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# FACTORS INFLUENCING SELF-ESTEEM IN CHILDREN WITH AUTISM: THE ROLE OF PSYCHOMOTOR CLUMSINESS

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**Abstract:**

**Introduction:** Self-esteem is a fundamental factor in the psychological development and social adjustment of children with autism; therefore, in order to develop effective interventions, it is considered critical to understand the factors that influence it. **Aim:** To investigate the self-esteem and psychomotor clumsiness of children with autism and the factors that affect children's self-esteem, studying the role of psychomotor clumsiness. **Methodology:** A cross-sectional quantitative correlation study was conducted. The dependent variable of the study was self-esteem, and was measured by the RES tool, and the independent variables were a) psychomotor clumsiness, which was measured by the M-ABC test (2nd Edition) and b) the characteristics of the child with autism. 152 teachers, the majority of whom were women, aged 21-40 years, living in an urban center, with a postgraduate qualification, specialization in special education, up to 10 years of experience and up to 5 years of experience in special education, who teach in a primary school, participated in the survey. The substudy children with autism (38 low, 65 moderate, 50 high functionality) are mostly boys, aged 8-14 years, with normal BMI and perform physical activity in and out of school. Data analysis was performed at $\alpha$=5% using independent samples t-test, One Way ANOVA, Pearson, Spearman and multiple linear regression tests. Data collection took place in special education schools from May 2023 to February 2024. The study received ethical approval from the University of Ioannina on 4/24/2023. **Results:** Moderate levels of psychomotor clumsiness emerged. Students struggled to an above-average degree in tests where the child is stationary and the environment is changing (*AV*=1.62), to a moderate degree in tests where the child is moving in a changing environment (*AV*=1.62), to a moderate degree in tests where the child is moving in a changing environment (*AV*=1,47) and stable environment (*AV*=1,42) and below average in tests where the child is stationary and the environment is stable (*AV*=1,29). Self-esteem levels scored slightly above average (*AV*=2,71). The variables "Child Stationary/Environment Stable" (beta=-0.256, p=0.036), attendance at "SMEAE/ENEEGY/KEDASY" (beta=-0.245, p=0.002) and "Physical activity outside of school" (beta=0.232, p=0.003) were found to be predictors of a decrease in "Self-Esteem". Lower levels of self-esteem were observed in low-functioning students (*AV*=2.58) compared to high-functioning students (*AV*=2.81, p=0.011). **Conclusions:** It is considered necessary to address the psychomotor clumsiness of children with autism on low-difficulty tests and physical activity outside of school in order to increase self-esteem levels. Vulnerable groups with low self-esteem were identified as students with autism attending special schools for SMEAE/ENEEGY/KEDASY and low-functioning children.

**Keywords:** psychomotor clumsiness, self-esteem, Autism functionality, influencing factors, physical activity

## 1. Introduction

### 1.1 Theoretical Background

Rosenberg *et al.* (1965, 1979) introduce the concept of self-esteem as a central element of personality, while Makri-Botsari *et al.* (2001) emphasize the connection between self-esteem and psychological well-being. Research shows that children with autism with higher levels of self-esteem report an increased ability to interact socially and a greater sense of happiness. In particular, research by McChesney and Toseeb (2018) demonstrates a positive association between self-esteem and happiness in children with autism. Research by Cooper *et al.* (2017) and McChesney & Toseeb (2018) highlight the importance of social identity on self-esteem in children with autism. Furthermore, they observe that children participating in social support programs develop skills that enhance their self-image and promote their social well-being. Given that self-esteem is a central component of mental health and social inclusion of children with autism, understanding the factors that shape it can lead to targeted interventions to improve the quality of life of these children is considered important. The necessity of the study arises from the need to enhance the social inclusion of children with autism, especially in a context where they are often marginalized. The most important factors influencing self-esteem include psychomotor clumsiness, physical activity, educational environment and autism functionality.

Psychomotor clumsiness is characterized by difficulties in movement coordination, balance and fine motor skills, and is a common phenomenon in children with autism. Lloyd *et al.* (2013) report that motor difficulties intensify with age, increasing the challenges children face. At the same time, Blake *et al.* (2003) highlight that children with autism have difficulty with visual motion recognition, exacerbating their psychomotor development.

