Scientific journal of physical and sports education(RSEPS)
(ISSN): 1135-1111 / EISSN 2661 - 7358
https://www.asjp.cerist.dz/en/PresentationRevue/452

Volume: 22/ N°: 01 (2023), p 624 - 641

Sports Participants and Its Effect on Body Posture in Adolescents. A Scoping Review Study.

PhD Seghari Taqieddine [1]	Mehidi Mohammed [2]
Oran University of Science and Technology, (Algeria)	Oran University of Science and Technology, (Algeria)
taqieddine.seghari@univ-usto.dz	mehidi7930@yahoo.fr

Received: 09 / 08 / 2022 **Accepted: 16 / 01 / 2023**

Abstract:
This scoping review mapped the existing evidence on sports participants and its effect on body posture in adolescents. Seven electronic databases were consulted in December 2021, with no limit on year or region. Adolescents' studies (10 to 19 years old) were eligible. A total of 233 documents were examined, twenty-one study focused on adolescents and the eligibility criteria. Most studies have shown an effect of sport participants on body posture in favor of athletes. No study has analyzed all deformities and the prevalence on large samples. The most-used tests to evaluate body posture based on observation. A comparative study between two groups of adolescent athletes and non-athletes were the most common and practicing sports to keep a good posture or prevent further deviation should be done carefully at every gender and sport type.

Keywords: Adolescent, Body Posture, Deviations, Deformities, Sport Participation.

Article info

[1] *Corresponding author*

1. Introduction

Sports practice shapes the character of a young person, improves physical fitness and considerably affects physical development and posture. The positive impact of physical activity on all aspects of health and fitness in children and adolescents has been proven in many studies. We aim to understand the effect of practicing sport on postural deformities in children.

Physical activity has an impact on the posture and physical development of a young organism. Sports training as a specific form of directional physical activity can exert a significant effect on the process of posture development of young men due to high training loads and repeated unilateral exercises

Some postural disorders are more common in certain sports fields, so it is assumed that the specific requirements of sport and training loads that occur during the execution of technical elements and prolonged repetition of these elements influenced the development of those postural disorders.

The most common postural abnormalities that occur in most sports are scoliosis and kyphosis, while lordosis occurs to a slightly smaller extent (Asghar & Imanzadeh, 2009).

The appearance of such postural disorders in sport is usually associated with the highly repetitive nature of sports. The early selection of certain sports entails involving children in the training process at an exceedingly initial period in their childhood. In this period of development, the children's spinal column is affected by the influence of large loads that occur during the training process, which can lead to adaptive changes in skeletal and muscle systems and disrupt normal petrogenesis. This long-term exposure to such loads which affects the morphology of the bones that are still underdeveloped and the mechanical integrity of the bones can lead to the improper development of the spinal column (Wojtys, Ashton - Miller, Huston, & Moga, 2000). There is a need for posture monitoring in sport, especially in young athletes. Previous studies on body posture mostly concerned adult athletes.

As we well known that adolescents if very critical period which in the individuals more vulnerable to illness, injuries, and deformities do to multiple factors such as poor nutrition, bad habits, lake of movement et all based on the information above we decided to contemned this scoping review study to gain insight into the effect of sport on adolescents and due to the fact that sport participant benefit the individuals on different levels (physically, spiritly, mentally…) we seek to provide a general knowledge about the physically level effectiveness specifically the changes on body posture in adolescents.

2. REVIEW QUESTION

Following an individual review of the literature and a critical reading consensus we reached to decide the following research question: is there any effect of sports participation on body posture in adolescents?

The sub-questions of the study:

What is the effect of sports on body posture in adolescents?

What are the most common postural deformities among adolescents?

What is the common material used to evaluate postural deformities in adolescents?

3. KEYWORDS

Adolescent, Body Posture, Deviations, Deformities, Sport Participation

4. ELIGIBILITY CRITERIA

Participants

Studies were included if they evaluated adolescent aged (10 to 19) practicing any type of sports (individual/team sports), and will exclude studies about participants with special needs or chronic deformities.

Concept

Studies were included if they were conducted about the effect of sport participant on body posture in adolescent. We focused on the athletes with five years of expertise and more; taking into consideration studies focused on one type of deformities such as (rounded shoulders, forward head, kyphosis...)

Context.

Only the studies done in English language were included, no date restrictions or design matter. We incorporated both descriptive and experimental studies for both genders, but we excluded the studies without full text available.

5. TYPES OF SOURCES

This scoping review will consider both experimental and descriptive study designs, other scoping review studies included.

In addition, systematic reviews that meet the inclusion criteria will also be considered depending on the research question.

web articles and opinion papers will also be considered for inclusion in this scoping review.

6. METHODS

This scoping review followed the Arksey and O'Malley iterative six-stage process by identifying the research question; finding relevant studies; selecting a study; charting the data; collating, summarizing and reporting the results; and an optional consultation exercise. Following the guidelines checklist of 20 items recommended by the Preferred Reporting Items for Systematic Review and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) and for the research questions we applied the PCC framework suggested by JBI.

7. SEARCH STRATEGY

The search strategy will aim to locate both published and unpublished studies. The text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles were used to develop a full search strategy for this article. The search strategy, including all identified keywords and index terms, will be adapted for each included database and information source. The reference list of all included sources of evidence will be screened for additional studies.

The databases to be searched include (ResearchGate, SNDL, ScienceDirect, PubMed, E-MAREFA, Scopus, Mendeley). Following the search, all named citations will be collated and uploaded into Mendeley Version 1803 for windows.

https://www.researchgate.net
https://www.sndl.cerist.dz
https://www-sciencedirect-com.sndl1.arn.dz
https://pubmed.ncbi.nlm.nih.gov

https://search-emarefa-net.sndl1.arn.dz/ar
https://www-scopus-com.sndl1.arn.dz/search/form.uri?display=basic#basic
https://www.mendeley.com/search/

Studies published in any English language will be included. Studies published before February 2022 will be included as (that was the deadline for searching and mapping the literature online).

