

Parks Design and Environmental Health and Safety: The Degree of Compliance with Standards

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ABSTRACT

Background: Parks are one of the indicators of improving the quality and living space. Therefore, in order to improve their safety and health, standards must be met. Thus, this study aimed to evaluate the safety of parks and some of the provided game amenities, sanitation, environment and their compliance with existing standards, as well as the satisfaction of visitors of district and regional parks in the ten districts of Shiraz municipality.

Methods: A total of 18 district and regional parks were surveyed. Evaluation was conducted through interviews and questions, checklists and field visits were completed and necessary data were collected. In addition, 270 people were surveyed and interviewed to assess their satisfaction with the sites. Finally, the collected data were analyzed by SPSS software.

Findings: The mean safety index for regional and district parks was 91.64% and 91.61% respectively, and the average score of the health sector of these parks was almost the same. Also, the health level was lower than the environmental level. In addition, it was found that, the district III municipality has the highest level of visitors' satisfaction and the area VII municipality has the lowest level of visitors' satisfaction.

Conclusion: Playground equipment should always be monitored by managers for possible risks. Therefore, according to the children's need for play equipment and their vulnerability to hazards, play equipment should be prioritized for equipment optimization. The results of the study of health and environmental issues showed that the health status of regional and district parks is lower than environmental variables which can be attributed to the lack of periodic monitoring of the parks health status.

Keywords: safety, health, environment, park, playground

INTRODUCTION

In present world, more than half of the world's population lives in cities in and this number is growing.[1] Parks and urban green spaces are one of the most important factors in shaping social sustainability and are considered as one of the indicators of community development and quality improvement and living space, perhaps that is why one of the criteria for assessing the quality of the environment of any city is the existence of parks and public green space.[2-4] Parks are valuable resources in social, economic and ecological terms.[5, 6] Inspection of park environments is important to understand their impact on physical activity and health. Physical activity is one of the most important social issues.[5] Parks are known as important environmental resources for physical activity.[5, 7] Participating in regular physical activity is an important factor in preventing obesity and maintaining public health along with many other benefits such as increasing mental alertness, reducing stress and depression. Lack of physical activity contributes to obesity and is a risk factor for chronic diseases and health problems such as diabetes, colon and breast cancer, osteoporosis, cardiovascular diseases and short life.[7-9] Parks, playgrounds and other open spaces provide a good opportunity for people to participate in low-cost and free physical activity, followed by a more active lifestyle.[7, 8] According to a study by Hilal Et al.(2012), 31.3% of adults (15 years and older) are physically inactive and do not engage in physical activity.[7] Well-designed and well-received parks provide a good environment for social interaction. But this valuable capital can lose its functional value due to the becoming unsafe. Maintenance

of the parks and equipment safety are key element to community health and are directly related to the rate of their use.[10] Today, various factors such as problems of urban life, safety, security and inadequacy of the required facilities have reduced the trend of using these places. Due to the fact that a large population of people with different cultural, economic, social and health conditions refer to these places and as the possibility of transmission and spread of diseases in these places, the importance of safety issues and environmental pollution in them, observance of health, safety and environmental standards in all these urban spaces is essential.[11] Green spaces as an essential part of the cities play an important role in the desired performance and comfort of people.[12-15] According to this, the lack of green space and natural environment with suitable quality, can cause serious disruptions in urban life and the quality of living conditions, and this is increasingly important for children and especially their play spaces as an important part of human society.[16] Urban public spaces are among the environments that children in particular and others in general interact with. On the other hand, green spaces and playgrounds in cities create a platform for participation between children and other age groups in the community, so securing playgrounds and parks seems necessary.[4] In fact, the optimal use of recreational spaces of the parks is literally formed and public space user can benefit from beauties created in the parks with peace of mind when they feel safe in that place.[4]

