

An evaluation of the effectiveness of a therapeutic program for children with global developmental delay

The effectiveness of a therapeutic program

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Abstract

Purpose – Global developmental delay (GDD) is highly prevalent among patients at child psychiatry clinics. However, preschool day treatment centers are currently scarce. As such, this study aimed to evaluate a program that was designed for children with GDD in order to improve their global skills and prepare them to join the school system.

Design/methodology/approach – This study utilized an observation retrospective design with a comparative group sample and included all children aged between 3 and 6 years who participated in the program for at least one academic year (experimental group). Their GDD diagnoses were based on the DSM-5 criteria (Diagnostic and Statistical Manual of Mental Disorders). Children with similar diagnoses who were on the waiting list constituted the control group. Pre- and post-scoring of the Children's Global Assessment Scale (CGAS) were conducted by the children's teacher and blinded investigator for the experimental group, while the children's mothers conducted the post-CGAS scoring for the control group.

Findings – The pre- and post-CGAS scores for the experimental group were 49.5 ± 12.8 and 58.3 ± 12.7 and 47.3 ± 17.3 and 66.6 ± 17.3 for the control group, respectively ($p = 0.001$). The children in the experimental group scored significantly better than the control group with respect to securing places in integrated, regular classes in the education system ($p = 0.001$).

Research limitations/implications – This study had certain limitations. First, the number of children in the control group was relatively small. Second, the baseline skill levels of some of the children in the control group may have been lower than those of the children in the experimental group at the beginning of the evaluation; this may explain why they had been put on the waiting list. Third, the information was gathered retrospectively; this is a method that is known to have its own limitations.

Practical implications – The clinical implications of the study are that the early identification and referral of GDD are key elements in the rehabilitation of these children and that early intervention programs are necessary for cases of moderate and severe GDD. Primary care physicians should follow up with GDD patients to ensure that referrals are being appropriately sought (Choo *et al.*, 2019).

Originality/value – The program was effective in both increasing the general functioning skills of the children in the experimental group and preparing them to attend regular, integrated classes. The program should be expanded and made available to more children with GDD.

Keywords Bahrain, Educational outcome, Global development delay, Preschool children

Paper type Research paper



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1. Introduction

Global developmental delay (GDD) can be seen in children aged under 5 years who fail to meet expected developmental milestones in multiple intellectual and functional areas ([American Psychiatric Association, 2013](#)). Children with GDD experience significant developmental delays in at least two developmental areas; these include physical, cognitive, communication, social or emotional, and adaptive skills ([Bryson *et al.*, 2018](#); [Moeschler *et al.*, 2014](#)). Children with GDD are considered a marginalized group with ignored specific needs ([Daelmans *et al.*, 2017](#)). GDD affects 1–3 % of children under 5 years of age, making it one of the most prevalent conditions at pediatric clinics ([Mithyantha *et al.*, 2017](#)). The majority of children with GDD live in low-income countries and are from families that experience high levels of poverty, lack education and do not have access to developmental evaluation tools and services ([Banks *et al.*, 2017](#)). Possible etiologies of GDD include genetic disorders, perinatal asphyxia, toxin exposure, cerebral dysgenesis, metabolic disorders, neglect and psychosocial factors ([Jimenez-Gomez & Standridge, 2014](#)). In cases without a specific etiology, prematurity and intrauterine growth restrictions are more frequently observed in patients with severe cases ([Thomaidis *et al.*, 2014](#)). Specific diagnoses, including those with no known etiology, and early detection can provide parents with information on treatment options and enable them to access special education and social support resources ([Scherzer *et al.*, 2012](#); [Suri & Vasudevan, 2017](#)).