The social and psychological implications of psychomotor clumsiness are significant. Whyatt and Craig *et al.* (2012) and Lahav *et al.* (2013) demonstrate that these difficulties and low psychomotor performance limit opportunities for social interaction, leading to low self-esteem. Similarly, Schroun *et al.* (2015) demonstrate that psychomotor clumsiness impedes social integration and self-efficacy, reinforcing feelings of inadequacy. Chow *et al.* (2001) and Henderson and Sugden (1992) highlight the importance of early diagnosis and intervention in motor skills. Carmody and Lewis *et al.* (2012) point out that idiosyncratic motor skills can lead to marginalisation and social racism, which further impairs self-esteem. Research by McChesney and Toseeb *et al.* (2018) shows that children with autism report high levels of self-esteem when social skills are enhanced. Crawford *et al.* (2001) show that motor development is directly related to increased self-esteem.

On the other hand, van der Cruijsen and Boyer *et al.* (2020) argue that children with low functioning have significantly reduced self-esteem, while the findings of Bartak and Rutter *et al.* (1976) demonstrate that challenges in social adjustment are directly

related to functionality. Meanwhile, Courchesne *et al.* (2011) demonstrate that brain differences in children with autism may affect the development of skills related to self-esteem. Starr *et al.* (2003) show that changes in self-concept in children with high functioning have a positive effect on their social adjustment.

The educational environment also affects self-esteem. Conley *et al.* (2007) show that special education students have lower self-esteem compared to their peers in mainstream schools. Molteno *et al.* (2001) add that children with severe intellectual disabilities in special schools have more behavioural difficulties, which negatively affects self-esteem. However, Reed *et al.* (2012) highlight that children with access to specialist provision improve their behaviour and socialisation.

Physical activity is one of the most important predictors of self-esteem. Ekeland *et al.* (2005) highlight that involvement in supervised activities leads to improvements in self-esteem. Similarly, Jones *et al.* (2017) demonstrate that increased physical activity enhances social skills and self-concept. Memari *et al.* (2017) add that moderate to vigorous intensity activities improve social integration and psychosocial well-being. The Greek literature provides further evidence of the importance of self-esteem and physical activity. Gkatzogia *et al.* (2018) highlight the positive effects of physical activity in improving motor skills and self-image. Furthermore, targeted interventions show particular effectiveness in improving self-esteem. Ketcheson *et al.* (2017) demonstrate that 8-week physical activity programs enhance motor function and social interaction. Ruggeri *et al.* (2020) point out that activities such as swimming and horseback riding promote self-esteem and social integration.

Only a few studies in Greece have focused on the combined approach of social and motor parameters, linking physical activity and psychomotor clumsiness with self-esteem. The present study aims to investigate the self-esteem and psychomotor clumsiness of children with autism and the factors that influence children's self-esteem by studying the role of psychomotor clumsiness. The research questions are:

1) What are the levels of psychomotor clumsiness of children with autism?
2) What are the levels of self-esteem of children with autism?
3) What factors affect the self-esteem of children with autism, and what is the role of psychomotor clumsiness?

Practically, the study can contribute to the advancement of educational and social programs that promote positive social identity, enhance self-esteem and reduce the exclusion of children with autism. Interventions based on these findings can improve social well-being by creating more inclusive communities.

## 2. Methodology

### 2.1 Research Design

A cross-sectional study was conducted to assess the self-esteem and psychomotor clumsiness of children with autism over a specific time period (Olsen *et al.*, 2010). The

present cross-sectional study was based on primary quantitative correlational research. The quantitative approach was considered the appropriate design as the substudy dimensions are measurable (Cohen, Manion, & Morrison, 2018) and also in order to investigate interrelationships between dependent and independent variables (Muijs, 2011). Specifically, the dependent variable of the study is self-esteem which was measured with the valid RSE (Rosenberg Self-Esteem Scale) instrument (Rosenberg, 1965). The independent variables of the study are psychomotor clumsiness, which was measured by the valid M-ABC (Movement Assessment Battery Coordination) test (2nd Edition) and child characteristics, which were assessed by closed-ended questions.

