MEDWIN PUBLISHERS
Committed to Create Value for Researchers

Open Access Journal of Kinesiology and Sports Medicine

# The Effects of Birth Weight Index on Motor, Cognitive Function and Relationship with Some Personality Characteristics of Children

**Alimohamadi F[1], Ezabadi RR[1]*, Abdoshahi M[1] and Marandi PK[2]**

[1]Department of Motor Behavior, Alzahra University, Iran

[2]Faculty of Education, University Kebangsaan, Malaysia

***Corresponding author:** Rosa Rahavi Ezabadi, Alzahra University, Tehran, Iran, Tel: 98 9132735397; Email: R.Rahavi@Alzahra.ac.ir

**Research Article**

**Volume 1 Issue 1**

**Received Date:** August 24, 2023

**Published Date:** September 22, 2023

DOI: 10.23880/oajksm-16000102

## Abstract

**Objective:** The aim of this study was to determine the effect of birth weight index on motor, cognitive function and relationship with some personality characteristics of children.

**Methods:** Population for this study included of 32 low birth weight and 35 normal birth students randomly selected. The mean age was 8, 04 ± 1. The Movement Assessment Battery for Children-2 test was used to assess motor function and Draw-A-Person Color test was used to assess cognitive function and personality characteristics.

**Results:** The result of Manova analyses and t test indicated that normal birth children had significantly better performance in fine Motor Function and cognitive function compared to children with low birth weight. In addition, the result of Spearman correlation analyses found no significant relationship between the personality traits of the two groups.

**Conclusions:** The findings revealed that children with normal birth had higher performance in some motor and cognitive performance compared to children with low birth weight. Therefore, it is necessary for children to benefit from intensive care and exercise interventions in terms of motor and cognition from the very first years of life.

**Keywords:** Children; Cognitive Function; Motor Function; Personality Characteristics

## Introduction

Low birth weight is one of the causes of death in the world and threatens society health. Global statistics show that low birth weight babies are increasing in developing countries [1]. According to the World Health Organization, There are sub-categories of preterm birth, based on gestational age and also prior to this premature was categorized as babies' weight. There are sub-categories such as low birth weight (birthweight less than 2500 grams), very low birth weight (birthweight less than 1500 grams) and Extremely low birth weight (birthweight less than 1000 grams) [2]. Therefore, low birth weight is considered as one of the risk factors in child health. Underweight children are at risk for problems such as sensory-neurological, cognitive and speech delays, neuro motor and visual impairments, behavioral, psychosocial, and school dysfunction [3,4] or cognitive and behavioral problems compared to other children [5].

The number of low birth weight babies has risen over the past two decades, mainly due to the increasing number of premature births [6]. Premature infants are classified

as high-risk infants. Medical interventions are only 30% effective on these babies Evolutionary Results.

About 30 to 50 percent suffer from problems such as fine activity, cognitive and behavioral problems or the infants had poor ability in motor functions, selective attention [7]. Also Studies have shown that motor function and cognitive disorders in premature infants appear as social and adaptive consequences of behavior in adults compared to peers Many of these children look normal but have less favorable motor function and behavioral conditions compared to normal children [8]. So, educational strategies and intervention can have a significant impact on the child for their behavior and motor function, continue same as their family. On the other hand, researchers interested in measuring motor functions due to the important role that motor behaviors play in human life. Findings on executive and motor performance [8]. The motor development of preterm infants and very low weight and also the results of studies on motor and cognitive development of such children indicate that premature infants appear to be physically normal, but they have significantly lower motor functional and cognitive performance than their peers [9-11]. However, some results showed that there was no difference in motor function between the premature children and normal children [12,13]. Therefore assessment of motor domain is not only for understanding and to promote the aspects of development but also to understand the possible delay and improve the instrument in this domain [14].