A Brazilian study that focused on the evaluation of functional and developmental prognoses of children with GDD as they entered school found that 80% had their diagnosis changed within their first 3 years of life; their mother's age at birth, assistance to perform cognitive tasks and poor balance were determinant outcome factors ([Dornelas *et al.*, 2016](#)). A Portage early education program for children with GDD in China succeeded in increasing their developmental quotient scores in gross and fine motor skills, adaptability, language and social abilities ([Liu *et al.*, 2018](#)). Another study focused specifically on the improvement of social skills in children with GDD with or without developmental co-ordination disorder ([Tal-Saban *et al.*, 2021](#)). In sum, there are inadequate results from evidence-based approaches; the effectiveness of early childhood delay projects in low-income countries cannot be evaluated. In high-income countries, the majority of intervention programs are family-based, and, even though such interventions occur in low-income countries as well, they are less than effective ([Smythe *et al.*, 2021](#)). Regionally, a study in the United Arab Emirates estimated the weighted prevalence of clinically significant developmental delays to be 2.44% ([Eapen *et al.*, 2006](#)), while a prospective study in Oman revealed that the most common etiology was perinatal asphyxia and that children predominantly presented clinically with abnormal neurological findings and microcephaly ([Koul *et al.*, 2012](#)). An earlier study conducted in Bahrain that examined the etiology of mild type intellectual disability in school-age children found that 42% of the sample had no traceable etiology ([Al-Ansari, 1993](#)).

In this study, we aimed to evaluate the effectiveness of a program that began in 2014 with the goal of making up for the deficits in children with GDD in two respects. The first indicator of effectiveness involved evaluating improvements in the children's developmental spheres and general functioning, and the second involved examining their education placement outcomes at school entry age (i.e. 6 years). This program is the first of its kind in Bahrain and likely in the Arabian Gulf region as a whole.

2. Methods

2.1 Participants

This observational retrospective case control study was conducted in the GDD kindergarten unit at the Al Wafaa Centre at the Bahrain Association for Intellectual Disability and Autism in Bahrain during September 2021. The study included 82 children with GDD aged 3–6 years

who were divided into two groups; there were 56 children in the experimental group and 26 in the control group. All 82 children had been diagnosed with GDD between 2016 and 2020 according to the relevant criteria of the fifth edition of the *Diagnostic and Statistics Manual of Mental Disorders* (American Psychiatric Association, 2013). The final experimental group was reduced from 62 to 56 children with GDD that had been registered with the therapeutic kindergarten for at least one year. The control group of 26 children with GDD was on the waiting list for the therapeutic kindergarten due to either limited capacity or parents' refusal a spot in the kindergarten.

2.2 Therapeutic program curriculum

The curriculum of the therapeutic program includes three levels of difficulty (i.e. levels 1–3); each level is commensurate with the developmental abilities and degree of delay of the child.

Level 1: children with severe developmental delays

Level 2: children with moderate developmental delays

Level 3: children with mild developmental delays

Each level has a comprehensive compensatory plan that covers nine aspects related to child development, including visual sensation, tactile sensation, auditory sensation, body control, arithmetic ability, language ability, life skills, social ability and motor ability.

2.3 Data collection and procedures

A working team, including four teachers, two blind investigators and authors was established to discuss the operation procedures. The team finalized the data collection sheet and trained the team members on both Children's Global Assessment Scale (CGAS) forms and how to fill it out. The team members examined the medical referral form and notes on the children's progress throughout their time in the program. They also regularly reviewed the pre- and post-scores and CGAS scores for every child during data collection. The blind investigators were in charge of calculating the final scores, with the help of the children's mothers, and defining the educational outcome for the control group. For the experimental group, the blind investigators and teachers calculated their pre- and post-scores separately. The mean of the scores from the teacher and the blind investigator was then calculated. Ethical approval for the study was obtained from the Administrative Council of the Bahrain Association for Intellectual Disability and Autism.

2.4 Tools

2.4.1 Data collection sheet. A data collection sheet was developed to assess the five main spheres used to define children's levels of development (i.e. cognitive ability, language ability, motor ability, self-help and social ability). Each child's performance for each ability was assessed in line with their age and determined to be either very good, good, acceptable, poor or very poor. The final score ranged from 1 to 100. We also collected demographic data on each child's age, gender and family income, as well as on their father's employment and education level.

The data collection sheet included three forms.

- (1) Teacher assessment form A (Appendix 1),
- (2) Blinded investigator assessment form B (Appendix 2) and
- (3) Final assessment form C (Appendix 3).

Finally, each child’s mother was asked to indicate whether their child was at home or was attending either regular school classes, integrated school classes, regular kindergarten or special needs kindergarten.