8. STUDY/SOURCE OF EVIDENCE SELECTION

Ensuing the mapping, all identified citations will be collated and uploaded into (Mendeley Version 1803 for windows) and duplicates removed. Following a pilot test, titles and abstracts will then be screened by the author for assessment against the inclusion criteria for the review. Potentially relevant sources will be retrieved in full and their citation details imported into Mendeley for Unified Management; the full text of selected citations will be assessed in detail against the inclusion criteria. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria will be recorded and reported in the scoping review. No disagreements between the reviewers at any stage of the selection process. The results of the search and the study inclusion process will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) following Gantt chart to highlight the eligibility criteria.

9. Data Extraction

After the screening, all studies were important and data was extracted from papers in the scoping review by the author using a data extraction tool based on the inclusion and exclusion criteria. The data extracted included specific details about the participants (adolescents aged 10 to 19 taking part in any type of sports), concept (focused on the effect of sport on body posture in any way possible), context (included all English language studies, both genders, athletes with five years or more of expertise, study methods and design of all empirical studies (descriptive, experimental...) and key findings relevant to the review questions about the (The effect of sport on posture, the common postural deformities and the materials used to evaluate body posture).

10. DATA ANALYSIS AND PRESENTATION

Table (1) present Gantt chart for the literature review

Study Title	Author/year	Objectives	Participants	Country of origin of included studies	Method	Results

A comparative analysis of the postural status of young girls' volleyball players from Vojvodina and their peers	Željko Krneta et al.,	The aim of the research was to analyze the posture status of young female volleyball players and their peers who did not play volleyball	The research was conducted on 429 female participants, aged between 11.5 and 16.5 in decimal years	University of Novi Sad, Faculty for Sport and Physical Education, Novi Sad, Serbia	Mann-Whitney U test	The results of the research showed a deviation from the normal status of the shoulders, shoulder blades and spine in the coronal plane in older female volleyball players at a greater percentage when compared to their peers
Postural variables in girls practicing sport gymnastics	Małgorzata Grabara 2010	To assess body posture variables in girls practicing sport gymnastics vs. their untrained mates.	104 girls aged 7 – 11 years	Department of Tourism and Recreation, Academy of Physical Education, Katowice, Poland	photogrammetry	Gymnast girls were significantly superior to their untrained mates in overall posture rating
A comparison of the posture between young female handball players and non-training peers	Małgorzata Grabara 2014	To evaluate and compare the posture in young female handball players and a group of non-training peers	125 handball players and 135 non-training individuals aged 12–15	Department of Recreation, The Jerzy Kukuczka Academy of Physical Education, Poland	body height and mass, BMI, fat mass and total body water and the posture was evaluated using the moiré method	The formation of anteroposterior curvatures of the spine diversified some of the age groups of training and non-training young females. Handball training can affect the quality of posture
Comparative analysis of body posture in child and adolescent taekwondo practitioners and non-practitioners	Jacek Marta et al., 2015	The aim of the research was an attempt to determine the effect of the traditional form of taekwondo training on a given group of young people.	The experiment group consisted of 41 taekwondo practitioners, while the control group formed 46 subjects 87 children aged 10-18 years	Institute of Physical Education, Tourism and Physiotherapy, Jan Dlugosz University of Czestochowa (Poland) Department of Kinesiology, University of Lethbridge (Canada)	Duometr Plus OP-1/DA made by OPIW. Bertrand's test	The traditional taekwondo training has a positive effect on the body posture change

Comparison of posture between gymnasts and non-athletes	Mića Radaković, et al., 2016	the difference in the postural status of the spine of school children who engage in gymnastics and their peers who do not engage in sports	97 primary school students aged 11 and 12	Faculty of Sport and Physical Education, University of Novi Sad, Serbia Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia	modified method of Napoleon Wolanski	Significant differences were found in left chest scoliosis between students who are not engaged in sports and those who are engaged in gymnastics
Differences in postural status of primary school students who engage in different sports and their peers who do not engage in sports	Mića Radaković et al., 2017	To analyze the postural status of primary school and to determine whether there are any statistically significant differences in relation to the sport in which the participants are engaged in	197 students aged between 11 and 12	Faculty of Sport and Physical Education, University of Novi Sad, Serbia	modified Napoleon Wolanski method	Based on the results, it can be concluded that a similar percentage of postural disorder occurs in athletes and non-athletes
A comparative analysis of the postural status of young girls' volleyball players from vojvodina and their peers	Željko Krneta, et al., 2012	To analyze the postural status of young female volleyball players from Vojvodina and their peers, primary school students who did not play volleyball	429 female participants, aged between 11.5 and 16.5 in decimal years	University of Novi Sad, Faculty for Sport and Physical Education, Novi Sad, Serbia	Their posture was determined using a clinical method. By the Mann-Whitney U test	Distorted posture was found only in older female players, i.e., in those who were involved in the training process for a longer period of time.
Comparison of posture among adolescent male volleyball players and non-athletes	Malgorzata Grabar 2015	The objective of the study was to assess and compare the postures of adolescent male volleyball players and their non-training peers	The study group formed 104 volleyball players while the control group consisted of 114 non-training individuals aged 14-16 years	Department of Recreation, The Jerzy Kukuczka Academy of Physical Education in Katowice, Poland	Body posture was assessed by the Moiré method	volleyball training does not negatively affect the posture of the training subjects. Postural asymmetries were seen in both the volleyball players and non-training peers; it might have resulted from lateralization

Effect of recreational taekwondo training on musculoskeletal system of primary school age children	Oleksandr et al., 2017	The aim is to substantiate the effect of taekwondo training on the musculoskeletal system of the junior students	70 primary school age students took part in the study	Physical education and sports department, Sumy State University, UKRAINE	theoretical analysis of scientific and methodological sources somatoscopy and somatometry	It was proved that through special means used in taekwondo the number of children involved in the recreational taekwondo group with normal posture and normal foot shape is much bigger than the children involved in the basketball group and those not involved in the sports groups at all
Effect of Swim Training on the Physical Characteristics of Competitive Adolescent Swimmers	Elizabeth E. Hibberdet al., 2016	To evaluate the effect of the swim training season on subacromial space distance and forward head and forward shoulder posture, as well as to determine the relationship between these variables	43 competitive adolescent swimmers and 29 non adolescent athletes	University of North Carolina at Chapel Hill, North Carolina, USA	physical examination that included evaluation of posture and subacromial space distance	Because of their training load, swimmers experience a decrease in subacromial space distance and an increase in forward shoulder posture over the course of 12 weeks of training, potentially making these athletes more vulnerable to the development of shoulder pain and injury.
Effects of the combined swimming, corrective and aqua gymnastics programmed on body posture of preschool age children	Aldvin Torlakoviæet al., 2013	to identify the possible effects that the implementation of the joint kinesiological programs of swimming and hydro-kinesiological therapy may have on the body posture in preschool children	50 boys with poor muscle tone	Faculty of Health Studies, University of Sarajevo, Bolnicka Bosnia and Herzegovina	Napoleon Wolanski method	It can be concluded that a joint program of corrective gymnastics with games and exercises in water had significant effects on improving the muscle tone in the respondents, which in turn had a direct impact on improving their body posture

