Journal of Physical Education and Sport ® (JPES), Vol. 22 (issue 3), Art 89, pp. 709 - 714, March 2022
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Application of parkour in physical education: agility learning and improvement

DAVID FERNÁNDEZ JUAN[1]; SALVADOR GARCÍA-MARTÍNEZ[2]; VÍCTOR JAVIER SOTOS-MARTÍNEZ[3]; ALBERTO FERRIZ-VALERO[4].
[1]Managing director of Natural Gymnastic, SPAIN
[2]Department of General and Specific Didactics, EDUCAPHYS Research Group, University of Alicante, SPAIN
[3]Department of General and Specific Didactics, University of Alicante, SPAIN
[4]Department of General and Specific Didactics, EDUCAPHYS Research Group, University of Alicante, SPAIN

Published online: March 31, 2022
(Accepted for publication March 15, 2022)
DOI:10.7752/jpes.2022.03089

Abstract
With the passage of time, the rate of students who are overweight and obese has increased, in order to reduce it and increase physical condition, parkour-based content was chosen to produce novelty in classroom. However, it was not known if this type of intervention would improve to a greater extent than methods that were normally used in the subject. Therefore, the purpose of the present study was to investigate the improvement provided by a Didactic Unit based on parkour in student agility compared to a Didactic Unit for team sports, as well as investigating how this improvement depended on gender. So as to clarify this uncertainty, 146 students participated in the study, 67 in team sport group (CON) and 77 in parkour group (EXP). A pre and post intervention agility test was used to evaluate the change provided by the Didactic Units. Results showed a greater significant improvement in the EXP group (p = 0.002) compared to the CON group, suggesting that an intervention through parkour achieves greater agility improvements. In the same line, when the sample was segmented by sex, a greater change was observed in the male EXP group (p = 0.007) compared with CON group, however, no differences were found when comparing female groups (p = 0.099). Therefore, it seems that parkour is a valid method to increase the agility of students in Physical Education in secondary education, getting better improvements than team sports in male gender, although it does not seem to be more favorable than team sports in female gender.
Key Words: secondary school, obesity, gender, traceur, innovation.

Introduction

Over the last few years, the ratio of the child population that presents overweight and obesity has increased, observing percentages greater than 30% (Yáñez-Ortega et al., 2019). This situation is a big problem for current life quality of children and it must be changed for a good lifestyle education since the childhood (Shmyhol et al., 2021). Moreover, overweight and obesity are not the only problem, highlighting associated conditions such as diabetes mellitus, systemic arterial hypertension, heart disease, among others (Hernández-Higareda et al., 2017). The combination of an overweight or obesity situation together with the risk of the appearance of any of the aforementioned conditions can lead to a reduction in the quality of life of children (Barcones-Molero et al., 2018; Cardona-Torres et al., 2018).

In order to alleviate a low quality of life, as well as situations of overweight and obesity, regular physical activity is recommended (Aguilar-Cordero et al., 2021; Serrano, 2018). Therefore, in the Physical Education subject, it has been tried to find new content that could motivate and increase the participation of students in the subject (González-Cutre et al., 2016). Getting an augment in participation with the objective of being able to achieve an improvement at body composition, physical performance and life quality.

With a view to increase student participation and motivation, teachers have begun to integrate innovative content during the last decade, among which parkour stands out. Some authors as Suárez Álvarez and Fernández-Rio (2012) expose parkour as a physical activity based on moving quickly and fluidly overcoming obstacles. While Rotawisky (2013) or Mango et al. (2021) defines it as a discipline in which the body traces and moves in a new way along routes within the city or urban outdoor. To carry out this sport discipline, it is necessary to learn specific techniques to overcome the obstacles that arise (Ferrero Martínez, 2011), so its practice may involve some danger if it is not done or prepared properly (Gavira et al., 2018). Even so, integration of this sport in the educational environment allows to achieve an increase in the basic physical capacities and motivation of the student towards the activity (Montoro Acosta & Baena Extremera, 2015), so its use can be useful, despite the possible risk.

Similarly, the parkour implementation allows to achieve improvements in postural control (Jabnoun et al., 2019), what may be transferable to other sporting contents (Strafford et al., 2018).