2.4.2 Children’s Global Assessment Scale. The Children’s Global Assessment Scale (CGAS; Appendix 4) was published in 1983 by Shaffer *et al.* with the aim of providing a standardized method for assessing the functioning abilities of children aged 4–16 years worldwide. This scale allows investigators to assess different aspects of a patient’s social and psychiatric functioning to provide a single, clinically expressive index of the severity of the disturbance. Final scores on the CGAS range from 1 to 100 (Shaffer *et al.*, 1983).

2.5 Assessments

The teacher assessments were conducted by the centre’s kindergarten teachers. Two medical students from the Arabian Gulf University were asked to participate in the assessment of the children as blinded investigators. The assessment process was explained to both the teachers and the blinded investigators. For the experimental group, the investigators assessed the pre- and post-program scores, which were based on the performance of each child before and after the program, respectively. For the control group, the investigators assessed pre-program scores, which were based on written records, while the post-program scores were determined using interviews conducted by the blinded investigators with the mothers. A mean score from both the teachers and blinded investigators was then calculated.

3. Results

The experimental and control groups were comparable in terms of age, gender and social status (Table 1). The experimental group comprised 56 children, and there were 26 children in the control group. The mean ages of the children in the experimental and control groups were 4.21 ± 1.00 years and 5.56 ± 1.63 years, respectively. Boys accounted for 83% of the experimental group and 58% of the control group. The average family income of the children was around 500 BHD for both groups.

Table 1.
Group demographics
by age, gender and
family income

Item	Experimental group <i>n</i> = 62	Control group <i>n</i> = 26
Age	4.21 ± 1.00	5.56 ± 1.63
Gender	52 male (83%)	15 male (58%)
Family income	50% around 500 BHD	50% around 500 BHD

Table 2.
Pre- and post-program:
CGAS scores by group

Group	Pre/post program	Mean	Standard deviation	<i>p</i> -value
Experimental group	Pre-program	49.5	12.8	0.001
	Post-program	58.3	12.7	
Control group	Pre-program	47.3	17.3	0.001
	Post-program	66.6	17.3	

Note(s): The pre- and post-CGAS scores were 49.5 ± 12.8 and 58.3 ± 12.7 for the experimental group and 47.3 ± 17.3 and 66.6 ± 17.3 for the control group. An increase in the children’s general functioning was confirmed for both groups ($p = 0.001$) (Table 2). To test the difference in age in both groups, the pre- and post-scores were adjusted for age four years in both groups to insure consistency. An ANOVA test was conducted, and a non-significant difference with the first test was shown

Educational placement	Experimental group		Control group		<i>p</i> -value	95% confidence interval
	<i>n</i>	%	<i>n</i>	%		
School (normal class)	33	58.83	2	7.7	0.00	(0.35, 0.68)
School (integrated class)	13	23.21	2	7.7	0.044	(0.004, 0.31)
Kindergarten (normal)	1	1.79	7	26.9	0.005	(-0.43, -0.08)
Kindergarten (with behavioral therapy)	7	12.5	8	30.7	0.070	(-0.38, 0.01)
At home	2	3.57	7	26.9	0.010	(-0.41, -0.06)
Total	56	100	26	100		

Note(s): When analyzing school placement, the experimental group received higher scores and performed significantly better overall than the control group. Notably, 58.83% of the children in the experimental group were in regular school classes as compared to 7.7% of the children in the control group ($p = 0.000$). Furthermore, 23.21% of the children in the experimental group were in integrated classes as compared to 7.7% of children in the control group ($p = 0.044$). Of the children in the experimental group, 1.79% were in normal kindergarten classes ($p = 0.005$), 12.5% were in kindergarten with behavioral therapy ($p = 0.070$) and 3.57% were at home ($p = 0.070$) (Table 3)

