Arch Pediatr Adolesc Med* 157:803–810
36. O'Dea JA, Caputi P (2001) Association between socio-economic status, weight, age and gender, and the body image and weight control practices of 6- to 19-year-old children and adolescents. *Health Educ Res* 16:521–532
37. Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, Buchner D, Ettinger W, Heath GW, King AC et al (1995) Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA* 273:402–407
38. Pate RR, Heath GW, Dowda M, Trost SG (1996) Associations between physical activity and other health behaviors in a representative sample of US adolescents. *Am J Public Health* 86:1577–1581
39. Pate RR, Trost SG, Levin S, Dowda M (2000) Sports participation and health-related behaviors among US youth. *Arch Pediatr Adolesc Med* 154:904–911
40. Patel DR, Luckstead EF (2000) Sport participation, risk taking, and health risk behaviors. *Adolesc Med* 11:141–155
41. Peretti-Watel P, Beck F, Legleye S (2002) Beyond the U-curve: the relationship between sport and alcohol, cigarette and cannabis use in adolescents. *Addiction* 97:707–716

42. Peretti-Watel P, Guagliardo V, Verger P, Pruvost J, Mignon P, Obadia Y (2003) Sporting activity and drug use: alcohol, cigarette and cannabis use among elite student athletes. *Addiction* 98:1249–1256
43. Raitakari OT, Porkka KV, Taimela S, Telama R, Rasanen L, Viikari JS (1994) Effects of persistent physical activity and inactivity on coronary risk factors in children and young adults. The cardiovascular risk in young finns study. *Am J Epidemiol* 140:195–205
44. Röhliberger C (1994) Sport, Alltagsbewältigung und Seelische Gesundheit von Adoleszenten. Sportwissenschaftliches Institut, Magglingen
45. Rowland T (2001) The role of physical activity and fitness in children in the prevention of adult cardiovascular disease. *Progr Pediatr Cardiol* 12:199–203
46. Sallis J, Patrick K (1994) Overview of the international consensus conference on physical activity guidelines for adolescents. *Pediatr Exerc Sci* 6:299–301
47. Sallis JF, Prochaska JJ, Taylor WC (2000) A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc* 32:963–975
48. Schmitz KH, Lytle LA, Phillips GA, Murray DM, Birnbaum AS, Kubik MY (2002) Psychosocial correlates of physical activity and sedentary leisure habits in young adolescents: the teens eating for energy and nutrition at school study. *Prev Med* 34:266–278
49. Steptoe A, Butler N (1996) Sports participation and emotional wellbeing in adolescents. *Lancet* 347:1789–1792
50. Sundgot-Borgen J (1994) Eating disorders in female athletes. *Sports Med* 17:176–188
51. Suris J, Michaud P, Chossis I, Jeannin A (2006) Towards a sedentary society: trends in adolescent sport practice in Switzerland (1993–2002). *J Adolesc Health* (in press)
52. Telama R, Yang X, Viikari J, Valimaki I, Wanne O, Raitakari O (2005) Physical activity from childhood to adulthood: a 21-year tracking study. *Am J Prev Med* 28:267–273
53. Thorlindsson T, Vilhjalmsson R, Valgeirsson G (1990) Sport participation and perceived health status: a study of adolescents. *Soc Sci Med* 31:551–556
54. van Mechelen W, Twisk JW, Post GB, Snel J, Kemper HC (2000) Physical activity of young people: the Amsterdam Longitudinal Growth and Health Study. *Med Sci Sports Exerc* 32:1610–1616
55. Vilhjalmsson R, Thorlindsson T (1998) Factors related to physical activity: a study of adolescents. *Soc Sci Med* 47:665–675
56. Westerstahl M, Barnekow-Bergkvist M, Hedberg G, Jansson E (2003) Secular trends in sports: participation and attitudes among adolescents in Sweden from 1974 to 1995. *Acta Paediatr* 92:602–609