Corresponding Author: DAVID FERNÁNDEZ JUAN, E-mail: david@gimnasianatural.org

The postural control acquired during parkour practice becomes more relevant during activities that require high agility, that is, good postural control is necessary to be able to change direction quickly and optimally (Daneshjoo & Raeisi, 2020; Sheppard & Young, 2006; Strafford et al., 2021b). Similarly, agility is a fundamental component that determines success in most sports, as can be seen in soccer (Amiri-Khorasani et al., 2010) or rugby (Green et al., 2011). So it can be assumed that parkour could be an interesting initiative to train agility and lead to greater agility improvements than other sports.

Therefore, the objective of this study is to analyze the effect of the application of a Didactic Unit (DU) with contents from parkour on agility in 1st and 2nd year secondary education students compared to another collective team sport. The hypotheses formulated in the current research are:

- Hypothesis 1 (H_1). Students who receive the DU with parkour content will improve their agility to a greater extent than the group that takes the DU in team sports.
- Hypothesis 2 (H_2). Male students who receive the DU with parkour content will improve their agility to a greater extent than the group that gets the DU in team sports.
- Hypothesis 3 (H_3). Female students who receive the DU with parkour content will improve their agility to a greater extent than the group that gets the DU in team sports.

Materials & methods

Study design

The research was carried out within the context of physical education subject during 20/21 academic course in three educational centers in the province of Alicante (Spain). The present investigation is based on a quasi-experimental design and with a non-equivalent control group (Campbell & Stanley, 1963). To contrast the hypotheses presented, some classes in the subject were assigned to the control group, CON, and other classes to the experimental group, EXP. The class groups were established by the school itself, following general criteria, such as ratio of students by group and sex. The EXP execute the DU of Parkour while the CON conducts a team sport based on Colpboll DU.

Participants

Initially 264 high-school students participated (12-15 years old, 1st and 2nd secondary education). After applying the exclusion criteria, a final sample of 146 students remained (85 boys: 58.22% and 61 girls: 41.78%). These exclusion criteria were: (1) regular attendance of class and being evaluated through an ongoing assessment process, that is 80% of the lessons (CON; n = 12, EXP; n = 14); (2) not completing the pre or post agility test (CON; n = 6, EXP; n = 10) or (3) not improving personal recording on agility test in post-test versus pre-test (CON; n = 52, EXP; n = 24). All participants and legal guardians were informed about the study, they signed the informed consent in accordance with the principles of the Helsinki Declaration (1975). Based on the above, the study was approved by the ethics committee of the University of Alicante (UA-2020-09-02).

Instruments

Agility Test (Figure 1) (Martínez, 2002). It starts from one side of the fence with associated pikes (fence 1), always behind it, for which a line must be drawn in extension to the obstacle line. The participant can choose the side of the fence from which he is going to start, an option that totally reverses the direction in which the obstacles must be passed. In this way, the laterality preferences of each individual are respected. The start is done in the direction of the farthest pike (towards the opposite side from where the start line is) to go around it on the outside.

- Go under the fence: after going around the pike, participant must go to the farthest part of the second fence, to pass under it in the direction of the second pike.
- Lateral jump of the fence: after going around the second pike on the outside, participant goes towards the most remote part of the start fence, then subject borders on that side to jump over it in the direction of the second fence. It should not be forgotten that this fence has limited its upper space due to the presence of the two attached pikes, which cannot be touched when the fence is jumped.
- Front jump of the fence: after passed the start fence laterally, participant must run towards the second fence, which is right in front of us, to surpass it from above without having to change more direction.

The performance assessment in this agility test is achieved through the time invested in performing it. It is a speed race with obstacles, therefore, the agility test has to be timed. To start, the timekeeper uses the cry of "ready" for the runner to get ready, and "now" to indicate the start, at which point the stopwatch is activated. The signal is complemented with the arm up in ready sign and lowering the arm to start. The height of the fence has been adapted from 62 cm to 72 cm for the students in question.

The end of the agility test is marked by the jump over the second fence, and the timer stops when the runner makes contact with the ground after the jump, assessing the time obtained in seconds and tenths of a second (dependent variable study). The participant is allowed to do two attempts, in case participant commits an infraction in the first one. If both are executed correctly the best time of the two attempts is chosen. In this sense, it is considered a fault in those attempts in which the participant: starts ahead of time, moves or throws a pike or fence, does not take the stipulated route or do the same exercise by walking, reluctantly or without showing

effort. The pre-test and post-test sessions followed the same structure so as to all students started from the same conditions at both data collection points. On the one hand, a general warm-up of 5 min: jogging and joint mobility, plus a specific warm-up of another 3-4 minutes (speed). On the other hand, while waiting, another circuit was enabled to carry out a familiarization of the circuit, only one attempt per student, in order of list, 10 minutes before the final.

