Early developmental delay in children with autism: A study from a developing country

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Abstract

Early diagnosis is appropriate and important for developmental disorders such as autism spectrum disorder. In many less developed countries, unfortunately, diagnosis of this disorder is delayed. The aim of the present study is to determine whether this disorder can be screened using simple strategies such as comparison of the age of acquisition of motor skills. For this purpose, 124 children with autism were chosen to enter the study, and their parents were asked to retrospectively specify the age of achieving milestones of sitting without support, standing alone and walking alone. Information obtained from the parents was compared with World Health Organization standards. Results indicate that participants (male and female) have significantly delayed age of acquisition of all three skills. Based on this result, it can be suggested that existing standards, as a simple means with low cost and easy availability, can be used for early screening of the disease at a younger age so that treatment can be provided more quickly.

1. Introduction

Autism spectrum disorder, a pervasive developmental disorder, is a subset of autism spectrum disorder that appears with features such as weakness in communication, weakness in socialization and repetitive stereotyped movements (American Psychiatric Association, 2000; Beighley, Matson, Rieske, Konst, & Tureck, 2014; Sipes & Matson, 2014). Also, children with autism have delay in motor skills development and motor function which, of course, do not count as factors in their diagnosis (Holck, Nettelbladt, & Sandberg, 2009; Matson, Mahan, Fodstad, Hess, & Neal, 2010a; Matson, Mahan, Kozlowski, & Shoemaker, 2010b; Ming, Brimacombe, & Wagner, 2007; Page & Boucher, 1998; Provost, Lopez, & Heimerl, 2007; Teitelbaum, Teitelbaum, Nye, Fryman, & Maurer, 1998).

However, children with other disorders have delays in communication skills and growth, including individuals with intellectual disability (Matson et al., 2010b; Perry, Flanagan, Geier, & Freeman, 2009; Stephenson & Dowrick, 2005), Down’s syndrome (Coe et al., 1999; Stephenson & Dowrick, 2005), epilepsy (Caplan et al., 2009; Menisevic & Sinanovic, 2009; Stephenson & Dowrick, 2005) and fetal addiction (Arendt, Angelopoulos, Salvator, & Singer, 1999; Bandstra et al., 2002; Bender et al., 1995). Children with autism have more delays in motor skills than those with other developmental disorders (Rogers, Hepburn, & Wehner, 2003), which has been shown by various standard methods and tools to measure motor skills, or by analysis of home-made videos (Adrien, Perrot, Sauvage, & Leddet, 1992; Noterdaeme, Mildenberger, Minow, & Amorosa, 2002; Ozonoff et al., 2008).

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Studies have also compared the motor skills of children with a range of autism disorders with other individuals with developmental disorders more than autism (Matson et al., 2010a, 2010b; Provost et al., 2007), including receptive and expressive communication disorders (Matson et al., 2010a; Provost et al., 2007) and intellectual disability (Provost et al., 2007); these studies have shown some differences. None of the studies reported significant differences, except for the study by Matson et al. (2010a, 2010b), which found that toddlers with autism have lower scores in gross motor skills than other groups affected by developmental disorders in gross motor skills. In fact, researchers found that 25% of the 18–35-month-old toddlers had delayed and impaired motor skills, while the figure for children with pervasive developmental disorders was 17%, and for individuals who had developmental disorders other than autism it was 2.4% (Matson et al., 2010a).

Matson et al. (2010a), in their study which compared the ages of acquiring milestone skills in children with autism, children with pervasive developmental disorder and children with growth failure, found that such children have differences in age of acquisition of all these skills. All groups had developmental delay with respect to the typically developed age. There are a few studies that have shown that people with autism are impaired in their gross and fine motor skills; these researches have studied some limited skills, such as crawling and walking (Adrien et al., 1992; De Giacomo & Fombonne, 1998; Page & Boucher, 1998; Teitelbaum et al., 1998).

In a study of 150, 16–32-month-old children with autism, 9.1% of these children were unable to walk; and 2.2% had developmental delays and impaired speech, and were also unable to walk (Ventola et al., 2007). These results suggest that children with a range of developmental disorders have deficit in their motor skills.

In another study by Hussein, Taha, and Almanasef (2011) conducted in Egypt and Saudi Arabia, it was reported that only children in Saudi Arabia had delayed development in their fundamental motor skills.

The World Health Organization (WHO), through studying different populations, presented graphs and standards for growth for the world’s population and sought to make these scales more comprehensive (Onis, 2006). In April 2006, the WHO provided the latest version of its standards for growth of children up to five years old (Onis, 2006). The standard of the WHO is based on data collected since the beginning of 1990, drawing on references to morphology measurements and alternative approaches to provide new tools for motor growth. The new measures are compatible with the prescriptive approaches and are designed to demonstrate growth of children at a certain time and place (Onis, 2006). But these measures are designed for use in typically developed persons (Onis, 2006); in other words, they can be used as criteria for the separation of typically and non-typically people. One of the problems that is unfortunately seen in developing countries is late diagnosis in people with autism, so that many of these people are identified after the age of three and some others after starting school (Samadi, McConkey, & Kelly, 2012). That is why attention cannot be paid directly to the growth process in these individuals from birth.

