



ORIGINAL SCIENTIFIC ARTICLE

IMPACT OF NEW LIVING ENVIRONMENT ON REACTIVE STRESS TOLERANCE IN PREADOLESCENT SPORTS TRAINEES OF JHARKHAND

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Accepted for Publication: January 15, 2023

Published: February 28, 2023

DOI: 10.17309/tmfv.2023.1.10

Abstract

Study purpose. The purpose of the study was to examine the effect of background experience related to family demography on the selected parameters of reactive stress tolerance in athletes who strictly lived in a training academy for a minimum of two years.

Materials and methods. A total of 200 male sports cadets were chosen by the Jharkhand State Sports Promotion Society in Ranchi, with chronological age ranging from 11 to 14 years and 4 years of training. The demographic information (the size of the family, the type of family, the order of birth, the family monthly income, and the location of the home) were considered as independent variables. Stress tolerance parameters (PR correct, PR incorrect, PR omitted, and median reaction time) were chosen as dependent variables. The Shapiro-Wilk test was used to determine data normality, while Levene's test was used to determine homogeneity. The Mann-Whitney U and Kruskal-Wallis tests were used to draw comparisons. For post-hoc comparison, Dunn's test with Holm correction was employed. The threshold for significance was set at $p = 0.05$.

Results. The percentile rank of correct responses ($p = 0.005$) and median reaction time ($p = 0.033$) related to birth orders showed significant results. Other factors related to family information and reactive stress tolerance were not significant.

Conclusions. According to the findings, it was concluded that being in new environment for a long duration reduced the early living experience related to family demography but effect of birth order still continued.

Keywords: reactive stress tolerance, family type, family size, birth order, family monthly income, housing location, preadolescent sportsperson, Jharkhand.

Introduction

Performance analysis, training, and research are all distinct fields of sports science. These are a subset of sports science concerned with enhancing an athlete's ability to compete at a high level (Donoghue, 2010). Performance analysis studies are useful in predicting real performance prior to the main competition. Although it is generally recognised that actual performance can only be achieved during the main competition (Chahal, Ghildyal, & Chahal, 2012), the degree of performance of athletes may be evaluated prior to competition. Athletes' reactions to competition

may be seen on the surface by looking at their technique, physiological responses, and behaviour patterns (Pahan & Singh, 2021). The way an athlete sees his or her surroundings has an impact on his or her reactions. Raglin (2001) argues that changes in the cognitive process are the most essential aspect that influences athletes' reactions to competition. As a result, it's crucial to look into information processing in the context of sports psychology's cognitive domain.

The most prevalent item that people notice and occasionally ignore is an athlete's behaviour. The demands of training and competition are not the same. Every competition produces stress in the competitors, so being successful in managing that stress is vital (Hanton, et. al., 2005; Kristiansen & Roberts, 2010).

The ability to function and react under stressful conditions has a significant impact on sporting performance (Jones, et. al., 2007; Craft, et. al., 2003; Anshel, et. al., 2002). The most important factor in sporting success is not the athlete's skill, but their ability to perform the skill under stressful conditions (Patmore, 1986). Stress places additional demands on athletes that can tax their resources to cope and respond during various competitive situations (Sheldon, et. al., 2009). Attentional concentration (Krohne & Hindel, 1988), motor coordination (Anshel, et. al., 2001), and decision-making ability are all sport-related characteristics that have been demonstrated to be influenced by stress.

While the majority of Indian literature on athletes' researchers has focused on investigating areas such as stress and sports performance (Singh, 2017), stress level of athletes and non-athletes (Singh & Pardhi, 2021), anxiety level and gender differences (Parveen, 2013), anxiety in college athletes (Assefa, 2014), anxiety in archers (Malik & Singh, 2015), burnout and competition anxiety (Bawa, 2010), and coping strategy (Acharya, 2017). Only a few studies related to reactive stress tolerance have been conducted in India (Pahan & Singh, 2021; Abhaydev, Bhukar, & Thapa, 2020). The potential of a person to respond immediately and correctly in a scenario when he or she is overstretched is known as reactive stress tolerance (Schuhfried, 2016). The construct looks at how well someone can stay focused and respond correctly when they're in a stressful situation.