Physical Exercise and Its Role in a Correct Postural Alignment	GERMINA COSMA et al., 2015	identify the effect of physical exercise like dynamic games in physical education class on correct posture of 20 students	20 students aged between 6-9 years	faculty of Physical Education and Sport, 156 Brestei Street, Craiova, Romania	testing posture through Posture Screen Mobile software	Prophylaxis physical deficiencies can be successfully achieved in physical education class, as long as we elaborate exercises aimed peculiarities to the subjects.
Influence of physical activities on the posture in 10–11-year-old schoolchildren	ŠTEFAN BALKÓ et al., 2017	monitor the actual state of posture of schoolchildren in the Czech Republic	50 10–11-year-old schoolchildren	Department of Physical Education and Sport, Faculty of Education, J.E. Purkyně University in Ústí nad Labem, CZECH REPUBLIC	Jaroš and Lomíček test (standardized) and a Saehan metallic goniometer	the results of our study clearly indicate that basic school children do not have good posture. In obese children, a higher number of defective and very defective posture was observed in comparison with the normal weight children. The children that performed physical activity three times a week had a perfect posture
Study regarding the difference of anthropometric development of children that practice sport compared with those that are sedentary	Ioan SabinMarcel Pomohaci 2015	To discover the differences between children that practice sport compared with sedentary children	25 children, with 9 to 10 years	National University of Physical Education and Sport, Bucharest, Romania University “Lucian Blaga”, Faculty of Science, Department of Environmental Sciences, Physics, Physical Education and Sport, Romania	the observation method anthropometric exams that consisted in measuring	the everyday sport activity helps in the child body development

Prevalence of Incorrect Posture among Children and Adolescents: Finding from a Large Population-Based Study in China	Lei Yang, XinhaiLu, Bin Yan, YeenHuang 2020	The study aims to estimate the prevalence of incorrect posture in Chinese children and adolescents and to describe the epidemiological findings stratified by the demographic characteristics	A total of 595,057 students were screened Age (year, mean ± SD) 12.8 ± 2.0	Department of Spine Surgery, the First Affiliated Hospital of Shenzhen People's Republic of China	national scoliosis screening standardized protocol the Adams forward bending test (FBT), visual inspection, and measurement of the angle of trunk rotation (ATR) using the sociometer	Chinese children and adolescents had a high prevalence of incorrect posture, with girls and older students being a high-risk group
Posture of adolescent male handball players compared to non-athletes	Małgorzata Grabara 2017	The aim of the present study was to assess the posture and somatic parameters in adolescent male handball players compared to non-athletes and determine whether a relationship exists between the posture and the volume of training and/or its frequency	Sixty-eight adolescent male handball players and sixty-nine non-athletes aged 15–18 was examined	Faculty of Physical Education, Department of Tourism and Health-Related Physical Activity, the Jerzy Kukuczka Academy of Physical Education in Katowice, Poland	The posture was evaluated by the moiré method	despite the predominance of asymmetric elements, handball training does not negatively affect the posture in the frontal and transverse planes
Posture of adolescent volleyball players – a two-year study	Małgorzata Grabara 2020	To assess and compare the posture of male and female adolescent volleyball players and non-training individuals over a 2-year period	32 volleyball players and 30 non-athlete peers	Institute of Sport Science, Jerzy Kukuczka Academy of Physical Education, Katowice, Poland	photogrammetric method based on the moiré phenomenon	Volleyball training affects the alignment of the pelvis, shoulder girdle and scapular. The study revealed a number of differences in spinal curvatures between male volleyball players and non-athletes which could be associated with growth velocity and differences in body height

The effects of exercise on body posture	Bade YAMAKO et al., 2018	The aim of this study is to describe the effects of exercise on the body posture by reviewing the literature	N/A	Ondokuz Mayıs University, Turky	databases including Web of Knowledge, PubMed, and Embase were investigated	The current review is considered to provide a synthesis of the research-based knowledge on postural sway that has been one of the basics of sport performance and fitness. Particularly, exercises to correct postural disorders should be done carefully at every age.
Comparative analysis of postural deformities between sports and non-sports participants	Dr.C.DURAI 2017	To compare postural deformities between sports and non- sports participants among school boys	300 School boys 9 to11 years	Dept. of Physical Education and Sports, Monomania Sundaranar University, Abishekapatti, Tirunelveli-12, Tamilnadu, India	standardized New York Posture Rating Test	The results of the study showed that there was a significant difference between sports and non-sports participants
Prevalence of postural deviations in the spine in schoolchildren: a systematic review with meta-analysis	Ana Paula Kasten et al., 2017	To estimate the prevalence of spine postural deviations in Brazilian schoolchildren	N/A	Federal University of Rio Grande do Su, Brazil	Searches were conducted in databases EMBASE, LILACS, PubMed, SCOPUS, SciELO, Science Direct, and Web of Science	There is low strength of evidence to establish a consensus about the values of the prevalence of spine postural deviations in Brazilian schoolchildren

The impact of a 60-minute swimming training on the quality of body posture and the level of balance in young adults	Dżesika Aksamit et al.,	The aim of the study was to evaluate the changes in the quality of body posture and body balance after a 60-minute intensive swimming training	9 people aged 18-22	State Higher Vocational School in Tarnow, Institute of Health Sciences, Poland University of Physical Education in Krakow, Faculty of Physical E education , Poland	Ultrasonic Zebris Pointer was used for three-dimension al assessment of body posture	It is not recommended to treat swimming as a substitute for corrective gymnastics. Intensive swimming training can exacerbate existing body posture errors in people who have just started improving their swimming technique.

