

# Neuropsychomotor evaluation and functional classification in schoolchildren between the ages of 10 and 12 from the public school system

## Avaliação neuropsicomotora e classificação funcional em escolares de 10 a 12 anos da rede pública

Adriano Zanardi da Silva<sup>1</sup>, Audrin Said Wojciechowski<sup>1</sup>, Tainá Ribas Mélo<sup>2</sup>, Bruna Yamaguchi<sup>3</sup>, Alessandro Said Touchan<sup>4</sup>, Andréa Serio Bertoldi<sup>5</sup>, Vera Lúcia Israel<sup>6</sup>

<http://dx.doi.org/10.11606/issn.2238-6149.v27i1p52-62>

Silva AZ, Wojciechowski AS, Mélo TR, Yamaguchi B, Touchan AS, Bertoldi AS, Israel VL. Neuropsychomotor evaluation and functional classification in schoolchildren between the ages of 10 and 12 from the public school system. Rev Ter Ocup Univ São Paulo. 2016 Jan.-Apr.;27(1):52-62.

**ABSTRACT:** Neuropsychomotor development (NPMD) involves the motor and cognitive areas and is influenced by environmental and task questions, which from an expanded health point of view can be classified by the International Classification of Functioning, Disability and Health (ICF). The objective of this study was to evaluate the school's NPMD and classify them according to the ICF. The study included 22 pre-adolescents (10-12 years) of both sexes, in the metropolitan region of Curitiba, Brazil, assessed by the Fonseca's Psychomotor Battery, the Functional Independence Measure, semi-structured interviews and ICF checklist for children and youth (ICF-CY). We observed that most students did not show changes in the NPMD, and that the self-report identified: changes in the family model, few possibilities for sports and leisure, preference for playing as entertainment, school as the prevailing environment, good self-perception of health, accessibility problems. In addition, we identified one child with delay in some isolated psychomotor factors, but with a good general psychomotor performance. The use of the model proposed by the authors answered the demands of the ICF, indicating its applicability and possibilities of use in the school environment.

**KEYWORDS:** Child education; School health; Psychomotor performance; Mainstreaming (education); International Classification of Functioning, Disability and Health.

Silva AZ, Wojciechowski AS, Mélo TR, Yamaguchi B, Touchan AS, Bertoldi AS, Israel VL. Avaliação neuropsicomotora e classificação funcional em escolares de 10 a 12 anos da rede pública. Rev Ter Ocup Univ São Paulo. 2016 jan.-abr.;27(1):52-62.

**RESUMO:** O desenvolvimento neuropsicomotor (DNPM) envolve as áreas motoras e cognitivas e é influenciado por questões do ambiente e da tarefa, o que numa visão ampliada de saúde pode ser classificado por meio da Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF). O objetivo deste estudo foi avaliar o DNPM de escolares e classificá-los de acordo com a CIF. Participaram do estudo 22 pré-adolescentes (10 a 12 anos) de ambos os sexos, na região metropolitana de Curitiba, avaliados por meio da Bateria Psicomotora de Fonseca, Medida da independência funcional, entrevista semiestruturada e *check-list* da CIF para crianças e jovens (CIF-CJ). Observou-se que a maioria dos estudantes não apresentou alterações no DNPM, e que o auto-relato identificou: mudança no modelo familiar, poucas possibilidades para esporte e lazer, preferência pelas brincadeiras como entretenimento, escola como ambiente predominante, boa autopercepção de saúde, dificuldade de acessibilidade. Além disso, identificou-se uma criança com atraso em fatores psicomotores isolados, mas com bom desempenho psicomotor geral. A utilização do modelo proposto pelos autores respondeu às dimensões da CIF, indicando sua aplicabilidade e possibilidades de uso em ambiente escolar.

**DESCRIPTORES:** Educação infantil; Saúde escolar; Desempenho psicomotor; Inclusão educacional; Classificação Internacional de Funcionalidade, Incapacidade e Saúde.

This work was performed in the Course Health and Functioning of the Physical Education Graduate Program of UFPR.

1. Degree in Physiotherapy by the Federal University of Paraná (UFPR), Curitiba-PR, Brazil. E-mail: zanardiufpr@gmail.com/asaidvoj@gmail.com.
2. Physical therapist, PhD student in Physical Activity and Health (UFPR), Professor at the Campos Andrade University (UNIANDRADE) and at the Brazilian Institute of Therapies and Teaching (IBRATE), Curitiba, PR, Brazil. Faculty and tutor of the Specialization Course in Gender and Diversity in School - UFPR, Matinhos, PR, Brazil. E-mail: ribasmelo@gmail.com
3. Physical therapist, Master's student in Physical Activity and Health (UFPR), Curitiba, PR, Brazil. E-mail: brunayamaguchi@hotmail.com
4. Physical Education Professor. Specialized in Teaching for Higher Education (UNICESUMAR), Full Professor of the Public School System of the state of Paraná, São José dos Pinhais, PR, Brazil. Professor at the Escola de Segurança (Hunter's), Curitiba, PR, Brazil. E-mail: aletouchan@hotmail.com
5. PhD in Motor Behavior by the Federal University of Paraná (UFPR), Brazil. Full Faculty of the State University of Paraná, Brazil. E-mail: seriobertoldi@gmail.com
6. PhD in Special Education by the Federal University of São Carlos (UFSCar), Brazil. Adjunct Professor of the Federal University of Paraná (UFPR) and of the Physical Education Graduate Program of UFPR, Brazil. E-mail: veral.israel@gmail.com

