Short-term speech-language intervention for children with disorders of the autism spectrum

Intervenção fonoaudiológica em curto prazo para crianças com distúrbios do espectro do autismo

ABSTRACT

Purpose: To assess any changes in the Functional Communicative Profile (FCP) and in the Social Cognitive Performance (SCP) of children with Autism Spectrum Disorders, based on two short periods of intervention.

Methods: The study was conducted with 21 children with Autism Spectrum Disorder diagnoses, randomly allocated into two groups, who received the same short-term intervention types (6 weeks with the mother and 6 weeks with the support of an educational software program). The intervention process was conducted by speech-language pathologists who were part of a graduate program in this area. Results: Samples of 15-minute interaction sessions between the child and speech-language pathologist were used to assess the changes in the FCP and the SCP. The statistic analysis pointed out differences only in Group 1 for the variables “percentage of communicative space used” and “use of the mediating object”. Conclusion: With the intervention sessions structured over 12 weeks, it was possible to observe a few changes in the children’s FCP and in the SCP. Therefore, we point out the need for new research studies of longer duration.

RESUMO

Objetivo: Avaliar mudanças no Perfil Funcional da Comunicação (PFC) e no Desempenho Sócio-Cognitivo (DSC) de crianças com Distúrbios do Espectro do Autismo (DEA) a partir de dois períodos curtos de intervenção. Métodos: O estudo foi realizado com 21 crianças com diagnóstico incluído nos DEA, que foram divididas aleatoriamente em dois grupos (G1 e G2) que receberam os mesmos modelos de intervenção em curto prazo (presença da mãe e apoio do software educacional) durante seis semanas cada um. O trabalho de intervenção foi conduzido por fonoaudiólogas que cursavam o programa de pós-graduação na área. Resultados: Partindo de filmagens de 15 minutos de interação entre terapeuta e paciente, foram mensuradas as mudanças no PFC e no DSC; a análise estatística indicou diferenças significativas apenas no G1, nas variáveis "porcentagem do espaço comunicativo utilizado" e "uso do objeto mediador". Conclusão: Com a estrutura de intervenção em 12 semanas, foi possível observar poucas mudanças no PFC e no DSC, de forma que o estudo sugere novas pesquisas com a duração mais longa.
INTRODUCTION

Autism Spectrum Disorders (ASDs) are currently considered all-encompassing development disorders that involve the areas of social interaction, language, and cognition. The etiology of autism varies, and, prior to 3 years of age, children in this spectrum already show symptoms, such as abnormal development in the areas of verbal and/or non verbal communication, social interaction, and behavioral alterations that include limited repertoire of interests and activities, and difficulties with shared attention, among others. For these reasons, these children can be diagnosed early(1,2).

When it comes to therapeutic interventions, the existing ASD treatments tend to concentrate on improving the most affected areas, such as language, social interaction, involvement in several types of activities, and even some difficulties that may be associated with the disorder, such as anxiety and short attention span(3).

Recent research studies in this field have presented diverse intervention models; among them, we mention those that emphasize the use of oxytocin as a possible aid in modulating social behavior(4); direct and individual language interventions(5); indirect interventions that rely on family as a factor in the therapeutic process(6); and interventions mediated by educational software programs(7); among others. However, more in-depth studies concerning a few well-known interventions(8) are still necessary.

We must be aware that, among the numerous existing intervention types, the therapeutic proposal of choice will depend on the stand taken by the professional responsible for a case in regards to the concept, etiology, and diagnosis of the autism spectrum. The impact of the DSM-5 and of new proposals of classification criteria will probably be gradually perceived in the spectrum. The impact of the DSM-5 and of new proposals of classification criteria will probably be gradually perceived in regards to the concept, etiology, and diagnosis of the autism spectrum. The impact of the DSM-5 and of new proposals of classification criteria will probably be gradually perceived in this spectrum already show symptoms, such as abnormal development in the areas of social interaction, language, and cognition. The etiology of autism varies, and, prior to 3 years of age, children in this spectrum already show symptoms, such as abnormal development in the areas of verbal and/or non verbal communication, social interaction, and behavioral alterations that include limited repertoire of interests and activities, and difficulties with shared attention, among others. For these reasons, these children can be diagnosed early(1,2).