Items	Accessibility
Study Design / Methodology	We have noted that most studies used the descriptive and experimental method over any meta-analytic or scoping review studies (and that is one of the reasons that allowed us do this scoping review study), and we can say that most of the researchers tend to use the descriptive method due to the nature of the topic that needs in most cases a comparative between two groups with substantial number of participants.
Objectives	Most earlier studies focused on studying the effect of one sport on body posture between athletes and non-athlete adolescents, and none of them compared the difference between two or more types of sports in how they affect the body posture of adolescents.
Participants	The average age of the participants in the earlier studies were between 12 and 15 years old, and athletes with expertise of more than 3 years of practice. As for the number of participants the mean was 180 individuals, As we noted, most studies examined both genders equally.
Study Tools	Research methods were varied, but many tools depend on observation like (New York posture test, moiré phenomenon test, Napoleon Wolanski method…). All those tests rely on the observation of the researcher; that is why we can see that all the studies used qualified people to do the observation, then the researcher will do the analysis of these data using pc programs.

Table (2) the Characteristic elements of the literature reviews

11. DISCUSSION

The scoping review study identified 233 studies, of which 56 were duplicated, thus 177 remained. As so, 130 were excluded based on the title and abstract. So that only 47 remained for detailed analysis, 29 of them were excluded after the screening and the full text reading for the eligibility criteria. After that, manual search was carried out in the references of the 18 studies, and 3 more studies were included. We ended up with 21 studies which were reviewed. Table (1) shows the Gantt chart of the studies selection. Table (2) shows a summary of the characteristic elements of those studies explained (Study Design and Methodology, Objectives, Participants, Study Tools). And based on our analyses of the studies selection, we can list few answers to the research questions. First, for the effect of the sport participant on body posture studies like (Željko Krneta et al.,2012, Dr.C.DURAI 2017, Małgorzata Grabara 2014,2015,2020) shows that there is a significant difference between sports and non-sports participants; therefore, sports reduce the spread of deformities in adolescents. But we can note that the prevalence of different types of deformities go higher in participants with longer years of expertise. Studies like (Elizabeth E. Hibberdet al.,and Željko Krneta, et al.,ž) which addressed this point showing that a longer period of training can affect the posture of adolescents by making them vulnerable to some type of postural deviations, based on the specificities of each sports like shoulder rotation in swimming.

For the second research question that discusses the prevalence of the postural deformities and the most common ones between adolescents we found that most of the studies focused on some major deformities like (Scoliosis, Rounded Shoulders, Lordosis and flat feet) before starting the observation, so that they keep the comparative between few deformities and use less time and tools. Nonetheless, we managed to get two studies with a large number of participants. Their object is to identified the prevalence of postural deformities on adolescents (Lei Yang, XinhaiLu, Bin Yan, YeenHuang 2020 and Ana Paula Kasten et al., 2017). Both studies showed high prevalence of postural deformities in adolescents, and they found out that girls and older students being the higher risk group to develop those deviations. Also, it shows that high and low shoulders and scapula title, pelvic tilt, flat back, thoracic kyphosis, lumbar concave, lumbar lordosis, lumbar kyphosis, account for high proportion in that order.

Finally, the third research question addressed the common material used to evaluate postural deformities. We counted different methods and tools, but the common thing between them is that the majority of the studies tend to use a descriptive method; that depends on the observation of the researcher and the expertise. We found that logical due to the nature of the studies mentioned and the objects that aims to find a significant result by doing a comparative protocol between two groups, in most cases athlete and non-athlete adolescents, and those are the most common methods (the Napoleon Wolanski method, New York posture test, Mann-Whitney U test).

12. CONCLUSIONS

This scoping review is considered to provide a solid theoretical knowledge about the effect of sport participants on body posture, in which we can say that the practice of sport can be extremely helpful in keeping a good posture and prevent prevalence of postural deformities although we cannot consider the practice of sport a substitute to a correction method for those deformities.

13. CONFLICTS OF INTEREST

There is no conflict of interest in this project.

14. REFERENCES

Asghari, A., & Iman Zadeh, M. (2009). Relationship between kyphosis and depression anxiety in athlete and non-athlete male students in selected universities of Tehran. World Applied Sciences Journal, 7 (10), 1311 – 1316.

Wojtys, E.M., Ashton – Miller, J.A., Huston, L.J., & Moga, P.J. (2000). The association between athletic training time and the sagittal curvature of the immature spine. The American Journal of Sports Medicine, 28 (4),490 – 498.

Education, P. (n.d.). STUDY REGARDING THE DIFFERENCE OF ANTHROPOMETRIC DEVELOPMENT OF CHILDREN THAT PRACTICE SPORT COMPARED WITH THOSE THAT ARE SEDENTARY.

Krneta, Z. (n.d.). A COMPARATIVE ANALYSIS OF THE POSTURAL STATUS OF YOUNG GIRLS' VOLLEYBALL PLAYERS FROM VOJVODINA AND THEIR PEERS Possibilities of improvement of intellectual, motor and cardio-respiratory abilities of children by means of kinesiological activities View project IMPROVING TESTING ABILITIES ON POSTURAL AND SPINAL COLUMN STATUS-SPINELAB View project. https://www.researchgate.net/publication/260362814

Grabara, M. (2010). Postural variables in girls practicing sport gymnastics. Biomedical Human Kinetics, 2(2010), 74–77. https://doi.org/10.2478/v10101-0018-6

Krneta, Z., Protic-Gava, B., Vukovic, M., & Scepanovic, T. (2012). A Comparative Analysis of the Postural Status of Young Girls Volleyball Players from Vojvodina. FACTA UNIVERSITATIS Series: Physical Education and Sport, 10(Special Issue), 311–318. http://facta.junis.ni.ac.rs/pe/pe201204/pe201204-05.pdf

Grabara, M. (2014). A comparison of the posture between young female handball players and non-training peers. Journal of Back and Musculoskeletal Rehabilitation, 27(1), 85–92. https://doi.org/10.3233/BMR-130423

Cosma, G., Ilinca, I., Rusu, L., Nanu, C., & Burileanu, A. (2015). Physical Exercise and Its Role in a Correct Postural Alignment. Physical Education, Sport and Kinesiotherapy Journal, XI (39), 58–64. https://www.researchgate.net/publication/279961540