Therefore, low birth weight can affect a person's growth and development and lead to social, emotional and behavioral problems. The result can cause problems in the health of society [15]. According to the interactive effect of physical, motor, cognitive and emotional development, all individual behaviors of the child under the influence of these interactions and integrated developments are explained and described as physical, motor, cognitive, and social dimensions [16]. Each child interacts with their physical and social environment under the influence of their unique biological characteristics. On the other hand, personality characteristics are an abstract concept that encompasses a unique pattern of personality traits and makes it possible to predict what a person will do in a particular situation. In a study in the field of children's painting shown that painting can show the stages of development in the field of cognitive processes and social skills in children [17]. Research findings on drawings and colors used by a child show ones personality and painting is a child's language. They are known through painting, storytelling, acting, and reflecting on their inner world. So a child's drawing is a message, what one cannot say is conveyed through paintings. Understanding the "language" of painting, provides valuable information for parents, educators, psychologists, and anyone who wants to understand the mystery of the child's world. The child experiences all the issues of one's life through painting tests oneself and builds own "I". Drawing lines are a reflection of child emotional world, and painting alone is a world that evolves as the child becomes more aware and transformed [18]. Therefore, the results of studies indicated that low birth weight are considered as one of the health problems. These are the health problems and the most important indicators of health in any society. The survival of new-borns depends on the gestational age and birth weight. With regard to the high prevalence of low birth weight and the importance of motor, cognitive and behavioral disorders society health needs to address as a consequence to improve health of society. The aim of this study was to investigate the effect of low birth weight index on the motor and cognitive performance and relationship with some personality characteristics of children.

## Methods

### Participants

Participants from Tehran's 14th district in the academic year 2018 included 588 boys and 612 girls (total 1200), from primary school in age group of 7-10 years old. The participants were selected using the cluster sampling method. The samples of this study were 35 normal birth children (19 girls and 16 boys), 32 low birth weight children (19 girls and 13 boys) with the mean age of 8.04±1. According to their vaccine file, inclusion criteria included birth weight between 1500 and 2500 grams for the group of low birth weight, normal maternal pregnancy and normal birth weight for the group of normal birth children, no medication and skeletal complications that prevents study. In the briefing session held for mothers, the personal information form and consent form was completed by the parents. The first test was MABC2 that individual took from participants and then draw a person (DAP) test was taken. The test taker gives a chance to participants to learn how should the homework be done .These test conducted by researcher and the children's teacher that they biffed by the researcher.

### Research Tools

This questionnaire information included age, sex, month and year of birth, birth weight, as well as ethnicity and social class were completed by parents. They then confirmed and informed their consent that their children would participate in the research.

**Assessment Battery for Children-2 (MABC-2):** This test measures the fine and gross motor function of children in the three age groups (3 to 6, 7 to 10 and 11 to 16 years).

It included 8 tasks for each one of the groups. In three different structures: hand agility, ball skills and static and dynamic balance. The raw score of each task is converted to the standard score and the total test score is obtained by adding the standard scores of 8 tasks. Evaluation was done according the Assessment Battery for Children-2. Using the total test score, the percentage score is determined from the MABC-2 test guide table to determine the child's movement delays. Depending on the age of the child, these eight tasks need 20 to 40 minutes. Studies in other countries have also evaluated the validity and reliability of the test in normal children in different parts of the world and reported the results of almost all of these studies with good validity and reliability [19,20].

In Iran, in the age group of 7-10 years in Tehran, the reliability between the examiners by calculating the inter-class correlation coefficient for manual agility skills was 0.923, aiming and throwing skills was 0.999, balance skills were 0.988 and the total test score was 0.985 . The retest reliability was obtained by calculating the inter-class correlation coefficient for manual agility skills 0.926, aiming and throwing 0.888, balance skills 0.967 and the total test score was 0.967. Cronbach's alpha coefficient for internal consistency of the test was 0.713 for manual agility, 0.765 for aiming and throwing, 0.603 for balance and 0.843 for the total test score. And also the mean content validity index of the items (0.696) and for each item (above 0.87) and the mean content validity ratio of the items (0.937) and for each item (0.75) was excellent. The results of the confirmatory factor analysis confirm the appropriateness of the model (each index above 0.9), indicate that the validity of the test construct is acceptable [21,22].

**Draw-A- Person Color Test:** This is one of the tests that was published in 1977 by psychologists Jacqueline [23]. This test is used to measure intelligence (IQ) and the children personality from 3 to 14 years age group. This test was done for both individual and group components [23]. The DAP was built as a projective test to assess personality and emotional characteristics. And draws the relationships between some components and elements of the drawing test with the personality traits of the children's. This projection is not conscious or direct but rather symbolic or indirect in some manner. In other words, people do not draw themselves; they draw what they see themselves to be, or the way they wish to be [24].

