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## ANXIETY MANAGEMENT AT THE TIME OF COVID-19: THE CONTRIBUTION OF PHYSICAL ACTIVITY IN CHILDHOOD

**Introduction:** The present work, through a scrupulous review of the literature, wants to reflect on the positive correlation between physical activity and the first symptoms of anxiety in childhood, and, the impact it has on psychological well-being, particularly of children and teenagers.

**Research Aim:** The article takes into consideration an in-depth Bibliographic Research on the most important search engines, selected on this topic including articles from 2016 to 2021.

**Evidence-based Facts:** Protocols with which we want to demonstrate the positive correlation between anxiety, depression and physical activity and its importance especially in this period of pandemic, which has determined a significant decrease in the levels of physical exercise, significantly increasing the risk of young people to incur in disorders of anxious type and to develop psychological distress.

**Summary:** Prevent and fight with simple but necessary motor solutions, indispensable for this target audience.

**Keywords:** physical activity, anxiety, developmental age, children, exercise, pandemic

### INTRODUCTION

Disorders such as anxiety and depression are among the most widespread and perhaps more prevalent than the mental disorders diagnosed today (Judd, Akiskal,

Paulus, 1997). Indeed, the latest Istat statistics show that depression and anxiety are widespread mental disorders, with figures exceeding 2.8 million, with people aged 15 years and over involved in a percentage of 5.4% (Italian National Statistical Institute, Istat 2018). These disorders are increasingly found in very young sections of the population, adolescents who report having suffered from depression, often associated with severe chronic anxiety. Istat estimated that 7% of the population over the age of 14 (3.7 million people) suffered from anxiety and depression disorders in the year. In the year 2016/2017, it was also estimated that children with developmental mental disorders, hosted by residential care facilities, were around 11% per 100 thousand resident children (Istat, 2018).

What has been described makes clear the importance of a timely intervention, of an early diagnosis, which is fundamental to reduce possible future negative effects, but which is not too invasive, given the peculiarity of the age. If it is undisputed that in the most serious cases, drug therapy significantly reduces anxiety and depression disorders, preventing them from becoming more acute and significantly reducing the child's quality of life, it should also be pointed out that in less acute cases or as a preventive measure, less invasive interventions more suited to young people could be used to control these disorders, such as physical activity, for which a positive correlation with anxiety and depression in young people has been found.

## RESEARCH AIM

The aim of this work is to consider the positive correlation between motor skills and psychological well-being of children, with the ultimate goal of restoring the right weight of physical education within the wider social and school context. The selection was done through search engines such as PubMed.gov; APA PsycNet; Google Scholar and MPDM. The keywords used to search for articles were: "mental health"; "physical activity"; "children's physical activity"; "depression in children"; "anxiety and physical activity"; "exercise and mental health"; "youth"; "move and feel good"; "sedentary behavior, major depression and middle childhood"; "effects of COVID-19"; "pandemic, behaviour and physical activity"; "the impact of COVID-19 in children".

The systematic review examines publications present between the years 2000 and 2020 that addressed this topic.

Exclusion criteria:

- language of publication: papers in languages other than English were excluded,
- age and sample characteristics of research papers: papers with adult-aged populations were excluded.

- Risks of bias were considered and mitigated according to these criteria:
- publication bias: scientific publications with significant and less significant results were considered, with a high sample of participants;
- time lag bias: scientific publications published between 2000 and 2020, wide time range;
- language bias: scientific publications selected from major search engines and published in scientific journals in the field.

The authors of the following article participated in the selection of articles, without funder.

The database search identified a total of 22 articles containing the keywords mentioned above; through preliminary screening of articles based on title and abstract and after careful reading, 11 studies were excluded. As a result, 11 studies were analyzed for review.