### 2.2 Questionnaire

1) **Teacher's personal data:** This section includes 8 closed-ended questions regarding gender, age, education level, region of residence, years of experience, years of experience in special education, speciality, and school of employment.
2) **Child data:** This section includes 6 questions on gender, child age, autism functionality, physical activity participation in and out of school, and BMI.
3) **Psychomotor clumsiness:** To assess levels of psychomotor clumsiness, the reliable and valid (conceptual construct validity) M-ABC (Movement Assessment Battery Coordination) tool was used to assess motor difficulties (Crawford, Wilson & Dewey, 2001; Chow, Henderson & Barnett, 2001) and was weighted in 2018 (Gkatzogia, 2018). The scale includes 48 Likert scale questions from 0-3, where higher values indicate greater psychomotor clumsiness in 4 tests, which result from the combination of the cases where the child is stationary or moving, and the environment is stable or changing:
    a) Child Stationary/Environment Stable,
    b) Child Moving/Environment Stable,
    c) Child Stationary/Environment Changing,
    d) Child Moving/Environment Changing.
4) **Self-Esteem:** The RSE (Rosenberg Self-Esteem Scale) (Rosenberg, 1965) was used, which includes 10 Likert scale 1-4 questions where higher values express higher agreement. 5 questions express the presence of self-esteem and 5 express absence of self-esteem as they are reversed during factor formation (1↔4, 2↔3). The validity of the instrument lies, according to the constructors, in its simultaneous predictive validity and conceptual construction through the method of known groups (Rosenberg, 1979).

### 2.3 Sample and Data Collection

The survey sample consisted of 152 teachers, sampled by cluster sampling according to the type of special education school (Creswell, 2014). The majority of the teachers were female (90.13%), aged 21-40 years (71.89%), urban residents (71.33%) with a postgraduate qualification (69.54%). Most of the teachers who had a specialty in special education

(67.97%) reported up to 10 years of experience (64.05%) and up to 5 years of experience in special education (56.86%) and taught in an elementary school (56.86%).

**Table 1:** Teacher Information

| **Attribute** | **Categories** | **N** | **%** |
|---|---|---|---|
| Gender | Male | 15 | 9,87 |
| | Female | 137 | 90,13 |
| Age | 21-30 | 45 | 29,41 |
| | 31-40 | 65 | 42,48 |
| | 41-50 | 31 | 20,26 |
| | 51-60 | 12 | 7,84 |
| Education Level | University (AEI/TEI) | 42 | 25,83 |
| | Master's Degree | 105 | 69,54 |
| | Doctorate (PhD) | 7 | 4,64 |
| Residence Area | Urban Centre | 107 | 71,33 |
| | Small Town | 27 | 18,00 |
| | Rural Area/Island | 16 | 10,67 |
| Years of Work Experience | 0-5 years | 62 | 40,52 |
| | 6-10 years | 36 | 23,53 |
| | 11-15 years | 35 | 22,88 |
| | 16+ years | 20 | 13,08 |
| Years of Experience in Special Education | 0-5 years | 87 | 56,86 |
| | 6-10 years | 35 | 22,88 |
| | 11-15 years | 21 | 13,73 |
| | 16+ years | 10 | 6,54 |
| Specialization | Special Education Sector | 104 | 67,97 |
| | Other Sectors | 49 | 32,03 |
| School Type | Kindergarten | 15 | 9,80 |
| | Primary School | 87 | 56,86 |
| | Middle/ High School | 2 | 1,31 |
| | Special Schools (SMEAE) | 27 | 17,65 |
| | Vocational School for Students with Special Needs (EEEEK) | 16 | 10,46 |
| | Special Vocational Secondary School (ΕΝΕΕΓΥ)/KEDASY | 6 | 3,92 |

The substudy children with autism are mostly boys (73.86%), aged 8-14 years (60.13%), with normal BMI (63.40%) and performing physical activity in (91.50%) and out of school (69.28%). Regarding functionality, 42.48% are moderate functioning autism, 32.68% are high and 24.84% are low.