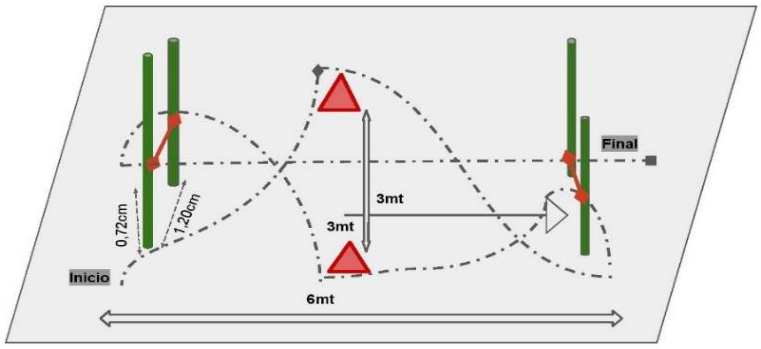

Figure 1
Original Agility Test adapted from Martinez (2002)

Process

Prior to the development of the study, three teachers (one per educational center), obtained a 24-hour training based on parkour applied to the teaching of Physical Education. The training course began on September 14 and ended on October 7, 2020. The contents developed in the course were: Natural gymnastics method: fundamentals and families of movement; The virtues of physical activity without the cons of specialization; Routines to exercise the whole body, enjoying and with awareness; Tools for students to integrate physical activity; The importance of nature, the immediate environment and public space and Values of non-competition and solidarity for optimal performance. More information in:

(http://cefire.edu.gva.es/sfp/index.php?seccion=edicion&id=8762140).

The current study was carried out in five weeks (October and November). The first day, the agility test (Pre-test) was carried out in all the groups to proceed to the intervention of the Didactic Units of each group, ending with the agility test at the end (Post-test).

Statistical Analyses

According to the text of Faul et al. (2007) the statistical power of the data was calculated with the free software G*Power (Ver. 3.1.9.6, University of Dusseldorf, Germany). The sample size, 146 participants, with an estimated average effect size (0.5), and a significance of 95%, achieve a power of 0.99.

Statistical software SPSS 24.0 was used to perform the analyses. Descriptive statistics were calculated for each factor (mean and standard deviation). Shaphiro-Wilk test for normality was carried out, with normal distributions being obtained in all cases (p>0.05).

The paired t-test was used to prove the effect of the intervention within the group (pre-post). The effect size was also calculated with Microsoft Excel software (Dominguez-Lara, 2018). This order of magnitude was considered small for values between 0.1-0.3, medium for 0.3-0.5, and large for values greater than 0.5 (Cohen, 1988; Coolican, 2009). To test the hypothesis, a mixed repeated measures analysis of variance model (ANOVA 2x2) was used when identifying pre-post differences to make the analysis robust. Time (pre- and post-intervention) was the within-subject factor, while group (control vs. experimental) was the between-subject factor. Finally, a 95% confidence interval was calculated for the differences and the significance value was set at $p < 0.05$.

Results

Baseline Differences

At pre-test, both groups presented similar starting values regarding the research variables. No significant differences were found among treatment groups based on sex (male, t = 0.891; p = 0.376; female; t = 0.462; p = 0.646).

Agility test performance

All treatment groups improved their performance in the agility test compared to the pre-test after the didactic intervention, in both men and women (Table 1). Despite this, if the difference in improvement of the treatment groups is carefully observed, the EXP group obtained a significantly greater improvement than the CON group.

Table 1
Descriptive data (average ± standard deviation) and paired t-test results.

Sex	Group	Average (time) ± SD		Paired t-test			CI 95%	
		Pre-test	Post-test	T	Sig.	ES	Inf	Sup
Male	EXP (n=47)	13.48 ± 1.36	10.68 ± 1.20	23.218	<0.001	3.386	2,55	3,04
	CON (n=38)	13.17 ± 1.80	12.78 ± 1.69	9.793	<0.001	1.588	0,30	0,46
Female	EXP (n=31)	14.37 ± 2.14	12.11 ± 1.77	13.995	<0.001	2.513	1,93	2,59
	CON (n=30)	14.15 ± 1.56	13.85 ± 1.65	5.514	<0.001	1.006	0,18	0,40

SD=Standard deviation; ES=Effect size; Av=Average; Sig=Signification, CI=Confidence Index, Inf=Inferior; Sup=Superior

Final differences

At post-test, the EXP group showed significantly lower values (higher test performance) than the CON group (Figure 2), both in boys (t = -6.434; p <0.001; ES = 0.697) and girls (t = -3.960; p <0.001; ES = 0.507).