In the domain of sport, there is a lack of research pertaining to the factors that might impact reactive stress tolerance in athletes. In accordance with past studies other than sports on family background, a few factors can be potentially related to cognitive functions. Place of residence and cognitive function (Xu, et. al, 2018), family type, family size, rural-urban background, and cognitive impairment (Sengupta, et. al, 2014), home situation and cognitive ability (Kaushal & Singh, 2021), birth size and cognitive function (Chandrashekarappa, et al., 2020), and poverty and cognitive function (Mani, et. al, 2013). Several studies have been conducted on socioeconomic status, environmental factors, and individual factors on sports participation (Kamphuis, et. al, 2008) (Verma & Verma, 2016). However, very few studies were conducted on socioeconomic status and psychological measures in sports.

The family structure, including family size, family type, birth order, family income, and house location, has not been studied in the Indian population. Therefore, the current study aims to compare the level of reactive stress tolerance with different family structures. The study will give us a better idea of how certain aspects of family structure and one of the sports-related cognitive abilities (reactive stress tolerance) work on. This may help us to find and develop sporting talents.

The current *study aims* to measure the performance of reactive stress tolerance and investigate whether living in a new environment for at least two years reduces the athletes' early life experience related to family demography.

Materials and Methods

Study Participants

Selection of Samples: 200 male subjects aged 11–14 years were selected from Jharkhand State Sports Promotion

Society, Ranchi. Samples having 4 years of training, 2 years of living experience in academy and average performance on quarterly physical assessments were selected by simple random sampling.

The study was conducted in accordance with the ethical principles of the Helsinki Declaration for human research and was approved by the Research Ethics Committee of the Lakshmibai National Institute of Physical Education.

Study Organization

Variables and Test Selection: As dependent variables, the determination test (DT) form S1 was used to measure percentile ranks (PR) like PR correct, PR incorrect, PR omitted, and median reaction time. Family information was selected as an independent variable which consists of demographic information e.g. family size (small ≤ 5 , large > 5), family type (nuclear = single parent family, joint = more than one parent) the order of birth, monthly income of the family as determined by the SES Scale (Wani, 2019), and the location of the house (urban, semi-urban, and rural).

Selection of Instrument and Scoring: Reactive stress tolerance was administered by a computerised testing system (the Vienna Test System by Schuhfried GmbH). For scoring percentile ranks, the correct, incorrect, omitted, and median reaction times as well as the median reaction time were chosen.

Informed Consent: The subjects were minors, therefore informed consent were taken from the administration, coach, and athlete in-charge of the academy. Subjects were briefed about the study and their consents were also taken.

Test Procedure: The test was administered between 9 a.m. and 5 p.m. Subjects were well informed about the date and time of their test. Before the start of the test, the programme offered a practise set. Once the subject acknowledged the practise test, the real tests were conducted. Introspective reports were gathered at the end of the test.

Statistical Analysis

The Shapiro-Wilk test was employed to ensure the normality of the data. Mann-Whitney U test was employed to compare two group variables, e.g. size of family and type of family. For comparing differences between three or more grouping variables, the Kruskal-Wallis test was employed. Dunn's Post-Hoc analysis was done for the variables showing the main difference in the Kruskal-Wallis test. As the sample sizes were unequal, so Holm's post-hoc correction was used for testing the significance at $p < 0.05$ level.

Results

For the purpose of analysing the data, the scores of reactive stress tolerance were arranged according to the parameters of family demographic information shown in Table 1. The normality of the data was checked where the output of Shapiro-Wilk confirmed that, independent variable order of birth with the dependent variable percentile rank of correct response and median reaction time were the only variables that demonstrated the normal distribution. After conducting Levene's test, it was observed that in a few categories of birth order, between both median reaction

Table 1. Family Information, Sample Distribution and Descriptive Statistics of Scores under Reactive Stress Tolerance