Specifically divided as follows:

- the positive correlation between physical activity and mental health in children and adolescents, with particular reference to depression and anxiety: Lubans et al. (2016); Korczak et al. (2017); Zahl et al. (2017); Philippot et al. (2019); Andermo et al. (2020); Pascoe et al. (2020);
- the strong impact that the pandemic, in its first phase, had in relation to the levels of physical activity recorded among children and adolescents and the assumption of incorrect habits, such as poor diet and high sedentariness, noting repercussions also at a psychological level: Ammar et al. (2020); Dunton et al. (2020); Dos Santos Cardoso de Sá et al. (2020); Moore et al. (2020); Wunsch et al. (2021).

## EVIDENCE-BASED REVIEW. PART ONE: RESULTS OF PROTOCOL ANALYSIS

(Summary Table 1)

4.1. *Article 1*: Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., Kelly, P., Smith, J., Raine, L., Biddle, S. (2016). Physical Activity for Cognitive and Mental Health in Youth. A Systematic Review of Mechanisms. *Pediatrics*, 138(3), 2–13.

The study clearly showed that physical activity has the potential to improve mental health through a number of psychosocial mechanisms that, according to different theoretical perspectives, relate mental well-being to the fulfilment of basic psychological needs related to the social sphere, autonomy, self-acceptance, environmental mastery and life purpose. More precisely, the psychosocial mecha-

nism proposed by Lubans et al. (2016) assumes that physical activity provides an opportunity for social interaction (relatedness), for mastery in the physical domain, enabling the subject to develop self-efficacy and competence, and to achieve improvements in physical appearance and, thus, also in self-perception (body image).

Finally, the behavioural mechanisms are based on the finding that physical activity also involves relevant changes associated with behaviour. Only 2 studies selected by Lubans et al. (2016), assessed the effects of interventions on behavioural mechanisms, with particular reference to significant changes in self-regulation skills, such as self-control. Furthermore, one of the two studies reported significant intervention effects on self-regulation, but no study reported a significant impact on mental health. The conceptual model presented by Lubans et al. (2016), therefore, starts from the evidence of numerous studies that have demonstrated the positive impact of physical activity on the cognitive dimension of children and adolescents (Best, 2010) and describes the potential mechanisms and factors involved. This article, therefore, represents the first systematic review on the mechanisms that are activated by physical activity and that positively affect the cognitive dimension and, more generally, the mental health of young people. In other words, it could be said that the study with its systematic review has shown that physical activity interventions can improve cognitive and mental health in young people, however, not enough evidence has been presented so that the specific mechanisms responsible for these effects can also be identified, with the exception of the correlation between physical activity and improved physical self-perception and self-esteem in young people (Marcolongo, Mariani, 2018).

4.2. *Article 2:* Korczak, D.J., Madigan, S., Colasanto, M. (2017). Children's Physical Activity and Depression: A Meta-Analysis. *Pediatrics*, 139(4), 2–12.

The meta-analysis showed that physical activity levels are higher in cases with minor depressive symptoms, showing that this association between physical activity and a decrease in depressive symptoms is stronger in cross-sectional studies, i.e. in types of observational studies in which the researcher does not practice any intervention, than in longitudinal studies, which are instead studies in which there is a time lag between the distinct variables analysed, so that a temporal relationship can be established between them. What is unique about this meta-analysis is that it clearly shows that the scientific evidence shows a strong correlation between physical activity and a decrease in depressive symptoms. This systematic review and meta-analysis also has the advantage of demonstrating that increased physical activity in childhood and adolescence is associated with a significant decrease in depressive symptoms, so that overall this study represents a significant reference point for structuring programmes to help at-risk individuals suffering from depression in

childhood and adolescence, improving their health in particular when physical activity is carried out regularly and with a good intensity, showing how these programmes can have positive, albeit weak, effects especially in a long-term perspective.

4.3. *Article 3*: Zahl, T., Steinsbekk, S., Wichstrøm, L. (2017). Physical Activity, Sedentary Behavior, and Symptoms of Major Depression in Middle Childhood. *Pediatrics*, 139(2), 1–9.