In the draw-a- person color test, according to Royer test [23], a total of 70 items are drawn from the person drawing, of which 23 points are related to the head, 33 points are related to the body, and another 14 points are related to the clothes. The total score is the sum of the head, body and clothes design scores. Then a color score is given, maximum of 11 is given. Each child is given a box containing of seven-colored pencils (blue, red, yellow, purple, brown and black). The child is also provided with a regular black pencil, an eraser pencil and a sheet of A4 paper vertically. Child is then asked by the examiner to "Draw a person on this paper as beautiful as you can, and paint it if you want." Also, full freedom is given to child regarding the placement of the person drawn on the page, its dimensions, the use of paper in a direction that is different from its original direction, the type of person drawn, the possible use of a ruler, adding elements other than the specified subject, or not to use paint. This test examines cognitive function; Childs intelligence (IQ) and personality characteristics such as introversion, extroversion, self-confidence, anxiety and aggression [23]. Mchover believes that drawing a person's color can be considered as a personal signature of the painter [18].

confirmed the validity of anxiety symptoms in a person's color drawing test, demonstrated the validity of aggression symptoms in this test. Also in another study conducted on 115 students aged seven to nine years, the validity of this test was confirmed in terms of both developmental and personality variables showed 80% reliability of a person's color drawing test symptoms [18, 25].

## Interpretation of Colored Draw a Person Color and Method of Scoring Intelligence (IQ) and Personality

In order to evaluate the results of the drawing a person colors test, children's painting was examined both in terms of overall aspects of painting and analytical aspects of painting. Following criterions were used.

Place of drawing the person, the dimensions and the proportions, the drawing lines, the position of the person and symmetry, the posture and movement, the color, the characterization of the person, the face and the perimeter of the person. These characteristics are introversion, extroversion, self-confidence, anxiety and aggression [18].

- Introversion items: the drawn person's small eye, the placement person on the left side of the screen, low color or no color, more use of cool colors such as blue, gray and black.
- Extroversion items: person's big eye, person on the right side of the page, use different colors in the painting, use more warm colors like red, orange, pink and yellow.
- Confidence items: Large dimensions and tall person, legs spacing, large head show high confidence. Tiny stature and short height, legs stuck together, hands clinging to the body, weak legs and faint lines show low self-confidence.

- Anxiety items: small person in the corner of the screen, small and stout legs, disabled person with no trunk (wooden) draw, excessive use of eraser, excessive use of purple, extreme use of black, imbalance of the person and throwing become.
- Aggression items: are examined according to the following items: wide and thick lips, excessive use of red, thick and colored lines, sharp teeth, eyebrows in the shape of seven and drawing a person in the shape of a police.

To evaluate intelligence (IQ) using scores obtained from the analytical aspects of painting that include the head, face, torso, limbs and clothing. According to the scores that the subject obtains from each section, determine the age of transformation, use normative tables based on the age of transformation in boys and girls. Should search for the closest score to the subject score according to the subject age that corresponds to the items. After obtained the evolution age of each item, they are then together and divide by 5. In the intelligence (IQ) formula, should put calendar age / (age of evolution * 100) = intelligence (IQ) [18].

## Data Analysis Method

Descriptive statistics were used to draw graphs, tables and present the indicators of central tendency. The normality of the data was evaluated using Kolmogorov-Smirnov test. To determine motor cognitive and personality characteristics used of one-way interaction, multivariate analysis of variance (MANOVA), t-test with two independent samples and Spearman correlation test were used. Data analysis was performed with SPSS version 24 at a significant level (P <0.05).

## Results

Analysis of demographic data of participants showed that the mean age (girls 8 ± 0.88, boys 8.21 ± 1.28). Mean weight (girls 28.38 ± 6.61. boys 30.98 ± 30 6.72). Height (girls were 132.02 ± 10.90, boys were 133.85 ± 6.56). The results of the Kolmogorov-Smirnov test confirmed the normality of data distribution of dependent variables (P <0.05). The mean (M) and standard deviation (SD) for all 67 participants' subjects of motor function scores (fine, gross, and balanced) and cognitive function of subjects by gender are as follows .