On the other hand, in the citizens' opinion, a good park is the one that is safe, clean and beautiful and more

importantly, it is a place where they meet each other. This communication is formed with peace of mind when there is a sense of safety in the parks, and the lack of this issue is one of the park's repulsion factors.[17-19] The topic of safety is one of the most important issues that can be seriously considered in the field of design, implementation, management and maintenance before accidents occur. Safety in parks and the equipment and services provided in them must be fully considered. Electrical installations and the possibility of connecting electricity to lighting poles due to irrigation, unauthorized entry of motorcyclists, possible dangers of recreational equipment such as electric carousels, children's swings and slides, the existence of dangerous surface differences in the park's sidewalks, existence of play equipment with sharp and dangerous angles and extras, lack of proper floor cover, use of electric wired lamps without safety considerations in the parks' fountain, lack of relief facilities, hygienic quality of food in park buffets, etc. should always be carefully and obsessively monitored and controlled by public green space managers as a necessity.[4, 20-22] At the same time, safety refers to the set of factors and conditions that prevent the occurrence of accidents and physical and life injuries, along with creating a sense of comfort and convenience in using the facilities and services of parks by users.[21] The important role of play and its necessity in physical, emotional, mental and intellectual, psychosocial development, creating social and moral behavioral patterns and promoting children's health has long been known.[23-26] Playgrounds are ideal for outdoor activities.[23] Outdoor play provides more opportunities such as cycling, rock climbing, using outdoor space, interaction with nature, experience and testing of individual physical abilities than indoor games.[26] While parks and playgrounds providing an enjoyable environment, they are places to develop physical, mental, social, emotional and creative skills needed for children's lives through the practice of respectful and fair methods for resolving disputes and conflicts, problem-solving ability, separation relevant and irrelevant information, communication with peers, promoting creativity and performing activities that include strategy and planning to achieve a goal.[23-25, 27]

According to Zinger (2002) playgrounds are an informal learning environment for social learning. Betsy (2001) and White (2008) also state that these places are environments where children can explore themselves and their world, develop their social skills, experience acceptance or rejected by their peers, cooperation and communication or trying to maintain friendships.[23] With all these benefits, we cannot ignore the dangers and risks in urban parks. If parks and playgrounds fail to provide safety, all of these benefits and functions will be problematic for visitors and will be affected.[23, 24, 26, 28] In a study conducted by Jafari et al. (2010) with the aim of investigating the safety of children in the playgrounds of urban parks in Tehran, more than 68% of playground equipment can cause hazards and injuries to children. Lack of care and maintenance of park equipment has caused the dangers of moving, running and walking on the flooring installed in playgrounds.[29] According to the US Consumer Product Safety Commission, there were approximately 190,000 child injuries on public playgrounds

in 2001 and they were so serious that they needed to go to the emergency room. Also, by average of 17 children die each year while playing in parks and playgrounds, most of which are due to head injuries following falls and suffocation or being caught in equipment straps and ropes[24, 30] and more than 35,000 children are treated annually for injuries caused by playground equipment in U.S. hospital emergency departments, and the cost of treatment and care for these injuries based on data collected and estimated by the U.S. Consumer Safety Commission in 2000, was about \$ 7.5 billion.[30] Data from that study by the Consumer Safety Commission show that 41% of these injuries are fractures.[30] Also, according to the 2008 statistics of the Greek Center for Research and Prevention of Injuries among Youth (CEREPR), 777 playground accidents occurred during the year in Athens.[23] Playground injuries are one of the leading causes of unintentional injuries to children under 14 in the United States.[31] For this reason, the issue of safety in public spaces, especially urban parks, from an individual, social and economic point of view is of special importance, so that it should be on the agenda of city planners and officials as a necessity.[28] Improving the level of safety and securing the mentioned spaces requires compliance with safety standards. In many countries, safety standards have been developed as a means of promoting safety with the aim of preventing serious injury and reducing the percentage of danger in parks and playgrounds (ASTM, 1993; British Standards Institution, 1986; Canadian Standards Association, 1990; Durval, 2000; Australian Standards Association, 1981; New Zealand Standards Association, 1986, etc.).[23, 25] These standards include some values and recommendations regarding the safe design, installation and maintenance of parks, playgrounds and equipment to reduce the risk of injury.[25] Specifically, there are standards related to the maximum height of the fall and the bottom of the equipment in order to reduce the risk of falling[27]. It has been shown that adhering to playground safety standards has many benefits.[27] It is worth mentioning that the National Standard Organization of Iran has also prepared and compiled instructions in this regard.[32-35] Despite this, a special organization in Iran periodically and regularly does not monitor the safety and health of parks and playgrounds. Also with some different organizations such as municipal green space, environment, standard office and also the existence of standards for the safety of parks and playground equipment, health and environmental status; accidents and problems from the mentioned aspects are observed for the users of these spaces. Therefore, according to the reasons mentioned and the need to study the safety of parks, especially in the field of children who are vulnerable, this study aims to assess the safety of parks and some facilities provided play, health, environment and their compliance with existing standards and also, the satisfaction of the visitors of the regional and district parks of Shiraz has been studied, through which the maintenance of the environment and the health of the users of the parks will be taken into consideration too. The reason for choosing this type of parks was that the parks differ in size, type and performance[36]. Therefore, in this study, considering the extent of parks, two types of regional and district parks