The study found bidirectional relationships between moderate to vigorous physical activity, sedentary activity and MDD symptoms, the data of which showed higher levels of moderate to vigorous physical activity between the ages of 6 and 8 years, while also detecting milder MDD symptoms. No relationship was tracked, however, between sedentary activity and MDD, and subsequent physical activity (or possible lack thereof) could not be predicted either. More specifically, the study, which presents itself as the first research to objectively examine the relationship between sedentary behaviour and depression in early and middle childhood subjects, finds no prospective correlation between sedentary behaviour and MDD symptoms. The researchers hypothesised that the correlation between sedentary activity and depression must depend to some extent on age. The study reveals that moderate to vigorous physical activity conducted during childhood may prevent future development of depressive symptoms, which are moderately stable from the age of 6 to 10 years. The study also shows that sedentary activity in children does not alter the risk of future depressive symptoms and that the latter does not influence the likelihood of moderate to vigorous physical activity or inactivity. Although the effect found is small it suggests that increasing moderate to vigorous physical activity in children could certainly have more relevant effects in the population to prevent depression, at least at subclinical levels (Zahl, Steinsbekk, Wichstrøm, 2017).

Even if the effects of improvement through physical activity are small, the fact that almost all children could follow non-invasive physical activity programmes and that these could be enjoyable is a very important aspect given the young age and the effectiveness with regard to a disorder such as depression that is increasingly increasing in the population, and in particular among the very young (Cuijpers, van Straten, Warmerdam, 2007).

As far as the correlation between sedentariness and MDD is concerned, it should be pointed out that the study did not present sufficient data to corroborate the hypothesis of a negative correlation, mainly because there were no comparable studies from this point of view, so it is hoped for future research to replicate the results of this study, with particular reference to this inverse relationship, in order to obtain sufficient data to corroborate the negative relationship between sedentariness and depression.

4.4. *Article 4*: Philippot, A., Meerschaut, A., Danneaux, L., Smal, G., Bleyenheuft, Y., De Volder, A.G. (2019). Impact of Physical Exercise on Symptoms of Depression and Anxiety in Pre-Adolescents: A Pilot Randomized Trial. *Frontiers in Psychology*, 10(1820), 1–11.

By comparing high-intensity, low-intensity and moderate-intensity exercise programmes with respect to their impact on depression and self-reported anxiety, the study found, through separate analysis of the two groups, that depressive symptoms were significantly reduced, especially in the LMIG. The HIG, on the other hand, did not show this improvement, although there was a trend towards improvement in  $VO_{2max}$  indices. The study found a positive correlation between physical activity and depressive and anxious symptoms, but it should be noted that the sample was very heterogeneous with regard to symptoms of depression/anxiety and was not a clinical sample, which also explains why some variables did not have a normal distribution. Consequently, the results obtained cannot be considered as clinically accurate either, as the participants were not subjected to a neuropsychiatric interview. Furthermore, the small sample size could be a factor contributing to the non-significance of the effect of group time in the *t*-test, which is independent for depression symptoms.

The results provided by the STAI-B test showed, in fact, a large effect size suggesting that for children in the infancy stage it would be more appropriate to structure a low-to-moderate physical activity programme, in combination with interaction and play, to better reduce anxiety/depression symptoms.

## EVIDENCE-BASED REVIEW. PART TWO

4.5. *Article 5*: Andermo, S., Hallgren, M., Nguyen, T.T.D, Jonsson, S., Petersen, S., Friberg, M., Romqvist, A., Stubbs, B., Schäfer, L. Elinder, L.S. (2020). School-Related Physical Activity Interventions and Mental Health among Children: A Systematic Review and Meta-Analysis. *Sports Medicine*, 6(25), 2–27.

This study found correlation levels between physical activity and psychological well-being to be low in six studies, medium in two studies, high in eighteen studies and unknown in five studies. A total of nine outcomes were identified, based on at least three studies each. These were symptoms of depression, anxiety, emotional problems, negative affect, well-being, health-related quality of life, self-esteem, positive affect and resilience. Narrative moderator analyses based on ten or more studies showed that the age of the children moderated the effect of the intervention on the internalisation of mental health problems. More specifically, interventions in younger children showed a significantly negative or no effect on the internalisation of mental health problems, whereas in older children they

showed a significant positive or no effect. In addition, studies with a high level of implementation showed a significant negative or no effect, while those with a low level of implementation showed no or a positive effect. No evidence of moderating effect was found for self-esteem, well-being or positive mental health. Although none of the studies selected for this meta-analysis were primarily aimed at reducing sedentary behaviour, it was highlighted that out of eleven outcomes studied, beneficial effects of physical activity interventions on positive mental health (Hedges'  $g = 0.405$ ), anxiety (Hedges'  $g = 0.347$ ), well-being (Hedges'  $g = 0.877$ ) and resilience (Hedges'  $g = 0.748$ ) were identified.