Grabara, M. (2015). Comparison of posture among adolescent male volleyball players and non-athletes. Biology of Sport, 32(1), 79–85. https://doi.org/10.5604/20831862.1127286

Wasik, J., Motow-Czyz, M., Shan, G., & Kluszczynski, M. (2015). Comparative analysis of body posture in child and adolescent taekwon-do practitioners and non-practitioners. Ido Movement for Culture, 15(3), 35–40. https://doi.org/10.14589/ido.15.3.5

Hibberd, E. E., Laudner, K. G., Kucera, K. L., Berkoff, D. J., Yu, B., & Myers, J. B. (2016). Effect of Swim Training on the Physical Characteristics of Competitive Adolescent Swimmers. American Journal of Sports Medicine, 44(11), 2813–2819. https://doi.org/10.1177/0363546516669506

Radaković, M., Madić, D., Radaković, K., Protić-Gava, B., Radanović, D., & Marković, K. Ž. (2016). COMPARISON OF POSTURE BETWEEN GYMNASTS AND NON-ATHLETES. 5, 36–41.

Kasten, A. P., Nichele Da Rosa, B., Schmit, F. D., Noll, M., & Candotti, C. T. (2017). Prevalence of postural changes in the spine in schoolchildren: a systematic review with meta-analysis Prevalence of postural deviations in the spine in schoolchildren: a systematic review with meta-analysis. J Hum Growth Dev, 27(1), 99–108. https://doi.org/10.7322/jhgd.127684

Durai, C. (2017). COMPARATIVE ANALYSIS OF POSTURAL DEFORMITIES BETWEEN SPORTS AND NON-SPORTS PARTICIPANTS. International Journal of Creative Research Thoughts (IJCRT), 5(2), 402–406. www.ijcrt.org

Deniz, K., & Karagöl, E. (2017). Turkish Studies. THE EFFECTS OF EXERCISE ON BODY POSTURE, 12(34), 143–162.

Grabara, M. (2017). Posture of adolescent male handball players compared to non-athletes. Baltic Journal of Health and Physical Activity, 9(3), 76–86. https://doi.org/10.29359/bjhpa.09.3.07

Balkó, Š., Balkó, I., Valter, L., & Jelínek, M. (2017). Influence of physical activities on the posture in 10–11-year-old schoolchildren. Journal of Physical Education and Sport, 17(1), 101–106. https://doi.org/10.7752/jpes.2017.s1016

Tomenko, O., Kirichenko, L., Skripka, I., Kopytina, Y., & Burla, A. (2017). Effect of recreational taekwondo training on musculoskeletal system of primary school age children. Journal of Physical Education and Sport, 17(3), 1095–1100. https://doi.org/10.7752/jpes.2017.03168

Radaković, M., Protić, B., Radaković, K., Madić, D., Šćepanović, T., Radanović, D., & Gušić, M. (2017). Differences in Postural Status of Primary School Students Who Engage in Different Sports and Their Peers Who Do Not Engage in Sports . 15, 63–71. https://doi.org/10.22190/FUPES1701063R

Aksamit, D., Sidor, T., Gądek, A., & Jankowicz-Szymańska, A. (2019). The impact of 60-minute swimming training on the quality of body posture and the level of balance of young adults. Health Promotion & Physical Activity, 4(3). https://doi.org/10.5604/01.3001.0012.8374

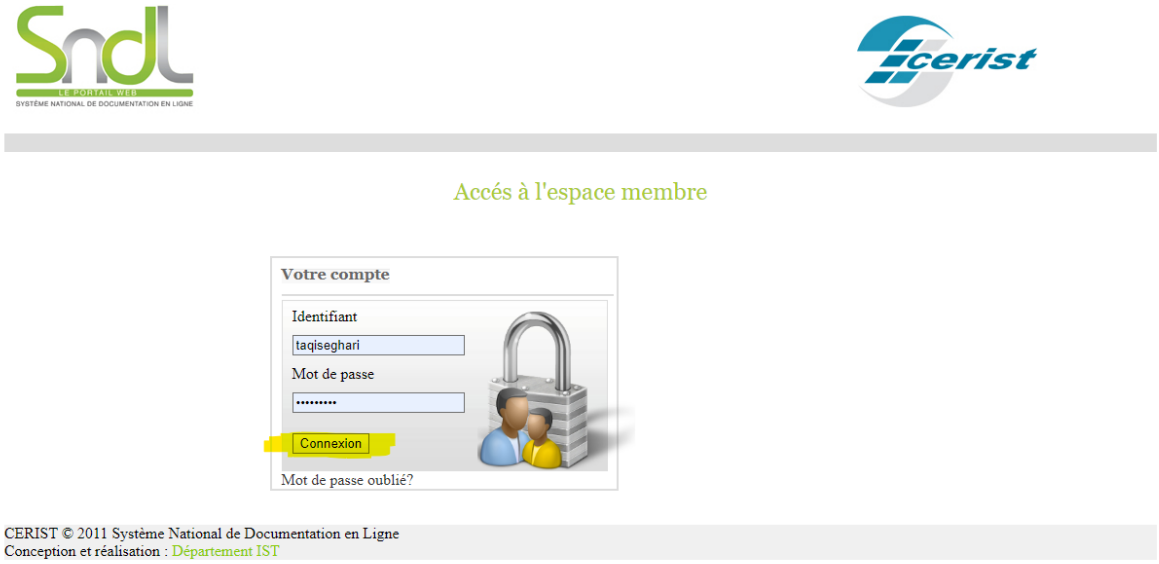
Grabara, M. (2020). Posture of adolescent volleyball players- A two-year study. Biomedical Human Kinetics, 12(1), 204–211. https://doi.org/10.2478/bhk-2020-0026

Yang, L., Lu, X., Yan, B., & Huang, Y. (2020). Prevalence of Incorrect Posture among Children and Adolescents: Finding from a Large Population-Based Study in China. IScience, 23(5), 101043. https://doi.org/10.1016/j.isci.2020.101043