were selected to investigate their current situation. Given that 90% of playground injuries occur, are associated with play equipment. [37] In order to check the safety of play equipment, due to the limitations of these devices in different parks, devices that were present in all parks had to be examined. For this reason, two devices, swing and slide, which are the most common gaming devices, were considered, and in the relevant checklist, parameters such as no fatigue, height, safety protection, etc. have been considered. Therefore, according to the foregoing, the purpose of this study was to investigate the safety of playgrounds, play equipment, health, environment and the level of satisfaction of visitors of regional and district parks in the ten districts of Shiraz Municipality.

MATERIALS AND METHODS

The present study was conducted to evaluate the safety status of Shiraz city parks and some of their equipment such as playgrounds and the level of visitors' satisfaction and their health and environmental conditions. This is a descriptive-analytical study in which two types of regional and district parks were evaluated according to the area, number of clients and type of equipment. In this study, it was found that there are a total of 55 regional and district parks in the ten districts of Shiraz Municipality. According to statistical methods, a total of 18 parks were selected as a sample by purposive or available sampling with 95% confidence level. The dispersion of the samples was such that in each municipal district, one regional park and one district park were examined, but two districts, 8 and 9, did not have a regional park. In this study, evaluation was done through interviews and questions, completion of checklists and field visits and existing standards. The checklist related to the evaluation of the safety of play equipment was designed and reviewed according to the standard 6204-4 (safety of toys - part 4: swings, slides and similar activity toys for indoor and outdoor family domestic use-safety requirements and test methods) of the Iranian National Standard Organization.[38] To check the health and environment in regional and district parks, a number of important criteria such as vegetation, trash, used toxins, attention to the health status of employees, etc. are selected and then checklists accordingly in the health section (8 questions) with a maximum score of 24 and the environment section (9 questions) with a maximum score of 27 was designed. The answers in this section were considered qualitatively in three categories: good, moderate and poor, and the scores for these answers were calculated as 3, 2 and 1, respectively. In the general section of playground safety, 27 questions with a maximum score of 54 and the slide safety section with 5 questions with a maximum score of 10 and swing safety with 4 questions with a maximum score of 8 were designed and scored. Due to the fact that swings and slides were common play equipment in all parks in the city, these two devices were selected and examined. In some of the sections, some questions could not be examined due to limitations such as the lack of cooperation between the guards and the executive officials of the park. Thus, in statistical analyzes, a safety realization index was defined and calculated. The general safety and security of the game equipment were scored as follows:

Safety realization index = $(A*2+B/T-NA)*100$

A: Number of "yes" answers

B: Number of "uncompleted" responses

T: Total number of questions

NA: Number of "unusable" answers

For a total of 18 selected regional and district parks, the average score of health and environment was calculated and the results were compared. Also, in the general section of safety and safety of play equipment, their index was calculated and evaluated.

The satisfaction of the clients was assessed by preparing and completing a questionnaire in the field, in which 15 questionnaires and a total of 270 questionnaires were distributed in each park, and people of different ages, men and women, cooperated in completing it. In the client satisfaction section, the sample size was determined to be 270 by the Cochran method, and 15 questionnaires were completed in each park. The questions were designed in such a way that initially the personal characteristics (age, gender, etc.) were included. Then, questions related to the park, such as satisfaction with the safety of existing play equipment, accident experience for people, etc. were designed. Visitors' satisfaction was calculated using a questionnaire and designing 10 questions, according to the two answers "yes" and "no". After collecting and extracting the questionnaire information, in the visitors' satisfaction section, data analysis was performed by T-test in SPSS. Statistical tests usually use the Mann-Whitney test for samples less than 30 and the T-test for samples greater than 30. Therefore, Mann-Whitney test was used for statistical analysis of 18 samples of the park and T-test was used for 270 samples of visitor satisfaction questionnaire.

