

Participation in Organized Youth Sport as a Predictor of Adult Physical Activity: A 21-Year Longitudinal Study

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The aim of this study was to investigate how participation in organized competitive youth sport predicts adult physical activity. A random sample of 2,309 boys and girls ages 9–18 years participated in the Cardiovascular Risk in Young Finns Study in 1980, and 1,606 (70%) of them again in 2001. Physical activity was measured using a short, validated questionnaire. The results showed that participation in youth sport, and persistent participation in particular, significantly predicted adult physical activity. Participation in sport competitions increased the probability of high activity in adulthood more among males than females.

The majority of young people in most Western countries participate in organized sports at some stage of their lives. In many countries the number of participants has increased during recent decades. At the same time the number of drop-outs has also increased (7,19). Much research has been done on children's and youth sport from the pedagogical, psychological, sociological, pediatric, and even legal viewpoints, but less attention has been paid to how children's and youth sport is related to a life-long physically active lifestyle (6,13,23,25).

In countries in which responsibility for organized competitive sport has been taken by schools, sport has always been an important part of education. But in countries in which sport is organized outside of school, sport clubs have attracted

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increased numbers of participants, making club sport an important educational institution alongside school physical education.

Individuals participating in youth sport are usually well motivated, their participation is regular and often persists over many years, and through training they learn many new skills. It can be expected, therefore, that participation in youth sports will also have long-term effects, such as continuation of physical activity in later life or a disposition to be active in adulthood. The results of some previous longitudinal studies have shown that participation in organized sport in childhood and adolescence is a good predictor of physical activity in adulthood (4,9,14,17,20). The results obtained from retrospective studies confirm this (7,12,15,16). Participation in youth sport has also been found to predict physical activity among elderly people (10,11). Curtis et al. (7) found that participation in extramural sports in particular was a better predictor of adult physical activity than participation in intramural sports. Our previous findings also support the idea that participation in competitions and training for competitions increases the probability of being physically active in adulthood (20).

Earlier tracking studies have used only one measurement in childhood and adolescence when comparing youth physical activity with adult physical activity. Our recent study showed that a persistently high level of activity at a young age considerably improves the prediction regarding adult physical activity as compared with cross-sectional data (21). It is also suggested that the above-mentioned possible benefits of sport participation are greater if the individual's participation in competitive sports lasts for many years.

Youth sports are characterized by high drop-out rates, and the number of persistent participants is much lower than the cross-sectional data indicate. For instance, in Finland 37% of the boys who were active in sport clubs at age 12 had dropped out by age 15 (18). Although big differences exist in drop-out numbers among countries and sport disciplines, some level of dropping out exists in every country. Thus, in an investigation of the influence of participation in youth sport on adult physical activity, the persistence of participation is an important issue.

The aim of this study was to investigate how participation in organized competitive youth sport predicts adult physical activity. Specifically, we wanted to ascertain the extent to which adult physical activity is predicted by the frequency of participation in sport-club training, participation in different levels of sport competitions, and persistent participation in youth sport.

Methods

The data were drawn from the Cardiovascular Risk in Young Finns Study, which is a broadly based multidisciplinary longitudinal project. The study was started in 1980 when cohorts of randomly sampled 3-, 6-, 9-, 12-, 15-, and 18-year-old boys and girls were examined for the first time. The measurements were replicated in 1983, 1986, 1989, 1992, and 2001. In 2001 the participants were respectively 24, 27, 30, 33, 36, and 39 years old. The sample was taken from the five university towns with medical schools (Helsinki, Kuopio, Oulu, Tampere, and Turku) and the surrounding communities. The sampling method has been discussed in greater detail by Åkerblom et al. (1,2). In this study, the data cover the years 1980, 1983, 1986, and 2001, and four cohorts of participants who were 9 years old and older

in 1980. At the baseline in 1980, 2,309 individuals participated in the physical activity measurements; seventy percent (1,606) participated again in 2001. The number of those who participated in 1980, 1983, and 2001 was 1,347, and the number of those who participated in 1980, 1983, 1986, and 2001 was 1,156. Equal numbers of females and males were invited to participate in the baseline measurements, but more females participated than males, and in the later measurements the drop-out rate was a little higher among males. All the analyses were carried out separately for females and males. There were no significant differences in the baseline physical activity index between the participants and drop-outs in 2001. Table 1 shows the number of participants by gender in the different categories of the independent variables.