**Correspondence address:** Adriano Zanardi da Silva. Rua Coração de Maria, 92. Campus Jardim Botânico, Curitiba, PR, Brazil. CEP: 80210-132. E-mail: zanardiufpr@gmail.com

## INTRODUCTION

Development, through an ecological perspective, is a continuous process of neuropsychomotor, cognitive and emotional acquisitions that occur as the child and/or adolescent experiences the physical and social environment<sup>1</sup>. During adolescence, stage of development characterized by a physical and psychological transition that occurs in non-linear fashion, several definitions as to the age of coverage exist, some related to puberty (maturation) and others taking into consideration several factors. According to the World Health Organization (WHO), those between 10-19 years are considered adolescents, classifying also as pre-teens those who are between 10 and 14 years<sup>2</sup>. In Brazil, the Child and Adolescent Statute (ECA) rules the age between 12 and 18 years<sup>3</sup> as the age of adolescence.

Between 10 and 14 years, pre-adolescents<sup>2</sup> are in a specialized motor phase, in which they use their acquisitions to improve motor performance, and for this reason, it is expected that they should develop psychomotor basic skills<sup>4</sup> that will serve them during their full intellectual development<sup>5</sup>, thus assisting in school acquisitions.

The update of health concepts brings new evaluation demands related to health, which consider the different human functions in direct connection with the environment, lifestyle and task demands<sup>4,6</sup> and should, therefore, be considered in the evaluation of children and adolescents<sup>7</sup>. This new approach is consistent with the model proposed by the International Classification of Functioning, Disability and Health (ICF), that classifies the main areas of health aspects linked to body functions and structures, activities and participation, while considering environmental and personal factors. Domains linked to bodily functions and structures, classify physiological and anatomical aspects which are linked to activities and participation relate to the everyday demands of the individual functionality in various aspects of individual and social life. Furthermore, environmental and personal issues are considered as contextual factors that influence other domains<sup>8</sup>.

Evaluating functionality using the ICF is a subject of increasing interest, developed by the World Health Organization (WHO) as a tool for the unification of terminology applied internationally to describe the individual functionality<sup>8,9</sup>. The version of ICF for Children and Youth (ICF-CY) is used to evaluate children and adolescents, analyzing the same health-related issues discussed in the ICF with some childhood and adolescence specificities<sup>10,11</sup> and that currently has been incorporated into the new version of the ICF<sup>9</sup>.

Although the current model should advocate health care and the ICF can be widely used, we observed that in terms of research, most studies that use it, do so under pathological conditions<sup>12</sup>, requiring investigations and descriptions of the ICF domains, also in the absence of disease conditions. For ICF and ICF-CY classification to be possible, it is necessary to first use qualitative or quantitative measurement instruments.

Considering what was previously mentioned, this article had as objective to evaluate the neuropsychomotor development of school aged children and classify them according to the International Classification of Functioning (ICF). In addition, we attempted to identify the contextual health conditions of pre-adolescent schoolchildren and encourage the use of ICF in this population.

## METHODOLOGY

This study is a cross-sectional design of evaluation and classification<sup>13</sup>, of a qualitative and quantitative character, which aims to identify the contextual conditions of health in pre-adolescents who attend public schools. Initially, we contacted the school director and upon being granted authorization, we submitted the project and had it accepted by the Research Ethics Committee of the HT, approval No. 1,373,189.

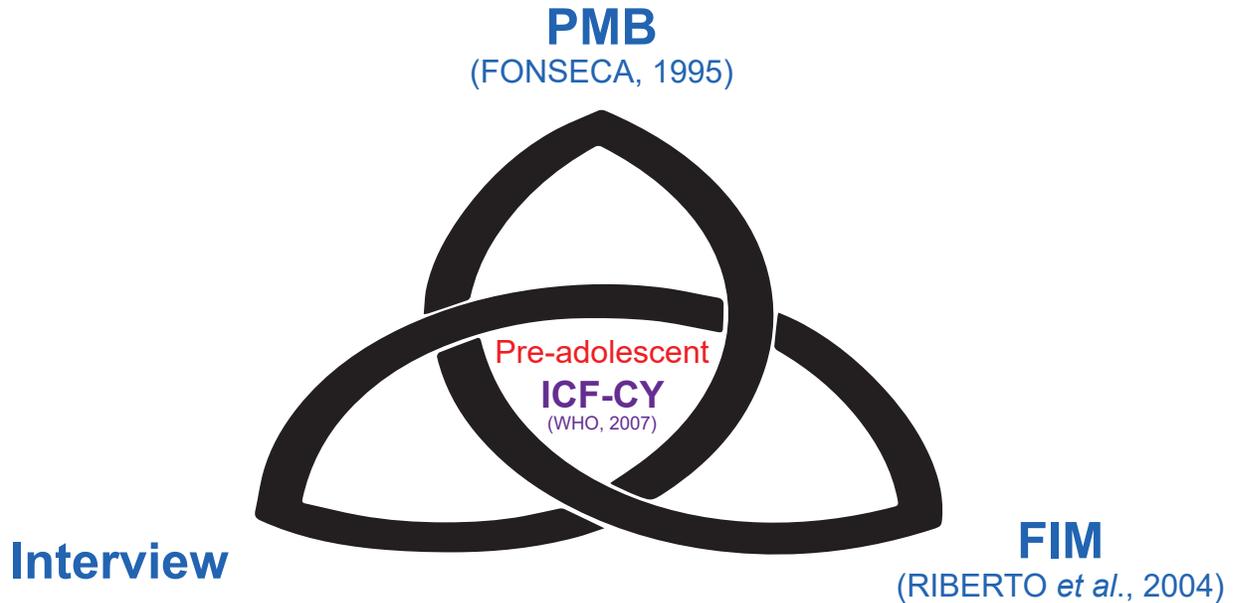
The inclusion criteria of the study participants comprised of pre-adolescents, aged 10 to 12 years, of both sexes, enrolled in a state school in the city of São José dos Pinhais, in the metropolitan region of the state capital of Paraná. Exclusion criteria included the refusal of those responsible for the participation of the pre-adolescents, their absence on the day of the evaluation or refusal to voluntarily participate in the study. We evaluated a total of 22 pre-adolescents with an average of 11.5 ( $\pm$  0.51) years of age, 13 boys (59.1%) and 8 girls (40.9%), in a state school in São José dos Pinhais.