| Gender | Variables | Fine Movement | | Gross Movement | | Balance | | Movement Function | | Cognitive Function | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weight | M | SD | M | SD | M | SD | M | SD | M | SD |
| Girl | Low birth weight | 7 | 2 | 10 | 3 | 9.4 | 1 | 8 | 2 | 93 | 20 |
| | Normal birth weight | 10 | 3 | 10 | 3 | 9.3 | 1 | 9 | 2 | 100 | 19 |
| Boy | Low birth weight | 7 | 3 | 10 | 3 | 8.8 | 1 | 8 | 3 | 77 | 17 |
| | Normal birth weight | 8 | 3 | 11 | 2 | 9,20 | 1 | 10 | 2 | 101 | 12 |

**Table 1:** Mean and standard deviation of motor function and cognitive function of subjects by gender, weight and week of birth.

### Motor Function

The results of M-box test were used to test the equal assumption of variance-covariance matrix. The results indicated that the variance-covariance matrix of motor function (fine, gross, balance) was observed among low birth weight and normal birth children (P> 0.05, Box's M =97 / 7, F = 1.262). The results of Leven's test showed that the homogeneity of variance of motor performance of fine movements was assumed to be fine (F = 0.007, P = 0.934), gross (F = 0.045, P = 0.833), and balance (F = 1.825, P = 0.181) is established between premature and normal birth children. The results of one-way MANOVA test showed that there is a significant difference between motor function of low birth weight and normal birth children (P <0.05, Wilks Lambda = 0.899, F (3, 63) = 3.897 and ŋ2 = 0/068). Thus, there is a significant difference between the subscales of fine movements of low birth weight and normal birth children (P = 0.035, F (1, 63) = 4.623 and ŋ2 = 0.066). Eta squared showed that 6.6% the variance of children's fine movements due to birth weight was low. But between the subscales of gross movements (P = 0.403, F (1, 63) = 0.710 and ŋ2 = 0.011) and balance (P = 0.783, F (1, 63) = 0.076, and =2 = 0.001) low birth weight and normal birth children was no significant difference. The comparison between the mean scores of fine movements showed that fine movements of normal birth children are significantly more than low birth weight children .

| Variable | Kind of Birth | Mean | Different Mean | P |
|---|---|---|---|---|
| Fine Movement | Normal birth | 8.6 | 1.4 | 0 |
| | Low birth weight | 7.2 | | |
| Gross Movement | Normal birth | 10 | 0.1 | 1 |
| | Low birth weight | 10 | | |
| Balance | Normal birth | 9.2 | 0.1 | 0 |
| | Low birth weight | 9.2 | | |

**Table 2:** LSD test results to compare the mean scores of fine, gross movements and balance of Low birth weight and normal birth children.

### Cognitive Function

The results of Leven's test indicated that the equal assumption of mean-variance for cognitive function score for low birth weight and normal birth children was confirmed (P >0.05). The result of t-test showed that there is a significant difference between the cognitive function of low birth weight and normal birth children. (ŋ2 = 0.136, df = 65, t = 3/20, p = 0.002) The mean score of cognitive function in normal birth children (M = 98.20) were significantly higher than low birth weight children (M = 86.88), Eta square shows that 3.16% of the variance of children's cognitive function was due to low birth weight.

### Personality Characteristics

The relationship between birth weight index with personality characteristics (introversion and extroversion, self-confidence, anxiety and aggression) was assessed using Spearman correlation test. Preliminary analyses were performed to ensure that the assumptions of normality, linearity, and uniformity were not violated. The results showed that the birth weight index had no significant relationship with any of the personality characteristics (introversion, extroversion, self-confidence, anxiety and aggression) (P> 0.05).

| Variables | introversion & extroversion | confidence | anxiety | aggression |
|---|---|---|---|---|
| birth weight index | -0 | 0.2 | 0 | -0 |
| Correlation Coefficient | 0.87 | 0.1 | 0.9 | 0.8 |

**Table 3:** Results of Spearman correlation test to investigate the relationship between birth weight and children's personality characteristics.

## Discussion

The aim of this study was to investigate the effect of birth weight index on motor (fine, coarse and balanced movements) and cognitive function and its relationship with some personality characteristics (introversion, extroversion, self-confidence, anxiety, Aggression) on children.