Participation in sports among 9- to 18-year olds in 1980, 1983, and 1986 was measured by means of a short self-report questionnaire that was administered individually in connection with a medical examination (22). The questions about participation in organized sport concerned frequency of participation in sports-club training sessions and participation in sport competitions at different levels. Youth sport in Finland is mainly organized by sport clubs under the aegis of sport federations outside the school system. Clubs arrange weekly training sessions in which young people are coached. The activity is competitive but perhaps not as exclusive as, for example, American school sport. For the statistical analyses, participation in sport-club training was divided into three categories: no participation or less than once a week (reference), once a week, and more than once a week. Participation in sport competitions was divided into four categories: no participation (reference), sport-club level, regional level, and national level. To study the effect of persistent participation in youth sport on adult physical activity, the participants were divided into those who participated in sport-club training in neither 1980 nor 1983 (Outsiders: reference), those who participated in 1980 but not 1983 (Dropouts), those who did not participate in 1980 but did in 1983 (Beginners), and those who participated in both measurements (Actives).

The dependent variable was physical activity in 2001. It was measured using a short self-report questionnaire consisting of questions concerning: a) the intensity of physical activity (how much breathlessness and sweating); b) frequency of intensive physical activity; c) hours spent on intensive physical activity; d) average duration of a physical activity session; and e) frequency of participation in organized physical activity. The answers were coded from 1 to 3: 1 represented inactivity or very low activity, 2 represented moderately intensive or frequent activity, and 3 represented frequent or vigorous activity. After coding, the five variables were summed to form a physical activity index (PAI). The structure of the PAI can be seen in Table 2. The internal consistency coefficients (alpha) of the PAI in the age-gender groups varied from 0.75 to 0.79. For the multinomial regression analysis the participants were assessed as active (outcome variable) if they belonged to the third tertile of the PAI (a score of 11 or more). This represents moderate or vigorous physical activity at least twice per week. The lowest tertile (5-7 points) formed the reference group. The median tertile was excluded from the analyses.

In 2001 a subsample of subjects ($n = 102$) underwent maximal cycle ergometer exercise testing using a protocol with increments of loading of 20/25 watts/min. Three indicators of exercise capacity (indicating fitness) were measured: estimated maximal oxygen uptake (VO_{2max}), mean workload attained during the last 4 min of

Table 1 Level of Adult Physical Activity* in 2001 by Sport Variables in Youth

Variable	Females				Males			
	n	Low	Med	High	n	Low	Med	High
Participation in sport club training sessions 1980								
Less than once/week	706	28.6	53.1	18.3	519	34.5	48.0	17.5
Once/week	109	20.2	58.7	21.1	97	20.6	45.4	34.0
Many times	56	10.7	48.2	41.1	119	16.8	39.5	43.7
Significance		$X^2 = 22.47, df = 4, p = .001$						
Participation in sports competitions 1980								
None	737	28.2	52.9	18.9	520	35.2	48.1	16.7
Sport-club level	66	18.2	57.6	24.2	94	21.3	46.8	31.9
Regional level	36	13.9	61.1	25.0	66	16.7	42.4	40.9
National level	32	15.6	50.0	34.4	55	0.1	32.7	58.2
Significance		$X^2 = 11.67, df = 6, p = .070$						
Participation in sport-club training (1980–1983)								
Outsiders	518	30.1	52.3	17.6	382	5.9	47.9	16.2
Dropouts	55	21.8	58.2	20.0	60	23.3	50.0	26.7
Beginners	77	13.0	62.3	24.7	67	20.9	47.8	31.3
Actives	76	14.5	50.0	35.5	12	11.6	36.6	51.8
Significance		$X^2 = 25.55, df = 6, p = 0.001$						
Participation in sport-club training (1980–1986)								
Outsiders	482	28.2	53.1	18.7	322	34.4	48.8	16.8
Dropouts	79	21.5	57.0	21.5	80	21.3	51.3	27.4
Beginners	40	25.0	52.5	22.5	47	23.4	40.4	36.2
Actives	38	7.9	44.7	47.4	68	13.2	35.3	51.5
Significance		$X^2 = 20.96, df = 6, p = 0.002$						

Note. Values for levels of adult physical activity shown as a percentage.

*Level of adult physical activity was divided into three categories: 5–7 = low, 8–10 = med., and 11–14 = high (chi-square test).