Prior to the evaluations, we familiarized ourselves with the school environment and trained with the evaluation instruments by five evaluators (physical therapists and a physical education teacher).

Evaluations consisted in the application of three instruments, chosen after the analysis of the main areas to be defined by the ICF-CY: Psychomotor Battery (PMB)<sup>13</sup>; Functional Independence Measure (FIM)<sup>14</sup>; and semi-structured interviews. The full evaluation process took about 50 minutes. The evaluations (PMB and FIM) were classified (ICF-CY) regarding the structures and/or functions, in activities and participation, as well as represent a general context of school domains of 10 to 12 years.

To organize the evaluations, seeking to include the ICF-CY, the authors proposed the model sketched in Figure 1. In this model, we observe the evaluation instruments cited (PMB, FIM and the interviews) at the extremities, linked

with each other to center the classification by the ICF-CY. This proposed evaluation and classification can be used by all rehabilitation professionals (occupational therapists, physical therapists, psychologists, speech therapists etc.).



Source: Developed by the authors

**Figure 1** – Evaluation and classification methodology proposed by the authors

### Evaluation by the Fonseca Psychomotor Battery (PMB)

The PMB<sup>14</sup> covers the psychomotor areas of tone, balance, laterality, body concept, spatiotemporal organization, global praxis, fine praxis, all organized on a battery of tests, applied and rated by direct observation. According to Fonseca<sup>14</sup>, each factor receives a score between 1 and 4, with 1 being related to an apraxic profile, 2 to dyspraxic, 3 to eupraxic and 4 to hyperpraxic. With the 7 factors, it is possible to obtain a general profile by adding the scorers: deficit (7-8 points), dyspraxic (9-13 points), normal (14-21 points), good (22-26 points) or superior (27-28 points).

### Functional Independence Measure X ICF-CY

The functional independence measure (FIM)<sup>15</sup> was applied to check the Activities of Daily Living (ADLs), self-care, mobility, communication and social cognition

and sphincters control. Each activity was evaluated and given a score of 1 (total dependence) to 7 (complete independence), so the total score ranges from 18 to 126. The FIM was indirectly punctuated, i.e. by questioning the participants.

### Semi-structured interview X ICF-CY

Lastly, the semi-structured interview was conducted regarding conditions of health, school and other activities, participation, interpersonal relationships and problems that may be related to these areas of life (Appendix 1).

### ICF-CY

ICF is divided into four dominions: body functions, body structures, activities and participation, and environment factors<sup>8,9</sup>. Body Functions Expression is linked to physiological functions, Body Structures

Expression is linked to anatomical parts of the organism, and Activities and Participation indicate the involvement of individuals in actions and situations of everyday life. Context factors are divided into Environmental Factors and Personal Factors. Personal factors do not present encoding and are used in a descriptive form<sup>8,9</sup>. The definition of functionality includes the presence of a qualifier (which works as a general scale of 0 to 4, with 0 representing no deficiency and 4 a complete deficiency).

The value 8 is used in unspecified situations and 9 when not applicable. Qualifiers validate the magnitude of the deficiency, limitation, restriction, barriers or facilitators of health conditions<sup>9</sup>. Although the classification by the ICF-CY has been performed after the evaluations, it guided the choice of these instruments and indicated which specific area of the ICF-CY would be covered by the evaluations (Figure 2).