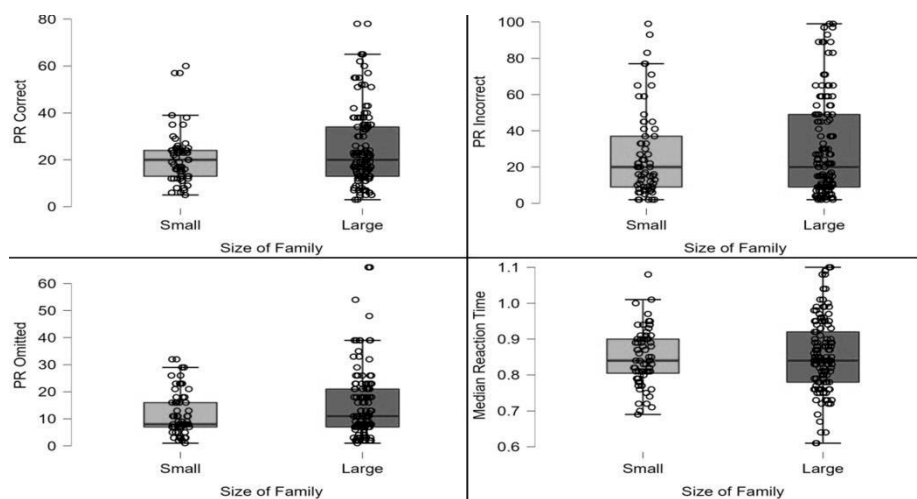
Family		PR Correct			PR Incorrect		PR Omitted		Median Reaction Time	
		N	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Size	Small	67	20	11	20	28	8	9	0.84	0.10
	Large	133	20	21	20	40	11	14	0.84	0.14
Type	Joint	54	18.5	17	22	38	11.5	14	0.86	0.12
	Nuclear	146	21	12.75	17	35	10	13.25	0.84	0.12
Birth Order	1st	52	21.5	16.25	18	37	11	11.75	0.85	0.09
	2nd	54	23	9	15	20.25	9	13.25	0.83	0.11
	3rd	47	13	14	24	42.5	9	16	0.88	0.14
	4th	29	22	19	15	26	13	16	0.83	0.15
	5th	11	21	14.5	17	14	8	12.5	0.83	0.09
	6th	7	13	9	37	30.5	11	5.5	0.94	0.12
Monthly Income	2641-7886	158	21	16.75	20	35	11	14	0.84	0.11
	7887-13160	23	20	10.5	13	26.5	8	8	0.85	0.13
	13161-19758	9	22	31	13	38	8	10	0.83	0.13
	19759-26354	7	17	11.5	15	26.5	8	6.5	0.85	0.10
	26355-52733	3	19	13.5	71	9	7	2.5	0.89	0.13
Location	Rural	53	23	18	16	28	9	14	0.82	0.10
	Semi-Urban	134	19	12.75	22	36	11	14	0.85	0.14
	Urban	13	18	10	13	10	8	5	0.88	0.15

time and percentile rank of correct response, the data were homogenous. Therefore, non-parametric tests were utilized for comparison.

Table 1, the descriptive statistics, e.g., sample distribution in each section of family demography, their mean ranks and interquartile ranks (IQR) associated with parameters of reactive stress tolerance and family demography are displayed in Table 1. The box-plots in Figure 1 to 5 illustrate the distribution of scores on each parameter of reactive stress

tolerance and family information. Information on gender was not measured.

Table 2 shows the output table of comparative statistics. To compare categorical variables, e.g., size of family and type of family, the Mann-Whitney U test were applied. The results show mean ranks, Mann-Whitney U statistics ($^{\wedge}$), and p-values. For other categorical variables, e.g., order of birth, family monthly income, and location of house, the Kruskal-Wallis tests were applied to find a difference in scores of