The results of the current review are encouraging, as school-based interventions can be provided to all children without families having to bear often very high costs. Such interventions have also been shown to have numerous other cardio-metabolic health benefits, especially in high-risk young people with obesity or hypertension (Bailey, 2006).

4.6. *Article 6*: Pascoe, M., Bailey, A. P., Craike, M., Carter, T., Patten, R., Stepto, N., Parker, A. (2020). Physical Activity and Exercise in Youth Mental Health Promotion: A Scoping Review. *BMJ Open Sport & Exercise Medicine*, 6, 1–11.

Of the 22 studies included in the aforementioned meta-analysis, which did not recruit participants on the basis of elevated symptoms of mental disorders, an effect size of physical activity on improved mental health was found. More specifically, in 17 of these, anxiety disorders and difficulties with body image, symptoms of depression, fatigue, mood and changes in mood, self-perception, quality of life, resilience, self-esteem, social skills, stress and substance use were found. In each of these cases, physical activity showed a promising role as a mental health promotion strategy. The results of this review and meta-analysis indicate that moderate-intensity exercise has mental health benefits, and is particularly effective for depression, anxiety and mood enhancement. This is an important result that reiterates the caution that should be exercised with structured programmes through vigorous physical activity, which does not always result in beneficial effects on mental health, so that a positive correlation with mental health is more likely to occur with respect to participation in low-intensity exercise (Ekkekakis, Parfitt, Petruzzello, 2011).

According to the results of the above-mentioned study, programmes based on physical activity are now open to more people as they are shown to have positive effects even at moderate intensity, allowing even the youngest children to benefit.

4.7. *Article 7*: Ammar, A., et al. (2020). Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity. Results of the ECLB-COVID19 International Online Survey. *Nutrients*, 12(1583), 2–13.

The study by Ammar et al. (2020) revealed that home confinement due to COVID-19 had a negative effect on all levels of physical activity (vigorous, moderate, walking and general) and an increase in daily time spent sedentary (sitting) by more than 28%. In addition, it revealed an unhealthy pattern of food consumption (type of food, eating out of control, snacking between meals and number of main meals). Only alcohol consumption decreased significantly. Despite recommendations that home confinement should not prevent people from being physically active, the present results show that there was a decline in all levels of physical activity during the period of confinement due to the COVID-19 health emergency and the subsequent period of home confinement. While the effect size is small to medium for most parameters, a 35% reduction per week was found for walking, so the effect size is medium to large. However, the most prominent change was found in the intake of sedentary behaviour, which increased more than one full standard deviation, with a very large effect size:  $d = 1.13$ , most likely due to the increased time of confinement at home due to quarantine. Indeed, 29% of the sample reported sitting for 6–8 hours per day during confinement (compared to 24% before), a threshold area that (Patterson et al., 2018) suggested an increase in illness and mortality risks. Much more severe was the proportion of individuals sitting for more than 8 hours per day, which increased from 16 to 40% during confinement. Preliminary data indicate that 41% of the sample increased their sitting behaviour by only one hour or less, but this increased by five hours or more for 27% of the sample.

The most significant contribution of this study is that it analyses an international sample and highlights the potential effects of the pandemic in its first phase. The study highlights a decrease in physical activity, an increase in sedentary behaviour and, finally, unhealthy eating habits. These aspects are very important, especially if one considers that children and adolescents are particularly exposed to them. The study, therefore, raises awareness of the possible risks and potential strategies to be implemented in order to promote the development of physical activity and maintain good health during the pandemic. Based on the results obtained, it is hoped that alternative support will be provided in the future during these particular crisis periods in order to motivate people not to fall prey to negative changes, perhaps with the help of assistive technologies such as apps, streaming services and social media. Indeed, technology and social media can be a valuable support to encourage active behaviour even at home.