Table 2 The Structure of Physical Activity Index (PAI) in 2001

Items	Code or PAI
How much breathlessness and sweating you experience when you engage in physical activity and sport?	
not at all	1
moderate amount	2
a lot	3
How often do you engage in intensive physical activity?	
not at all	1
once/month or more	1
once/week	2
2–3 times/week	2
4–6 times/week	2
every day	3
How many hours a week you engage in intensive physical activity?	
not at all	1
one-half hour/week	1
1 hour/week	1
2–3 hours/week	2
4–6 hours/week	2
over 7 hours/week	3
How much time do you usually spend in a physical activity session?	
less than 20 min	1
20–40 min	2
40–60 min	2
more than 60 min	3
Do you participate in organized physical activity?	
not at all	1
occasionally/sometimes	1
regularly about once/week	2
many hours and times/week	3

Note. Range of PAI scores: minimum 5–maximum 15

the test (W_{last4}) and hypothetical maximal workload sustainable for 6 min (W_{max6} ; 3). The validity of the physical activity measurements was studied by correlating childhood and adulthood PAI with the indicators of exercise capacity. The correlation coefficients ranged from $r = .20$ to $r = .53$, and were highest between the PAI and W_{max6} . In both sexes childhood PAI correlated with W_{max6} : $r = .39$, $p = .027$, and $r = .33$, $p = .044$, for women and men, respectively. Similarly, the correlations between adulthood PAI and W_{max6} were $r = .49$, $p = .001$, and $r = .53$, $p = .001$, for women and men, respectively. A significant correlation was also found between adulthood PAI and waist circumference in both sexes: $r = -.14$, $p = .001$, and $r = -.12$, $p = .001$, for women and men, respectively.

Multinomial logistic regression analyses using odds ratios (OR) and corresponding 95% confidence intervals (95% CI) were assessed to explore how

sport-club training, participation in sport competitions, and persistent participation were associated with a high level of physical activity (the highest tertile) in adulthood. The lowest tertile of physical activity formed the reference group. The analyses were conducted separately for males and females. One-way analysis of variance and least significance difference (LSD) were used to analyze the differences in adult PAI among the four sport-participation groups (Outsiders, Beginners, Dropouts, and Actives). Statistical analyses were performed using a SPSS® software package (Version 12.0).

Results

For both sexes, those who participated in organized sport in their youth were more active in adulthood than nonparticipants. For example, among males, 58% of participants in national competitions belonged to the active group in adulthood as compared with only 18% of nonparticipants. The respective percentages for females were 34 and 19 (Table 1). Regular frequent participation in childhood and youth (at ages 9 to 18 in 1980) notably increased the probability of adults being highly active for both sexes, the odds ratios being five- to six-fold higher than in the reference group (no participation). Among males, participation once a week also significantly increased the probability of being active in adulthood (see Figure 1 and Table 3).

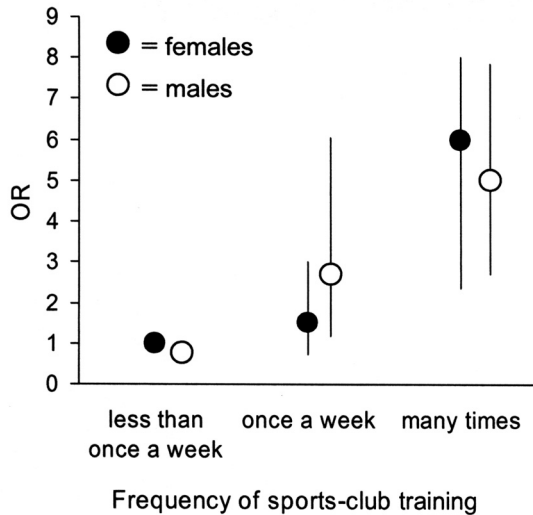


Figure 1— Odds ratios (OR) and 95% confidence intervals (CI) for being active in 2001 (highest/lowest tertile of physical activity index) according to frequency of participation in sports-club training in 1980.