**Fig. 1.** Data Distribution of Reactive Stress Tolerance by Size of Family

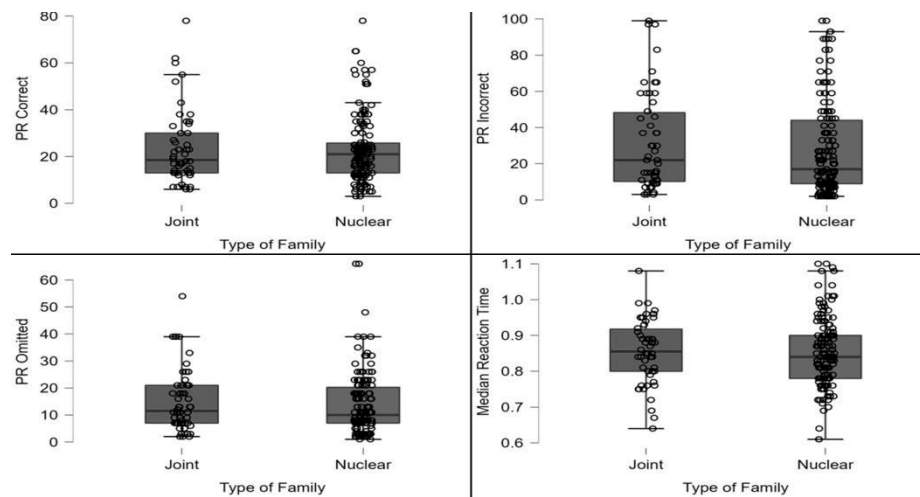


Fig. 2. Data Distribution of Reactive Stress Tolerance by Type of Family

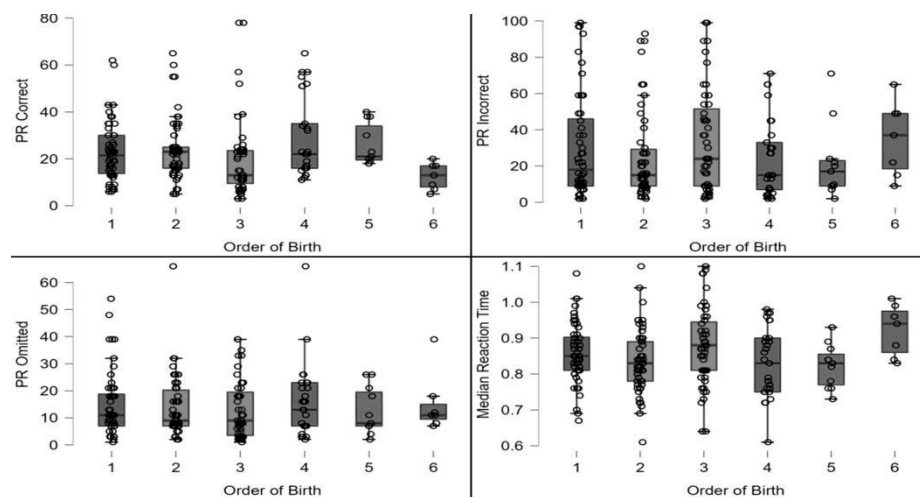


Fig. 3. Data Distribution of Reactive Stress Tolerance by Order of Birth

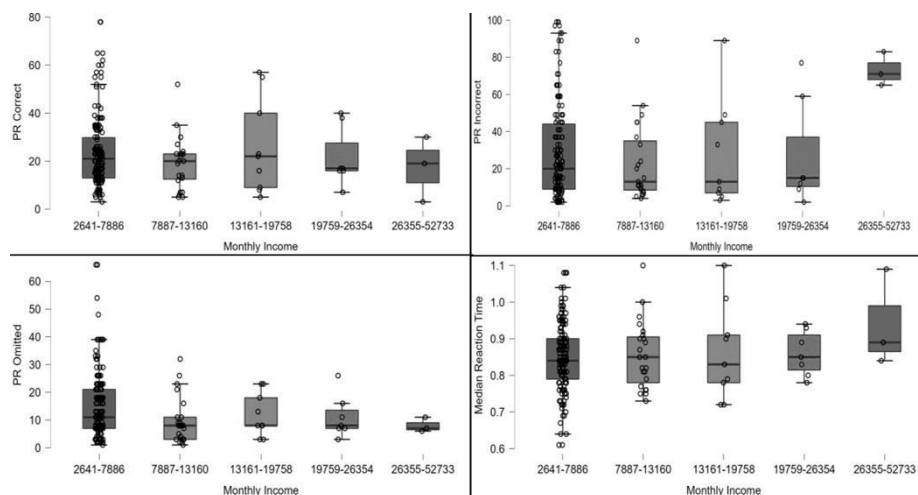


Fig. 4. Data Distribution of Reactive Stress Tolerance by Monthly Income

Table 2. Comparative Statistics of Variables under Reactive Stress Tolerance with Different Family Information