**Table 2:** Information on Children with Autism

| Attribute | Categories | N | % |
|---|---|---|---|
| Gender | Male | 113 | 73,86 |
| | Female | 40 | 26,14 |
| Age | 3-7 | 36 | 23,53 |
| | 8-14 | 92 | 60,13 |
| | 15-18 | 16 | 10,46 |
| | 19+ | 9 | 5,89 |
| Autism Functionality | Low | 38 | 24,84 |
| | Moderate | 65 | 42,48 |
| | High | 50 | 32,68 |
| Physical Activity at School | No | 13 | 8,50 |
| | Yes | 140 | 91,50 |
| Physical Activity Outside School | No | 47 | 30,72 |
| | Yes | 106 | 69,28 |
| Body Mass Index (BMI) | Underweight | 22 | 14,38 |
| | Normal | 97 | 63,40 |
| | Overweight/ Obese | 34 | 22,23 |

### 2.4 Data Collection and Ethical Concerns

The Ethics Committee of the University of Ioannina approved the conduct of the research on 24/04/2023. Data collection was performed during the period 1/05/2023-29/02/2024, online through the Google Forms Application. The administrations of the special education schools shared the teachers' personal e-mails with the researcher. The researcher informed the teachers about the purpose of the survey, the context of the survey, and that their participation was anonymous, voluntary and with their own consent. In addition, they were informed that their responses would only be used for the purposes of the research and that they had the right to delete their participation at any time they wished. The necessary ethical considerations of scientific research were observed (APA, 2010).

### 2.5 Statistical Analysis of Data

Statistical analysis of the data was performed using SPSS 26 software at a 5% significance level. Percentages, mean, and standard deviation were used to assess the level of psychomotor clumsiness and self-esteem. The factors of psychomotor clumsiness and self-esteem were tested for internal consistency of reliability using Cronbach's alpha index (Galanis, 2013), which was calculated by averaging the corresponding questions and tested for normal distribution based on the Shapiro-Wilk test (Razali & Wah, 2011). The normality assumption was met for all factors except "Child Stationary/Environment Stable" ($p=0.046$). Therefore, the non-parametric Friedman test for dependent samples was used to compare the levels of psychomotor clumsiness between factors. The relationship between psychomotor clumsiness and self-esteem was examined using Pearson's correlation coefficient for normal distributions and Spearman's coefficient for

non-normal distributions. Self-esteem levels were compared between two independent samples using the parametric t-test and between three or more independent samples using the parametric one-way ANOVA with post hoc analysis LSD. Predictors of self-esteem were explored using multiple linear regression models (Field, 2017).

**Table 3:** Normality Check for Study Factors

| Factors | W (153) | p-value |
|---|---|---|
| Child Stationary/Environment Stable | 0,982 | 0,046 |
| Child Moving/Environment Stable | 0,985 | 0,093 |
| Child Stationary/Environment Changing | 0,990 | 0,331 |
| Child Moving/Environment Changing | 0,987 | 0,155 |
| Self-Esteem | 0,987 | 0,147 |

## 3. Results

### 3.1 Reliability analysis

Reliability analysis demonstrated excellent reliability for the psychomotor clumsiness factors "Child Stationary/Environment Stable" ($\alpha$=0.922), "Child Moving/Environment Stable" ($\alpha$=0.919), "Child Moving/Environment Changing" ($\alpha$=0.908), "Child Moving/Environment Changing" ($\alpha$=0.906) and acceptable for "Self-Esteem" ($\alpha$=0.682).