Since, in future, therapeutic interventions at early ages have an important role in the development of these individuals, it seems that conducting a study to identify the age at which these children achieve basic skills such as sitting, standing and walking could be useful. Most of researches in this area have been done on older people, and we need greater awareness of the age of achieving these skills by these individuals. Therefore, in the present study, the question is whether there is a difference between the ages of achieving the milestones (sitting, standing and walking alone/without support) that can be determined with the help of the WHO standards (Onis, 2006). If this difference is observed, it can be understood that these standards allow us to use them as a tool for early screening of persons suspected of being affected by disorders such as autism.

2. Methodology

2.1. Participants

The participants for this research included 124 children registered in exceptional school in Tehran. Tehran presents special education for the largest population of children. All the participants for this research were given diagnostic test of autism. In addition to the confirmed test results, additional diagnosis test session was conducted by employing DSM-IV and clinical judgment by a pediatrician who was not involved in the research. All the participants were at same level (high function). The exclusion criteria included neurodegenerative disease, moderate to profound mental retardation, and any developmental and mental comorbidity.

2.2. WHO growth reference

This reference is provided by the WHO. In its design, samples from around the world, including Ghana, India, Oman, Norway and the USA, participated in a longitudinal study. The study was performed as a Multicentre Growth Reference Study (MGRS) by the WHO. Children were assessed by these standards from four months old to walking independently. Six basic motor skills that were easily measurable and seemed significant for keeping stature were measured: sitting without support, hands-and-knees crawling, standing with support, walking with support, standing alone and walking alone (de Onis et al., 2012).
Table 1
Demographic information of groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Percentage</th>
<th>Age Mean</th>
<th>sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>70</td>
<td>78.7</td>
<td>7.3</td>
<td>2.02</td>
</tr>
<tr>
<td>Girls</td>
<td>18</td>
<td>21.3</td>
<td>6.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>100</td>
<td>6.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Table 2
Results of one sample T-test for age of sitting without support.

<table>
<thead>
<tr>
<th>Group (mean months)</th>
<th>DF</th>
<th>T</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys (7.49)</td>
<td>WHO Standard (5.9)</td>
<td>70</td>
<td>4.43</td>
</tr>
<tr>
<td>Girls (8.21)</td>
<td>18</td>
<td>3.94</td>
<td>0.001**</td>
</tr>
<tr>
<td>Total (7.64)</td>
<td>89</td>
<td>5.64</td>
<td>0.0001**</td>
</tr>
</tbody>
</table>

** a = 0.001.

2.3. Data collecting

At next phase, parents of children were asked to answer a questionnaire designed by the researcher. The questionnaire collected demographic information about the children (age, sex, etc.), and recorded the age at which children achieved skills of sitting, standing and walking. In fact, the parents were supposed to answer our questions retrospectively. In order to ensure the accuracy of the age of acquisition of skills, the parents were asked not to answer questions where there was uncertainty about the correct answer. At the end, 92 questionnaires were collected. The standard age for acquiring basic skills as determined by the WHO was also obtained from the WHO standard (Onis, 2006). After obtaining the desired standards, mean age of each skills considered as the age criterion (sitting = six months, standing = 11 month, walking = 12.1 months), and was compared with the mean obtained from the present study for each skill by a one-sample T-test. All statistical tests were done by SPSS version 19, and at a significance level of α = 0.05.

3. Results

The results showed that girls reached to sitting without support between 4–13 months (m = 8.21; sd = 2.55) and boys between 3 and 24 months (m = 7.51; sd = 3.02); age of standing without support for girls was between 5 and 36 months (m = 15.51; sd = 7.97) and for boys between 7 and 36 months (m = 12.65; sd = 6.26) also girls reached walking alone between 9 and 60 months (m = 24.53; sd = 14.61) and for boys was between 8 and 48 months (m = 16.59; sd = 8.26) (Table 1). These results showed that children with ASD met milestones both before and after the standards set by WHO, but in general they were delayed.

Results of one sample T-test (Table 2) showed that there is a significant difference between age of reaching to sitting without support in boys and girls in comparison with WHO standard (p < 0.05) but results of Independent T-test showed that there was not any significant difference between boy and girls in age of sitting without support (p > 0.05).

There was also significant difference (p < 0.05) between age of standing without support of girls and boy by WHO standard (Table 3) but there was not any significant difference between boys and girls (p > 0.05).