		PR Correct				PR Incorrect				PR Omitted				Median Reaction Time		
Family		N	MR	Statistics	p	MR	Statistics	p		MR	Statistics	p		MR	Statistics	p
Size	Small	67	96.68	4199.5 [^]	0.507	99.78	4407.5 [^]	0.901		90.34	3774.5 [^]	0.077		99.25	4372 [^]	0.829
	Large	133	102.42			100.86				105.62				101.13		
Type	Joint	54	100.85	3923 [^]	0.958	108.1	3531.5 [^]	0.258		106.29	3629.5 [^]	0.388		105.72	3660 [^]	0.437
	Nuclear	146	100.37			97.69				98.36				98.57		
Birth Order	1st	52	104.67	16.957 [†]	0.005 ^{**}	102.8	5.202 [†]	0.392		104.22	1.632 [†]	0.897		104.5	12.104 [†]	0.033 [*]
	2nd	54	108.06			94.08				100.44				89.61		
	3rd	47	79.17			110.96				93				114.78		
	4th	29	116.5			89.29				105.83				87.22		
	5th	11	124.5			89.41				94.32				80.45		
	6th	7	50.43			126.57				111.36				145.43		
Monthly Income	2641-7886	158	103.13	2.095 [†]	0.718	100.97	6.903 [†]	0.141		105.91	7.736 [†]	0.102		99.63	1.735 [†]	0.784
	7887-13160	23	86.17			91.17				74.54				99.61		
	13161-19758	9	101.33			93.56				94.89				99.11		
	19759-26354	7	94.79			94.29				86.29				106.71		
	26355-52733	3	82.67			182.83				64.33				142.83		
Location	Rural	53	112.57	3.799 [†]	0.15	97.31	0.857 [†]	0.651		99.73	0.777 [†]	0.678		89.65	2.583 [†]	0.275
	Semi-Urban	134	97.35			102.84				102.07				104.1		
	Urban	13	83.73			89.42				87.42				107.65		

MR: Mean Rank, [^]Mann-Whitney U Statistics, [†]Chi-square: Kruskal-Wallis, ^{*}Significant at 0.05, ^{**}Significant at 0.01

reactive stress tolerance. The information in Table 2 contains mean ranks, chi-square value ([†]), and p-value from the Kruskal-Wallis tests on these variables.

Kruskal-Wallis H test showed that there were statistically significant difference in percentile rank of correct response $\chi^2(5) = 16.957$, $p = < 0.01$, and median reaction time $\chi^2(5) = 1.632$, $p = 0.033$, between the orders of birth Table 2, and Figure 3.

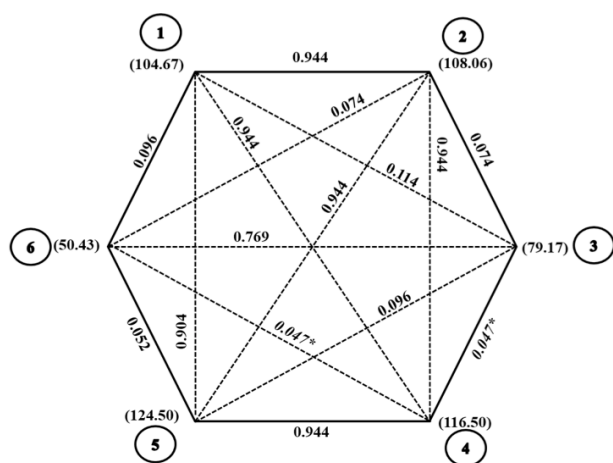


Fig. 6. Dunn's Post-Hoc Analysis between Percentile Rank of Correct Response and Orders of Birth

Figure 6 depicts the post-hoc comparison of the percentile rank of correct response and birth orders. Statistical significance was found between two groups, group 1; 3rd and 4th child, $p = 0.047$, and group 2; 4th and 6th child, $p = 0.047$.