Findings: In this study, 18 regional and district parks were evaluated. From a safety point of view, the average safety index for regional parks was 91.64% and for district parks was 91.61%. The highest and lowest safety indexes of district parks were 100% for Khaldabrin Park and 70% for Kuhpayeh and Entezar II parks and these values for regional parks were 100% for Abuzar Park and 87% for Hijab Park. After examining the safety status of playgrounds in the parks, it was found that the mean, maximum and minimum safety index values in regional and district parks were 64.4%, 87%, 57%, 69.96%, 91% and 48% respectively. Also, the comparison of this index between the mentioned parks showed that there was no significant relationship. However, this comparison showed that the median playground safety index in district parks is slightly higher than in regional parks. It should also be noted that there is a significant relationship between the general safety of playgrounds and parks and the safety of playground equipment such as slides (Table 1). During the study of the two other parameters of the health and environment of these parks, the average scores of the health section of the regional and district parks were almost the same and the observed difference was slight. Table (2) shows the health and environmental status of the studied parks. Some of the hazards related to play equipment in the parks under study are shown in Figures (1 and 2). Furthermore, figure(3) shows a health and safety tip problem.

Table 1. Relationship between general playground safety and playground equipment safety (slide) in regional and district parks

		General playground safety	Playground equipment safety (slide)
General playground safety	correlation coefficient	1	0.788
	Sig (2-tailed)	-	0.001
Playground equipment safety (slide)	The correlation coefficient	0.788	1
	Sig (2-tailed)	0.001	-

Table 2. Health and environmental status in regional and district parks

Parameter under investigation	Type of park	mean	Standard deviation
Health status	district	18.30	2.21
	regional	19.37	3.58
the environment	district	23.30	3.56
	regional	22.50	3.58

Table 3. Overall satisfaction of visitors of the parks in different areas of the municipality

Municipal areas	Average level of satisfaction	Standard deviation
1	8.10	1.32
2	8.83	1.01
3	9	0.98
4	8.87	0.99
5	8.20	1.44
6	8.03	1.29
7	7.76	1.35
8	8.86	1.18
9	8.13	1.12
10	7.53	1.25
Total	8.31	1.29

In addition, the average satisfaction of visitors of regional and district parks was almost the same, although this factor was similar between both men and women. Also, there was no significant relationship between age and job parameters with the level of satisfaction of visitors of the studied parks ($p\text{-value} > 0.05$). Meanwhile, in the evaluation of the level of people's satisfaction of the parks in the ten districts of Shiraz Municipality, it was determined that the parks of District 3 of the municipality have the highest satisfaction and District 7 of the municipality has the lowest level of satisfaction from the visitors' point of view. In general, there was a relatively good level of satisfaction of regional and district parks in Shiraz. The overall satisfaction of visitors of the parks in different areas is given in Table (3).



Figure 1. Lack of proper flooring in children's playground

* This image is related to one of the studied parks. In the playground, in addition to not having a slide seat belt, the floor is worn out and uneven, there is no color, contrast and sufficient amount of light, inappropriate flooring has been used in case children fall on it can cause stumbling and severe injuries in children.



Figure 2. Lack of suitable stairs for slide

* Above picture, shows one of the slides in the playground of one of the studied parks. Lack of proper stair tread, improper stair rise, no hand hold, unsafe connection of stair treads only with chains that do not have the required stability, does not have the necessary safety for children.



Figure 3. Improper first aid box

"No first aid kit can be seen in this box for health and safety emergencies.

