

# COVID-19: Sports activity and health-related quality of life of Swiss children and adolescents before and during the initial stay at home period

Journal of Health Psychology  
1–15

© The Author(s) 2022

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/13591053221122722

journals.sagepub.com/home/hpq



Cäcilia Zehnder , Claudio R Nigg   
and Valentin Benzing 

## Abstract

The aim of this study was to investigate sports activity and health-related quality of life (HRQoL) of Swiss children and adolescents (7–16 years) during the national COVID-19 stay at home (SaH) period. In total, 237 parent-child pairs gave information about HRQoL and sports activity (duration and type) before and during SaH. Results show that sports activity decreased during SaH and was also positively related to HRQoL. These findings indicate that sports activity of children and adolescents should be promoted during SaH, for which innovative home-based interventions may be useful.

## Keywords

coronavirus disease 2019, pandemic, physical activity, quality of life, sports

## Introduction

In March 2020, the rapid global spread of COVID-19 prompted the World Health Organization (WHO) to declare the international outbreak of the COVID-19 pandemic (WHO, 2020). This has led governments globally to enact restrictive measures, with stay at home (SaH) periods being imposed in many countries to control the spread of COVID-19 (Hale et al., 2021).

On March 16th 2020, the Swiss Federal Council's declared an "extraordinary situation." Restrictions were introduced including closure of publicly accessible facilities (e.g. swimming pools, sports, and playgrounds), as well as prohibition of public and private events (e.g. sports

events), face-to-face classes at educational institutions, and associated physical education. These restrictions were maintained until May, 2020 (Press release of the Swiss Federal Council, 2020a, 2020b). Thus, sport clubs, sport facilities, and other sporting opportunities that are important for physical activity (PA) behavior for children and adolescents (Lamprecht et al., 2014) and typically contribute to a structured daily routine were restricted or closed. Recent

---

University of Bern, Switzerland

### Corresponding author:

Valentin Benzing, University of Bern, Bremgartenstrasse  
145, Bern, 3012, Switzerland.

Email: valentin.benzing@unibe.ch

research findings showed that routine and structured days, such as ordinary school days, are associated with a higher PA behavior in children, as opposed to unstructured days (e.g. weekend or holidays; Brazendale et al., 2017). In addition, distance rules and contact limits were established (Press release of the Swiss Federal Council, 2020b). Unlike in other countries (e.g. Italy, China), Switzerland did not impose a ban on outdoor sports activities, such as walking, hiking, and cycling (Altakarli, 2020; Sebastiani et al., 2020). Instead, the Swiss population were only advised to stay at home and not leave the house unless it is necessary (Press release of the Swiss Federal Council, 2020b). Nevertheless, the restrictions led to decisive changes in the everyday lives of children and adolescents which may have had a negative effect on their PA behavior.

PA is defined as all movements of the body that originate through the skeletal muscles and results in energy expenditure (Caspersen et al., 1985). The PA recommendations of the WHO for childhood and adolescence include 60 minutes of moderate-to-vigorous PA per day (Bull et al., 2020). Numerous scientific studies confirm the health-promoting effects of PA (e.g. Miles, 2007). For example, regular PA is associated with better mental health, well-being (Lippke and Vögele, 2006), bone health, self-esteem (Carson et al., 2017), and it is considered to be the basis for a healthy development (Jones et al., 2020). In addition, regular PA acts as a buffer against several viral infections by modulation and strengthening the immune system (da Silveira et al., 2021). Initial studies identified regular PA as an auxiliary tool that reduces the severity and negative consequences of COVID-19 infections (Burtscher et al., 2021; da Silveira et al., 2021; Sallis et al., 2021).

However, most initial studies examining PA in childhood and adolescence during SaH have detected a decrease in PA. A study of 6–17-year-old Chinese children and adolescents found a decrease of 435 minutes per week of PA during SaH (Xiang et al., 2020). In a study comparing adolescents from different countries, reduced

PA was found in all included countries Brazil, Chile, Colombia, Spain, and Italy (Ruiz-Roso et al., 2020). A rise in physical inactivity has also been observed among children and adolescents from Canada (Moore et al., 2020), Croatia (Zenic et al., 2020), and Switzerland (Benzing et al., 2022). Those living in rural areas were more physically active than those living in urban areas during SaH (Zenic et al., 2020). In contrast to these studies, research findings on German children and adolescents aged 4–17 years showed an increase in PA, but a decrease in sports activity (Schmidt et al., 2020).

Sports activity is a key indicator of PA behavior across the lifespan (Murphy et al., 2016) and it contributes to health benefits associated with PA (Eime et al., 2013). It refers to a subset of PA and includes organized or informal participation. Aims of sports activity are to establish social relationships, achieve competitive results, or express/improve physical fitness and mental well-being (Commission of the European Communities, 2007). In contrast to the US definition of “sports,” sports activity does not solely incorporate performance-oriented activities (Jekauc et al., 2013). Sports activity goes beyond classic team sports, including individual sports, as well as fitness-oriented and recreational activities (Rowe et al., 2004).

According to a Swiss study by Lamprecht et al. (2014), 10–14-year-olds spend in total about 6.6 hours per week on regular sports activity under normal conditions, while 15–19-year-olds spend around 5.6 hours. About 60% of 10–14-year-olds train at least once a week in a sports club, which is reduced to 38% in 15–19-year-olds. Previous studies from Germany and Italy examined the change in sports activity of children and adolescents during SaH compared to before. The German study found a decrease of 75.6 minutes per week in sports activity (Schmidt et al., 2020). Similar findings were also observed in obese Italian children and adolescents aged 6–18 years who reduced their sports activity by 150 minutes per

week (Pietrobelli et al., 2020). In addition, sports activity seems relevant for an active lifestyle and for health-related quality of life (HRQoL; Moeijes et al., 2019; Schumacher et al., 2003; Vella et al., 2014).

HRQoL is a multidimensional construct that includes components of subjective well-being and functioning, describing an individual's subjective health status (Schumacher et al., 2003). Previous studies found that PA and sports activity are related to HRQoL in children (Gu, 2017; Kamolthip et al., 2021; Lin et al., 2012; Marker et al., 2018; Moeijes et al., 2019; Wu et al., 2017). Under normal circumstances, higher sports activity levels are associated with higher HRQoL scores (Anokye et al., 2012; Marker et al., 2018; Omorou et al., 2013). In fact, children who did not regularly participate in sports activity or dropped out had a lower HRQoL compared to active peers (Vella et al., 2014). During SaH, HRQoL was generally lower than before, as shown in studies from Norway with adolescents aged 16–19 years (Riiser et al., 2020), and from Germany with children and adolescents aged 7–17 years (Ravens-Sieberer et al., 2022).