The effects due to the pandemic in its first phase were negative across all levels of physical activity. The results of this survey agree with recent studies showing that restrictions and lockdown have had a dramatic impact on lifestyle activities globally.



4.8. *Article 8*: Dunton, G.F., Do, B., Wang, S.D. (2020). Early Effects of the COVID-19 Pandemic on Physical Activity and Sedentary Behaviour in Children Living in the U.S. *BMC Public Health*, 20(1351), 1–13.

This study found, by interviewing parents who experienced the pandemic, that the most frequent physical activities were free play/unstructured physical activity (e.g. walking around), tag (i.e. high-energy circuits that can be done at home or outdoors, characterised by few effective movements), other active games but also going for a walk. Differences in children's gender and age were observed in the frequency of physical activities, with boys being more likely to participate in sports/training than girls. In addition, younger children (aged 5–8) were more likely to participate in free play/unstructured physical activity, ride a bicycle/skateboard or roller-skate than older children (aged 9–13). However, older children were more likely to participate in circuit training/conditioning than younger children (Dunton, Do, Wang, 2020).

Several types of sedentary behaviours performed by children since the onset of the pandemic (April–May 2020) have also been described, the main ones being most of the time spent watching television/video/movies, or sitting during outings with friends or family. Differences in children's gender and age were found in the duration of reported sedentary behaviour. Boys spent more time playing computer or video games than girls, while girls spent more time than boys using the Internet, email and social networks.

With regard to the places of physical activity during the pandemic, the study found: at home or in the garage, on the pavements and streets of their neighbourhood, but also places such as parks or trails, which were less frequently reported before the pandemic and increased during the restrictions due to the health emergency. One of the most striking findings from this study was the substantial proportion of children who had started using remote and streaming services to engage in physical activity during the initial period of the pandemic. Restrictions and closures due to the health emergency have had a major impact, especially among older children (aged 9–13), so in order to prevent changes in physical activity levels and sedentary behaviour from continuing beyond the pandemic period, it is necessary to promote physical activity in children at or near home. In the context of national and international health policies, in addition to the potential benefits of school closures and social distancing measures on containment of infection, the potential harm to the physical and mental health of children and adolescents should be taken into account, and policies to safeguard their health should be put in place that are also related to a careful and comprehensive assessment of risks and benefits in the short and long term (Saulle et al., 2021). One of the most unique findings from this study was the substantial percentage of children who had

begun using remote and streaming services to engage in physical activity during the early pandemic period. Sedentary behaviors of younger children are inferred. One limitation of this data is that it comes from parents, perforce, not experts. However, we are convinced that taking them into consideration is important to have a general overview.

4.9. *Article 9*: Dos Santos Cardoso de Sá, C., Pombo, A., Luz, C., Rodrigues, L.P., Cordovil, R. (2020). COVID-19 Social Isolation in Brazil: Effects on the Physical Activity Routine of Families with Children. *Revista Paulista de Pediatria*, 39, 1–8.

The study showed that most children live in a flat (56%), and do not have a dedicated place for physical exercise (86.6%). Concerning the outdoors, 27.7% do not have daily access to an outdoor space; 54.4% have an outdoor area up to 12 m<sup>2</sup>; and 17.9% have access to an area larger than 12 m<sup>2</sup>. It is worth mentioning that 52.9% of the families reported that it was not easy to maintain social isolation among the children, while only 27.7% reported that it was easy. Before isolation, 67.8% of the children practised physical activity at least twice a week. With social isolation and quarantine, most parents indicated a reduction in their children's physical activity levels: 46.1% reported that their children did much less physical activity, and 37% said that physical activity was less frequent than during school time. Screen time, sleep and family activities, on the other hand, increased: 38% report more time spent on screen activities (Dos Santos Cardoso de Sá, et. al., 2020).