DISCUSSION AND CONCLUSION

In this study and the results of the assessment of the safety status of regional and district parks in the ten districts of Shiraz Municipality showed that among the regional parks, Khoudebarin Park is the best and Entezar II and Kouhpayeh have the worst conditions and Abuzar Park is the best and Hijab Park has the worst safety situation as district parks. According to the analysis performed with the help of statistical tests, the averages of safety realization index were calculated to be 69.96% and 64.4%, respectively, and it seems that the safety status of regional and district parks in Shiraz is at a moderate level. It seems necessary to take the required measures in the cases under consideration, such as installing a warning strip around the site of the construction operation, installing signboards and warning signs, providing relief facilities, and conducting periodic inspections. As observed in the study findings, there is no significant difference between the safety level of regional and district parks, which can be attributed to the provision of similar facilities by the municipality and contractors in the parks. In the study of the safety status of playground equipment, two swing and slide devices as common equipment that are present in most types of parks were also examined. The lowest safety score of playground equipment in regional parks, was allocated to Alavi parks, Namaz and Entezar II and the highest score was allocated to Irani and Khoudebarin parks. It was also found that the best condition of the mentioned parameter for regional parks is related to Razavi Park and the worst condition is referred to Morvarid, Jamaran, Fazilat and Abuzar parks. But the sum of reviews showed that in this regard, the safety of parks is assessed at a desirable level. However, due to the potential dangers, these two playing devices must always be monitored and controlled by managers. Therefore, due to the need of children for these play equipment and their vulnerability, in order to prevent dangers such as falling when slipping or falling

from the swing due to lack of belt or loose connections, these two play equipment should be given priority in equipment optimization. Some of the hazards related to play equipment in the parks under study are shown in Figures (1 and 2), including the unevenness of the playground floor, insufficient contrast on the floor, lack of handles and guardrails next to the stairs of slides, improper width and appearance of stairs, unsafe and unsteady connection of stairs, etc. that can lead to injuries such as falls, stumbling, twisting feet. It is noteworthy that according to the studies in Table (1), there is a correlation between playground safety and slide safety, which shows that with the increase in the safety of parks in the field of safety, the results are clear. The higher the safety of the playground, the higher the standard of the slides. The results of health and environmental issues of regional and district parks in Shiraz (table.2) showed that the health status with an average of 19.37 in regional parks and 18.30 in district parks is allocated at a lower level than the environmental variable with an average of 22.5 in regional parks and 23.5 in district parks. The reason for this can be attributed to the lack of a periodic inspection of the health status of the parks. It is possible to improve the level of health and environment of parks by preparing checklists, instructions and executive methods in the field of health and environment according to national and international standards and requirements. The culture promotion by municipality and the media can also be effective. Usually in park spaces, the presence of gardeners and other people who are responsible for cleaning and caring for the environment can be observed. This issue can be effective in increasing the environmental quality of parks in terms of conducting care. According to the results of statistical analysis, there is no significant difference between the respondents in the two groups of regional and district parks in terms of satisfaction. However, the satisfaction of the clients, especially their safety, is very important in enjoying the facilities of the parks. Efforts should be made so that all different segments of society, of all ages and genders, can achieve the desired level of comfort and tranquility in the use of these places. In short, there is no difference between regional and district parks in terms of safety, health and environment. In general, based on the assessment of regional and district parks in Shiraz from different aspects, it can be said that among the regional parks, Khoudebarin Park located in District 1 and Entezar II park located in District 10, had the best and weakest conditions, respectively. It is noteworthy that Abuzar regional park located in the eighth district of the municipality would have been in a relatively better condition in other respects, if the health situation was ignored. It is thought that because the provision of health, environment and security services in the parks is entrusted to different contractors and is not closely monitored by the municipality, we see differences in safety, health and environmental performance in each area. It seems that management and contracting as a unit can better monitor this area and apply a system of encouragement and punishment in the direction of employee safety and the game environment. On the other hand, the municipality is in contact with one contractor regarding supervision, and the management of several contractors can make

supervision difficult. Periodic review and monitoring can be effective. Make every effort to equip enclosed spaces with fire extinguisher capsules. In case of defects in play equipment and other items that can be important and effective in children's health, necessary measures should be taken to resolve the problem as soon as possible. It is suggested to the researchers in the field of safety, health and environment to conduct similar studies in the future, they consider accidents' statistics, comparison of new equipment in the field of safety, health and environment in the world and Iran and the possibility of their implementation, designing parks in accordance with safety, health, environmental standards, review other types of parks such as local parks and the possibility of establishing models such as HSE-MS. Considering that the present study is the first study conducted in the field of safety, health and environment of parks in Shiraz, informing the evaluation results of this article to institutions such as municipalities, Landscape and Urban Green Space Organization of Shiraz Municipality can be a step forward to eliminate shortcomings and help improve the situation. In addition, providing conditions for visitors to be able to convey their criticisms and suggestions to the relevant authorities can be effective in resolving existing problems.