**Table 4:** Reliability Analysis

| Factors | Questions | Cronbach Alpha | Reliability |
|---|---|---|---|
| Child Stationary/Environment Stable | 1-12 | 0,922 | Excellent |
| Child Moving/Environment Stable | 13-24 | 0,919 | Excellent |
| Child Stationary/Environment Changing | 25-36 | 0,908 | Excellent |
| Child Moving/Environment Changing | 37-48 | 0,906 | Excellent |
| Self-Esteem | 1R, 2R, 3, 4R, 5, 6R, 7-9, 10R | 0,682 | Acceptable |

**Note:** R: Reverse question.

### 3.2 Levels of Psychomotor Clumsiness

Statistically significant differences were observed between psychomotor clumsiness factors (X2 (3)=58.890, p<0.001). Specifically, the levels of psychomotor clumsiness in the "Child Stationary/Environment Stable factor" (*AV*=1.29) are statistically lower than those in the factors "Child Moving/Environment Stable" (*AV*=1.42, p=0.034), "Child Stationary/Environment Changing" (*AV*=1.62, p<0.001) and "Child Moving/Environment Changing" (*AV*=1.47, p=0.003). In addition, the levels of psychomotor clumsiness in the "Child Stationary/Environment Changing" factor (*AV*=1.62) are statistically greater than those in the "Child Moving/Environment Stable" (*AV*=1.42, p<0.001) and "Child Moving/Environment Changing" (*AV*=1.47, p<0.001) factors.

**Table 5:** Comparison of Psychomotor Clumsiness Factors

| Factors | Mean (AV) | Std. Dev. (T.A.) | Statistic | p-value |
|---|---|---|---|---|
| Child Stationary/Environment Stable | 1,29 | 0,64 | $X^2$ (3)=58,890 | **<0,001** |
| Child Moving/Environment Stable | 1,42 | 0,60 | | |
| Child Stationary/Environment Changing | 1,62 | 0,58 | | |
| Child Moving/Environment Changing | 1,47 | 0,61 | | |

### 3.3 Self-esteem levels

Self-esteem levels were assessed as slightly above average (*AV*=2.71, T.A.=0.43). Teachers agreed that children feel that they have good qualities (83.66%, *AV*=2.93), that they are as worthy as others (71.90%, *AV*=2.78) and that they are satisfied with themselves (66.67%, *AV*=2.66). However, slightly more than half of the teachers reported that children sometimes do not feel worthwhile (54.25%, *AV*=2.46).

**Table 6:** Self-Esteem

| Question | Mean (AV) | Std. Dev. T.A. | Strongly Disagree (%) | Disagree (%) | Agree (%) | Strongly Agree (%) |
|---|---|---|---|---|---|---|
| 5. Believes they have good qualities. | 2,93 | 0,70 | 5,88% | 10,46% | 68,63% | 15,03% |
| 7. Thinks they are as worthy as others. | 2,78 | 0,83 | 9,80% | 18,30% | 56,21% | 15,69% |
| 9. Feels satisfied with themselves. | 2,66 | 0,86 | 13,07% | 20,26% | 54,25% | 12,42% |
| 3. Does not have a negative attitude toward themselves. | 2,60 | 0,91 | 13,07% | 30,07% | 40,52% | 16,34% |
| 8. Believes they do things as well as others. | 2,48 | 0,94 | 18,30% | 28,76% | 39,87% | 13,07% |
| 1. Sometimes feels useless. [R] | 2,46 | 0,80 | 13,73% | 32,03% | 48,37% | 5,88% |
| 6. Does not consider themselves successful. [R] | 2,29 | 0,81 | 16,99% | 41,83% | 35,95% | 5,23% |
| 10. Believes they do not respect themselves as much as they should. [R] | 2,22 | 0,85 | 20,92% | 42,48% | 30,07% | 6,54% |
| 4. Is not proud of themselves. [R] | 2,19 | 0,83 | 21,57% | 42,48% | 31,37% | 4,58% |
| 2. Is sometimes bad. [R] | 2,16 | 0,89 | 27,45% | 34,64% | 32,68% | 5,23% |
| Overall Self-Esteem | **2,71** | **0,43** | | | | |

**Note:** R: Reverse question.

### 3.4 Correlates of Self-Esteem

"Self-esteem" was negatively associated with all the factors of psychomotor clumsiness: "Child Stationary/Environment Stable" (rho (153) =-0.309, p<0.001), "Child Moving/Environment Stable" (r(153) =-0.220, p=0.006), "Child Stationary/Environment Changing" (r(153) =-0.192, p=0.017), and "Child Moving/Environment Changing" (r(153) = -0.310, p<0.001).