The results of this study are quite alarming as they highlight that time devoted to physical activity can be compromised in this situation. The living conditions of these children are more sedentary than those with normal school activities. In general, the study found that little space is reserved for physical activity during the pandemic, regardless of gender and sex; while the average percentage of intellectual activity and screen time increases, so does the average percentage of sedentary time. The aforementioned study, therefore, warns of the possible negative effects derived from this period and represents a first approach in relation to the domestic routines of Brazilian families and their impact on the physical activity time of children living in social isolation. However, it should be pointed out that the phenomenon is still evolving and requires further investigation in relation to the second phase of the pandemic and a greater understanding of the socio-economic variables of households, which play an important role but were overlooked in the above study. In summary: the pandemic has severely limited physical exercise in childhood, increased screen time. A limitation of these data is that they come from parents, by force majeure, not from experts and in any case we are convinced to keep in mind as they give us a general overview. Due to the pandemic and social isolation, the time spent on the screen can be greatly

influenced by the use of social media, which represented the only way to stay in touch with family and friends especially in the first phase of the pandemic.

4.10. *Article 10*: Moore, S.A., Faulkner, G., Rhodes, R.E., Brussoni, M., Chulak-Bozzer, T., Ferguson, L.J., Mitra, R., O'Reilly, N., Spence, J.C., Vanderloo, L.M., Tremblay, M.S. (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(85), 1–11.

The study found that children had fewer sedentary attitudes, such as spending their free time in front of the screen (5.1 h/day) than teenagers (6.3 h/day). Both children and teenagers, however, experienced a significant decline in all physical activities except household chores. The most dramatic decrease was in outdoor physical activity (2.28%) and sport (2.28/5.00 and 1.96/5.00 for children and young people, respectively), while screen time and social media use were reported to be much higher than before the epidemic (screen time 4.10/5.00 and 4.21/5.00 for children and young people respectively; and social media 3.30/5.00 and 3.78/5.00 for children and young people, respectively). Parents also confirmed these data with their input. The aforementioned study also revealed a peculiar relationship between parents' ability to provide their children with support for movement and play behaviour and their age. More specifically, the study shows that younger parents in the sample manage to provide more support for their children in relation to exercise (-0.11), but also in relation to outdoor (-0.16) and indoor play (-0.10), as well as family physical activity (-0.11). Being a younger parent would also appear to result in less social media use (-0.13) and more sleep (0.12) in this study. Children living in single-family homes had more outdoor physical activity (0.12) and spent more time walking and cycling (0.13). Having a dog was associated with more outdoor play (0.11) and less indoor play (-0.10). Parental encouragement was associated with more outdoor physical activity of children but also with more time spent walking and cycling (0.12), indoors (0.12) and with family (0.24).

Half of the respondents (50.4%) indicated that their child was doing more hobbies or activities indoors, and 22.7% reported that they were doing more hobbies or activities outdoors. Among those who provided a written response, the top three indoor activities were arts and crafts (12.9%), puzzles and games (11.3%), and video games (10.2%). Of the top internal activities reported, 17.5% were screen-based (e.g. phone, tablet, television) while only 2.6% indicated hobbies such as dancing and physical activity. The results of this study, in other words, are among the first to confirm the negative correlation between pandemic-related restrictions and movement among children and young people. In particular, the study shows that spending time outdoors is associated with greater physical activity, less sedentary

time, better sleep, and a range of other benefits, e.g. mental health, function. Active indoor play, on the other hand, does not appear to replace active outdoor play resulting in a net decrease in reported play activity.

This study, therefore, provides evidence of the immediate collateral consequences of the COVID-19 epidemic, demonstrating a negative impact on the movement and play behaviour of Canadian children and young people. The results highlight the need for a balance between disease prevention, which we reiterate can be physical as well as mental, and health promotion efforts specific to increased physical activity by parents towards their children, in a period as unprecedented as it is dramatic. The above findings can guide efforts to preserve and promote children's health during the epidemic but also for the recovery period, with the ultimate aim of mitigating potential long-term harms (Dos Santos Cardoso de Sá et al., 2020). Also in this study there is a negative impact on movement due to the pandemic and it is shown that younger parents stimulate their children more to exercise. It is important that the community, school and parents are aware of the possible inconveniences and specific risks to mental health in the youngest and plan targeted interventions for those at greatest risk.