Findings showed that children with low birth weight have lower performance in motor function than their natural counterparts, especially in fine movement.The finding of the present research is in agreement with the findings that showed children with low birth weight have lower motor skills. Low birth weight also has negative long-term consequences in three areas: motor function, child behavior, and academic achievement [25]. The other results revealed that very early premature birth children were poorer in motor programming performance than their peers or the another results also showed that premature infants have functional retardation in design and motor skills [4]. In a review survey on motor development in very premature and very low birth weight children from birth to adolescence the result indicated that very premature children are associated with significant movement disorders throughout childhood [9,10]. Other Finding of a study showed that at the age of four to five years, motor coordination, postural stability, and limb strength of children have a significant relationship with very low birth weight. The results indicate that there is a significant relationship between birth weight and motor skills [11]. While, the results of the present research are not consistent with the findings of the other research that shows there is no difference between motor function of children with very low and normal birth weight [12]. Also, with some of the results of the meta-analysis study, showed that children with very low birth weight had significantly more problems in maintaining their balance than catching the ball, and to a lesser extent hands had difficulty in agility [9]. The findings of the present study indicated lower cognitive

function of low birth weight infants. As such low birth weight, in addition to the consequences of motor function, also has cognitive consequences. The research finding showed that motor dysfunction, sensory-motor dysfunction increases cognitive impairment in very early premature children [8,13]. Moreover findings of the systematic review on cognitive, motor, behavioral, and academic performances of premature infants, the results revealed that low birth weight had lower performance in motor skill, behavioral and cognitive performance, reading, maths, and spelling at primary school age which continues into high [4,5].

Another finding of the present study was no relationship observed between some personality characteristics (introversion, extroversion, self-confidence, anxiety, and aggression) of children with low birth weight do not agree with the findings of the following research. Some research findings indicated that very low weight birth children compared to normal birth weight groups had more maladaptive behaviors in the areas of daily life skills and social skills, but no difference was observed in the field of communication [25]. These children are at risk of emerging problems in terms of behavioral and emotional characteristics [11]. The results indicated that premature five-year-olds showed slower reaction time and poor motor skills compared to their peers. Anxiety disorders in such children is also caused by family, biological, developmental and environmental contextual variables [6,24] also believes that the specific onset of each anxiety disorder may be related to the interaction between living conditions, learning history, developmental and biological processes. In addition, various factors influence children's aggression; including family, gender, academic failure are important causes in children's aggression [1,6]. In another finding, revealed by teachers of precocious children, was same as their parents as violent behavior, problems with attention and poor social processes, and increased depressive symptoms. However, most premature infants were assessed in school without any apparent problems. Despite these results, the teachers of children reported that these children entered the school environment with a weaker appearance and were at risk for behavioral problems [25].

In general, the findings address the need to evaluate and measure motor and cognitive function due to the important role it plays in motor behaviors and interaction with the physical and social environment of each individual. Therefore, diagnosis during motor, behavioral and cognitive disorders can prevent many complications and disorders in behavior. So, by timely intervention and correction of dysfunctional behaviors in this period and by increasing social skills and popularity among peers and adults, children can be prepared for future responsibilities.

## Conclusion

The findings showed that infants who had low birth weight are also at risk of movement and cognitive problems in future. The present research results are recommended to provide the necessary motor and cognitive care at an early age. To identify children at risk and prevent the decline of motor and cognitive function of these children with useful strategies. It is also recommended to educators and teachers to pay special attention to these children due to their performance in fine movements and cognitive function and learning. Therefore, it is suggested that other age groups be examined in future research.

## References

1. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Mathews TJ, et al. (2010) Births: inal data for 2007. Natl Vital Stat Rep 58(24): 1-85.

2. Cutland CL, Lackritz EM, Mallett Moore T, Bardají A, Chandrasekaran R, et al. (2017) SLow birth weight: Case definition & guidelines for data collection, analysis, and presentation of maternal immunization safety data. Vaccine 35(48): 6492-6500.

3. Ballot DE, Potterton J, Chirwa T, Hilburn N, Cooper PA (2012) Developmental outcome of very low birth weight infants in a developing country. BMC Pediatr 12: 11.

4. Van Baar AL, Van Wassenaer AG, Briët JM, Dekker FW, Kok JH et al. (2005) Very preterm birth is associated with disabilities in multiple developmental domains. J Pediatr Psychol 30(3): 247-255.

5. Sansavini A, Guarini A, Savini S (2011) Linguistic and cognitive delays in very preterm infants at 2 years: general or specific delays Foniatría y Audiología 31(3): 133-147.