When it comes to therapeutic interventions, the existing ASD treatments tend to concentrate on improving the most affected areas, such as language, social interaction, involvement in several types of activities, and even some difficulties that may be associated with the disorder, such as anxiety and short attention span(3).

Recent research studies in this field have presented diverse intervention models; among them, we mention those that emphasize the use of oxytocin as a possible aid in modulating social behavior(4); direct and individual language interventions(5); indirect interventions that rely on family as a factor in the therapeutic process(6); and interventions mediated by educational software programs(7); among others. However, more in-depth studies concerning a few well-known interventions(8) are still necessary.

We must be aware that, among the numerous existing intervention types, the therapeutic proposal of choice will depend on the stand taken by the professional responsible for a case in regards to the concept, etiology, and diagnosis of the autism spectrum. The impact of the DSM-5 and of new proposals of classification criteria will probably be gradually perceived in the course of being incorporated into clinical practices. Considering each child’s abilities and main difficulties generally lead to more efficient therapeutic processes(1,9).

Among different forms of therapy, in this study we emphasized two short-term speech-language interventions for children with ASD, namely intervention with the presence of the mother, and intervention with the support of an educational software program, both after a period of six months of individual language intervention as a baseline for the analysis. These alternatives are detailed as follows:

I. Individual therapy: this intervention proposal is widely reported in the national literature. In this case, the bond between the speech-language pathologist and the patient is of great importance for a good therapeutic progress and a favorable prognosis; studies point out that the patient’s communication functions increase when the interlocutor is a familiar individual, such as a speech-language pathologist(10).

It is also important to highlight that, when assistance is provided individually, the speech-language pathologist has the opportunity to pay exclusive attention to a child’s abilities and difficulties, a fact that allows for the organization of new intervention approaches based on the patient’s response to the therapy(11). The advancements that this intervention type allows are innumerable; authors have cited in the literature, among other aspects, more extensive vocabulary acquisition, increase of words per sentence, and improvements in verbal behavior(12).

II. Therapy with the presence of the mother: engaging mothers in the process of therapeutic intervention with ASD children requires many considerations, such as the mothers’ availability and psychological situation. Research studies have shed light on the reality of families with autistic children by showing how the parents regard work and family, and by bringing to the forefront the important fact that some mothers use their time at work and/or during their children’s therapy sessions as a moment to “escape” from their stressful routines(13). Another study indicates that the greater the number of necessities manifested by the parents to care for their children with autism (for instance, lack of information about medical services and social security that can benefit the child, and need for help to pay for expenses and a caregiver while the parents are absent), the more acute the anxiety, stress, and depression manifested by the parents(14).

Despite the aforementioned considerations, some authors emphasize that, even if the parents admit the existence of stress and the limited time enjoyed as a family, when they agree to receive precise orientation and supervision from a speech-language therapist in order to participate in their children’s intervention, the benefits are visible both in regards to the children — who show improvements in the severity of autistic symptoms, social interaction, communication, and increased language comprehension and production(15,16) — and the parents, who begin to understand their children’s situation better, how to treat them in a more efficient and informed manner, and to show evidence of improvement in their interactions with the latter(16,17).

Another factor that has gained space in the literature is the training of parents and primary caregivers of children with ASD with the purpose of teaching them how to develop the children’s language and communication skills(18), how to understand the general characteristics of the autism spectrum, and to empower them with principles of how to deal with inappropriate behavior in the familial context(19). These trainings can benefit not only the families, who learn how to adequately understand and stimulate the children (thus improving the parents’ confidence to care for them) and to perceive changes in the children’s behavior after the intervention(20), but also benefit the children, who show improvement in the areas of language, imitation, eating behaviors, and a reduction of inappropriate behaviors(18-20).