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REFERENCES

1. C.Kondo M, Fluehr JM, McKeon T, Branas CC. Urban green space and its impact on human health. *International journal of environmental research and public health*. 2018;15(3):445.
2. Khakpour B, Kamandari M, Hoseini SM. Investigation of the status of safety indicators in Kerman Regional Parks[Persian]. *Geography and Urban Planning*. 2017;22(13):71-84.
3. Daviran E, Ghayebloou S. Quality Assessment of Safety Stability Status in Urban Parks(Case Study: Rasht Regional Parks)[Persian]. *Space Planning*. 2018;22(4):137-163.
4. Ebrahimzade E, Maleki S, Hatami D. Assessment of Safety in Urban Parks Case Study: Parks Izeh City[Persian]. *Research and Planning*. Winter 2014;5(19):57-72.
5. T.Kaczynski A, Stains SAW, M.Besenyi G. Development and Testing of a Community Stakeholder Park Audit Tool. *American Journal of Preventive Medicine*. 2012;42(3):242-249.
6. Paymard P. Improve safety in children's play space Case Study of Shiraz Parks[Persian]. *School of Architecture and Urban Development: Shahid Beheshti*; January 2014.
7. Schipperijn J, Bentsen p, Troelsen J, Toftager M, Stigsdotter UK. Associations between physical activity and characteristics of urban green space. *urban Forestry & Urban Greeting*. 2013;12:103-116.
8. Babey SH, Wolstein J, Krumholz S, al. e. Physical Activity, Park Access and Park Use among California Adolescents. *Health Policy Brief www.healthpolicyucla.edu*. 2013-03-27.
9. Ahmadinejad P, Esmaeilpour MRM. Possible effects of antioxidants on control of noise induced hearing loss: A systematic review and meta-analysis. *Annals of Tropical Medicine and Public Health*. 2018;11(Special Issue), pp. S700.
10. Alam MT, Murshed R, Bhiuyan E, Saber S, Alam RF, Robin RC. A case series of 100 COVID-19 positive patients treated with combination of ivermectin and doxycycline. *Journal of Bangladesh College of Physicians and Surgeons*. 2020;10-15.
11. Laghaei HA, Bahmanpour H, Heidari F. Quantitative and qualitative identification of parks and green spaces in Tehran Case Study: Shahriar District 8, Tehran.[Persian]. *Human and environment*. 2009;7:2-13.
12. CICEA C, PIRLOGEA C. GREEN SPACES AND PUBLIC HEALTH IN URBAN AREAS. *Theoretical and Empirical Researches in Urban Management*. 2011;6(1):83-92.
13. Stigsdotter UK. Urban green spaces: Promoting health through city planning. Tilgængelig på <http://www.sundskap.se/publikationer/pdf/NAEP>. 2014.
14. Nasab MAJ, Fahimi AH, Fam SN. Investigating strategies to increase the efficiency of urban parks and green spaces Case Study: Arak City Parks.[Persian]. *Urban Management*. Spring 2016;42:227-248.
15. Panahi H, Keikavoosi-Arani L, Salehi L. Sunscreen use: a theory-based interventional study using HAPA. *Health Education*. 2020.
16. Babey SH, Brown ER, Hastert TA. Access to safe parks helps increase physical activity among teenagers. *Health Policy Research Brief*. 2005;December 2005:1-6.
17. Cohen D, Marsh T, Williamson S, Derosé KP, Martinez H, Setodji C, McKenzie T. Parks and physical activity: why are some parks used more than others? *Preventive medicine*. 2010 January;50:S9-S12.
18. Hoseini M, Bahmanmiri MM, Sedighi A. Assessment and Analysis of Safety Status in Urban Parks (Example Example: Kohsangi Park and Shahraj Park Mashhad)[Persian]. *Geography and Regional Development*. Spring and Summer 2014;1(24):185-207.
19. SalehiLeili L, Keikavoosi-Arani L. Investigation E-health literacy and correlates factors among Alborz medical sciences students: a cross sectional study. *International Journal of Adolescent Medicine and Health*. 2020;1(ahead-of-print).
20. Mott A, Evans R, Rolfe K, Potter D, Kemp KW, Sibert JR. Patterns of injuries to children on public playgrounds. *Archives of disease in childhood*. 1994;71(4):328-330.
21. Luymes DT, Tamminga K. Integrating public safety and use into planning urban greenways. *Landscape and urban planning*. 1995;33(1-3):391-400.
22. Petridou E, Sibert J, Dedoukou X, Skalkidis I, Trichopoulos D. Injuries in public and private playgrounds: the relative contribution of structural, equipment and human factors. *ACTA PÆDIATR*. 2002;91:691 - 697.
23. Botsoglou K, Hrisikoub S, Kakanab DM. Measuring safety levels in playgrounds using environment assessment scales: the issue of playground safety in Greece. *Early Child Development and Care*. 21 JULY 2010; iFirst Article:1-12.
24. YASEMIN AC, IK, CANAN GU, LBAYRAK, ELIK GLTC. Investigation of the level of safety and appropriateness of playgrounds in Elazig city in Turkey. *International Journal of Environmental Health Research*. 2004;14(1):75-82.
25. Uskun E, Kişioğlu AN, Altay T, Çıkrınlar R, Kocakaya A. Assessment of the current status of playground safety in the midwestern region of Turkey: an effort to provide a safe environment for children. *The Turkish Journal of Pediatrics*. 2008;50(6):559-565.
26. Çay RD. Sustainable landscape planning and design, Chapter:Assessment of the Safety of Playgrounds in Terms