The aim of this study was to investigate sports activity and the relationship with HRQoL in Swiss children and adolescents during and before the SaH. In detail, we examined sports activity, including duration, sport types, and homework from physical education and sports clubs. In addition, we investigated the relationship among sports activity and HRQoL, and the difference between regular and non-regular sports activity on HRQoL during SaH. Considering the current empirical evidence (e.g. Anokye et al., 2012; Marker et al., 2018; Omorou et al., 2013; Pietrobelli et al., 2020; Schmidt et al., 2020; Vella et al., 2014), we expected that sports activity decreased during SaH, and that higher levels of sports activity were associated with better HRQoL during SaH. More specifically, children and adolescents with regular sports activity would have higher HRQoL during SaH than those with non-regular sports activity.

## Methods

### Design and procedure

A cross-sectional online survey including parents and children's ratings was conducted between April 14th and May 11th 2020 using LimeSurvey. Data were collected anonymously, and the study received ethical approval by the Institutional Review Board of the Faculty of Human Sciences at the University of Bern (no. 2020-04-00011). School administrations and principals were informed about the research project regarding its objectives and methods and were subsequently asked to participate. In total, nine school principals agreed to take part in this project and therefore received a letter of information. The principles forwarded this document to their schoolteachers who shared the letter with the parents. Note that to ensure complete anonymity, the exact number of contacted students and teachers were unknown. The letter included a URL and QR code providing direct access to the questionnaire. On the first page of the online questionnaire, parents were asked about their informed consent to participate. Participation was voluntary and all data was kept confidential.

### Participants

A total of 237 child-parent pairs were recruited through nine different schools in the German-speaking Swiss cantons Aargau, Zurich, St Gallen, Valais, Schaffhausen, and Appenzell Outer-Rhodes (for background variables see Table 1). Participating children and adolescents were 7–16-years-old (44.1% girls,  $M_{age} = 11.70$ ,  $SD = 2.47$ ). Participants were excluded from the study if they were ill, in quarantine or injured 7 days prior the data collection.

### Measures

**Self-reported sports activity.** In order to measure sports activity, an adapted version of the German Physical Activity, Exercise and Sport Questionnaire (Bewegungs- und Sportaktivität

**Table 1.** Background variables of participating children and parents.

	Children (n = 237)	Parents (n = 237)
Gender (n, %)		
Female	104 (44.1%)	188 (81.7%)
Male	132 (55.9%)	42 (18.3%)
Age (years) n, %	7–10 years:	<34: 15 (6.3%)
	7: 9 (3.8%)	35–44: 120 (50.6%)
	8: 15 (6.3%)	45–54: 97 (40.9%)
	9: 32 (13.5%)	>55: 5 (2.1%)
	10: 18 (7.6%)	
	11–13 years:	
	11: 41 (17.3%)	
	12: 35 (14.8%)	
	13: 26 (11.0%)	
	14–16 years:	
	14: 15 (6.3%)	
	15: 33 (13.9%)	
	16: 13 (5.5%)	
Nationality (n, %)	Swiss: 173 (73.6%)	
	Dual citizenship: 33 (14.0%)	
	Other nationalities: 29 (12.3%)	
Living environment (n, %)	Rural: 142 (59.9%)	
	Agglomeration: 36 (15.2%)	
	Urban: 59 (24.9%)	
Socio-economic status (n, %)		<6000 CHF: 66 (27.8%)
		6001–9000 CHF: 84 (35.4%)
		>9001 CHF: 87 (36.7%)
School grade (n, %)		1. Grade 19 (8.4%)
		2. Grade 108 (47.6%)
		3. Grade 100 (44.1%)
Membership in sports club (n, %)	177 (75.0%)	

Fragebogen: BSA-F; Fuchs et al., 2015) was used. The questionnaire asks for the sport types, frequencies (per week), and duration (minutes) of sports activity in the past 4 weeks, however, in contrast to the original questionnaire, wording was adapted to refer to the last 7 days and during a typical week before SaH. Frequency and duration were multiplied to calculate the total sports activity in minutes per week. Acceptable psychometric properties have been demonstrated. To explore changes in sport types, each response was subsequently categorized according to 10 categories: Athletics, dance, martial arts, gymnastics, winter sports,

endurance and strengthening sports, games, other sports, and no sports activity.

Athletics includes competitive sports activities in running, walking, jumping, and throwing, such as pole vaulting or discus throwing (Nelson, 2020). Dance incorporates rhythmic movements of the body to express emotions and ideas, to release energy, or to have fun, such as ballet or hip hop (Mackrell, 2020). Martial arts include various combat sports with high or prolonged use of force and explosive or flowing movements such as kung fu, judo, and karate (The Editors of Encyclopaedia Britannica, 2020). Gymnastics includes the systematic

execution and demonstration of exercises, for example on the rings or bars (Bruce, 2020). Games are composed of the four subcategories: Invasion (e.g. football, ice hockey, floorball), Target (e.g. golf, bowling), Striking/Fielding (e.g. baseball, cricket), and Net/Wall Games (e.g. tennis, volleyball, badminton) which are characterized by different rules and tactics (Bunker and Thorpe, 1982). Winter sports are practiced outdoors in snow or on ice, such as skiing, cross-country skiing, and snowboarding (Meyer et al., 2011). Finally, we formed the two categories endurance and strength sports, which aim to improve health-related fitness. Health-related fitness refers to cardiorespiratory endurance, muscle strength and endurance, body composition, and flexibility (Caspersen et al., 1985). Sports activities that did not fit into these categories (e.g. horse riding, sport shooting) were categorized as other sports.

Direct changes in the level of sports activity due to SaH was additionally asked by the item “Are you currently doing more, less or the same amount of sports activity compared to before SaH?” Since the WHO emphasized the importance of regular participation in PA and sports activity, we have also captured the regularity of sports activity before and during SaH (WHO, 2018). Compared to the assessment of sports activity (type, frequency, and duration in the past 7 days), two questionnaire items were used to assess whether children were regularly active before and during SaH, which refers to a longer period than the past 7 days. The following two items were asked: “Were you regularly active in sports before SaH?” and “Are you regularly active in sports during SaH?” with the response options of 1 (yes) and 2 (no).