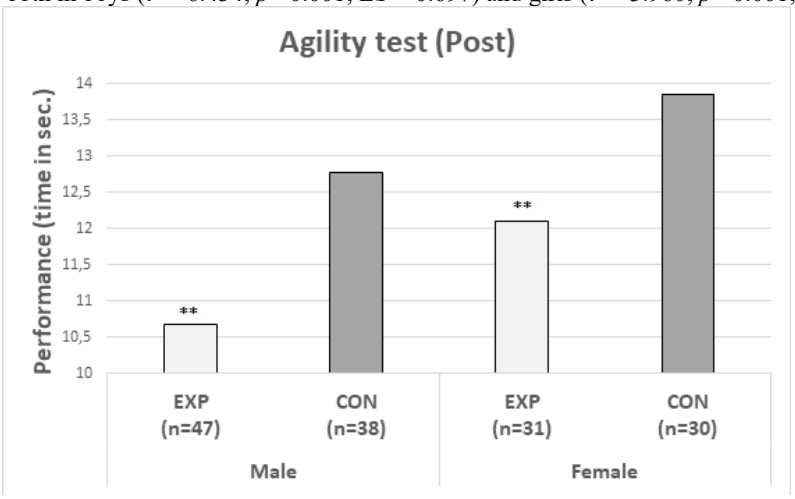

Figure 2
*Chart of bars representative of final differences between groups (EXP vs CON). ** = significant change.*

Hypothesis Testing

An interaction effect (Time x Treatment) was found for Agility test performance. That is, the EXP group decreased significantly more in this variable after the intervention compared to the control group (F(1) = 9.994, p = 0.002; η^2_p = 0.065). Thus, H1 was supported. However, an interaction effect (Time x Treatment) was found for Agility test performance in males (F(1) = 7.644, p = 0.007; η^2_p = 0.084) but not in females (F(1) = 2.809, p = 0.099; η^2_p = 0.045). So, H2 was supported but H3 was not.

Discussion

In the present study it has been tried to observe the impact of a DU based on parkour content on the agility of the students as the first objective. The second objective was to compare the changes obtained between a DU with parkour content and a DU with team sports content (Colpboll). While the third objective was based on comparing the changes obtained segmented by genders between a DU with parkour content and a DU with team sports content.

Only one previous study has evaluated the agility change caused by the practice of parkour, obtaining a positive relationship between plyometric training, usually used in parkour training, and the improvement of agility (Daneshjoo & Raeisi, 2020). In addition, in parkour, one of the greatest performance premises is agility, as is observed by Abellán-Aynés and Alacid (2016) and Strafford et al. (2021), the speed of completing a parkour route depends to a large extent on the agility of the athlete, obtaining higher agility values in the highest performing athletes. Therefore, the increase in agility is supported through parkour training.

The results support hypothesis 1 (H1), this is due to the fact that the DU proposal based on parkour for the EXP group achieved a significant increase in the agility variable greater than in the CON group. These results agree with the data presented by Edriss (2019), showing the implementation of a parkour program achieved improvements in variables of speed, acceleration and displacement in team sports players, which are highly related to agility. As well as, the proposals of Strafford et al. (2018, 2021) by exposing team sports can be benefited from the introduction of parkour training, in this way it would increase the performance possibilities in this type of athletes.

In parallel, hypothesis 2 (H2) is also accepted, showing a significant difference in the results after the intervention between the EXP and CON groups. As can be seen in Table 1, a greater time reduction is shown for the EXP group than for the CON group. It is logical to think the male population of the study would have favorable differences in the EXP group, as it has been previously exposed by Edriss (2019) or Strafford et al. (2021a), who interviewed various team sports coaches and obtain positive opinions to the inclusion of parkour as a method of training and improvement in these sports. However, the female population of the present study does not show differences between the EXP and CON groups. This may be due to a lower motivation to participate in this type of tests, comparing with boys, due to stereotypes and social aspects that decrease the desire of participation of this group (Moreno-Murcia et al., 2006; Sagarzazu Olaizola & Lallana Del Rio, 2012). Therefore, H3 cannot be accepted.