Table 3. Educational placement outcome by group

4. Discussion

The program in question is the first of its kind in Bahrain and likely the Arabic Gulf region as a whole. Overall, evaluation showed an increase in skills across all the measured areas as well as an increase in the children's chances of enrolling in the regular school system as compared to the children in the control group. In the experimental group, fewer children remained at home by the time they turned six. This is the case when children do not pass the first assessment by a teacher at school entry, and it is not related to a child's age. It is worth mentioning that the gain in skills in both groups was not related to the age factor. Similar studies describing a similar curriculum in the region could not be found, and so these results could not be compared to analogous others. Some studies conducted in the region have assessed GDD from different perspectives, such as the prevalence rate and causes in referred clinical cases (Al-Ansari, 1993; Eapen *et al.*, 2006; Koul *et al.*, 2012). Prospective studies, although limited in number, showed similar results. For example, a study in China on the effect of a portage early education program on children with GDD showed a significant positive change after six months of application. The program under evaluation is family- and hospital-based, meaning that it cannot be accurately compared with this study (Liu *et al.*, 2018). In this study, an increase in general functioning measured by the CGAS was documented in both groups, but was more pronounced in the control group; however, the marked increase in the post-scores of the control group could also reflect the mothers' subjective responses. This increase in the post-scores in the control group was not re-examined by an independent objective evaluation, as were the scores from the experimental group. In the experimental group, the final post-score was the mean of the scores from the teacher and the independent blinded evaluator. The progress in the general functioning of both groups partially supported the study hypothesis; however, in this study the final one of the outcomes measured was the educational placement. Outcomes regarding educational placement were significantly higher among the experimental group, which further adds support to the study hypothesis. The skill levels in each examined category (i.e. motor, self-help, cognitive, social and psychological skills) were not precisely determined for the control group, and so the difference between the two groups could not be examined to assess the determinant factors and what exactly was responsible for the developmental progress (Dornelas *et al.*, 2016). The clinical implications of the study are that the early identification and referral of GDD are key elements in the rehabilitation of these children and

that early intervention programs are necessary for cases of moderate and severe GDD. Primary care physicians should follow up with GDD patients to ensure that referrals are being appropriately sought (Choo *et al.*, 2019).

This study had certain limitations. First, the number of children in the control group was relatively small. Second, the baseline skill levels of some of the children in the control group may have been lower than those of the children in the experimental group at the beginning of the evaluation; this may explain why they had been put on the waiting list. Third, the information was gathered retrospectively; this is a method that is known to have its own limitations.

5. Conclusion

In this study, a comprehensive training program targeting preschool children with GDD was evaluated. The results demonstrated that the program was successful in enhancing the children's overall skills. The program helped children integrate more smoothly into the regular school system as compared to the control group. Primary care physicians are the ones most responsible for the referral of children with GDD to these programs, and so they should be familiar with the options. At present, the program is able to accommodate only a small number of children with GDD, so future efforts should focus on expanding the program to reach a wider population. The main obstacle in expanding the program is that it requires a high teacher-child ratio as trained teachers are difficult to recruit. In the future, the research community should focus on early intervention for children with GDD in low-income settings.

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Appendix 1
Teacher assessment form A

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Name:

Serial Number:

Age: Year Month

Sex: M F

Father's employment: W NW R S

Father's education level: I P S C AC

Income (BHD): <500 501-1000 1001-1500 >1500

Social class: 1 2 3 4 5

Teacher Assessment

(Score 1)

Cognitive ability:

Very poor	Poor	Acceptable	Good	Very good
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Language ability:

Very poor	Poor	Acceptable	Good	Very good
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Self-help:

Very poor	Poor	Acceptable	Good	Very good
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Motor ability:

Very poor	Poor	Acceptable	Good	Very good
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Social ability:

Very poor	Poor	Acceptable	Good	Very good
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CGAS (Score 1)

Teacher Assessment – Score 2

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Cognitive ability:

Very poor	Poor	Acceptable	Good	Very good
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Language ability:

Very poor	Poor	Acceptable	Good	Very good
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Self-help:

Very poor	Poor	Acceptable	Good	Very good
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Motor ability:

Very poor	Poor	Acceptable	Good	Very good
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Social ability:

Very poor	Poor	Acceptable	Good	Very good
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CGAS (Score 2)

Length of time in the program

1–2 years	2–3 years	3–4 years
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Appendix 2
Blinded investigator assessment form B

Name:

Serial number:

Cognitive ability:

Very poor	Poor	Acceptable	Good	Very good
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Language ability:

Very poor	Poor	Acceptable	Good	Very good
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Self-help:

Very poor	Poor	Acceptable	Good	Very good
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Motor ability:

Very poor	Poor	Acceptable	Good	Very good
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Social ability:

Very poor	Poor	Acceptable	Good	Very good
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Blinded Investigator Assessment (Score 1)

Cognitive ability:

Very poor	Poor	Acceptable	Good	Very good
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Language ability:

Very poor	Poor	Acceptable	Good	Very good
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Self-help:

Very poor	Poor	Acceptable	Good	Very good
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Motor ability:

Very poor	Poor	Acceptable	Good	Very good
-----------	------	------------	------	-----------

Social ability:

Very poor	Poor	Acceptable	Good	Very good
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CGAS (Score 2)

Comments:

The child is now educated:

1. At home.
2. In a regular school class.
3. In an integrated school class.
4. In regular kindergarten.
5. In special kindergarten.