Table 3 Odds Ratios (OR) and 95% Confidence Intervals (CI) for High Level vs. Low Level of Adult Physical Activity in 2001 According to the Sport Activity in Youth

Variable in 1980	Females		Males	
	OR	CI	OR	CI
Frequency of participation in sport-club training sessions				
less than once/week	1.00		1.00	
once/week	1.64	0.88–3.06	3.25	1.76–5.97
many times	6.00	2.38–15.14	5.11	2.88–9.08
Participation in sports competitions				
no participation	1.00		1.00	
sport-club level	2.00	0.92–4.35	3.16	1.70–5.87
regional level	2.69	0.88–8.21	5.16	2.45–10.89
national level	3.29	1.12–9.68	13.46	5.07–35.74
3-year tracking of sport-club training (1980–1983)				
outsiders	1.00		1.00	
dropouts	1.57	0.67–3.71	2.53	1.16–5.50
beginners	3.26	1.45–7.31	3.32	1.58–6.95
actives	4.21	1.99–8.88	9.86	5.03–19.31
6-year tracking of sport-club training (1980–1986)				
outsiders	1.00		1.00	
dropouts	1.51	0.73–3.11	2.66	1.31–5.42
beginners	1.36	0.53–3.48	3.18	1.39–7.25
actives	9.07	2.60–31.68	7.99	3.59–17.82

Note. High level = Physical Activity Index score of 11–14, low level = Physical Activity Index score of 5–7 (chi square test).

The odds ratios for reporting a high level of activity in 2001 were 13 times greater for males and 3 times greater for females who had been national level competitors in 1980 as compared with those who had not participated in competitions. Boys' participation at sport-club and regional level competitions in 1980 was also a significant predictor of high activity in adulthood (see Figure 2 and Table 3).

The odds ratios obtained from the multinomial regression analyses for being highly active in adulthood were 9 times greater for male Actives and 4 times greater for female Actives than male and female Outsiders. Beginners had a three-fold greater probability for high activity in 2001 than Outsiders (see Figure 3 and Table 3). The odds ratio for Dropouts was significant among males but not among females. One-way analysis of variance and LSD was used to reveal possible

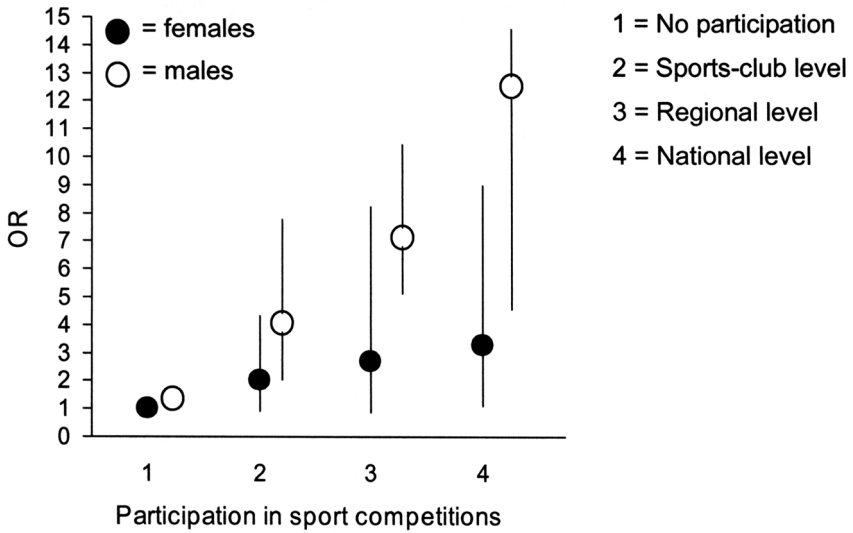


Figure 2—Odds ratios (OR) and 95% confidence intervals (CI) for being active in 2001 (highest/lowest tertile of physical activity index) according to participation in sport competitions in 1980.