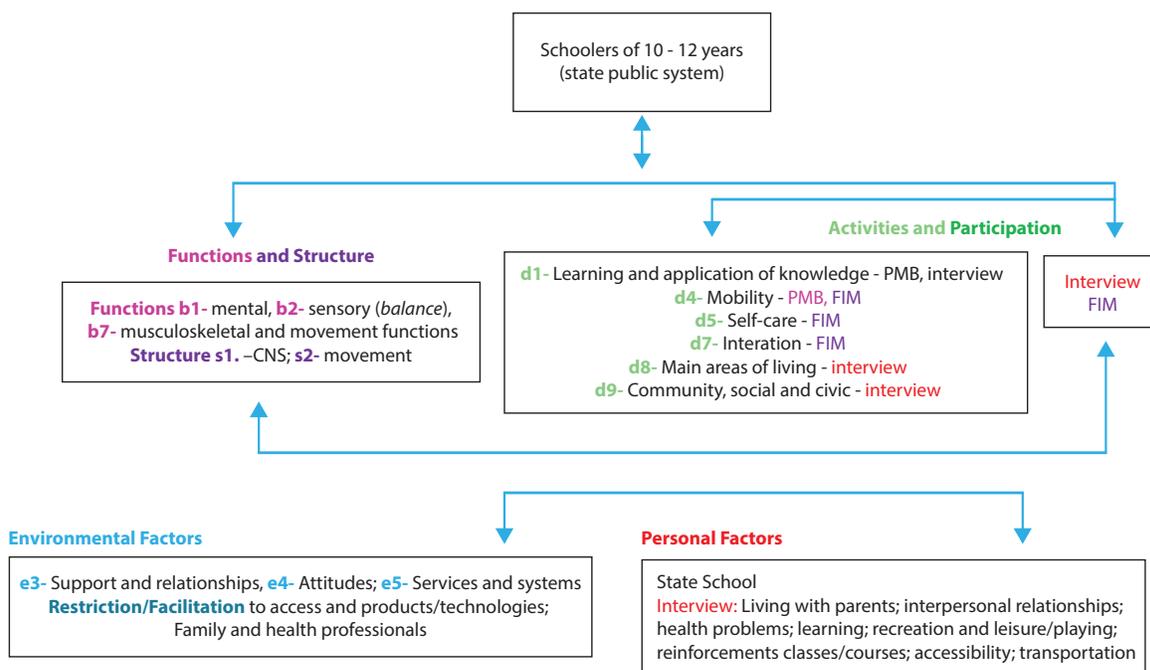


Figure 2 – Organization of the evaluations following the models ICF-CY<sup>9,10</sup>, PMB<sup>14</sup> and FIM<sup>15</sup>

## DATA ANALYSIS

The nominal and/or ordinal variables were described in absolute and percentage frequency, while the numerical variables were described as mean and standard deviation, using descriptive statistics through *Microsoft Excel*® 2013. Regarding the results of the semi-structured questionnaire, the analysis was organized by emergent central themes<sup>16</sup>, after reading and organizing the answers.

## RESULTS

### Evaluation by Fonseca Psychomotor Battery X ICF-CY

The main results regarding the psychomotor factors evaluated using the PMB<sup>14</sup> are shown in Table 1.

We did not identify any changes in the functions and structures related to psychomotor aspects for most of the children evaluated (95.45%), with the majority of children (72.73% and 22.73%) with eupractic and hyperpractic profiles, respectively, in the means of the factors evaluated. As the total score of the PMB, the average of the evaluated students was 24 (±0.26) points, which is classified by the PMB as a “Good” psychomotor profile. Of these children, 13 (61.90%) have a mesomorphic body type, 3 (14.29%) have an endomorphic profile and 6 (28.57%), an ectomorphic profile.

### Functional Independence Measure X ICF-CY

The FIM perceives (Table 2) total independence in ADLs in activities that signify independence for 95.45% of the children.

**Table 1** – Qualitative-quantitative results of the evaluations by PMB

<b>PMB (n=22)</b>	<b>Average rating</b>		
I- Tone (T)	4		
II- Balance (E)	3		
III- Lateralization (L)	3		
IV-Body concept (BC)	4		
V-Spatiotemporal structuring (STS)	3		
VI- Global praxis (GP)	3		
VII-Fine praxis (FP)	4		
<b>Sum</b>	<b>24</b>	72.73%	Eupraxis
<b>Mean</b>	<b>3</b>	22.73 %	Hyperpraxis
<b>Standard deviation</b>	<b>0.26</b>	4.55 %	Dyspraxis

4: hyperpraxis; 3: eupraxis; 2: dyspraxis; 1: apraxis

**Table 2** – Evaluation of the Functional Independence Measure (FIM)

<b>n=22</b>	<b>FIM</b>	
21	95.45%	Complete Independence (all of the items)
1	4.55%	Minimum help / Modified Independence (Self-care: nourishment; Social cognition: problem and memory solving).

Only 1 student (4.55%) in the age mentioned showed dominions of performance below his peers and he is an included student classified as having an intellectual disability (alteration of the structure s110.8, and unspecified function b160.8, b164. 8, b172.8) without changes to tone, muscle strength and/or signs of alterations in reflexes during the physical evaluation. This student showed tone, lateralization, body concept and global praxis in line with a eupraxis profile and, therefore, no alterations. In dominions linked to balance, spatiotemporal structuring and fine praxis, the child presented a dyspraxis profile, thus being classified as mild alteration by the ICF-CY (b.147.1) in these areas. Therefore, it is possible to say that intellectual disability interferes with their motor skills and the dominions mentioned.

This has also been out into evidence by some FIM scores, indicating a supervision of the caregiver in compliance with the ADLs in the areas of self-care (feeding), communication (understanding) and social cognition (problem and memory solving). Thus, this child has mild alteration of learning and knowledge application (b117.1 and d1.1), self-care (d5.1), although, despite these characteristics, this child is enrolled in regular school and classroom, with reinforcement classes offered by the Specialized Educational Service (AEE), which allows him

inclusion and eases his activities and participation (e3+4, e5+4). Therefore, the AEE classroom was considered a facilitator of this inclusion process.

**Semi-structured interview X ICF-CY**

Overall, pre-adolescents showed no restrictions in the dominions of learning and knowledge application, mobility, self-care when their activities were investigated, however, regarding participation and environmental factors, some children reported not having access to other forms of education (courses) and environmental issues, such as lack of accessibility, are perceived by them, in the vicinity of the school and their homes. These items were identified through the interviews.

As for interpersonal relationships, linked to family and housing, 6 students reported not living with their father and mother, with 2 citing the presence of stepfathers and 4 with only the presence of the mother; 7 adolescents had no siblings. In their interpersonal relationships with friends, 5 students reported having difficulties with friendships and of these, 2 admitted to having been subjected to physical aggression during disagreements with colleagues.