4.11. *Article 11*: Wunsch, K., Nigg, C., Niessner, C., Schmidt, S.C.E., Oriwol, D., Hanssen-Doose, A., Burchartz, A., Eichsteller, A., Kolb, S., Worth, A., Woll, A. (2021). The Impact of COVID-19 on the Interrelation of Physical Activity, Screen Time and Health-Related Quality of Life in Children and Adolescents in Germany. *Results of the Motorik-Modul Study. Children*, 8(98), 2–14.

The results of the study showed a negative influence of pre-COVID-19 ST on physical activity during the pandemic, independent of sex and age. The finding of the negative association between pre-COVID-19 ST and PA during the pandemic should prompt health policy to implement measures that may lead to a reduction in sedentary behaviour, giving young people the opportunity to have a better understanding of how healthy lifestyles, combined with good levels of physical activity can significantly improve their well-being and quality of life. Future studies, therefore, should investigate the relationships between PA, ST and HRQoL and investigate prospective relationships between the three constructs when COVID-19 is no longer present, using device-based measures of PA and HRQoL especially in children and adolescents (Scully et al., 1998). Regardless of gender and age, the data shows a negative influence on physical activity during the pandemic.

## SUMMARY. DISCUSSION OF RESULTS AND CONCLUSIONS

A review of the above protocols (Table 1) suggests that physical activity interventions can improve the mental health of children and adolescents. There is ample evidence that physical activity has positive effects on mental health for children and young people, particularly in reducing depressive and anxious symptoms. Although further high-quality research and analysis is needed to determine which type of physical activity intervention is most appropriate in children and young people, especially in relation to the pandemic, the review of the above articles shows that regular, professionally supervised, moderate-intensity physical activity undoubtedly has positive effects on the mental health of young people. If we consider the increase of disorders such as depression and anxiety among the population, the pandemic period and the effects in particular on children and adolescents (Istat, 2018), it becomes necessary to further investigate this positive correlation between physical activity and mental health, in order to structure appropriate pathways to be used also as prevention tools.

Certainly, more reliable and relevant data will be available with further experiments. However, we believe that researchers with their work taken into account in this review, have helped to give us an overview of physical activity in childhood carried out during the pandemic and how important it can be to channel states of anxiety in children and beyond.

Table 1.  
*Presentation of the analysed protocols*

Authors, year Country	No. of sub- jects Sample	Age	Activity Performed and purpose	Period/ Duration Research	Results	Study limits	Journal	Search engine
Lubans et al. (2016) Australia	20 to 1,273	7–11	Review of studies up to 2015 to explain the relationship between physical activity and mental health	July 2015	Description of mechanisms underlying the correlation between physical activity and mental health	Unbalanced study selection	<i>A Systematic Review of Mechanisms Pediatrics</i>	Pubmed
Korczak et al. (2017) Canada	14 to 55	8–19	Review of 50 studies to find positive correlation between physical activity in childhood and adolescence	January 2017	Increased physical activity in childhood and adolescence is associated with decreased depressive symptoms	Lack of standard musings; self-reported symptoms; small samples	<i>Pediatrics</i>	Pubmed
Zahl et al. (2017) Norway	776	6–10 anni	Measuring physical activity with an accelerometer 24 h a day for 7 days and describing MDD symptoms in children with an interviewer in order to assess the effects on MDD after physical activity	7 days	Bidirectional relationships between physical activity, sedentary behaviour and MDD symptoms	Small sample	<i>Middle Children Pediatric</i>	Pubmed
Philippot et al. (2019) Belgium	27	9–11	Low-moderate and intensive exercise programmes four times a week to assess mental health effects	5 weeks	Positive relationship between physical activity and decrease in depressive symptoms	Small, non-clinical sample	<i>Frontiers in Psychology</i>	APA PsycNet