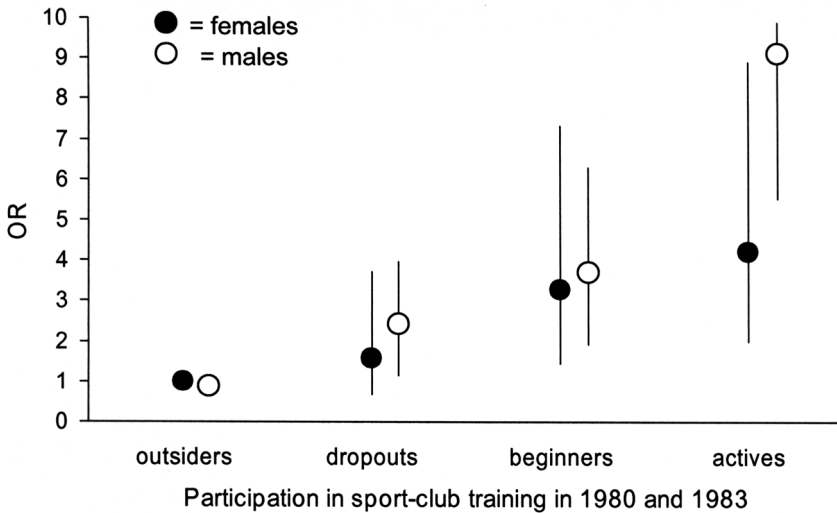


Figure 3—Odds ratios (OR) and 95% confidence intervals (CI) for being highly active in 2001 (highest/lowest tertile of physical activity index) according to the four groups of sport participation in 1980 and 1983.

differences in adult PAI 2001 among Dropouts, Beginners, and Actives. There were no differences in physical activity between Dropouts and Beginners or between Actives and Beginners. Actives had a higher PAI mean than Dropouts among both females ($p < .023$) and males ($p < .000$).

The influence of persistent sport participation over 6 years was studied as above by using data from 1980 and 1986. The probability for adulthood activity among Actives compared with Outsiders was now 9 times greater in women and 8 times greater in men. Among males but not females the odds ratios for Dropouts and Beginners were also significantly greater than those for Outsiders (see Figure 4 and Table 3).

Discussion

The aim of the study was to investigate how participation in competitive youth sport predicts adult physical activity. The results show that participation in youth sport significantly predicts adult physical activity. The results support the findings of previous studies confirming that youth sport is an important predictor of adult physical activity (4,7,9,12,15,16,17,20). New information provided by this study were the results showing the effect of persistent sport participation in youth on adult physical activity. The earlier studies have been based on only one measurement of participation in youth sport. The results of this study showed clearly the strong effect of persistent participation lasting 3 or 6 years as compared with nonparticipation or dropping out during the period in question. Also, a short experience of youth

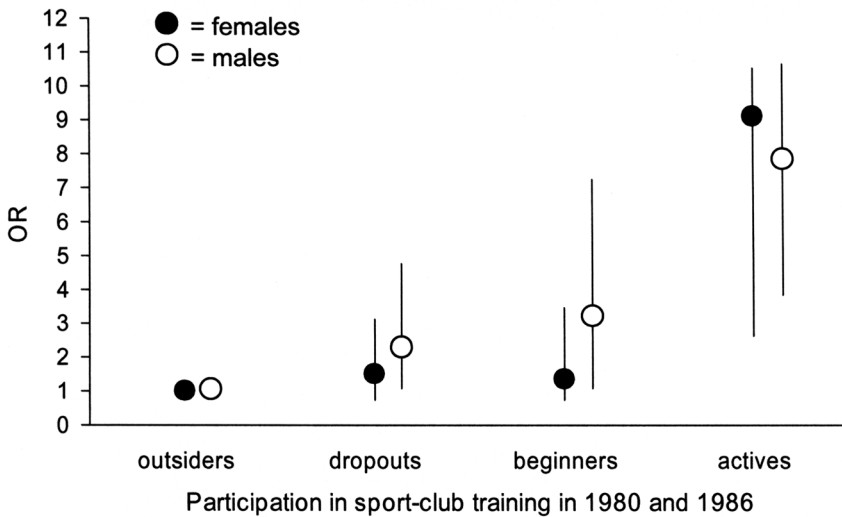


Figure 4—Odds ratios (OR) and 95% confidence intervals (CI) for being highly active in 2001 (highest/lowest tertile of physical activity index) according to the four groups of sport participation in 1980 and 1986.

sport, represented here by Beginners, increases the probability of being active in adulthood; nonetheless the probabilities for adult activity were very much higher for Actives. Both logistic regression analysis and analysis of variance showed that dropping out from youth sport seemed to have a different effect than beginning youth sport on adult physical activity during the same time period. The follow-up period was 3 years, and we do not know how much time Beginners and Dropouts, respectively, spent on youth sport. The result, however, might indicate that for Dropouts the youth sport experience was not encouraging.

In this analysis of the influence of participation in youth sport, nonparticipants formed the reference group. Many of those in such a reference group who do not participate in organized youth sport might be physically active outside youth sport, for instance, in self-organized activities. This emphasizes the importance of participation in youth sport to a physically active lifestyle.