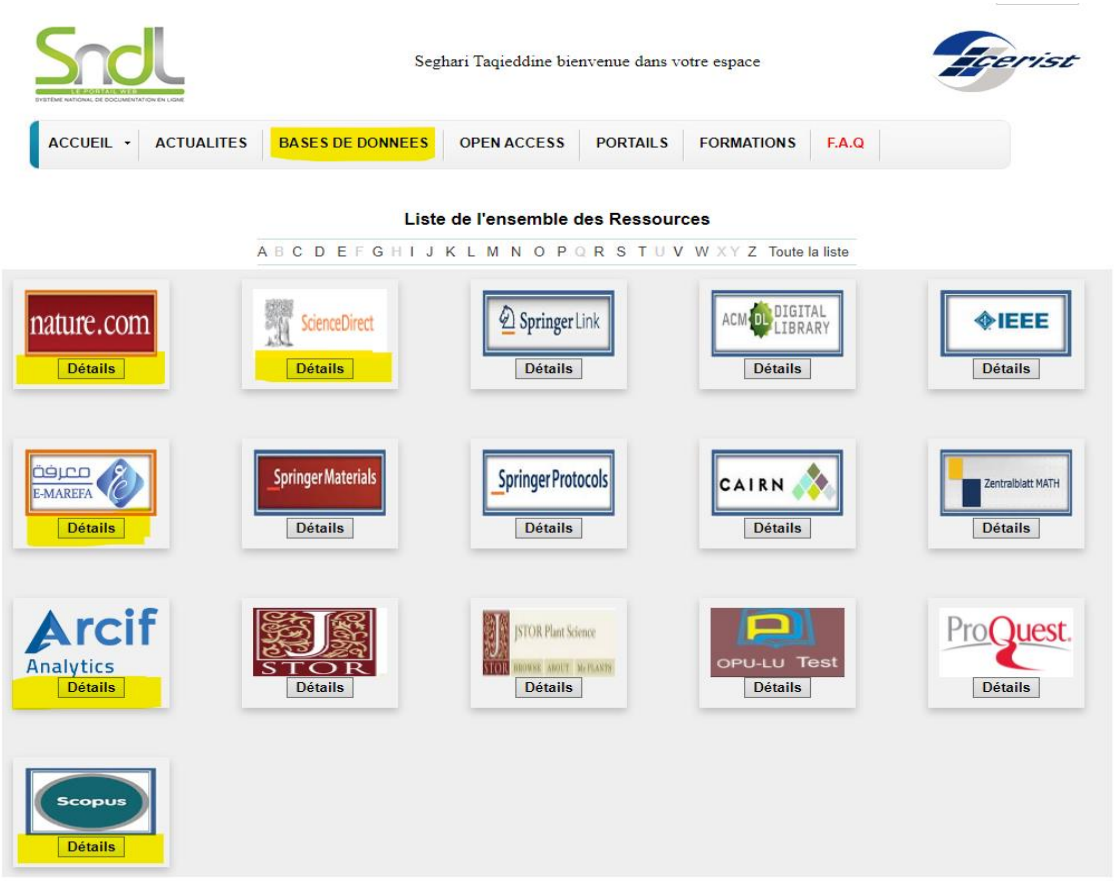
15. Appendices

Appendix I: Search strategy

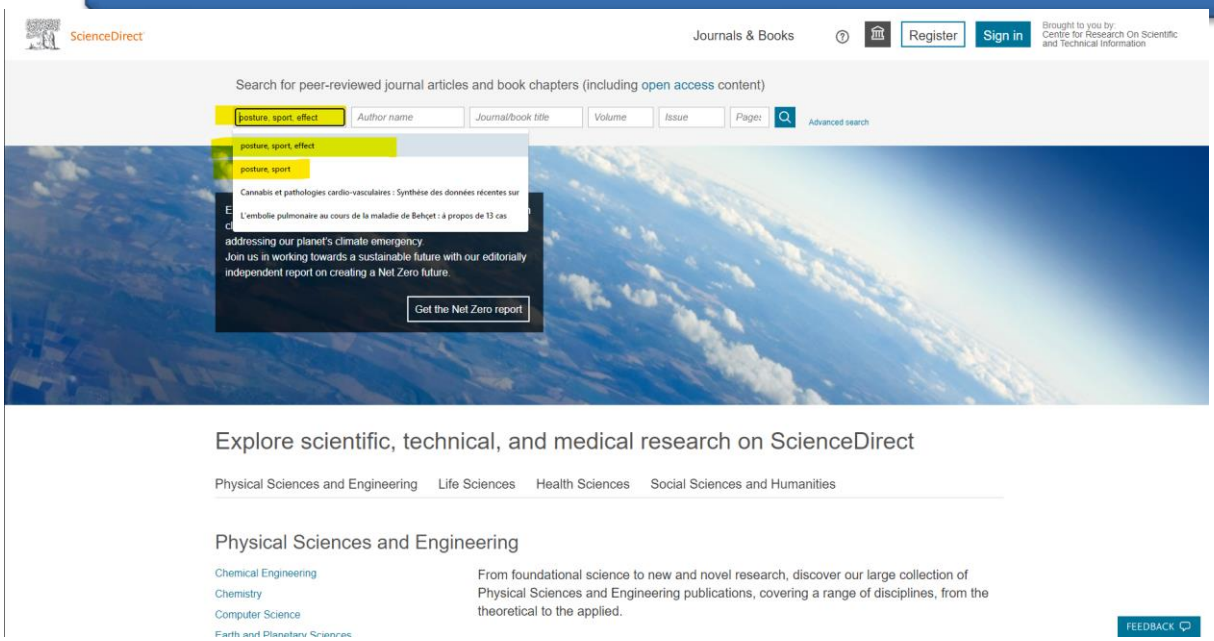
Step 1: Access the Sndl database.