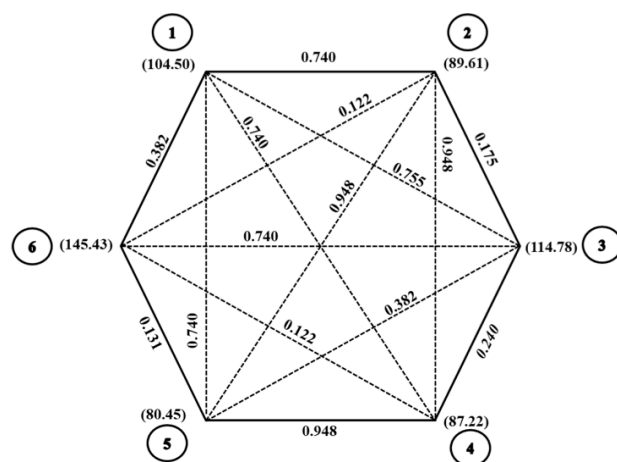


Fig. 7. Dunn's Post-Hoc Analysis between Median Reaction Time and Orders of Birth

Figure 7 depicts the post-hoc comparison of the median reaction time and birth orders. Though the Kruskal-Wallis test showed a significant difference but, no statistical significance was observed in the result of Dunn's post-hoc analysis.

Discussion

As it is well known that athletes resides in academies for several years to train and achieve their optimal performance, the current study lays stress to find out whether living in sports academy for the minimum of two years reduces the effect of family demography such as family size, family type, birth order,

family monthly income and house location. Reactive stress tolerance, one of the dimensions of cognitive ability required in sports was tested to understand the research problem. The subjects lived in same academy and had similar training experience for the minimum of two years were selected for the study. Food style, living style, daily schedule, e.g., sleep-wake, academic and training time were similar for all participants.

Starting with the visual presentation of data on Figure 1 to 5, all data in each factor of family information related to parameters of reactive stress tolerance were widely distributed and found to be non-normal, with the exception of percentile rank of correct response and median reaction time related to birth order. The two parameters relating to birth order were found to be normally distributed yet homogenous in character. The age group chosen for the research, 11-14 years, is assumed to be the reason of non-normal findings. According to the previous findings, different psychological, physical, and physiological changes occur throughout this age (IGNOU, 2010; Allen & Waterman, 2019). Some children's growth begins early or late, while others develop in a predictable way according to their age (Thompson, 2009). The living experience at the academy and the hours when the tests conducted are two further aspects that may be identified. Cadets aged 11 had two years of living experience, while those aged 12, 13, and 14 had three, four, and five years of living experience, respectively. Findings of relevant literature also indicate that an individual's cognitive and physical performance is influenced by time of day, time of test, and their circadian rhythm (Facer-Childs, et. al, 2018).

Adaptation to New Environment

In connection to measures of reactive stress tolerance, such as percentile rank of incorrect response and omitted stimuli related to birth order, components of family information, such as size, type, monthly income, and location, were shown to be non-significant in Table 2. It is possible to infer that when a sportsperson is exposed to a new environment for a lengthy period of time, their early life experience linked to the specified reactive stress tolerance decreases.

Effect Still Continued

Table 2 shows that birth order is associated with two metrics of reactive stress tolerance: percentile rank of correct response and median reaction time, both of which were determined to be statistically significant. It may be inferred that the birth order has an impact on one's capacity to make accurate decisions and react quickly in a stressful scenario. The influence of birth order was not lessened by spending at least two years in a different setting. A detailed examination of the results of the post-hoc analysis is essential for reaching this conclusion. Figure 6 shows the post-hoc pairwise comparison of birth order and percentile rank of correct responses, which indicates two pairs of significant differences: 1) fourth and third order, and 2) fourth and sixth order. Figure 7 shows no significant differences in birth order and median response time after a post-hoc pairwise comparison. Figure 7 shows that the fifth kid has the greatest mean rank, followed by the fourth, second, first, third, and fifth. In general, children of one or two-child family size have strong cognitive capacity (Polit, 1982; Dandes & Dow, 1969),

and when the birth order rises, cognitive ability reduces (Blake, 1981). The individuals' living experience at the academy, developmental age, and age-truncation may have contributed to the catastrophic finding. The participants who were 11 years old had less training experience than the individuals who were 14 years old. In the sports sector, age truncation is a serious concern that may have affected the result. It's also possible that the findings are correct, but that the child's development must be investigated in order to arrive at a meaningful conclusion.