The high drop-out rates in child and youth sport found in many countries (8,17) have aroused concern among sport leaders over losing potential talent too early. The results of this study support the idea that the drop-out problem should also be considered from the pedagogical point of view and from the perspective of public health. According to the results, the youth sport experience has more impact on an active lifestyle when participation is regular and persistent. This emphasizes the need to offer more opportunities for young people to participate in competitive sports without screening or discrimination.

The high drop-out rates, in part, are explained by the natural psychosocial development of young people because “it is a necessary part of the normal trial-and-error sampling procedure that the youngsters employ in trying to find those activity or achievement domains they enjoy the most” (5). On the other hand, there are large numbers of young athletes who would prefer to continue competitive sport but do not do so because they are screened out because of low achievement or because they perceive a sport as too demanding in the relation to their perceived ability. It would therefore be important that opportunities to continue competitive sport without screening are made available to those young people who want to participate in sports without being champions.

There is some evidence that screening and drop-out rates vary among European countries. For instance, in Germany boys continue to play soccer longer than do boys in Finland. In 1995, twenty-four percent of 15-year-old German boys were still playing soccer and 19% had stopped playing, whereas in Finland only 10% were still playing and 30% had stopped. (19). During recent decades projects have been initiated and implemented in Finland to steer youth sport in more inclusive and less exclusive direction.

Although there are differences in drop-out rates among European countries, the results of the present study have ecological validity in those European countries in which youth sport is organized by sport clubs. In principle, sport clubs are open to anybody who wishes to participate; in order to increase inclusiveness in team games, many clubs have teams at two levels—one more competitive and the other less so. Possibilities to participate also have an economic dimension, and in many sports parents pay a large proportion of the costs.

Among females, only frequent (many hours a week) participation in youth sport significantly predicted adult physical activity (high odds ratio). In addition, in males the odds ratio for frequent participation was higher than the ratio for participation

once a week. Frequent participation might mean more serious training and evidently results in better fitness and motor skills, as well as higher motivation and perceived competence. Participation many times a week was also related to persistent participation. For example, 72% of boys and 67% of girls who participated frequently in 1980 were still active at least once a week in 1983. A gender difference was seen also in the effects of persistent sport participation. Among males, continuous participation over 3 years increased remarkably the probability of adult physical activity, but among females only persistence over 6 years resulted in the same high probability. It seems that girls' sport participation should be both frequent and long lasting in order to have a strong influence on adult physical activity.

In Finland almost all of those who participate in sport-club training sessions also participate in competitions. Participation in competitions in youth has a greater influence on men's physical activity in adulthood than that of women. In men, but not in women, lower-level competitions also seem to increase the probability of being active in adulthood. And in both sexes participation in high-level competitions means a higher probability of later-life activity, but among men the influence of high-level competitions is much stronger than in women. Participation in high-level competitions requires frequent and persistent training.

This study does not offer any definitive explanations for why sport participation in youth correlates with physical activity in adulthood. We know that physical activity does not continue from youth to adulthood along the same sport pathway in the sense that specific sports in which an individual participates in youth will not necessarily be the sports chosen in adulthood (17,21). The main forms of physical activity for young people are different from those of adults. Our main hypothesis is that regular, persistent physical activity and sport participation increases psychological, social, and physical readiness for physical activity in later life, as well as the probability of re-engaging in physical activity after a possible break. The relationship between youth sport participation and psychological readiness has been shown in a longitudinal study (9). The self-selection hypothesis, however, must also be taken into account as a possible explanation for the correlation between youth and adulthood physical activity. This is to say that people with certain characteristics are those who are most likely to participate in sport at a young age and in adulthood. Such characteristics as a genetic disposition to good fitness or appropriate psychological temperament variables might explain at least a part of the correlation. In our analyses one dimension of Type A behavior, responsible leadership, correlated positively with physical activity among young people and adults (24), but responsible leadership in youth did not correlate with physical activity in adulthood. More than 60% of Finnish males and 50% of females participate in youth sport at some stage in their youth. Initiation into sport is usually encouraged by parents and peers. Thus, self-selection at this stage is not so important. Self-selection might, however, influence the process whereby some young people drop out and some continue.

Conclusions and Recommendations

We conclude that regular and persistent participation in youth sport strongly increases the probability of being physically active in adulthood. It is

recommended that young people be offered more opportunities to participate in some kind of competitive sport without screening.

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