Conclusion

New contents offered by parkour in Physical Education sessions seem to be sufficient to achieve improvements in the individual's physical condition and obesity. As can be seen in the present study, the introduction of content based on parkour achieves greater improvements in agility than the practice of team sports content (Colpboll). In fact, when it is observed segmented by gender, it is showed how male students obtain greater agility improvements through parkour. However, no differences in agility gain were found among females between the groups. This means that a proposal for a Didactic Unit based on parkour causes greater improvements in agility than the practice of team sports for male gender. Moreover, it causes improvements for female gender, although they are not greater than sport team Unit. Therefore, parkour can be used as a newer and more optimal type of training to improve student agility. Nevertheless, further studies could investigate deeper how parkour training affects agility and why female gender did not show any change.

Conflicts of interest - None

References

Abellán-Aynés, O., & Alacid, F. (2016). Anthropometric profile, physical fitness and differences between performance level of Parkour practitioners. *Archivos de Medicina Del Deporte*, *33*(5), 312–316.

Aguilar-Cordero, M. J., León-Ríos, X. A., Rojas-Carvajal, A. M., Latorre-García, J., Pérez Castillo, Í. M., & Sánchez-López, A. M. (2021). Effects of physical activity on quality of life in overweight and obese children. *Nutricion Hospitalaria*, *38*(4), 736–741. https://doi.org/10.20960/nh.03373

Amiri-Khorasani, M., Sahebozamani, M., Tabrizi, K. G., & Yusof, A. B. (2010). Acute Effect of Different Stretching on Illinois Agility Test in Soccer Players. *Journal of Strength and Conditioning Research*, *24*(10), 2698–2704. https://doi.org/10.1519/JSC.0b013e3181bf049c

Barcones-Molero, M. F., Sánchez-Villegas, A., Martínez-González, M. A., Bes-Rastrollo, M., Martínez-Urbistondo, M., Santabárbara, J., & Martínez, J. A. (2018). The influence of obesity and weight gain on quality of life according to the SF-36 for individuals of the dynamic follow-up cohort of the University of Navarra. *Revista Clinica Espanola*, *218*(8), 408–416. https://doi.org/10.1016/j.rce.2018.05.005

Campbell, D. T. & Stanley, J. C. (1966). Experimental and quasi-experimental designs for research. Rand McNally.

Cardona-Torres, L. M., Centeno-Reséndiz, J. V., & Álvarez-Hernández, A. (2018). Health quality related with life: perception of obese and non-obese adolescents and their parents [in Spanish]. *Revista de Enfermería Del Instituto Mexicano Del Seguro Social*, *26*(2), 121–128.

Cohen, J. (1988). *Statistical Power Analysis For The Behavioral Sciences*. Routledge.

Coolican, H. (2009). *Research methods and statistics in psychology*. Hooder.

Daneshjoo, A., & Raeisi, S. (2020). Effect of Eight Weeks Plyometric Training on Some Kinematic Parameters, Horizontal Jumping Power, Agility, and Body Composition in Elite Parkour Athletes. *Journal of Sport Biomechanics*, *6*(1), 54–65. https://doi.org/10.32598/biomechanics.6.1.1

Dominguez-Lara, S. (2018). Effect size, a quick guide. *Educación Médica*, *19*(4), 251–254. https://doi.org/10.1016/j.edumed.2017.07.002

Edriss, S. (2019). Implementations of Tacto Software for Analysing Athletic Effects of Parkour on Youth Football Player's Performance. *LASE Journal of Sport Science*, *10*(1), 63–73. www.alemande.lv

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/175-191.10.3758/bf03193146

Ferrero Martínez, C. J. (2011). Rediscovering the body through the city, rediscovering the city through the body. *Encrucijadas. Revista Crítica de Ciencias Sociales*, *2*, 105–114.

Gavira, J. F., Llerena, A. M., Nicaise, D. M., & García, E. P. (2018). Risk perception evaluation in parents and/or guardians of a group of beginner traceurs before and after parkour practice. *Journal of Physical Education and Sport*, *18*(2), 695–702. https://doi.org/10.7752/jpes.2018.02101

González-Cutre, D., Sicilia, A., Sierra, A. C., Ferriz, R., & Hagger, M. S. (2016). Understanding the need for novelty from the perspective of self-determination theory. *Personality and Individual Differences*, *102*,

159–169. https://doi.org/10.1016/j.paid.2016.06.036

Green, B. S., Blake, C., & Caulfield, B. M. (2011). A valid field test protocol of linear speed and agility in rugby union. *Journal of Strength and Conditioning Research*, *25*(5), 1256–1262. https://doi.org/10.1519/JSC.0b013e3181d8598b