Regarding health, 8 students admitted having problems: with 2 reports of bronchitis and other asthma,

seizures, rhinitis + labyrinthitis, rhinitis, visual deficit + headache, unconfirmed heart murmur. Of these, only 3 (those who cited having rhinitis + labyrinthitis, asthma and seizures) reported that these conditions have influenced their daily activities.

When questioned about their learning, 6 students claimed to have difficulty. All students used their grades to evaluate whether they were struggling or not learning in school. In this context, a student reported having flunked one year, and that he was going through the same failed school year. One student reported having stopped school when his grandmother fell ill, had diabetes and suffered a limb amputation. One student complained having difficulty with writing. One student attended reinforcement classes and one of the students joined school in the second grade of elementary school, not having attended the first year, due to late enrollment.

All reported having leisure and recreational activities. The activities related to religion, such as masses and services, were described by 5 students. Football and street games were remembered by 4 adolescents, others mentioned activities were posing outside, playing ball, volleyball or basketball, walking around and going to the park. The activities mentioned by only one student were watching TV, playing computer, using the tablet, going to grandma's house, using the bike, playing ping-pong, youth gatherings and fishing.

As for extracurricular activities (courses, reinforcement classes etc.), as well as lessons in school, 6 students reported participating in other activities. Football was cited by 2 students and others mentioned catechesis, guitar lessons, computer + English and reinforcement classes.

Only 2 students reported no longer playing. The most cited plays, by preference, were: playing in the street with colleagues, with balls, football, cycling, rollerblading, basketball, catch, marbles, hide and seek, rope and playing with dolls.

Regarding mobility and access, two students reported having difficulties with the sidewalk next to the school, which is undergoing renovations. The others did not report accessibility difficulties inside or outside the school. As for the means of transportation, the families of 3 students opted for transportation to school via van/ 3 come to class with their parents' vehicle (car or motorcycle); 9 walk to school, with 5 being accompanied by adults (with a student reporting only going to school when it does not rain, because whoever accompanies him is a wheelchair-bound uncle), 2 walk alone and 2 in the company of colleagues who study in the same school; 3 go by bicycle on their own and 1 goes by bicycle, while accompanied by sisters who attend the same school.

## DISCUSSION

With the instruments used, it was possible to observe the contextual factors of the health of pre-adolescents, allowing for the classification of the current health situation in this sample.

Castanedal and Bahia<sup>12</sup>, during a systematic review on the use of the ICF, identified existing research only in pathological conditions, with few studies describing the typical population, especially children and adolescents, which highlights the contribution of this study.

### Evaluation by Fonseca Psychomotor Battery X ICF-CY

The majority (72.73% and 22.73%) of the children in this study, with 10 to 12 years had eupractic and hyperpractic profiles, respectively, with an overall profile classified as "Good", which according to Campos et al.<sup>17</sup> is what is expected in this age group. This is due to this age being a specialization phase of the movements, when they are expected to be more mature and coordinated. Environmental stimuli provided by the family and the environment itself, favor the chemical-morpho-functional specialization of the cells of the nervous system, synaptic formation between the functional structures of the nervous system, which are quantitatively more intense, the more they are stimulated<sup>18</sup>.

The fact that one of the pre-adolescents evaluated presented with a dyspractic profile, explains well the relationship between intellect and motor skills, this because it is a student included with intellectual disabilities with no other associated deficiencies, and which showed performance lower than his peers, especially in factors such as balance, spatiotemporal structure and fine praxis. It is evident that the CNS is plastic and with various possibilities of reorganization with functional adaptability, allowing for a constant feedback from the environment<sup>19</sup>. Therefore, it is worth noting that the earliest the evaluations, the greater the chances of preventing disturbances and neurological motor deficits affecting the development and performance (personal, professional and academic) of children and adolescents<sup>20</sup>.

Although we have observed psychomotor alterations in individual factors, in its overall profile, we have a "normal" classification. This leads to thinking about the positive effects of inclusion, such as an environmental facilitator, rather than "normalizing" functions and structures, allows for the development of psychomotor factors. Thus, Campos et al.<sup>17</sup> cite that identifying deficits

and potential factors while evaluating the psychomotor profile favors establishing intervention guidelines aimed at the population in question, either for the purpose of promotion, prevention, reeducation of the development in the school environment.

These psychomotor alterations are due to alterations in the structure (s110.8), and in the functions (b160.8, b164.8, b172.8), linked to the CNS and classified as unspecified due to lack of tests that demonstrate the nature or the type of change. The schooler shows alterations in 3 functional units proposed by Fonseca<sup>14,21</sup>. The spinal cord, brainstem, thalamus, hypothalamus, and cerebellum constitute the first functional unit and are thus responsible for the regulation of tone and balance. The second functional unit, composed by the cortical areas of the occipital, temporal and parietal lobes relates to the psychomotor factors of lateralization, body concept and spatiotemporal structure. Finally, the third functional unit, which involves the frontal lobe cortex, is responsible for global and fine praxis<sup>22</sup> and psychomotor changes were observed related to all these units by the PMB, as well as in the dominions of the ICF-CY. Thus, we understand that, although there are alterations in the balance, spatiotemporal structure and fine praxis factors in the lower than his peers performance of the schooler with ID, these are liable to stimuli in the school environment<sup>23</sup>.

### **Functional Independence Measure X ICF-CY**

We observed a correlation with intellectual disability in the evaluated components which showed alterations and which are mentioned by Bezerra and Araújo<sup>24</sup>, especially on the issue of transferences of learning.