III. Therapies with the use of educational software programs: this approach has been on the spotlight of research studies on autism. Scholars report that some children with ASD have a great interest in computer games and suggest that these individuals can benefit from controlled and structured virtual environments because of individualized tutoring, multisensory interactions, and the possibility of repetition — in case they are necessary for learning — that these programs offer. It is important to highlight studies that indicate the ability that these children have to expand the knowledge acquired during therapy with...
educational software programs to include other natural environments, such as their home or school\textsuperscript{21,22}.

Among the advantages brought by the use of computer programs in therapeutic processes, authors point out these children’s vocabulary expansion, more complex grammatical constructions\textsuperscript{21}, symbolism comprehension, deeper knowledge of the function of certain objects that appear in the software\textsuperscript{25}, learning of orthographic symbols\textsuperscript{22}, and recognition of facial expressions and inferences about mental states (Theory of Mind)\textsuperscript{21}.

Recent publications elucidate diverse possibilities of using innovative technologies, such as interactive computer programs and virtual reality, to provide benefits to individuals with ASD, among them the development of social and communication skills\textsuperscript{25}.

**PURPOSE**

The main purpose of this study was to verify possible changes in the Functional Communication Profile (FCP) and in the Social Cognitive Performance (SCP) of children with ASD based on two short periods of intervention, considering the FCP and SCP data collected after a six-month period of individual intervention as the baseline.

**METHODS**

This study was approved by the Ethics Committee of the School of Medicine of Universidade de São Paulo (FMUSP), report number 289/13. All parents or legal guardians signed the Informed Consent approved by this committee. In addition, each child agreed to participate in this study.

**Participants**

The participants of this study were 21 children aged between 2 and 12 years, with ASD psychiatric diagnoses, who had been assisted at FMUSP’s Laboratory for Speech-Language Investigation of ASDs (LIF-DEA) for at least six months, and for 1 year at the most.

The following aspects were established as inclusion criteria:

- The children’s diagnoses had to be included in the autism spectrum;
- They had to attend at least 80% of the anticipated therapy sessions;
- The mother had to indicate the possibility of participating in the therapy sessions at the scheduled times.

The participants were randomly allocated in two groups:

- Group 1 (G1): this group underwent the intervention cycles in the following order: 6 weeks of therapy with an educational software program, and 6 weeks of therapy with the mother’s or primary caregiver’s presence. Ten children composed this group.
- Group 2: this group underwent the intervention cycles in the following order: 6 weeks of therapy with an educational software program, and 6 weeks of therapy with the mother’s or primary caregiver’s presence. Eleven children were part of this group.

**Procedures**

The speech-language interventions carried out with the participants were conducted by pathologists who were also students of a graduate program with a specific focus on the area in question.

The first cycle of modified therapy for both groups was initiated after a six-month period of individual speech-therapy assistance. The routine assessments, which include the FCP and the SCP, carried out after the period of individual speech-therapy assistance, were computed and served as the baseline against which the results of the modified therapy cycles were analyzed.

All participants were filmed after the first and the second cycles. The recording took place while the patients spontaneously interacted with the speech-language pathologists for 15 minutes, at the beginning and at the end of each modified therapy cycle, so that the data were transcribed and later analyzed in relation to the following tests:

- Functional Communication Profile, as proposed by Fernandes\textsuperscript{10,26,27}: this is a model of assessment of communication functions. The interaction is analyzed based on communicative acts, communicative means, and communication functions. We considered the following variables: number of communicative acts produced per minute, percentage of interactive acts, and percentage of communicative space used.
- Social Cognitive Performance, as proposed by Molini and Fernandes\textsuperscript{28}: this is a procedure to verify aspects of gestural and vocal communication intention, use of the mediating object, gestural and vocal imitation, combinatorial play, and symbolic play. For this study, we used the same recorded situation to analyze the FCP\textsuperscript{29}.