6. Keshavarz M, Eskandari N (2011) Supportive methods in premature infants. Tehran: AndishehRafia.

7. Tanis JC, Van Braeckel KN, Kerstjens JM, Bocca Tjeertes IF, Reijneveld SA, et al. (2015) Functional outcomes at age 7 years of moderate preterm and full term children born small for gestational age. The Journal of pediatrics 166(3): 552-558.

8. Marlow N, Hennessy EM, Bracewell MA, Wolke D (2007). Motor and executive function at 6 years of age after extremely preterm birth. Pediatrics 120(4): 793-804.

9. De Kieviet JF, Piek JP, Aarnoudse Moens CS, Oosterlaan J (2009) Motor development in very preterm and very low-birth-weight children from birth to adolescence: A

meta-analysis. Jama 302(20): 35-42.

10. Schepers S, Deković M, Feltzer M, De Kleine M, Van Baar A (2012). Drawings of very preterm-born children at 5 years of age: a first impression of cognitive and motor development. European journal of pediatrics 171: 43-50.

11. Brown L, Burns YR, Watter P, Gibbons KS, Gray PH (2015) Motor performance, postural stability and behavior of non-disabled extremely preterm or extremely low birth weight children at four to five years of age. Early human development 91(5): 309-315.

12. Ribeiro CDC, Pachelli MRDO, Amaral NCDO, Lamônica DAC (2017) Development skills of children born premature with low and very low birth weight SBF 29(1): e20160058.

13. Kara ÖK, Günel MK, Açikel C, Yiğit S Yiğit, Arslan M (2015) Is there any difference between high-risk infants with different birth weight and gestational age in neurodevelopmental characters? Turk Paediatri Ars 50(3): 151-157.

14. Tamplain P, Webster EK, Brian A, Valentini NC (2019) Assessment of Motor Development in Childhood: Contemporary Issues, Considerations, and Future Directions. Journal of Motor Learning and Development 8(2): 391-409.

15. Linsell L, Johnson S, Wolke D, Morris J, Kurinczuk JJ, et al. (2019) Trajectories of behavior, attention, social and emotional problems from childhood to early adulthood following extremely preterm birth: a prospective cohort study. European child and adolescent psychiatry 28(4): 531-542.

16. Goodway JD, Ozmun JC, Gallahue DL (2020) Understanding motor development: Infants, children, adolescents, adults. In: 8th (Edn.), Jones & Bartlett Learning.

17. Lee A, Hobson RP (2006) Drawing self and others: How do children with autism differ from those with learning difficulties Br J Dev Psychol 24: 547-565.

18. Dadsetan P (2015) Personality assessment of children based on graphical tests. Tehran: Roshd Publications.

19. Valentini NC, Ramalho MH, Oliveira MA (2014) Movement assessment battery for children-2: translation, reliability and validity for Brazilian children. Res Dev Disable 35(3): 733-740.

20. Chow SMK, Hsu YW, Henderson SE, Barnett AL, Lo SK (2006) The Movement ABC: A cross-cultural comparison of preschool children from Hong Kong, Taiwan, and the USA. Adapted physical activity quarterly 23(1): 31-48.

21. Akbaripour A, Daneshfar A, Shojaee M (2019) Reliability of the Movement Assessment Battery for Children - Second Edition (MABC-2) in children aged 7-10 years in Tehran. J Rehab Med 7(4): 90-96.

22. Akbaripour A, Daneshfar A, Shojaee M (2018) Validation of the Movement Assessment Battery for Children -Second Edition in the age band two in Tehran, Empowering Exceptional Children Journal 8(1): 121-127.

23. Royer J (1977) Personality through the drawing of the man. Brussels: Editest.

24. Zeini M, Khaksar E, Baloochi Anaraki M, Rezaei S, Arefanian R (2018) Comparison the Elements of Draw–a-Person Test (DAP) in Children with Autism Spectrum and Attention Deficit/Hyperactivity Disorders with Normal Children. Quarterly Journal of Child Mental Health 4(4): 117-129.

25. Rahavi Ezabadi R, Hejazizi Dinani P, Hamidi N (2019) Comparing of motor proficiency, behavior and educational progress preterm children 8-10 years with term children. Motor Behaviour 33: 89-104.