Among the participants of this study, only one schooler did not have a score of "complete independence" in all items of the MIF. Thus, this student with ID, although with an intellectual performance below average with adaptive limitations, according to Moura et al.<sup>25</sup>, there might be findings in this age group where the typical pre-adolescents are not yet completely independent.

### **Semi-structured interview X ICF-CY**

The school is cited by Biasoli-Alves<sup>26</sup> a space that should provide, in the absence of other public policies, social participation, allowing pre-adolescents the possibility of achieving the most of their capabilities. The quality of the stimuli offered by schools positively influence the health of children and adolescents, while environments with poor resources, have lower performance in various areas of

child development<sup>27</sup>, and in this study we observed that, in general, the stimuli experienced by the pre-adolescents here evaluated, reflected positively when analyzing the quantitative aspects of their psychomotor development, already discussed above. It is noteworthy, then, the school as a responsible participant in promoting an inclusive context, and the school should be apt to receive all students<sup>28</sup>.

In addition, the school and family are endorsed as responsible for providing development in the early stages of life near adulthood<sup>26</sup>. However, the qualitative approach, through accounts, highlighting some relevant points: changes in the family model, lack of possibilities for sports and leisure, entertainment through play, school as the prevailing environment, good self-perception of health, learning difficulties, accessibility difficulties perceived by those who have contact with those with disabilities.

As for interpersonal relationships, linked to the family model and housing, we observed in this study, a current view of the family model, no longer centered only on the father/mother<sup>29</sup>. It is known, however, that these changes reflect in the family context: divorce or absence of parents, number of individuals in the family, unemployment, low education of the parents, conflict or violence are cited as risks to adversity in the physical, social, cognitive and emotional development<sup>30</sup>. The absence of one parent was cited frequently during the interviews, and studies<sup>27</sup> indicate that this may negatively reflect on social, emotional and cognitive aspects of children and/or adolescents.

Although all pre-adolescents evaluated reported leisure and recreation activities, most of them were linked to religious activities, exactly during a stage of development in which involvement in games, recreational activities and even sport activities are recommended<sup>31</sup>. This betrays the contextual factors involved, closely linked to the economic situation, the lack of incentives and public policies for culture and sports on site, in a country still developing like Brazil<sup>32,33</sup>.

The economic difficulties are proven to be a barrier for optimal development in childhood and adolescence<sup>30,32</sup>, which confirms the need for both cross-sectional and longitudinal studies with methodological approaches beyond the quantitative and physical aspects of development.

Only two students reported no longer playing. The play, from an early age is how they relate to the world for children, encouraging their learning processes, language acquisition, cognition and self-confidence<sup>34</sup>. Interestingly

to note that football, cycling and street games were remembered by most, similarly to the reports by Nunes and Emmel<sup>33</sup>, inversely proportional to mentions of the technologies, mentioned by only one student as a form of entertainment. These are positive aspects that reveal the practice of sports and games, for some, which is favorable for establishing friendships, besides the fun they allow<sup>34</sup> and may also be responsible for their good evaluated psychomotor performance.

None of the pre-adolescents reported having worked. This leads to a protective factor of the development, since they occupy their most appropriate social place, which is that of a student, with some interface with the play, expected for their age and related to the optimal development in childhood and adolescents<sup>35</sup>.

Most have the school environment as a reference for their learning processes, since most extracurricular activities were rarely mentioned. The relevance of this data is the fact that the school is a modifiable environment, with marked influences on the development of the schoolers, influencing their perception of wellbeing<sup>36</sup>.

When asked about their learning, 6 students claimed to have difficulty, based on their school performance. The grades of each course seek to reflect the learning, and for Costa Lima and Pinheiro<sup>37</sup>, in addition to neurological issues, learning in adolescence becomes more complex due to interest and the teacher-student relationship.

The student who reported difficulties with writing is a part of inclusion. Fine praxic functions, which include writing, as well as other handling tasks may show deficits, due to difficulties to fine sensorimotor and cognitive functions<sup>37</sup>. The children with learning deficit may require

a longer period of time and attempts to perform and to learn these tasks<sup>34</sup>.

Regarding the health problems mentioned, only 3 presented with functional consequences in everyday life, with most being linked to allergic alterations that can be correlated with environmental factors not measured in this study.

## CONCLUSION

The pre-adolescents evaluated presented a neuropsychomotor development expected for their age in quantitative and qualitative terms. The proposed approach allowed for the identification of difficulties in a specific case related to intellectual disability, but that presented a performance close to the chronological age, probably due to an involvement in an inclusion process.

Some points should be highlighted in this age group by the self-report: changes in the family model, lack of possibilities for sports and leisure, entertainment through play, school as the prevailing environment, good self-perception of health, accessibility difficulty perceived by those in contact with those with disabilities.

The multidimensional view that makes up the pre-adolescent expanded health should be accompanied by professionals and can be classified/standardized as relevant epidemiological data. The ICF<sup>9,10</sup> brings this proposal to observe the expanded health context, increasingly used in scientific studies in Brasil<sup>38</sup>.

The challenge of professionals and public policies is to implement its use in various health actions, such as the monitoring of children, adolescents and young healthy public school students.

## APPENDIX 1. SEMI-STRUCTURED INTERVIEW

### Evaluation

School: .....

Name: .....

Date of birth: .... / .... / .....

Living with: .....

Any health related problems?

.....

Do you believe that your health condition is interfering with your activities?