When comparing age of walking alone in boys and girls with WHO standard, the results of one sample T-test showed that there were a significant difference between WHO standard and ASD children which reveals that ASD children (boys and girls) have delay in their development (Table 4). Furthermore there was a significant difference between boys and girls in age of walking alone (T = 0.81, sig: 0.003).

4. Discussion and conclusions

The aim of the present study was to compare the age that children with autism achieved milestones with the WHO’s standards, which are designed as a measure to assess children’s natural growth (de Onis et al., 2012). For this purpose, by referring to special schools in different districts of Tehran, information for about 92 children was collected, and the results
obtained from this information were compared with the standards of the WHO \citep{Onis2006}. The results showed that both boys and girls have a developmental delay in the age of acquisition of sitting skills compared to the established standard; this was significant when comparing children to this standard generally. Most studies showed no significant difference between male and female \citep{DeGiacomoFombonne1998, Matson2010a, Matson2010b, Ming2007, PageBoucher1998, Teitelbaum2019}.

This study showed that children with autism have significant differences in all basic motor skills (sitting, standing and walking) compared to the standards of the WHO \citep{Fig1}. According to WHO standards, the age of achieving the skill of sitting independently is six months, while the children in this study acquired this skill on average at 7.66 months. In fact, 59\% of these children had developmental delay in acquiring the skill of sitting compared to the WHO standard. Also, in the skill of standing alone, the mean age of acquisition of this skill in the international standard was 11 months; 57\% of children with autism had a developmental delay compared with the scale. In walking alone, the standard of the WHO was determined as 12.1 months; 65.9\% of children with autism had a developmental delay compared to this standard. The curves of the National Center for Health Statistics and the WHO have been accepted as an international standard for growth in the first five years of life for all countries \citep{deOns2012}. Growth differences among children in developed countries and developing countries are related to environmental conditions rather than genetic differences \citep{GranthamMcGregor2007}; the WHO does not recommend preparing country standards and believes that if children are in desirable conditions in the early years of life, they will reach their maximum growth potential. The experience of countries worldwide has shown that all children under five years old in good condition have the same growth potential \citep{GranthamMcGregor2007}. Accordingly, the WHO many years ago proposed using the standard curve of the National Centre for Health Statistics to assess child development in all countries. Studies of Iran have shown that Iranian children and teenagers of the upper classes living in good economic and health conditions also had proper physical growth comparable with the standards of the National Center for Health Statistics \citep{Ministry2005}.

\begin{table}[h]
\centering
\begin{tabular}{lrrr}
\hline
Group (mean months) & DF & \(T\) & Sig \\
\hline
Boys (16.59) & WHO Standard (12) & 70 & 4.61 & 0.0001* \\
Girls (23.54) vs. total (18.31) & 18 & 3.73 & 0.002** \\
Total (18.31) & 89 & 5.68 & 0.0001* \\
\hline
\end{tabular}
\caption{Results of one sample \(T\)-test for age of walking alone.}
\label{tab:results}
\end{table}

\(** a=0.001.\)
The results of this study confirm some previous research done in other places and show that delay in motor skills in these patients is dependent on their development disorders; and geographic differences are not an important factor in this issue. However, some researchers believe that motor skills in children with autism are not impaired, and that these individuals are healthy (Gillberg et al., 1990). Such a conclusion may be wrong, because these studies are based on the reports by the children’s families. In another study, Ming et al. (2007) concluded that the children they studied did not have motor deficits. Of course, they believed that their results should be interpreted with caution because some of the subjects were diagnosed with Asperger’s, and it is said that people with Asperger’s do not have motor deficits.

Given that the present research showed developmental delay and impaired motor skills in children with autism, it is consistent with the results of the study by Berkeley, Zittel, Pitney, and Nichols (2001), which claimed that in addition to other domains mentioned in the diagnostic guidelines, motor skills should also be considered. Good motor development skills, especially in milestones such as sitting, standing and walking, can be considered a lens through which to explore the surrounding environment for the child. These skills are necessary for more advanced skills such as jumping, running and physical activities (Provost et al., 2007). According to the results obtained, it is recommended that in developing countries where there are not enough diagnosis tools, signs like delay in motor development delay should be treated as a warning sign for disorders such as autism. Previous studies (Samadi et al., 2012) indicate that diagnosis of this disorder is, in these countries, sometimes delayed until school age. On the other hand, early diagnosis will lead to better and prompt treatment.

The present study had some limitations: although the parental reports were obtained from reliable sources, retrospective approaches can negatively affect the validity of research (Majnemer & Rosenblatt, 1994). In addition, due to not having precise measurement tools like motor growth measuring tests, the accuracy of the data may be slightly reduced, so it is suggested that in further studies, if possible, valid tools should be used besides parents’ reports. Furthermore, it is recommended that for more assurance, analysis of home videos of these children at early ages should be used, along with reports from parents, for interpretation of the data.

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References