Appendix 3

Children's Global Assessment Scale

David Shaffer, MD, Madelyn S. Gould, PhD, Hector Bird, MD, Prudence Fisher, BA. Adaptation of the Adult Global Assessment Scale (Robert L. Spitzer, MD, Nathan Gibbon, MSW and Jean Endicott, PhD)

DATE: / /

100–91 *DOING VERY WELL*

Superior functioning in all areas (at home, at school and with peers), is involved in a range of activities, and has many interests (e.g. has hobbies, participates in extracurricular activities, belongs to an organized group such as Scouts). Likeable, confident, everyday worries never get out of hand. Doing well in school. No symptoms

90–81 *DOING WELL*

Good functioning in all areas. Secure in family, school, and with peers. There may be transient difficulties and “everyday” worries that occasionally get out of hand (e.g. mild anxiety associated with an important exam, occasional “blow-ups” with siblings, parents, or peers)

80–71 *DOING ALL RIGHT—minor impairment*

No more than slight impairment in functioning at home, at school, or with peers. Some disturbance of behavior or emotional distress may be present in response to life stressors (e.g. parental separation, death, birth of a sibling), but these are brief and interference with functioning is transient; such children are only minimally disturbing to others and are not considered deviant by those who know them

70–61 *SOME PROBLEMS—in one area only*

Some difficulty in a single area but generally functioning pretty well (e.g. sporadic or isolated antisocial acts such as occasionally playing hooky, petty theft, consistent minor difficulties with schoolwork, mood changes of brief duration, fears and anxieties that do not lead to gross avoidance behavior, self-doubt). Has some meaningful interpersonal relationships. Most people who do not know the child well would not consider them deviant but those who do know them well may express concern

60–51 *SOME NOTICEABLE PROBLEMS—in more than one area*

Variable functioning with sporadic difficulties or symptoms in several but not all social areas. Disturbance would be apparent to those who encounter the child in a dysfunctional setting or time but not to those who see the child in other settings

50–41 *OBVIOUS PROBLEMS—moderate impairment in most areas or severe in one area*

Moderate degree of interference in functioning in most social areas or severe impairment functioning in one area, such as may result from, for example, suicidal preoccupations and ruminations, school refusal and other forms of anxiety, obsessive rituals, major conversion symptoms, frequent anxiety attacks, and frequent episodes of aggressive or other antisocial behavior, with some preservation of meaningful social relationships

40–31 *SERIOUS PROBLEMS—major impairment in several areas and unable to function in one area*

Major impairment in functioning in several areas, and unable to function in one of these areas (i.e. disturbed at home, at school, with peers, or in society at large) with, for example, persistent aggression without clear instigation, markedly withdrawn and isolated behaviour due to either mood or through disturbances or suicidal attempts with clear lethal intent. Such children are likely to require special schooling and/or hospitalization or withdrawal from school, but this is not a sufficient criterion for inclusion in this category

30–21 *SEVERE PROBLEMS—unable to function in almost all situations*

Unable to function in almost all areas (e.g. stays at home, in the ward, or in bed all day without taking part in social activities OR severe impairment in reality testing OR serious impairment in communication, which may sometimes be incoherent or inappropriate)

20–11 *VERY SEVERELY IMPAIRED—considerable supervision is required for safety*

Needs considerable supervision to prevent hurting others or self (e.g. frequently violent, repeated suicide attempts OR to maintain personal hygiene OR gross impairment in all forms of communication, such as severe abnormalities in verbal and gestural communication, marked social aloofness, and stupor

10–1 *EXTREMELY IMPAIRED—constant supervision is required for safety*

Needs constant supervision (24-h care) due to severely aggressive or self-destructive behaviors or gross impairment in reality testing, communication, cognition, affect or personal hygiene

Specified time period: 1 month

CGAS SCORE =

The effectiveness of a therapeutic program