.....

d820 School education / d815 Pre-school education

What grade are you on? Attends school since what age? Stopped going to school at any point (after starting school, if yes, why?)

.....

How are your grades this semester?

.....

d816 Pre-school life and related activities / d835 School Life and related activities

What other education activities do you have in your routine? (Class? Reinforcement classes?)

.....

d825 Professional qualification

Participates in any professional training course? (Or computer classes? Or language courses?)

Do you work or have worked at some point?

.....

d920 Recreation and Leisure

What leisure activities have you participate in? (Place, contacts, activities...)

.....

e320 Friends

Would you say that you fit in at school regarding friendships? Do you have any difficulties in this aspect? (Is there a colleague you don't get along with? How do you face this?)

.....

d910 Community life

What other activities do you have in your routine? (Sports, courses, religious activities, organizations...)

.....

d880 Involvement in play

.....

e540 Regarding transportations

How do you get to school (and to the other activities in your routine)?

.....

e515 Architecture and construction

.....

## REFERENCES

1. Albuquerque KAd, Mancini MC, Drummond AdF, Megale L, Chagas PSdC. Estimulação ambiental e uso do andador infantil por lactentes com desenvolvimento normal. Rev Bras Saúde Matern Infant. 2011;11(2):181-5. <http://dx.doi.org/10.1590/S1519-38292011000200009>.
2. Organización Mundial de La Salud (OMS). La salud de los jóvenes: un reto y una esperanza. Ginebra; 1995.
3. Brasil. Lei n. 8.069, de 13 de julho de 1990, dispõe sobre Estatuto da Criança e do Adolescente (ECA). Versão atualizada em 2012. Rio de Janeiro: Cedeca RJ; 2012.
4. Gallahue DL, Ozmun JC. Entendendo o desenvolvimento motor: bebês, crianças, adolescentes e adultos. Boston: McGraw-Hill; 2002.
5. Rosa Neto F. Manual de avaliação motora. Porto Alegre: Artmed; 2002.
6. Tolocka RE, Horita KY, de Oliveira CB, Coelho VAC, Santos DCC. Como brincar pode auxiliar no desenvolvimento de crianças pré-escolares. Licere (Belo Horizonte). 2009;12(1):1-21. Disponível em: <https://seer.ufmg.br/index.php/licere/article/view/614/501>.
7. Gannotti ME, Christy JB, Heathcock JC, Kolobe TH. A path model for evaluating dosing parameters for children with cerebral palsy. Phys Ther. 2014;94(3):411-21. doi: 10.2522/ptj.20130022.
8. Organização Mundial de Saúde (OMS). CIF: Classificação Internacional de Funcionalidade, Incapacidade e Saúde. São Paulo: EDUSP; 2003.
9. Organização Mundial de Saúde (OMS). CIF: Classificação Internacional de Funcionalidade, Incapacidade e Saúde. São Paulo: EDUSP; 2015.
10. Organização Mundial de Saúde (OMS). CIF Classificação Internacional de Funcionalidade, Incapacidade e Saúde: atividades e participação, fatores ambientais, versão experimental traduzida e adaptada, com base na CIF (2003) e ICF-CY (2007). Porto; 2007.
11. Vale M. Classificação Internacional de Funcionalidade (CIF): conceitos, preconceitos e paradigmas. Contributo de um construto para o percurso real em meio natural de vida. Acta Pediatr Port. 2009;40(5):229-36. Disponível em: [http://repositorio.hlcl.min-saude.pt/bitstream/10400.17/891/1/Acta%20Ped%20Port%202009\\_40\\_229.pdf](http://repositorio.hlcl.min-saude.pt/bitstream/10400.17/891/1/Acta%20Ped%20Port%202009_40_229.pdf).
12. Castaneda L, Bergmann II A, Bahial L. A Classificação Internacional de Funcionalidade, Incapacidade e Saúde: uma revisão sistemática de estudos observacionais. Rev Bras Epidemiol. 2014;437:451. <http://dx.doi.org/10.1590/1809-4503201400020012ENG>.
13. Marques AP, Peccin MS. Pesquisa em fisioterapia: a prática baseada em evidências e modelos de estudos. Fisioter Pesq. 2005;11(1):43-8. Disponível em: <http://www.revistas.usp.br/fpusp/article/viewFile/76382/80092>.
14. Fonseca V. Manual de observação psicomotora, significação psiconeurológica dos fatores psicomotores. Porto Alegre: Artes Médicas; 1995.
15. Riberto M, Miyazaki MH, Jorge Filho D, Sakamoto H, Battistella LR. Reprodutibilidade da versão brasileira da Medida de Independência Funcional. Acta Fisiatr. 2001;8(1):45-52.
16. Minayo MCdS. Análise qualitativa: teoria, passos e fidedignidade qualitative analysis: theory, steps and reliability. Ciên Saúde Coletiva. 2012;17(3):621-6. <http://dx.doi.org/10.1590/S1413-81232012000300007>.
17. Campos AC, Silva LH, Pereira K, Rocha NAC, Tudella E. Intervenção psicomotora em crianças de nível socioeconômico baixo. Fisioter Pesq. 2008;15(2):188-93. <http://dx.doi.org/10.1590/S1809-29502008000200013>.
18. Castilho-Weinert LV, Forti-Bellani CD, editores. Fisioterapia em neuropediatria. Curitiba: Omnipax Editora; 2011. Disponível em: <http://omnipax.com.br/livros/2011/FNP/FNP-livro.pdf>.
19. Sanches-Ferreira M, Lopes-dos-Santos P, Santos MA. A desconstrução do conceito de Deficiência Mental e a construção do conceito de Incapacidade Intelectual: de uma perspectiva estática a uma perspectiva dinâmica da funcionalidade. Rev Bras Educ Espec. 2012;18(4):553-68. <http://dx.doi.org/10.1590/S1413-65382012000400002>.
20. Valentini NC, Coutinho MTC, Pansera SM, Santos Vd, Vieira JLL, Ramalho MH, et al. Prevalência de déficits motores e desordem coordenativa desenvolvimental em crianças da região Sul do Brasil. Rev Paul Pediatr. 2012;30(3):377-84. <http://dx.doi.org/10.1590/S0103-05822012000300011>.
21. Fonseca Vd. Psicomotricidade e psiconeurologia: introdução ao sistema psicomotor humano (SPMH). Rev Neuropsiq Infância Adolesc. 1994;2(3):23-33. Disponível em: [http://www.psiquiatriainfantil.com.br/revista/edicoes/Ed\\_02\\_3/in\\_05\\_07.pdf](http://www.psiquiatriainfantil.com.br/revista/edicoes/Ed_02_3/in_05_07.pdf).
22. Kolyniak Filho C. Motricidade e aprendizagem: algumas implicações para a educação escolar. Constr Psicopedag. 2010;18(17):53-66. Disponível em: [http://pepsic.bvsalud.org/scielo.php?script=sci\\_arttext&pid=S1415-69542010000200005](http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1415-69542010000200005).
23. Mansur SS, Marcon AJ. Perfil motor de crianças e adolescentes com deficiência mental moderada. Rev Bras