Furthermore, statistically significant differences were observed in the levels of "Self-Esteem" in relation to the school of attendance (F (3,149) =4.186, p=0.007), with teachers teaching in SMEAE/ENEEGY/KEDASY reporting lower levels (M. O.=2.48) compared to those teaching in Kindergarten (*AV*=2.75, p=0.045), Primary/Middle/High School (*AV*=2.78, p=0.001) and EEEEK (*AV*=2.77, p=0.027).

Moreover, "Self-Esteem" levels varied according to autism functionality (F (2,150) = 3.350, p=0.038), with lower levels observed in low-functioning students (*AV*=2.58) compared to high-functioning students (*AV*=2.81, p=0.011).

Finally, students who perform physical activity outside of school showed higher levels of 'Self-Esteem (*AV*=2.78) compared to those who do not (*AV*=2.57, p=0.006).

**Table 7:** Statistically Significant Correlations with "Self-Esteem"

| **Variable** | **Category** | **Mean (*AV*)** | **Std. Dev.** | **Statistic** | **p-value** |
|---|---|---|---|---|---|
| Child Stationary/ Environment Stable | - | - | - | rho (153) = -0,309 | **<0,001** |
| Child Moving/ Environment Stable | - | - | - | r (153) = -0,220 | **0,006** |
| Child Stationary/ Environment Changing | - | - | - | r (153) = -0,192 | **0,017** |
| Child Moving/ Environment Changing | - | - | - | r (153) = -0,310 | **<0,001** |
| School Type | Kindergarten | 2,75 | 0,38 | F (3,149) = 4,186 | **0,007** |
| | Primary/Secondary School | 2,78 | 0,44 | | |
| | SMEAE/ENEEGY/KEDASY | 2,48 | 0,33 | | |
| | EEEEK | 2,77 | 0,48 | | |
| Autism Functionality | Low | 2,58 | 0,31 | F (2,150) = 3,350 | **0,038** |
| | Moderate | 2,71 | 0,45 | | |
| | High | 2,81 | 0,45 | | |
| Physical Activity Outside School | No | 2,57 | 0,42 | t (151) = -2,773 | **0,006** |
| | Yes | 2,78 | 0,42 | | |

### 3.5 Predictors of Self-Esteem

Predictors of a decrease in "Self-Esteem" were found to be psychomotor clumsiness in the "Child Stationary/Environment Stable" test (beta=-0.256, p=0, 036) and school attendance in the "SMEAE/ENEEGY/KEDASY" (beta=-0.245, p=0.002), while "Physical activity outside school" (beta=0.232, p=0.003) emerged as a predictor of an increase in "Self-esteem".

**Table 8:** Multiple Linear Regression with Dependent Variable "Self-Esteem"

| **Independent Variables** | **B** | **Beta** | **t** | **p-value** | **VIF** |
|---|---|---|---|---|---|
| Constant | 2,859 | - | 15,638 | **<0,001** | - |
| Child Stationary/Environment Stable | -0,173 | -0,256 | -2,118 | **0,036** | 2,711 |
| Child Moving/Environment Stable | 0,068 | 0,095 | 0,637 | 0,525 | 4,128 |
| Child Stationary/Environment Changing | 0,133 | 0,181 | 1,198 | 0,233 | 4,216 |
| Child Moving/Environment Changing | -0,197 | -0,281 | -1,839 | 0,068 | 4,334 |
| SMEAE/ENEEGY/KEDASY | -0,255 | -0,245 | -3,102 | **0,002** | 1,152 |
| Autism Functionality | -0,019 | -0,034 | -0,381 | 0,704 | 1,476 |
| Physical Activity Outside School | 0,215 | 0,232 | 2,979 | **0,003** | 1,125 |

**Note:** F (7,145) =5,765, p <0,001, $R^2$=21,8%

## 4. Discussion

The current study investigated the levels of self-esteem and psychomotor clumsiness of children with autism and the factors that affect children's self-esteem, studying the role of psychomotor clumsiness.