Regarding the child’s opportunities to be active in sports from the parents’ point of view, the following two items were used: “How do you currently rate you child’s opportunity to be physically active?” with response options of 1 (deficient), 2 (sufficient), and 3 (abundant), and “How do you rate your child’s opportunity to be to be physically active compared to time before SaH?” with responses reported as 1 (unchanged), 2 (reduced), and 3 (increased).

Further questions were asked about physical education and sports clubs’ homework. Whether homework was received, whether it was carried out, and how long it was. Response options to the questions “prefer doing more sports,” “have received homework” and “have done these” were 1 (yes) and 2 (no). Time spent for physical education and sports club’s homework was labeled “How much time per week did you spend doing school sports/sports club homework during SaH?” with children and adolescents choosing response on a 4-point-Likert-scale; 1 (up to 1 hour), 2 (1–2 hours), 3 (2–3 hours), and 4 (over 3 hours).

*Health-related quality of life.* The generic HRQoL questionnaire (Fragebogen zur Erfassung der gesundheitsbezogenen Lebensqualität: KINDL; Bullinger and Ravens-Sieberer, 1995) is an instrument with comparable features to other HRQoL assessments for children (Pakpour et al., 2019). A strength of the KINDL is the assessment of self-esteem, which is rarely included in other generic HRQoL instruments (Lin, 2018; Pakpour et al., 2019). It consists of 24 items that assess 6 dimensions of HRQoL: Physical well-being, emotional well-being, self-esteem, family, friends, and school (parent report). An example item is: “During the past week, my child had a headache or abdominal pain.” All items were rated on a 5-point-Likert-scale ranging from 1 (never) to 5 (all the time). Due to SaH and the associated school closure, the question “Last week during school. . .” has been replaced by “Last week during distance learning. . .”. The values were transferred to a scale ranging from 0 to 100. The total value of HRQoL is the average of all 6 dimensions. Good psychometric properties of the KINDL have been previously demonstrated (Cronbach’s alpha: 0.85; Ravens-Sieberer et al., 2007).

*Background and specific variables.* Socioeconomic status was assessed using one question asking parents about their monthly income. Response format was 1 (up to 6000 CHF), 2 (6001–9000 CHF), and 3 (more than 9001

CHF). Parents also indicated gender, nationality, date of birth of their child, their education level and information about their work. In this context, parents were asked whether they had worked before/during SaH, and if yes, whether they had worked in home office, giving answers 1 (yes) and 2 (no). In addition, a subsample of 180 parents were asked if they follow the COVID-19 conditional rules and whether they were worried about their child becoming infected due to the pandemic. These two COVID-19 conditional items were prefaced by "Please select the appropriate answer for each item." An example item is: "I do not want my child outside because of the risk of infection," with response options ranging from 1 (not true) to 5 (true).

### Statistical analyses

Statistical analyses were conducted using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and R statistical software (version 1.3.1093, PBC). Differences between duration of sports activity before and during SaH were calculated using a paired sample *t*-test. To examine further hypotheses, moderator analyses with PROCESS (version 4.0) were used to identify factors such as children's age, parental educational level, socioeconomic status, COVID-19 conditional safety behavior, gender, doing home office, and rural and urban differences that may moderate the relationship between sports activity before and during SaH. In order to detect changes in sport types and regular sports activity McNemar tests were calculated. Pearson correlations were used to investigate the association of sports activity and HRQoL (total score, physical well-being, psychological well-being, self-esteem, family, friends, school). *T*-tests for independent samples were calculated to determine whether children who were regularly active during SaH differ in HRQoL compared to those who were not (note that in case of unequal variances or sample sizes, the Welch test was used). Effect sizes are indicated using Cohen's *d* (small=0.20, medium=0.50, large=0.80; Cohen, 1988).  $p < 0.05$  was

considered statistically significant. Maximum likelihood estimation was used for missing values (percentage of missing values <5%).

## Results

### Sports activity before and during stay at home

See Table 2 for a comparison of sports activity before and during SaH. Children and adolescents showed lower levels of sports activity during SaH than before (-55.3 minutes per week;  $d=0.358$ ). A similar finding was obtained using the single-item question, whether they were more, less, or equally active in sports, with the majority indicating a lower level of sports activity (57.2%). Only 26.0% were equally active and 16.7% were even more active compared to before SaH. Variables such as education level, socioeconomic status, doing home office, urban and rural differences, and age did not moderate the relationship between sports activity before and during SaH ( $ps > 0.05$ ). Fear of COVID-19 infection and gender proved to be moderators of the effect between sports activity before and during SaH, while higher values for fear of COVID-19 ( $\Delta R^2=0.04$ ,  $F(1, 175)=9.33$ , 95% CI [-0.251, -0.054],  $p=0.003$ ) and male gender ( $\Delta R^2=0.015$ ,  $F(1, 228)=4.34$ ,  $p=0.038$ ) were associated with lower sports activity during SaH. Fear of COVID-19 explained only 4.0% and male gender 1.5% of the variance. In terms of regularity of sports activity, fewer children indicated to be regularly active during SaH than before ( $\chi^2[1]=24.574$ ,  $p < 0.001$ ,  $n=215$ ).

### Sport types before and during stay at home

Regarding changes in sport types before and during SaH (for an overview see Figure 1 and Table 2), it was shown that games were significantly less performed during SaH ( $p < 0.001$ ). There was also a decline in gymnastics ( $p < 0.001$ ), athletics ( $p=0.002$ ), dance ( $p=0.004$ ), winter sports ( $p < 0.001$ ), and other sports ( $p < 0.001$ ). However, endurance

**Table 2.** Comparisons of sports activity of Swiss children and adolescents before and during stay at home.

	Before stay at home (n = 237)	During stay at home (n = 237)	<i>d</i>	<i>p</i>
	Mean (SD)	Mean (SD)		
Sports activity (minutes/week)	349.8 (279.86)	294.2 (294.90)	0.358	0.007
	<i>n</i> (%)	<i>n</i> (%)	$\chi^2$	
Regularity of sports activity	215 (90.7)	165 (76.7)	24.574	<0.001
Sport types				
Games	147 (30.18)	87 (18.24)	34.127	<0.001
Gymnastics	31 (6.37)	8 (1.68)	16.690	<0.001
Athletics	12 (2.46)	2 (.42)	8.100	0.004
Dance	31 (6.37)	18 (3.77)	8.471	0.004
Endurance sports	117 (24.02)	236 (49.48)	81.427	<0.001
Strengthening sports	15 (3.08)	39 (8.18)	13.820	<0.001
Winter sports	13 (2.67)	0 (0)	11.077	<0.001
Martial arts	11 (2.26)	5 (1.05)	– <sup>1</sup>	0.131
Other sports	95 (19.51)	48 (10.06)	19.547	<0.001
No sports activity	15 (3.08)	34 (7.13)	12.000	<0.001

*M*, SD, *n*, and *d* represent mean, standard deviation, number, and Cohen's *d*.