- Crescimento Desenvolv Hum. 2006;16(3):9-15. Disponível em: <http://pepsic.bvsalud.org/pdf/rbcdh/v16n3/03.pdf>.
24. Bezerra GF, Araujo DAdC. Breve estudo sobre a deficiência mental e sua relação com a escola regular: um pouco além das pedras e negativas. In: Anais do 7º ENIC. 2009;1(1):1-18. Disponível em: <http://anaisonline.uems.br/index.php/enic/article/view/995>.
  25. Moura TCd, Santos LHCd, Bruck I, Camargo RMR, Oliver KA, Zonta MB. Independência funcional em indivíduos com paralisia cerebral associada à deficiência intelectual. Rev Pan-Amaz Saúde. 2012;3(1):25-32. doi: 10.5123/S2176-62232012000100004.
  26. Biasoli-Alves ZMM. Orientação de pais: partilhar conhecimentos sobre desenvolvimento e práticas de educação como estratégia de intervenção. Texto Contexto Enferm. 2005;14:64-70. <http://dx.doi.org/10.1590/S0104-07072005000500008>.
  27. Jaffee SR, Van Hulle C, Rodgers JL. Effects of nonmaternal care in the first 3 years on children's academic skills and behavioral functioning in childhood and early adolescence: a sibling comparison study. Child Dev. 2011;82(4):1076-91. doi: 10.1111/j.1467-8624.2011.01611.x.
  28. Silva ACB. Educação inclusiva: contribuições para o desenvolvimento de um compromisso ético em sua efetivação. Rev Ter Ocup Univ São Paulo. 2012;23(2):163-8. <http://dx.doi.org/10.11606/issn.2238-6149.v23i2p163-168>.
  29. Braga MdGR, Amazonas M. Família: maternidade e procriação assistida. Psicol Estud. 2005;10(1):11-8. <http://dx.doi.org/10.1590/S1413-73722005000100003>.
  30. Sakuramoto S, Squassoni C, Matsukara T. Social support, parenting style and mental health of children and adolescents. Mundo Saúde. 2014;38(2):169-78. doi: 10.15343/0104-7809.20143802169178.
  31. Gonçalves H, Hallal PC, Amorim TC, Araújo CL, Menezes AM. Fatores socioculturais e nível de atividade física no início da adolescência. Rev Panam Salud Publica. 2007;22(4):246-53. <http://dx.doi.org/10.1590/S1020-49892007000900004>.
  32. Riechi TIJ, Moura-Ribeiro MVL, Ciasca SM. Impact of preterm birth and low birth weight on the cognition, behavior and learning of school-age children. Rev Paul Pediatr. 2011;29(4):495-501. <http://dx.doi.org/10.1590/S0103-05822011000400005>.
  33. Nunes AC, Emmel MLG. O uso do tempo nas atividades cotidianas de crianças de classe popular de 9 a 12 anos. Rev Ter Ocup Univ São Paulo. 2015;26(2):176-85.
  34. Souza VG, Carvalho AC. A importância do brincar no desenvolvimento psicomotor: relato de experiência. Rev Psicol UNESP. 2011;9(2):79-92.
  35. Alberto MdFP, Santos DPd. Trabalho infantil e desenvolvimento: reflexões à luz de Vigotski. Rev Psicol Estudo. 2011;16(20):209-18.
  36. Matos MGD, Carvalhosa SF. A saúde dos adolescentes: ambiente escolar e bem-estar. Psicol Saúde Doenças. 2001;2(2):43-53.
  37. Costa RPB, Lima MCP, Pinheiro CVdQ. Os impasses da educação na adolescência contemporânea. Bol Psicologia. 2010;60(132):97-106.
  38. Ruaro JA, Ruaro MB, Souza DE, Fréz AR, Guerra RO. Panorama e perfil da utilização da CIF no Brasil: uma década de história. Rev Bras Fisioter. 2012;16(6):454-62.

Article received on: 12/24/15

Article accepted on: 03/29/16