The first research question investigated the level of psychomotor clumsiness in children with autism. The results showed moderate levels of psychomotor clumsiness. Students struggled to an above-average level on tests where the child is stationary and the environment changes, to a moderate level on tests where the child is moving, and to a below-average level on tests where the child is stationary and the environment is stable. One of the common problems of children with autism is the development of motor skills. The brain and spinal cord work in harmony to coordinate the planning and execution of movements, from simple to complex, involving every aspect (Courchesne *et al.*, 2011). Children with autism, particularly those with Asperger syndrome, show differences in symptom severity and developmental functionality compared to those with other pervasive developmental disorders (Starr *et al.*, 2003). Their performance on standardized tests may be affected by their motivation and attention, suggesting the necessity for adapted testing conditions (Koegel *et al.*, 1997). These children may have difficulties in organizing their behavior in extended temporal situations (Diamond *et al.*, 1998) and may also have difficulty with visual motion recognition (Blake *et al.*, 2003). Whyatt and Craig *et al.* (2012) demonstrated that children with autism have significant motor deficits, particularly in activities requiring balance and interaction skills. This suggests that motor difficulties are not always generalised but are focused on complex activities (Whyatt & Craig, 2012). Research by Lloyd *et al.* (2013) showed that toddlers with autism show increasing motor difficulties with age. These difficulties include the development of both gross and fine motor skills, with differences becoming more apparent with each six-month increase in age (Lloyd *et al.*, 2013). Furthermore, Ketcheson *et al.* (2017) highlighted the importance of early intervention in motor skills. Specifically, an 8-week intervention programme significantly improved gross motor skills, coordination and physical activity in children with autism aged 4-6 years (Ketcheson *et al.*, 2017).

The second research question looked at the self-esteem levels of children with autism. The results showed that self-esteem levels were moderate to high. Although there is some evidence that children feel that they have good qualities, that they are worthy as much as others and that they are satisfied with themselves, slightly more than half of the teachers reported that children sometimes do not feel worthwhile. During peer interaction, due to stigma, children with autism who experienced consistent failures in school and were despised or disapproved of by others developed an inferiority complex that led to maladaptive behaviors. In other words, they manifest anxiety and negative emotions such as being easily irritable or showing aggression, tending to be negative, or having a lonely attitude towards life. On the other hand, children with good cognition portray feelings of inferiority that lead to social maladjustment - hence loneliness and frustration. They display excessive emotionality combined with a lack of confidence in their own opinion, leading to unexpected, explosive behaviours due to hypersensitivity and shyness, resulting in low self-esteem (Makri-Botsari, 2001). McChesney and Toseeb *et al.* (2018) showed that almost half of participants with autism reported high levels of self-esteem and happiness despite difficulties in managing social relationships. However, a lower rate at the 'ideal level' of self-esteem was observed compared to children without autism (McChesney & Toseeb, 2018). Research by Cooper *et al.* (2017) highlighted that creating a positive social identity in people with autism can enhance their personal self-esteem. A strong identity in autism appeared to work protectively against symptoms of anxiety and depression (Cooper *et al.*, 2017).

The third research question investigated the factors that influence self-esteem in children with autism and the role of psychomotor clumsiness. The results indicated that children with autism with higher psychomotor clumsiness had lower self-esteem. Psychomotor clumsiness emerged as a predictive risk factor that reduces self-esteem in low-difficulty tests where the child is stationary and the environment is stable. Autistic children face marginalization from the beginning of their childhood. This exclusion, at times, escalates into what can be called social racism - an act that is mainly fuelled by the behaviour of their peers in the school environment. Children are often labelled as 'special' based on idiosyncratic physical characteristics such as abnormalities in gait or appearance based on Carmody & Lewis' (2012) study, and when faced with consistent failure, they develop feelings of inferiority leading to behavioural dysfunction (Makri-Botsari, 2001). Whyatt and Craig *et al.* (2012) found that children with autism have significant difficulties in psychomotor performance, especially in activities that require balance and interaction skills, such as catching a ball. These difficulties affect their self-esteem as they are often associated with social isolation and marginalisation (Whyatt & Craig, 2012). The study by Lahav *et al.* (2013) indicated that children with low psychomotor ability respond worse to intervention programmes and have an increased risk of low self-esteem. These findings highlight the importance of individualized approaches to enhance psychomotor development in children from vulnerable social groups (Lahav *et al.*, 2013). According to Schroun *et al.* (2015), parents of children with

weak motor skills describe difficulties in social interaction and self-care. These limited skills are directly linked to low self-esteem and require specific interventions (Schroun *et al.*, 2015).