Statistical significance is defined as  $p < 0.05$ .

<sup>1</sup>No value, as the expected frequency is <5.

( $p < 0.001$ ) and strength sports ( $p < 0.001$ ) were reported more frequently during SaH. There were no significant differences in martial arts ( $p = 0.125$ ). Children and adolescents were mainly engaged in health-related fitness activities during SaH. However, more children did not engage in any sports activity during the SaH compared to before ( $p < 0.001$ ). Regarding parent's ratings, 41.7% of the parents indicated that their child's opportunities to be active during COVID-19 were sufficient; 18.9% indicated that the opportunities were inadequate and 39.4% were abundant. The majority of parents (52.8%) indicated that opportunities were reduced compared to before the SaH. A smaller proportion estimated the opportunities as unchanged (26.1%) or increased (21.1%).

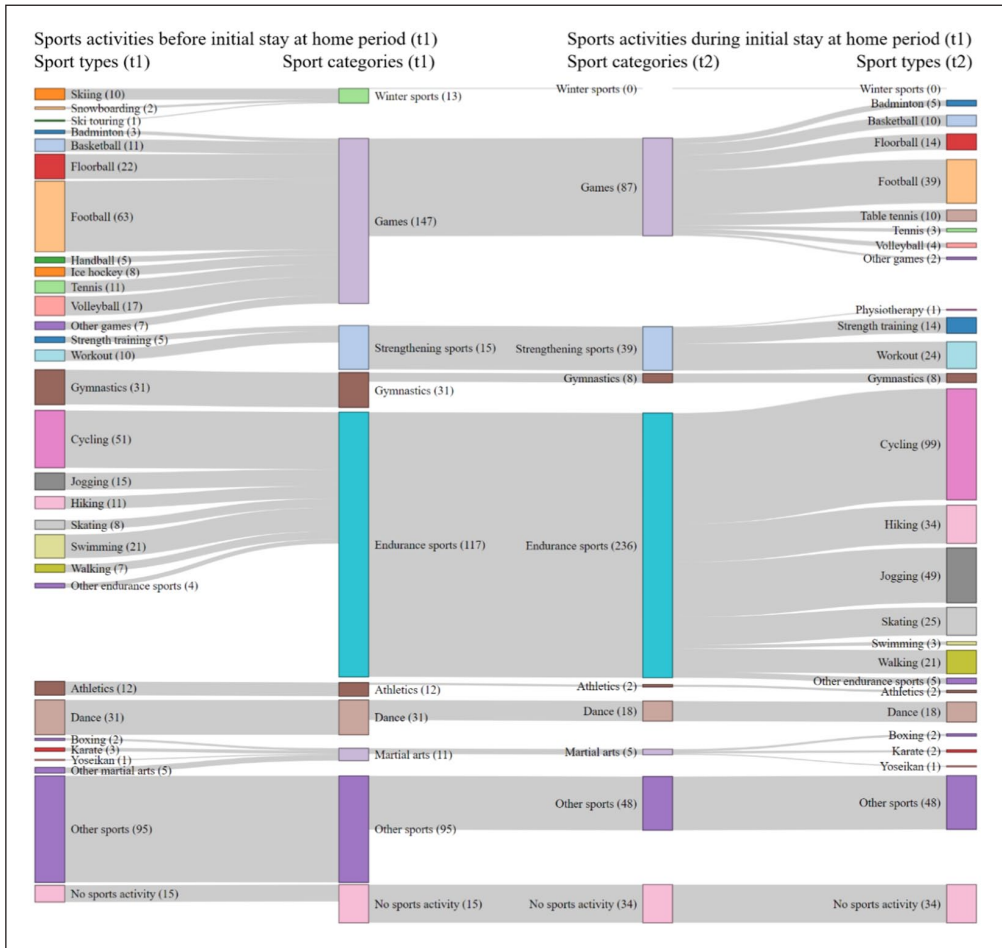
### Homework in the context of physical education and sports club

Regarding homework in physical education, 80.9% of children and adolescents reported

having received homework. 84.4% of them did their homework, whereas 15.6% did not. The majority (64.8%) spent less than 1 hour per week on their homework in physical education, 23.5% had 1–2 hours per week, 10.1% had 2–3 hours per week, and only 1.7% had more than 3 hours per week on sports homework. In terms of sports club membership, 75.0% of children and adolescents reported being in a sports club, 25.0% were not. Of those who were active members, only 37.0% received homework from their sports club, with 66.7% of them who did their homework. The majority (63.0%) did not receive any homework. 53.8% reported that the time requirement per week was less than 1 hour, 29.2% between 1 and 2 hours, 10.8% between 2 and 3 hours, and 6.2% more than 3 hours.

### Sports activity and HRQoL

Pearson correlations showed (see Table 3) significant associations in child-reported



**Figure 1.** Sankey diagram depicting sport types before (t1) and during (t2) stay at home.

sports activity during SaH and the parent-reported HRQoL in the total score ( $r=0.144$ ,  $p=0.028$ ), emotional well-being ( $r=0.144$ ,  $p=0.028$ ), and school ( $r=0.131$ ,  $p=0.045$ ). No relationships were found in the categories of physical well-being, self-esteem, friends, and family ( $ps > 0.05$ ).

Children and adolescents who were regularly active in sports during SaH revealed a significantly higher HRQoL ( $d=0.449$ ) overall than children and adolescents who were not (see Table 4). More specifically, they showed a greater sense of physical well-being ( $d=0.954$ ) and school ( $d=0.391$ ) compared to the other

**Table 3.** Correlational matrix showing the relationships between sports activity and health-related quality of life.

Health related quality of life scores (n = 237)	r	p
Total HRQoL	0.144	0.028
Physical well-being	0.113	0.087
Emotional well-being	0.144	0.028
Self-esteem	0.031	0.641
Friends	0.062	0.352
Family	0.037	0.575
School	0.131	0.045

Statistical significance is defined as  $p < 0.05$ .