Hernández-Higareda, S., Pérez-Pérez, O. A., Balderas-Peña, L. M. A., Martínez-Herrera, B. E., Salcedo-Rocha, A. L., & Ramírez-Conchas, R. E. (2017). Maternal metabolic diseases associated with overweight and pre-pregnancy obesity in Mexican women with high-risk. *Cirugia y Cirujanos (English Edition)*, *85*(4), 292–298. https://doi.org/10.1016/j.circir.2016.10.004

Jabnoun, S., Borji, R., & Sahli, S. (2019). Postural control of Parkour athletes compared to recreationally active subjects under different sensory manipulations: A pilot study. *European Journal of Sport Science*, *19*(4), 461–470. https://doi.org/10.1080/17461391.2018.1527948

Mango, P., Castaldo, F. B., & Calefato, A. (2021). Parkour – a bridge between motor activities and live-ability practices in the urban jungle. *Journal of Physical Education and Sport*, *21*(1), 600–605. https://doi.org/10.7752/jpes.2021.s1069

Martínez López, E.J. (2002). Physical Fitness Tests [in Spanish]. Barcelona, Paidotribo

Montoro Acosta, S., & Baena Extremera, A. (2015). A new content in the area of Physical Education. Parkour [in Spanish]. *EmásF: Revista Digital de Educación Física*, *37*, 106–124. https://doi.org/10.22380/2539472X63

Moreno-Murcia, J. A., Martínez-Galindo, C., & Alonso-Villodre, N. (2006). Gender and attitudes toward the practice of physical activity and sport. *RICYDE. Revista Internacional de Ciencias Del Deporte*, *2*(3), 20–43. https://doi.org/10.5232/ricyde2006.00302

Rotawisky, J. L. (2013). Parkour, tracing bodies - Urban heterotopias [in Spanish]. *Revista Colombiana de Antropología*, *49*(2), 41–61.

Sagarzazu Olaizola, I., & Lallana Del Rio, I. (2012). The Influence On Traditional Gender Stereotypes In Sports Participation Of Women And Their Reproduction [in Spanish]. *I Congreso Internacional de Comunicación y Género*, 2033–2047.

Serrano, J. A. (2018). Child and youth obesity [in Spanish]. *Revista de l'Institut d'Estudis Superiors de La Família*, *4*, 36–47.

Sheppard, J. M., & Young, W. B. (2006). Agility literature review: Classifications, training and testing. *Journal of Sports Sciences*, *24*(9), 919–932. https://doi.org/10.1080/02640410500457109

Shmyhol, I., Hrytsai, N., & Onipko, V. (2021). Problems of overweight and obesity among students at general secondary educational institutions. *Journal of Physical Education and Sport*, *21*(5), 2901–2907. https://doi.org/10.7752/jpes.2021.s5385

Strafford, B. W., Davids, K., North, J. S., & Stone, J. A. (2021a). Effects of functional movement skills on parkour speed-run performance. *European Journal of Sport Science*, 1–9. https://doi.org/10.1080/17461391.2021.1891295

Strafford, B. W., Davids, K., North, J. S., & Stone, J. A. (2021b). Exploring coach perceptions of Parkour-style training for athlete learning and development in team sports. *Journal of Motor Learning and Development*, 1–23. https://doi.org/https://doi.org/10.1123/jmld.2021-0005

Strafford, B. W., van der Steen, P., Davids, K., & Stone, J. A. (2018). Parkour as a Donor Sport for Athletic Development in Youth Team Sports: Insights Through an Ecological Dynamics Lens. *Sports Medicine - Open*, *4*, 21–27. https://doi.org/10.1186/s40798-018-0132-5

Suárez Álvarez, C., & Fernández-Rio, J. (2012). Pakour in School [in Spanish]. In *Lulu.com* (pp. 30–31).

Yáñez-Ortega, J. L., Arrieta-Cerdán, E., Lozano-Alonso, J. E., Gil Costa, M., Gutiérrez-Araus, A. M., Cordero-Guevara, J. A., Vega Alonso, T., Carramiñana-Martinez, I., Álamo Sanz, R., Varela Rodriguez, C., & Mateos-Cachorro, A. (2019). Prevalence of overweight and obesity in child population. A study of a cohort in Castile and Leon, Spain. *Endocrinologia, Diabetes y Nutricion*, *66*(3), 173–180. https://doi.org/10.1016/j.endinu.2018.10.004