Additionally, lower levels of self-esteem were observed in children with autism attending SMEAE/ENEEGY/KEDASY. Obviously, special schools are attended by children with autism who have more severe problems and, therefore, have lower self-esteem. Children with severe and profound levels of intellectual disability, who are often in special schools, have more behavioural difficulties (Molteno *et al.*, 2001). Research by Conley *et al.* (2007) also found that students with emotional disturbances and learning disabilities who attend special education have significantly lower self-esteem than general education students, especially in social and leadership skills. This suggests that special education environments should be designed to enhance the self-esteem of these children (Conley *et al.*, 2007). However, children with special needs, including those with autism, show greater improvements in behavior and socialization compared to those in general education (Reed *et al.*, 2012).

Furthermore, low autism functionality was associated with lower self-esteem, with statistically significant differences in self-esteem between children with low and high autistic functioning. Research by van der Cruijsen and Boyer (2020) found that children with autism and low functionality had lower explicit self-esteem compared to typically developing peers, with lower self-esteem directly related to symptoms of depression (van der Cruijsen & Boyer, 2020). McChesney and Toseeb's (2018) study found that children with lower autistic functioning were more likely to be categorised as having moderate to low self-esteem and positive functionality, suggesting that functioning influences self-esteem and psychosocial well-being (McChesney & Toseeb, 2018). Bartak and Rutter's (1976) study highlighted that children with low autism functionality experience more difficulties with social adjustment, and these difficulties are associated with lower levels of self-esteem compared to children with higher functionality (Bartak & Rutter, 1976).

Physical activity outside of school emerged as a predictor of increased self-esteem in children with autism, highlighting the benefits of physical activity on children's psychology and enhancing their self-image. Physical activity has a positive impact on the psychological and physical development of children with autism. It has been found to improve physical and social skills, reduce repetitive behaviours and enhance self-esteem (Jimenez Martinez *et al.*, 2018). The meta-analysis by Ekeland *et al.* (2004) demonstrated that participation in regular physical activity leads to short-term improvements in self-esteem in children, especially when the exercise involves supervised and group activities, suggesting the inclusion of such activities as part of educational interventions (Ekeland *et al.*, 2005). The study by Jones *et al.* (2017) observed that increased physical activity was positively associated with improved socialization and self-concept skills in children with autism spectrum disorders, indicating the beneficial effects of physical activity in multiple domains (Jones *et al.*, 2017). Research by Memari *et al.* (2017) showed that

children with better social functionality and higher levels of cognitive flexibility participate more in moderate to vigorous physical activity, which highlights the importance of physical activity as a means to promote social inclusion and self-esteem (Memari *et al.*, 2017).

The results of the study are limited in their generalization as they mainly concern boys with autism, 8-14 years old, who perform physical activity in and out of school and have normal BMI. A further limitation of the study is the fact that the research was not experimental but cross-sectional. To safely establish cause and effect relationships, it is suggested that future researchers conduct experimental research examining the levels of self-esteem before and after training individuals with autism in psychomotor clumsiness exercises as well as the effects of psychomotor clumsiness on self-esteem before and after the intervention (Kirk, 2013). The systematic review by Ruggeri *et al.* (2020) also demonstrates that physical activity interventions such as horse riding and swimming improved motor skills and psychosocial skills in children with autism, suggesting the importance of using these activities to enhance self-esteem and thus, it is important to conduct further experimental research examining levels of self-esteem before and after training individuals with autism in psychomotor clumsiness exercises.

**Conflict of Interest Statement**

The authors declare no conflicts of interest.

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