- of Surface Material and Equipment: Peter Lang GmbH; December 2017.
27. Martin J, Cooper C. Playground safety in SouthWestern Sydney. *J Paediatr Child Health*. 2005;41:587-591.
 28. INFRASTRUCTURE U. DESIGN STANDARDS for URBAN INFRASTRUCTURE. 8 Guide Signs. Edition 1 Draft. Urban Publisher; 2006. p. 13.
 29. Jafari H, Salehi A, Sadeghinaeini H. Evaluation of Children's Playground Safety in Parks with Environmental Planning Approach. *Ecology*. winter 2010;36(56):13-24.
 30. Purvis JM, Hirsch SA. Playground Injury Prevention. *CLINICAL ORTHOPAEDICS AND RELATED RESEARCH*. 2003;409:11-19.
 31. Olsen HM, Hudson SD, Thompson D. Developing a Playground Injury Prevention Plan. *The Journal of School Nursing*. June 2008;24(3).
 32. Holick MF, Chen TC. Vitamin D deficiency: a worldwide problem with health consequences. *The American journal of clinical nutrition*. 2008;87(4):1080S-1086S.
 33. Moghadas Inanloo E, Keshavarz Z, Naeiji Z, Asgari M. Comparison of serum vitamin D levels in threatened abortion patients and women with normal pregnancy. *The Iranian Journal of Obstetrics, Gynecology and Infertility*. 2019;22(10):49-57.
 34. INSO 8987-1. Amusement rides and devices-Part1: Design and Construction (Amendment No1)Sep.2013.
 35. INSO 8982-2. Amusement rides and devices- Part 2: Operation and maintenance(Amendment No1)Sep.2013.
 36. Howard AW, MacArthur C, Willan A, Rothman L, Moses-McKeag A, MacPherson AK. The effect of safer play equipment on playground injury rates among school children. *Cmaj*. 2005;172(11):1443-1446.
 37. Sadeghinaeini H, Jafari H, Salehi E, Mirlohi A. Safety of Playgrounds in Urban Parks (Featured: Tehran District Parking). *Iran Occupational Health*. Autumn 2010;3(7):32-42.
 38. Organization INS. INSO 6204-4 1st. Revision. Safety of toys –Part 4:Swings, slides and similar activity toys for indoor and outdoor family domestic usesafety requirements and test methods ICS:9720050: Institute of Standards and Industrial Research of Iran(ISIRI); 2016.