**Table 4.** Children's health-related quality of life in terms of regularity of sports activities.

	Yes (n = 165)	No (n = 50)	95% CI	p	d	
	M (SD)	M (SD)				
Regularity of sports activity						
Total HRQoL	77.80 (9.21)	72.85 (9.83)	1.97	7.92	0.001	0.449
Physical well-being	85.38 (13.14)	75.50 (15.86)	4.96	14.80	<0.001	0.954
Emotional well-being	80.15 (13.63)	75.75 (14.76)	-0.02	8.82	0.051	0.269
Self-esteem	71.17 (16.60)	69.38 (19.77)	-3.73	7.33	0.522	0.088
Friends	70.61 (17.18)	67.09 (18.39)	-2.11	9.15	0.219	0.172
Family	82.27 (12.37)	79.13 (13.69)	-0.89	7.19	0.126	0.211
School	77.73 (16.04)	70.29 (16.52)	2.30	12.58	0.005	0.391

Statistical significance is defined as  $p < 0.05$ .

M, SD, and n represent mean, standard deviation, and sample size. CI: confidence interval; HRQoL: health-related quality of life; d: Cohens' d.

children. There were no significant differences in socioeconomic status, doing home office, urban and rural differences, and parent's level of education ( $ps > 0.05$ ).

## Discussion

The aim of this study was to investigate sports activity and HRQoL during the COVID-19 SaH in children and adolescents in Switzerland. This study had three main findings. First, a decrease in sports activity was observed during SaH compared to before. Second, during SaH, sports activity was positively associated with HRQoL. Third, children and adolescents who indicated to practice sports activity regularly during SaH had a higher HRQoL than those who did not.

The current findings using self-reported data showed a significant decrease in sports activity among Swiss children and adolescents. These findings are generally in line with studies from Germany and Italy (Pietrobelli et al., 2020; Schmidt et al., 2020). However, Swiss children and adolescents reported higher levels of overall sports activity in the current study (294.2 minutes/week) compared to children and adolescents included in previous studies from Germany (170.1 minutes/week; Schmidt et al., 2020) and Italy (216 minutes/week; Pietrobelli et al., 2020). Given the small effect sizes found in the current study, it seems that in

contrast to other European countries, Swiss children and adolescents were less affected by the consequences of the COVID-19 pandemic in the initial SaH period. Since governmental restrictions were more stringent in Italy and Germany, we assume that they might have had a greater influence on sports activity behavior.

A decline in sports activity should be monitored carefully since recent studies identified PA as a protective factor for negative COVID-19 consequences (Halabchi et al., 2021; Sallis et al., 2021). Adults with some participation in PA had better health outcomes after COVID-19 infection than those who were inactive (Sallis et al., 2021). This result implies that any amount of PA may have a positive effect on health outcomes. Meeting the PA recommendations on a regular basis was found to be associated with highest risk reduction among COVID-19 infections (Sallis et al., 2021). Since sports activity is a major component of PA (Council of Europe, 1992), regular sports activity should be promoted in children and adolescents to strengthen the immune system (da Silveira et al., 2021; Nieman and Wentz, 2019) and prevent health risks (Sallis et al., 2021). In addition, regular sports activity in childhood leads to higher levels of sports activity in later life (e.g. Perkins et al., 2004; Richards et al., 2007; Telama et al., 2005). However, this study revealed that during SaH,

a greater number of children and adolescents were not regularly active compared to before. This is not surprising as sports clubs and other sporting opportunities which contribute to a structured exercise routine (Brazendale et al., 2017) were closed. It seems that the restrictions may have disrupted the daily structure and exercise habits of children and adolescents. Given the health benefits associated with regular sports activity, it should be monitored during and after SaH to investigate whether it normalizes again over time.

Fear of COVID-19 infection was found to be a moderator for sports activity during SaH. Children and adolescents with more fear of a COVID-19 infection had modestly lower levels of sports activity during SaH. This finding is in line with a previous study, finding that individuals with more fear of COVID-19 infection showed more risk-mitigation behavior, such as social distancing (Chung et al., 2022; Harper et al., 2022). Based on this previous study, we speculate that higher levels of fear were associated with higher insecurity, doubt, or avoiding social contacts, consequently leading to decreased sports activity in Swiss children and adolescents.

Compared to before SaH, children and adolescents engaged less in games, gymnastics, athletics, and dance, but strength and endurance sports gained popularity. Restrictions prevented practice of these sport types due to the closure of infrastructure and rules of social distancing and contact limits (Press release of the Swiss Federal Council, 2020a, 2020b), which would also explain the increase in sports inactivity during SaH compared to before. Interestingly, most children and adolescents switched to sport types that were possible to maintain during the SaH and did not stop completely with exercising.

Furthermore, results show that girls participated in sports activity more than boys during SaH. In general, Swiss boys are more likely to play team games such as football, floorball, and basketball, while Swiss girls are more engaged in dance and fitness-oriented activities (Bringolf-Isler et al., 2016). In addition to sporting preferences, the sporting setting is also an

important factor, as boys are more active members in sports clubs than girls. Since the measures to combat the COVID-19 virus banned all club activities (Press release of the Swiss Federal Council, 2020b), we assume that boys were more affected than girls by the restrictions. Although the detected effect size was small, this may explain why a larger percentage of girls in the current study continued their usual sports activity during SaH compared to boys.

Although a decrease in opportunities to do sports and be physically active was noted by parents, the opportunities to be active were still perceived as sufficient. The possibility to go outside within rules of contact limits and social distance was one of the marked differences between Switzerland and other countries in Europe (Hale et al., 2021). Given the results of the current study, maintaining an adequate level of sports activity seems to be an important factor for children and adolescents. This may explain the (compared to other European countries) smaller decrease in sports activity in Switzerland, as Swiss children and adolescents were able to practice outdoor sports and other sports activities during SaH.

Most children and adolescents received physical education homework during SaH. The majority of them estimated the amount of time spent with physical education homework to be less than 1 hour per week. We consider the amount of sports homework to be insufficient, as weekly sports classes in Switzerland usually last 135 minutes (The Federal Assembly of the Swiss Confederation, 2011). In contrast to physical education teachers, only a few coaches from sports clubs had given homework, despite most participating children and adolescents being members of a sports club. It is conceivable that neither the sport teachers nor the coaches of the sports clubs were prepared for the sudden SaH period, however, more high-quality home-based trainings need to be made available for teachers and trainers in the future. These could even be used as active homework during regular school to promote PA (and sports activity) in children and adolescents.

