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Efficacy of Mom's Belief Integrated Therapy Protocol (MBITP) based therapies across multiple therapy centers serving neurodivergent populations

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Abstract

Long term and intensive therapy that can provide for a multimodal comprehensive approach has been found to be an effective modality for children presenting with varied kinds of Neurodevelopmental delays, concerns and diagnosis. In India and in the world at large there are millions of Neurodivergent children who are in need of high-quality Psychological therapeutic services that are easily accessible. Varied therapy centers provide such a solution in which the child is at the very core of the therapeutic process. The primary objective of the study was to measure the effectiveness of the center based in-person intervention for children with Neurodivergent needs. A pre-post T-test analysis demonstrates that even with as less as 2 hours of weekly therapies such as Speech, OT and Behaviour therapy-based interventions within a span of 3 months of providing quality therapy there has been significant positive progress for children in all five domains of development, as hypothesized.

Keywords: Center-based intervention; Neurodivergent children; Special needs; Child Psychology; Developmental Psychology

1. Introduction

Evidence suggests that intensive and long-term therapy is required to show significant changes and progress, especially for addressing the multifaceted and complex needs of children with ASD and other Neurodevelopmental challenges (Broomfield and Dodd, 2011); (Kasari, 2002). Over the past many years research done on early intervention has found between modest to large effects, hence this variability in the effect size still leaves lot of room for further investigation (Ramey and Ramey, 1998). In this study the effect of multimodal therapies provided face-to-face at centers for a period of 12 weeks is investigated, comparing baseline assessment to post 12-weeks assessment. It is hypothesized that child centered multimodal therapy based on curated intervention for each child will be effective. It is being investigated as to how effective it is?

Research suggests that child-centered therapy is promising, but also that more studies are required to consolidate the extent of the impact (Hillman, 2018). Child-centered refers to care in which the child is at the center of the health-care practice that is a holistic solution for the given concerns, catering to the immediate explicit needs. This could be of any nature, such as medical, emotional, psychological, behavioural or even academic. Wherein the needs and interests of the child is at the heart of the intervention planning (Carter et al., 2014).

The intervention approach explored in this study is child-centered, this implies that the program is curated to benefit the parent's life positively and to empower them as much as the child's by providing some 'parallel guidance, psycho-

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education and counselling related to the best practices for supporting their child, as much as providing direct child-focused intervention across the different centers. This was additional advantage for families, but considerably on more ad-hoc basis, as needed by families.

The four main therapies practiced extensively at most therapy clinics are Speech therapy, Behaviour therapy, Occupational therapy and Special education and all four have been found to show notable progressive improvements (Broomfield and Dodd, 2011), (Hocutt A. M. (1996); (Sharma and Shrikhande, 2018); (Novak and Honan, 2019) and (Liddane, 2021). Furthermore, numerous studies show the long-term positive quality of life benefits both in the short and the long term (Dixon et al., 2016); (Velō et al., 2019); (Broomfield and Dodd, 2011); (Reynolds et al., 2001) and (Anderson et al., 2003).

It is pointed in previous literature that a single model or approach is unlikely to be highly effective from a 360-degree treatment needs perspective, especially for children with Autism. As Autism is a multifaceted condition. A multimodal treatment is becoming increasingly popular as a method of intervention (Velō et al., 2019) and (Prior et al., 2011). Overall, it is agreed that it is not a straight forward undertaking to assess efficacy, especially when analyzing such a comprehensive intervention model (Kasari, 2002) and also evaluating effectiveness in a neurodivergent population of children.

Having an effective Comprehensive therapy model that can be clinically standardized across a large scale is one of the greatest challenges in a field that is still seen as more subjective than objective, regardless of quality results or consistently proven progress across varied settings. However that is precisely why a research of this nature and scale becomes crucial. To put into perspective, India is home to a sixth of the world's population of children and moreover India has the largest adolescent population in the world as per latest NICEF statistics (UNICEF, 2022). Out of this 24% of the population of children is under the age of 10 years, that is a total of 239 million children, and out of all the children in the age bracket of 2 to 9 years. 23.7 million children have neurodevelopmental disorders (Thakur, 2018). This is not even accounting for the general delays in children in the general population of the neurotypical kids who also exhibit delays to varying degrees. Hence no ambition is big enough to satisfy the goal of providing high-quality therapies across the nation reaching to farthest areas. Though even the greatest endeavor needs a first step. A model that puts the child at the very heart of the intervention and creates an eco-system of support that is comprehensive in nature. That is what the MB's intervention across 100+ centers in India is aiming to achieve. The child centered care and support is available at every step along the way, as and when required. Parents have a constant touch-base with the Therapist/ Psychologist, who themselves are supported by a huge team of mental health professionals. Mom's Belief Integrated Therapy Protocol (MBITP) is followed in all the centers in this study for across-the-board standardization of intervention for families, even though at every step of the journey for the child and the family the intervention is continuously customized to their needs based on results achieved and optimum clinical judgement.