The educational software program selected for this study was BabySpeak – Desenvolvendo a Linguagem Oral®, which has eight different activities with the purpose of using visual and auditory stimuli to develop oral language through play.

The statistical analysis of the averages of the results was performed through Student’s \textit{t}-test considering significance levels of 5% (0.05) and 10% (0.10). The results were confirmed by Tukey’s test.

**RESULTS**

The statistical analysis was conducted with Student’s \textit{t}-test with the purpose of verifying the significance of the differences observed in the FCP and the SCP results between both intervention moments and the baseline period. We considered significance levels of 5% (0.05) and 10% (0.10).

Upon comparison of the three moments of data collection of each FCP variable used, it was possible to observe a statistically
significant difference of 10% only in relation to the variable “percentage of communicative space used” in G1; this difference was negative, which demonstrates that the participants’ performance dropped after the third moment of intervention (that is, following the intervention with the educational software program) when compared to the baseline (0.08) and the first cycle of intervention (0.09). The results of this quantitative analysis are displayed in Table 1.

Table 1. Significant differences between the baseline and the moments of intervention for the Functional Communication Profile variable “communicative space used” in Group 1

<table>
<thead>
<tr>
<th></th>
<th>Baseline and first moment</th>
<th>Baseline and second moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCP – communicative space used</td>
<td>0.733675</td>
<td>0.087808</td>
</tr>
</tbody>
</table>

Caption: FCP = Functional Communication Profile.

The analysis concerning the SCP variables in the three moments of collection yielded a statistically significant difference of 5% only in relation to the variable “use of the mediating object” in G1 when the baseline performance was compared to the third moment, that is, intervention with the aid of the educational software program. These data demonstrate that the participants’ performance dropped when the first moment of analysis was compared to the last. The results of this quantitative analysis are displayed in Table 2.

Table 2. Significant differences between the baseline and the moments of intervention for the Social Cognitive Performance variable “use of the mediating object” in Group 1

<table>
<thead>
<tr>
<th></th>
<th>Baseline and first moment</th>
<th>Baseline and second moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCP – use of the mediating object</td>
<td>0.185687</td>
<td>0.01431</td>
</tr>
</tbody>
</table>


After each cycle of modified short-term intervention, we collected qualitative data that were submitted to the percentage of patients who presented positive and negative points for behaviors and abilities in each group.

In this analysis, a positive performance was defined as the patient’s good acceptance of the therapeutic intervention; increased interaction with the speech-language pathologist; appearance of positive behaviors, such as the patients’ increased interest in therapeutic activities and shared games; use of verbal communication and eye contact; and positive adhesion shown by the mother or primary caregiver, which enabled them to comprehend their children’s situation and help them to deal with daily issues. Negative performance, in turn, was defined as the patient’s non acceptance or extreme difficulty to accept the intervention; the patients’ negative behaviors, such as whining or temper tantrums; decreased interaction with the speech-language pathologist; and non adhesion to the therapeutic intervention shown by the mother or primary caregiver.

The analysis of these data indicated that G1 presented similar performance in both short-term intervention cycles, given that, in both moments, the patients presented more indicative factors of positive than negative performance, even if the percentage of positive performance was higher for the cycle with the presence of the mother/legal guardian (80%) when compared to the cycle carried out with the use of the educational software program (60%). These data are presented in Table 3.

Table 3. Qualitative analysis percentage found for Group 1

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>Mother/legal guardian</td>
<td>80%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Educational software</td>
<td>60%</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

In regards to Group 2, we observed better performances in the cycle with the presence of the mother/legal guardian, as 63.63% of the participants showed positive performances against only 27.27% in the cycle conducted with the educational software program. These data are presented in Table 4.