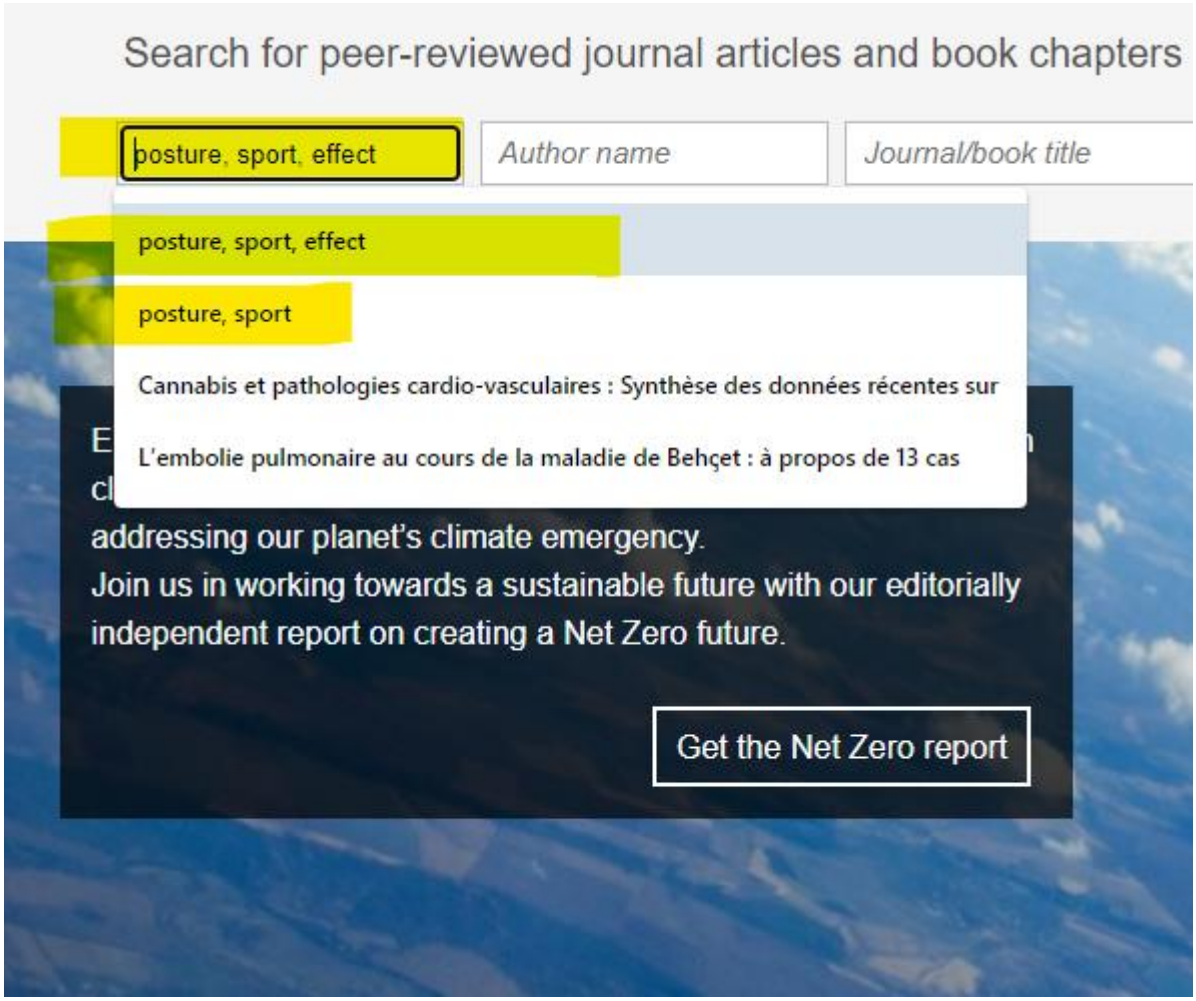


Step 2: Choose one of the databases e.g. (ScienceDirect)

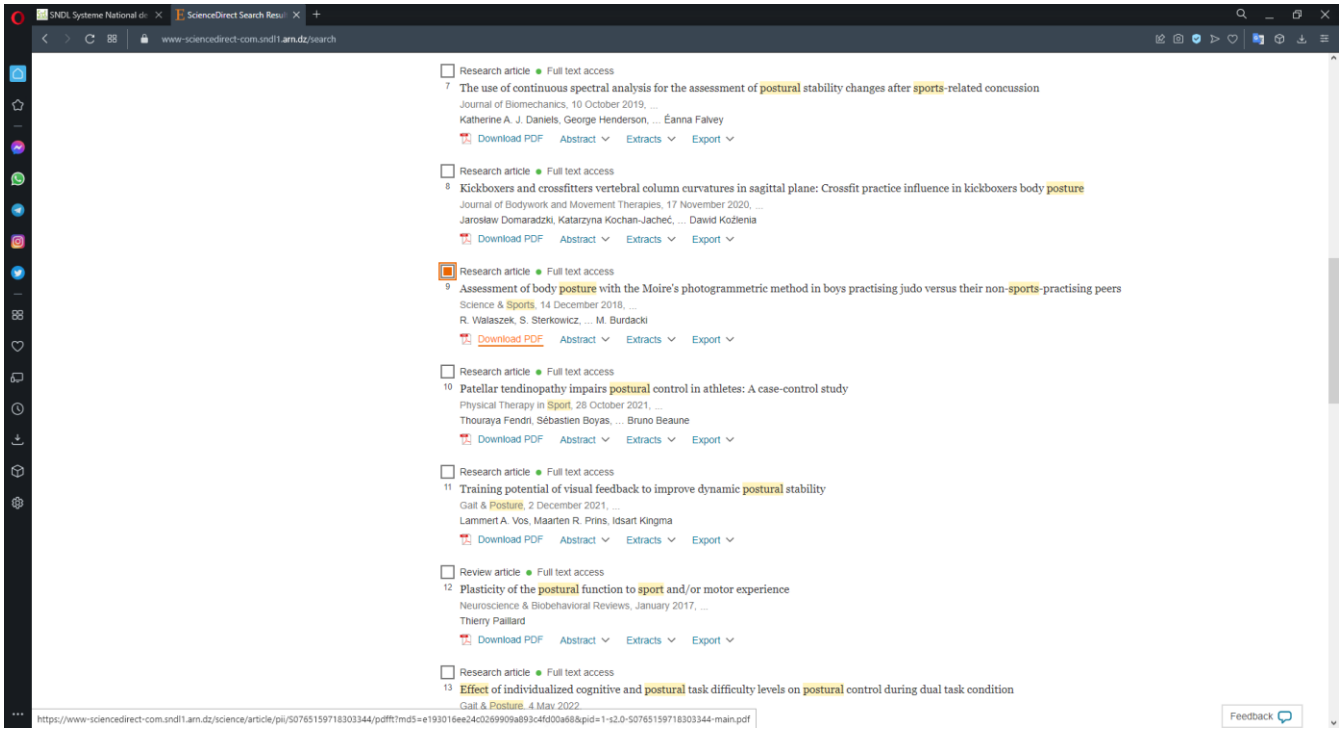


Step 3: Use keywords to start the research.