Andermo et al. (2020) Sweden	19 to 2,797	8-17	Review of scientific studies (2009 to 2019) investigating school physical activity programmes and effects on mental health	November 2019 – June 2020	Positive correlation between physical activity and mental health in school curricula	Very arbitrary selection of instruments to assess results	<i>Frontiers in Psychology</i>	APA PsycNet
Pascoe et al. (2020) Australia	29 studies	12-25	Review of 22 studies (1980 to 2017) to assess the correlation between physical activity and mental health in young people	More than 3 days	Moderate physical activity also has mental health benefits for young people	Small sample	<i>BMJ Open Sport &amp; Exercise Medicine</i>	Pubmed
Ammar et al. (2020) University of Magdeburg (principal investigator), University of Sfax, University of Münster and University of Paris-Nanterre	1,047	18	ECLB-COVID19 electronic survey to assess pandemic lifestyle change	April 2020	Effect of home isolation on PA and power supply detected	Highly defined inclusion and exclusion criteria	<i>Nutrients</i>	MDPI
Dunton et al. (2020) USA	211	20-61 (parents) 5-13 (re-spective children)	Online survey aimed at parents of children to provide information on their children's lifestyle before and after the pandemic	April – May 2020 first survey, 6-12 months later second survey	Children's differences in physical activity frequencies by gender and age and sedentariness increasing with the pandemic	Understanding the effects of the pandemic that are still unclear because the phenomenon is very recent and evolving	<i>Public Health</i>	Pubmed

Dos Santos Cardoso de Sá et al. (2020) Portugal	15 Brazilian families with children under 13 years old	0–12	Online survey conducted to assess the impact of the pandemic on children's lives	24 April 2020 – 24 May 2020	Pandemic puts people at risk of a sedentary lifestyle and increases the risk of mental health impairment	Lack of information on the social and economic status of the households involved. Not all variables	<i>Rivista Paulista de Pediatria</i>	Google Scholar
Moore et al. (2020) Canada	1,472	5–13	Online survey conducted to assess the impact of the pandemic on children's lives	February 2020 – March 2020	Relationship between pandemic, increased screen time and decreased physical activity	No data collected in relation to the economic situation of the parents involved in the study	<i>International Journal of Behavioral Nutrition and Physical Activity</i>	MDPI
Wunsch et al. (2021) Germany	1,711	10–17	MoMo Wave 3 online pandemic questionnaire administration	August 2018 – March 2021	Negative correlation between ST and physical activity before and during the pandemic	Possible influence of social desirability on results	<i>Children</i>	Pubmed

Source: Authors' own study.



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ZARZĄDZANIE LĘKIEM PODCZAS COVID-19:  
WPŁYW AKTYWNOŚCI FIZYCZNEJ W DZIECIŃSTWIE

**Wprowadzenie:** W niniejszej pracy, poprzez skrupulatny przegląd literatury, podjęto próbę refleksji nad pozytywną korelacją pomiędzy aktywnością fizyczną a pierwszymi objawami lęku w dzieciństwie oraz nad jej wpływem na dobrostan psychiczny, szczególnie dzieci i młodzieży.  
**Cel badań:** Artykuł uwzględnia pogłębione Badania Bibliograficzne obejmujące artykuły z lat 2016–2021.

**Stan wiedzy:** Artykuły, za pomocą których chcemy wykazać pozytywną korelację między lękiem, depresją i aktywnością fizyczną oraz jej znaczenie zwłaszcza podczas pandemii, która spowodowała znaczny spadek poziomu wysiłku fizycznego, znacząco zwiększając u młodych ludzi ryzyko wystąpienia zaburzeń typu lękowego i dystresu psychicznego.

**Podsumowanie:** Należy zapobiegać i walczyć prostymi, ale niezbędnymi rozwiązaniami motorycznymi dla tej grupy docelowej.

**Słowa kluczowe:** aktywność fizyczna, lęk, wiek rozwojowy, dzieci, ćwiczenia, pandemia