Table 4. Qualitative analysis percentage found for Group 2

<table>
<thead>
<tr>
<th></th>
<th>Group 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Educational software</td>
<td>27.27%</td>
<td>72.72%</td>
</tr>
<tr>
<td>Mother/legal guardian</td>
<td>63.63%</td>
<td>36.36%</td>
</tr>
</tbody>
</table>

DISCUSSION

The participants of this study were divided in groups but submitted to the same modified short-term interventions. Statistically significant differences were observed only in G1 in relation to the variables “percentage of communicative space used” and “use of the mediating object”.

Concerning the first variable mentioned above, we observed a decrease in the proportion of occupation of the communicative space, which suggests that the participants began to interact less with their speech-language pathologists after the intervention with the use of the educational software program. This fact is against the literature consulted\(^\text{23}\), considering that a recent research study demonstrated that the use of a certain computer program targeting the training of social skills in children with ASDs led to an increase in their facial recognition ability and recognition of emotions and social interaction, not only in a context of controlled activity, but also in their daily routine\(^\text{30}\).

The data obtained in this study lead us to believe that the sole use of an educational software program, in a controlled environment with direct human tutoring, aiming at helping and interacting with the patient at all times, is not enough to prompt the evolution of an individual’s social skills. This brings forth the possibility of inciting a more expansive evolution of these skills in programs with a duration of at least six months\(^\text{31}\). In this case, in addition to direct human monitoring to help and interact with the patient, professionals would also select scientifically verified software programs with the clear objective of improving social skills.
The second aforementioned variable, use of the mediating object, did not demonstrate any reduction in the participants’ performance; it only indicated that they opted for not using the mediating object while interacting with the speech-language pathologist (in the first moment, seven individuals used the mediating object, but, in the third moment, this number was reduced to only two). Considering that the analysis was conducted in a spontaneous situation, in many cases the individuals did not have the opportunity to use mediating objects, as the object of their interest was within their reach. In studies carried out by the author of the SCP test, she reports this characteristic, demonstrating that, in cases of analyses performed in spontaneous contexts, certain social cognitive aspects might not be observed, not because the patients are unable to display them, but because of the lack of activities necessary to assess such aspects.

Although we counted on a wide gamma of data that were submitted to statistical analysis in this study, few variables showed significant differences. This finding puts into question the fact that the experimental model of collecting data in 12 weeks (6 weeks for each short-term intervention model) may be a complicating factor, considering that other authors suggest that the shortest therapeutic intervention period necessary to identify any progress has a minimum duration of six months.

The qualitative analysis was carried out because we considered it important to take into account the speech-language pathologists’ perspective. As it is reported in the literature, this type of analysis elucidates important elements for reflection, such as the fact that the children experienced positive and negative points that influenced their performance during the sessions.

CONCLUSION

Considering the necessity of identifying more efficient and economically viable procedures for speech-language intervention with ASD children, the main purpose of this study was to verify possible changes in the FCP and in the SCP of children with ASD based on three different therapeutic situations.

The results of the quantitative analysis indicated that statistically significant differences of 10% and 5% were observed only in G1 in relation to the FCP variable “percentage of communicative space used” and the SCP variable “use of the mediating object”, respectively.

As an unanticipated result, we can mention the data from the qualitative analysis, which demonstrated that the individuals’ performances were positive in both short-term intervention cycles in G1. We highlight that in both groups the cycle with the presence of the mother/legal guardian yielded the best performances.

Another aspect to be considered is the need for an individualized analysis in which the impact of each model can be assessed in relation to each child in his/her specific stage of development. The wide individual variations observed in the autism spectrum frequently generate results in which the performances of the study groups require thorough analyses. Thus, statistically significant results are even more relevant in regards to therapeutic interventions in this population.

Therefore, although other authors indicate the advantages of using technological resources in the process of intervention, the family’s participation must be carefully considered.

The results presented here suggest the necessity of new studies with adequate intervention duration; we propose increasing the duration of each cycle to six months.

* LFM elaborated the project, conducted data collection and literature review, and wrote the final report; FDMF defined the procedures, coordinated the project, and collaborated in the final version of this paper.

REFERENCES