Step 4: Map the results and select the eligible studies to download.



Journal of Biomechanics, 10 October 2019, ...
Katherine A. J. Daniels, George Henderson, ... Éanna Falvey
Download PDF Abstract Extracts Export

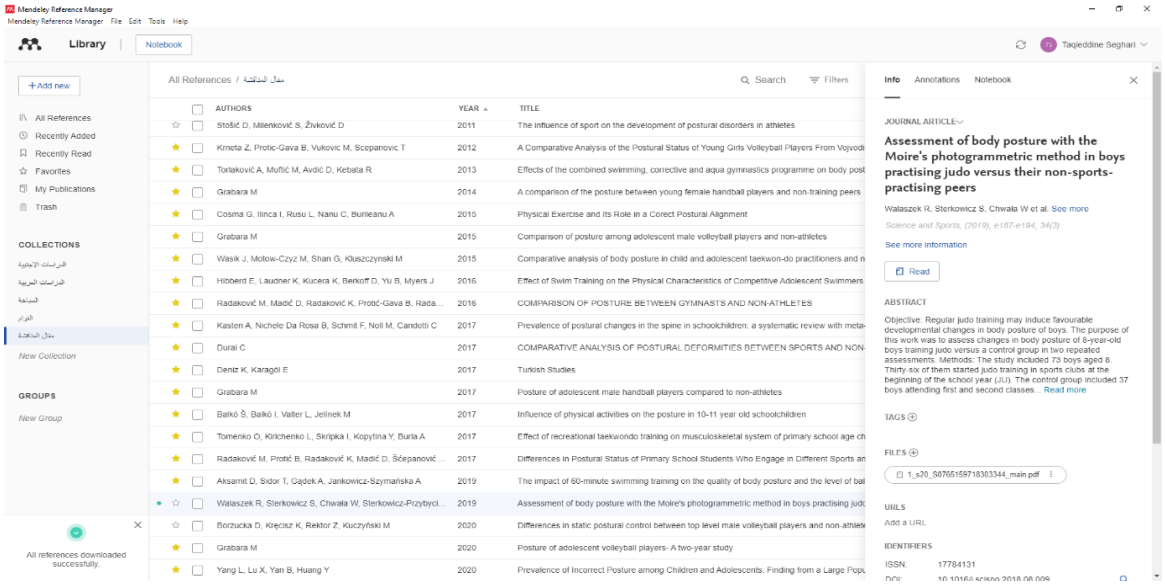
Research article • Full text access
8 Kickboxers and crossfitters vertebral column curvatures in sagittal plane: Crossfit practice influence in kickboxers body posture
Journal of Bodywork and Movement Therapies, 17 November 2020, ...
Jarosław Domaradzki, Katarzyna Kochan-Jacheć, ... Dawid Kożlenia
Download PDF Abstract Extracts Export

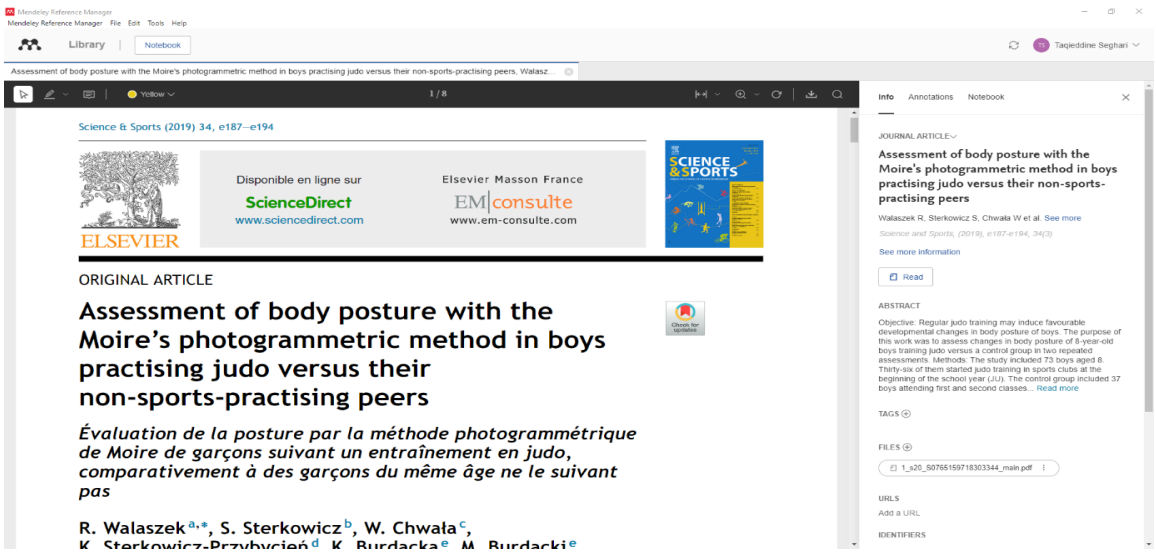
Research article • Full text access
9 Assessment of body posture with the Moire's photogrammetric method in boys practising judo versus their non-sports-practising peers
Science & Sports, 14 December 2018, ...
R. Walaszek, S. Sterkowicz, ... M. Burdacki
Download PDF Abstract Extracts Export

Research article • Full text access
10 Patellar tendinopathy impairs postural control in athletes: A case-control study
Physical Therapy in Sport, 28 October 2021, ...
Thouraya Fendri, Sébastien Boyas, ... Bruno Beaune
Download PDF Abstract Extracts Export

Research article • Full text access
11 Training potential of visual feedback to improve dynamic postural stability
Gait & Posture, 2 December 2021, ...

After downloading the studies, start the second process of collating and uploading into Mendeley.





After that, the screening process will start to evaluate the selected studies.

Appendix II: Data extraction instrument

We used three different (mentioned below) methods to complete this scoping review, and applied the perfect protocol to get the best result and achieve the research goals.

1. The PRISMA extension for scoping reviews: https://prisma-statement.org/Extensions/ScopingReviews
2. JBI data extraction form: https://bmjopen.bmj.com/content/bmjopen/9/7/e029811/DC3/embed/inline-supplementary-material-3.pdf?download=true
3. Arksey and O'Malley framework scoping review: https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-5-69/tables/2