This study revealed a positive relationship between HRQoL and sports activity during SaH. Within the HRQoL dimensions assessed, a modest but significant association was found between emotional well-being and school. These findings are in line with previous studies that detected a dose-response relationship between sports activity and HRQoL (Anokye et al., 2012; Marker et al., 2018; Omorou et al., 2013), stressing its importance for emotional well-being (Donaldson and Ronan, 2006; Steptoe and Butler, 1996) and cognitive development and functioning (Costigan et al., 2016; Etnier et al., 2006) under normal conditions. Thus, the promotion of PA and sports activity of children and adolescents during SaH seems relevant as higher levels of PA and sports activity may result in fewer emotional and behavioral problems, less anxiety, better stress regulation, and improved mental health (Donaldson and Ronan, 2006; Fraser-Thomas et al., 2005; Panza et al., 2020; Vella et al., 2017).

In general, previous studies found a decline in HRQoL compared to before SaH. In Germany, a significant decrease in HRQoL was found for 40.2% of the participating children and adolescents during SaH (Ravens-Sieberer et al., 2022). In Norway, HRQoL was also significantly lower compared to European standards during the SaH (Riiser et al., 2020). In addition, during SaH a decrease within the domains of emotional well-being and school were observed in previous studies (Duan et al., 2020; Jiao et al., 2020; Patrick et al., 2020; Ravens-Sieberer et al., 2022; Zhou et al., 2020).

Furthermore, results show that children and adolescents who did not regularly engage in sports activity during SaH had lower HRQoL compared to those who were regularly active. Most pronounced differences were evident within the total score and the domains of physical well-being and school. The notion that regularity of sports activity is important for HRQoL is in line with multiple studies before SaH (Gopinath et al., 2012; Kruger et al., 2007; Laforge et al., 1999; Lustyk et al., 2004).

The results of the study may be interpreted as follows; children and adolescents who were

able to be regularly active during SaH feel more alert and active due to PA, which improves their assessment of their physical well-being. In addition, regular involvement in sports activity may provide a sense of a regular daily routine and children continue to have better access to social support. This may mitigate the negative feelings associated with the absence of a school routine. Considering previous findings and the results of the current study, we believe that sports activity should be promoted during the SaH.

### *Limitations and future directions*

This study has certain limitations. First, we only assessed sports activity, not PA. In further research projects, both PA and sports activity should be determined to provide a more comprehensive picture. Moreover, no distinction was made between organized and non-organized sports activity. This would be of interest as a previous study found a decrease in organized sports activity and an increase in unorganized sports activity during SaH (Schmidt et al., 2020).

Second, sports activity before the SaH period was assessed retrospectively. In particular, asking about sports activity prior to SaH favors memory bias and longer reference periods lead to less valid results (Schacter, 2001). Third, self-reports may be biased. In addition to self-reports, therefore, additional device-based assessments with accelerometers should be used in future studies.

Fourth, in the questionnaire we asked about usual sports activity during a typical week before SaH and sports activity during the last 7 days. In a typical week before SaH, mostly habitual sports activities (e.g. weekly soccer practice) may have been reported, and therefore less special or unique sports activities were indicated. This may have led to an overestimation of the duration of sports activity in the last 7 days.

Finally, the study sample is not representative of Switzerland but reflects a convenience sample. Compared to a (Swiss) representative study

(Bringolf-Isler et al., 2016) which used similar assessment instruments (see supplementary documents Table 5), the current sample is somehow comparable regarding nationality, socioeconomic status, and school grade to the Swiss population. However, in the current study only participants from six German-speaking cantons coming mainly from rural areas were included. Therefore, the generalizability of results to Swiss children in general is questionable.

## Conclusion

The central findings of the current study reveal lower sports activity during SaH than before, and a positive relationship between sports activity (during SaH) with HRQoL. In addition, children who participated regularly in sports activity reported a higher HRQoL than those who were not regularly active. These findings indicate that sports activity is relevant and may be related to HRQoL during SaH. Therefore, innovative approaches are needed to increase home-based sports activity. These sports activity interventions may be developed in cooperation with school and sports clubs to enhance the sports activity level of children and adolescents during and outside of pandemics. In addition, attention should be paid especially to children and adolescents who do not regularly engage in sports activity. Considering the negative impact of physical inactivity, such programs may not only improve physical but also mental health.

## Data sharing statement

De-identified participant data for all variables are available in Figshare and as supplementary materials on the SAGE Journals platform. This includes a dataset with all variables used in analyses (clearly labeled), code of statistical analyses, AMOS graphics, and outputs. It is available in the Figshare repository and as Supplemental Material via the SAGE Journals platform.

## Declaration of conflicting interests


The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## ORCID iDs

Cäcilia Zehnder  <https://orcid.org/0000-0002-7001-2184>

Claudio R Nigg  <https://orcid.org/0000-0002-2897-4689>

Valentin Benzing  <https://orcid.org/0000-0002-9940-5635>

## References

- AITakarli N (2020) China's response to the COVID-19 outbreak: A model for epidemic preparedness and management. *Dubai Medicine Journal* 3: 44–49.
- Anokye NK, Trueman P, Green C, et al. (2012) Physical activity and health related quality of life. *BMC Public Health* 12(1): 624.
- Benzing V, Gaillard P, Scheidegger D, et al. (2022) COVID-19: Physical activity and quality of life in a sample of Swiss school children during and after the first stay-at-home. *International Journal of Environmental Research and Public Health* 19(4): 2231.
- Brazendale K, Beets MW, Weaver RG, et al. (2017) Understanding differences between summer vs. school obesogenic behaviors of children: The structured days hypothesis. *International Journal of Behavioral Nutrition and Physical Activity* 14: 100.
- Bringolf-Isler B, Probst-Hensch N, Kayser B, et al. (2016) *Schlussbericht zur SOPHYA*. Magglingen: Bundesamt für Sport.
- Bruce FA (2020) Gymnastics. *Encyclopedia Britannica*. Available at: <https://www.britannica.com/sports/gymnastics> (accessed 30 August 2022).
- Bull FC, Al-Ansari SS, Biddle S, et al. (2020) World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine* 54(24): 1451–1462.
- Bullinger M and Ravens-Sieberer U (1995) Grundlagen, Methoden und Anwendungsgebiete der Lebensqualitätsforschung bei Kindern. *Praxis der Kinderpsychologie und der Kinderpsychiatrie* 44(10): 391–399.
- Bunker D and Thorpe R (1982) A model for teaching games in secondary schools. *Bulletin of Physical Education* 18: 5–8.