Conclusion

On the basis of the current study, it can be inferred that the ability to quickly and appropriately react to ever changing stimuli in sporting events is affected by the birth order of an individual. Because psychological characteristics can distinguish between high and low performers who meet the same physical and physiological standards, personnel from talent identification and development programmes may consider cognitive ability tests to identify long-term athletes. For better understanding, samples from a particular age group that have similar background information may be chosen for the study.

Acknowledgement

For my study, I would like to convey my heartfelt gratitude to Late. Professor (Dr.) Jayashree Acharya for her invaluable guidance and helpful advice throughout the data collection process.

Conflict of Interest

The author declares that there is no conflict of interest.

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ВПЛИВ НОВОГО ЖИТТЄВОГО СЕРЕДОВИЩА НА СТІЙКІСТЬ ДО РЕАКТИВНОГО СТРЕСУ В ПІДЛІТКІВ-ВИХОВАНЦІВ СПОРТИВНИХ ШКІЛ У ШТАТІ ДЖХАРКХАНД (ІНДІЯ)

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 2 табл., 7 рис., 38 джерел.

Мета дослідження. Метою дослідження було вивчення впливу попереднього досвіду, пов'язаного із сімейною демографією, на вибрані параметри стійкості до реактивного стресу у спортсменів, які суто жили в спортивній академії протягом мінімум двох років.

Матеріали та методи. Для участі в дослідженні Товариством сприяння спорту штату Джхаркханд у місті Ранчі (Індія) були відібрані загалом 200 спортсменів-курсантів чоловічої статі хронологічним віком від 11 до 14 років із досвідом тренувань 4 роки. Демографічну інформацію (кількість членів сім'ї, тип сім'ї, порядок народження, місячний дохід сім'ї та місце розташування житла) розглядали як незалежні змінні. Параметри стійкості до стресу (процентильний ранг правильних реакцій, неправильних реакцій, пропущених реакцій і середнього часу реакції) були обрані як залежні змінні. Для визначення нормальності розподілу даних використовували критерій Шапіро-Уїлка, а для визначення однорідності дисперсій – критерій Левена. Для порівнянь використовували U-критерій Манна-Уїтні та критерій Краскела-Уолліса. Для апостеріорних порівнянь застосовували критерій Данна з поправкою Холма. Поріг значущості був заданий на рівні $p = 0,05$.

Результати. Процентильний ранг правильних реакцій ($p = 0,005$) і середній час реакції ($p = 0,033$), пов'язані з порядками народження, показали статистично значущі результати. Інші фактори, пов'язані з інформацією про сім'ю та стійкістю до реактивного стресу, не були статистично значущими.

Висновки. Відповідно до результатів дослідження було зроблено висновок, що перебування в новому середовищі протягом тривалого часу скорочувало ранній життєвий досвід, пов'язаний із сімейною демографією, але вплив порядку народження все-таки зберігався.

Ключові слова: стійкість до реактивного стресу, тип сім'ї, кількість членів сім'ї, порядок народження, місячний дохід сім'ї, місце розташування житла, спортсмен передпідліткового віку, штат Джхаркханд (Індія).

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Cite this article as: Pahan, M.K., Malhan, V., & Napoleon, Y. (2023). Impact of New Living Environment on Reactive Stress Tolerance in Preadolescent Sports Trainee of Jharkhand. *Physical Education Theory and Methodology*, 23(1), 72-79. <https://doi.org/10.17309/tmf.2023.1.10>

Received: 30.09.2022. Accepted: 15.01.2023. Published: 28.02.2023

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