- Burtscher J, Millet GP and Burtscher M (2021) Low cardiorespiratory and mitochondrial fitness as risk factors in viral infections: Implications for COVID-19. *British Journal of Sports Medicine* 55(8): 413–415.
- Carson V, Lee EY and Hewitt L (2017) Systematic review of the relationships between physical activity and health indicators in the early years (0-4 years). *BMC Public Health* 17: 854.
- Caspersen CJ, Powell KE and Christenson GM (1985) Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports* 100(2): 126–131.
- Chung GK, Strong C, Chan YH, et al. (2022) Psychological distress and protective behaviors during the COVID-19 pandemic among different populations: Hong Kong general population, Taiwan healthcare workers, and Taiwan outpatients. *Frontiers of Medicine* 9: 800962.
- Cohen J (1988) *Statistical Power Analysis for the Behavioral Science*, 2nd edn. New York: Erlbaum Associates.
- Commission of the European Communities (2007) White Paper. *White Paper on Sport*.
- Costigan SA, Eather N, Plotnikoff RC, et al. (2016) High-intensity interval training for cognitive and mental health in adolescents. *Medicine and Science in Sports and Exercise* 48(10): 1985–1993.
- Council of Europe (1992) *European Sports Charter. Recommendation No. R (92) 13 REV*.
- da Silveira MP, da Silva Fagundes KK, Bizuti MR, et al. (2021) Physical exercise as a tool to help the immune system against COVID-19: An integrative review of the current literature. *Clinical and Experimental Medicine* 21(1): 15–28.
- Donaldson SJ and Ronan KR (2006) The effects of sports participation on young adolescents' emotional well-being. *Adolescence* 41(162): 369–389.
- Duan L, Shao X, Wang Y, et al. (2020) An investigation of mental health status of children and adolescents in China during the outbreak of COVID-19. *Journal of Affective Disorders* 275: 112–118.
- Eime RM, Young JA, Harvey JT, et al. (2013) A systematic review of the psychological and social benefits of participation in sport for adults: Informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity* 10: 135.
- Ethier JL, Nowell PM, Landers DM, et al. (2006) A meta-regression to examine the relationship between aerobic fitness and cognitive performance. *Brain Research Reviews* 52(1): 119–130.
- Fraser-Thomas JL, Côté J and Deakin J (2005) Youth sport programs: An avenue to foster positive youth development. *Physical Education and Sport Pedagogy* 10(1): 19–40.
- Fuchs R, Klaperski S, Gerber M, et al. (2015) Messung der Bewegungs- und Sportaktivität mit dem BSA-Fragebogen. *Zeitschrift für Gesundheitspsychologie* 23(2): 60–76.
- Gopinath B, Hardy LL, Baur LA, et al. (2012) Physical activity and sedentary behaviors and health-related quality of life in adolescents. *Pediatrics* 130(1): e167–e174.
- Gu X (2017) Understanding children's physical activity and health-related quality of life: An expectancy-value approach. *Advances in Physical Education* 7: 140–155.
- Halabchi F, Mazaheri R, Sabeti K, et al. (2021) Regular sports participation as a potential predictor of better clinical outcome in adult patients with Covid-19: A large cross-sectional study. *Journal of Physical Activity and Health* 18(1): 8–12.
- Hale T, Angrist N, Goldszmidt R, et al. (2021) A global panel database of pandemic policies (Oxford Covid-19 government response tracker). *Nature Human Behaviour* 5: 529–538.
- Harper CA, Satchell LP, Fido D, et al. (2022) Functional fear predicts public health compliance in the COVID-19 pandemic. *International Journal of Mental Health and Addiction* 19: 1875–1888.
- Jekauc D, Wagner MO, Kahlert D, et al. (2013) Reliabilität und Validität des MoMo-Aktivitätsfragebogens für Jugendliche (MoMo-AFB). *Diagnostica* 59(2): 100–111.
- Jiao WY, Wang LN, Liu J, et al. (2020) Behavioral and emotional disorders in children during the COVID-19 epidemic. *The Journal of Pediatrics* 221: 264–266.
- Jones D, Innerd A, Giles EL, et al. (2020) Association between fundamental motor skills and physical activity in the early years: A systematic review and meta-analysis. *Journal of Sport and Health Science* 9(6): 542–552.
- Kamolthip R, Fung XCC, Lin CY, et al. (2021) Relationships among physical activity, health-related quality of life, and weight stigma in

- children in Hong Kong. *American Journal of Health Behavior* 45(5): 828–842.
- Kruger J, Bowles HR, Jones DA, et al. (2007) Health-related quality of life, BMI and physical activity among US adults ( $\geq 18$  years): National physical activity and weight loss survey, 2002. *International Journal of Obesity* 31: 321–327.
- Laforge RG, Rossi JS, Prochaska JO, et al. (1999) Stage of regular exercise and health-related quality of life. *Preventive Medicine* 28: 349–360.
- Lamprecht M, Fischer A, Wiegand D, et al. (2014) Sport Schweiz 2014 Kinder- und jugendbericht. Bundesamt für Sport.
- Lin C (2018) Comparing quality of life instruments: Sizing them up versus pediatric quality of life inventory and Kid-KINDL. *Social Health and Behavior* 1(2): 42–47.
- Lin CY, Su CT and Ma HL (2012) Physical activity patterns and quality of life of overweight boys: A preliminary study. *Hong Kong Journal of Occupational Therapy* 22(1): 31–37.
- Lippke S and Vögele C (2006) Sport und körperliche Aktivität. In: Renneberg B and Hammelstein P (Hrsg) *Gesundheitspsychologie*. Berlin, Heidelberg: Springer, S.198–216.
- Lustyk MKB, Widman L, Paschane AAE, et al. (2004) Physical activity and quality of life: Assessing the influence of activity frequency, intensity, volume, and motives. *Behavioral Medicine* 30(3): 124–132.
- Mackrell JR (2020) *Dance*. Encyclopedia Britannica. Available at: <https://britannica.com/art/dance> (accessed 30 August 2022).
- Marker AM, Steele RG and Noser AE (2018) Physical activity and health-related quality of life in children and adolescents: A systematic review and meta-analysis. *Health Psychology* 37(10): 893–903.
- Meyer NL, Manore MM and Helle C (2011) Nutrition for winter sports. *Journal of Sports Sciences* 29 Suppl 1(1): S127–S136.
- Miles L (2007) Physical activity and health. *Nutrition Bulletin* 32(4): 314–363.
- Moeijes J, van Busschbach JT, Bosscher RJ, et al. (2019) Sports participation and health-related quality of life: A longitudinal observational study in children. *Quality of Life Research* 28(9): 2453–2469.
- Moore SA, Faulkner G, Rhodes RE, et al. (2020) Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: A national survey. *International Journal of Behavioral Nutrition and Physical Activity* 17(1): 85–111.
- Murphy MH, Rowe DA and Woods CB (2016) Sports participation in youth as a predictor of physical activity: A 5-year longitudinal study. *Journal of Physical Activity and Health* 13(7): 704–711.
- Nelson B (2020) Athletics. Encyclopedia Britannica. Available at: <https://www.britannica.com/sports/athletics> (accessed 30 August 2022).
- Nieman DC and Wentz LM (2019) The compelling link between physical activity and the body's defense system. *Journal of Sport and Health Science* 8(3): 201–217.
- Omorou YA, Erpelding ML, Escalon H, et al. (2013) Contribution of taking part in sport to the association between physical activity and quality of life. *Quality of Life Research* 22(8): 2021–2029.
- Pakpour AH, Chen CY, Lin CY, et al. (2019) The relationship between children's overweight and quality of life: A comparison of sizing me up, PedsQL and Kid-KINDL. *International Journal of Clinical and Health Psychology* 19(1): 49–56.
- Panza MJ, Graupensperger S, Agans JP, et al. (2020) Adolescent sport participation and symptoms of anxiety and depression: A systematic review and meta-analysis. *Journal of Sport and Exercise Psychology* 42(3): 201–218.
- Patrick SW, Henkhaus LE, Zickafoose JS, et al. (2020) Well-being of parents and children during the COVID-19 pandemic: A national survey. *Pediatrics* 146(4): e2020016824.
- Perkins DF, Jacobs JE, Barber BL, et al. (2004) Childhood and adolescent sports participation as predictors of participation in sports and physical fitness activities during young adulthood. *Youth & Society* 35(4): 495–520.
- Pietrobelli A, Pecoraro L, Ferruzzi A, et al. (2020) Effects of COVID-19 lockdown on lifestyle behaviors in children with obesity living in Verona, Italy: A longitudinal study. *Obesity* 28(8): 1382–1385.
- Press release of the Swiss Federal Council (2020a) *Coronavirus: Federal Council to ease further measures from 11 May*.
- Press release of the Swiss Federal Council (2020b) *Ordinance on measures during the special situation to combat the COVID-19 epidemic*, pp.1–20.
- Ravens-Sieberer U, Ellert U and Erhart M (2007) Gesundheitsbezogene Lebensqualität von Kindern und Jugendlichen in Deutschland: Eine normstichprobe für Deutschland aus dem Kinder- und Jugendgesundheitsurvey (KIGGS).

- Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz* 50(5-6): 810–818.
- Ravens-Sieberer U, Kaman A, Erhart M, et al. (2022) Impact of the COVID-19 pandemic on quality of life and mental health in children and adolescents in Germany. *European Child & Adolescent Psychiatry* 31: 879–889.
- Richards R, Williams S, Poulton R, et al. (2007) Tracking club sport participation from childhood to early adulthood. *Research Quarterly for Exercise and Sport* 78(5): 413–419.
- Riiser K, Helseth S, Haraldstad K, et al. (2020) Adolescents' health literacy, health protective measures, and health-related quality of life during the Covid-19 pandemic. *PLoS One* 15(8): e0238161.
- Rowe N, Adams R and Beasley N (2004) *Driving up participation: The challenge for sport*. Sport England.
- Ruiz-Roso MB, de Carvalho Padilha P, Matilla-Escalante DC, et al. (2020) Changes of physical activity and ultra-processed food consumption in adolescents from different countries during Covid-19 pandemic: An observational study. *Nutrients* 12(2289): 1–13.
- Sallis R, Young DR, Tartof SY, et al. (2021) Physical inactivity is associated with a higher risk for severe COVID-19 outcomes: A study in 48 440 adult patients. *British Journal of Sports Medicine* 55: 1099–1105.
- Schacter DL (2001) *The Seven Sins of Memory: How the Mind Forgets and Remembers*. Boston: Houghton Mifflin Company.
- Schmidt SCE, Anedda B, Burchartz A, et al. (2020) Physical activity and screen time of children and adolescents before and during the COVID-19 lockdown in Germany: A natural experiment. *Scientific Reports* 10(1): 21780.
- Schumacher J, Klaiberg A and Brähler E (2003) Diagnostik von Lebensqualität und Wohlbefinden - eine Einführung. In: Schumacher J, Klaiberg A and Brähler E (Hrsg) *Diagnostische Verfahren Zu Lebensqualität und Wohlbefinden*. Göttingen: Hogrefe, S.329.
- Sebastiani G, Massa M and Riboli E (2020) Covid-19 epidemic in Italy: Evolution, projections and impact of government measures. *European Journal of Epidemiology* 35(4): 341–345.
- Steptoe A and Butler N (1996) Sports participation and emotional wellbeing in adolescents. *Lancet* 347: 1789–1792.
- Telama R, Yang X, Viikari J, et al. (2005) Physical activity from childhood to adulthood: A 21-year tracking study. *American Journal of Preventive Medicine* 28(3): 267–273.
- The Editors of Encyclopaedia Britannica (2021) Martial arts. Encyclopaedia Britannica. Available at: <https://www.britannica.com/sports/martial-art> (accessed 30 August 2022).
- The Federal Assembly of the Swiss Confederation (2011) *Federal act on the promotion of sport and exercise (Sport Promotion Act, SpoPA)*.
- Vella SA, Cliff DP, Magee CA, et al. (2014) Sports participation and parent-reported health-related quality of life in children: Longitudinal associations. *The Journal of pediatrics* 164(6): 1469–1474.
- Vella SA, Swann C, Allen MS, et al. (2017) Bidirectional associations between sport involvement and mental health in adolescence. *Medicine and Science in Sports and Exercise* 49(4): 687–694.
- World Health Organization (2018) More active people for a healthier world. *Journal of Policy Modeling* 28(6): 615–627.
- World Health Organization (2020) *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020*. Available at: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11-march-2020> (accessed 30 August 2022).
- Wu XY, Han LH, Zhang JH, et al. (2017) The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: A systematic review. *PLoS One* 12(11): e0187668.
- Xiang M, Zhang Z and Kuwahara K (2020) Impact of COVID-19 pandemic on children and adolescents' lifestyle behavior larger than expected. *Progress in Cardiovascular Diseases* 63(4): 531–532.
- Zenic N, Taiar R, Gilic B, et al. (2020) Levels and changes of physical activity in adolescents during the COVID-19 pandemic: Contextualizing urban vs. rural living environment. *Applied Sciences* 10(11): 3997–4014.
- Zhou SJ, Zhang LG, Wang LL, et al. (2020) Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *European Child & Adolescent Psychiatry* 29(6): 749–758.