There is evidence provided that children with ASD show significant improvement in communication, cognitive abilities and social adaptive skills when provided timely multimodal interventions (Zachor and Itzchak, 2010). It is also found that the multimodal therapy plan not only has long lasting effects on children with ASD but also has positive effects for the respective comorbid disorders (Velō et al., 2019). While therapeutic intervention is believed to be the core basis of progress in children with Neuro-developmental delays, it has been found that pediatric occupational therapy conclusively suggests that activity-level, parental education and top-down approaches are best to achieve the desired goals (Novak and Honan, 2019). The occupational therapy for children promotes activity level of children in everyday life empowering them by developing independence, enabling them to participate in enjoyable pursuits and turning more productive and active gradually. An absence of support towards timely intervention because of disability or lacking skills, causes low self-esteem, deep social isolation and low motivation (Novak and Honan, 2019). Similarly, Behaviour therapy in addition has also helped in achieving goals. It has shown long lasting results in children and adults even after the intervention plan is not repeated continuously. The new behaviour and skills are well-learnt within a time-span, then maintained and built upon. Behaviour modification therapies have the power to impact a child's very identity, skill enhancement, facilitating cognitive maturation process, self-concept, learning abilities, to be enabling them to form their personalities. These in itself makes for very compelling reasons for such kind of therapy to be taken up for utmost benefits.

There is sufficient evidence of significant progress that has been achieved and shown through research conducted in recent past. A study on 730 children with speech and language delays suggests that the progress of children was significantly effective on kids who received speech and language therapy for 6 months period with an average of 6 hrs than no treatment over the same 6 months period (Broomfield and Dodd 2011). Also, special education approaches often propagate for specialized adaptations and high-density teaching accommodations for children with different learning needs (Norwich and Lewis, 2001). Research has also found evidence that typical learning environments are

not as conducive in which to implement what we know, to give every child the right to an inclusive, optimal learning and educational environment, one has to think as such; that such institutions can be created and fostered everywhere and it is not just one or few special places serving such needs (Zigmond, 2003). There are these aforementioned studies that are indicating positive and good progression for children taking the OT, Speech, Behaviour and Special-education based respective therapies.

This pilot study is done with the endeavor to get a true representation of how well the (MBITP) model across different Mom's Belief (MB) centers are able to achieve the goal of providing therapies within as short span of time as 12 weeks and with as less therapy as 2 hours up to 7 hours frequency. It is an ambitious undertaking. The different kinds of therapies provided within the MBITP model are Speech, OT, Behaviour therapy and Special education. The therapies provided were individualized weekly and not just any one or two out of the four, but at times all of them combined as a treatment plan based on whatever was required for the child for their treatment across the 3 months (12-weeks) duration for a small random sample of 50 children from across 20 centers in different parts of India.

A study of this magnitude is one of a kind aiming to quantify the effect of intervention within such a short span of time with such few numbers of hours of intervention per week, based on the (MBITP) model, which is essentially protocol for effective intervention planning and execution of therapies provided across all the Mom's Belief centers.

If we are able to show effect in a duration as short as three months, then longer term benefits have an even better chance of improvement, as the cumulative effect of consistent intervention over a long duration is higher and a richer outcome can be expected, which is very promising. The only condition is that the therapies are taken up regularly without breaks progressively working on the skills that need to be built on consistently.

An important consideration with long term undertaking of therapies is when parenting, nurturing and caring for their Neurodivergent children there is tendency for caregiver burnout sooner or later, even for the most resilient parents and families. Caregiver burn out is very common in families where the parenting needs are higher due to several factors including having a child with different needs which needs to be constantly deciphered and catered to. Currently we look at a shorter timeline of 3 months. In most situations an individualized education plan (IEP) is made for 6 months. However, this is a bold study in that it took only half the time of one IEP cycle of 6 months to show progress that has been achieved.

1.1. Objective

The objective of this study was to measure the effectiveness of center based in-person intervention based on MBITP for children with Neuro-developmental concerns. The children at the therapy centers could be accessing Speech therapy, Occupational therapy, Special education or behaviour-cognitive therapy, Play therapy- one-on-one or group that is child centered. These are all different kinds of therapies a child could be receiving or a combination of a few of these. That is depending on the individual needs of a child as ascertained by the clinicians at the respective center. The varied range of presenting concerns could be as follows, Neurodevelopmental, Psychological, Behavioural, Speech-related, school-related issues, sensory issues etc. Some centers are somewhat more advanced in their treatment approaches and in the kinds of therapies they provide, however that is only in a few cases. Our goal for this study was to look at the therapies being received currently by the generic population at a larger scale across different cities in India. Hence, purposefully these factors or variables were not controlled for, otherwise the realistic and true outcome from the data could not be tapped into.

Our hypothesis is that there would be a significant positive improvement after 3 months of MBITP therapeutic intervention at the MB centers, if that does not get shown through the results of the post 3 months of intervention timeline, our hypothesis would be rejected.

2. Material and Methods

2.1. Ethics approval

This is a minimum risk study. To elaborate a minimal risk to subjects indicates that the probability and magnitude of harm or discomfort in the research are not greater than those ordinarily encountered in daily life or during the performance of routine physical and psychological examinations or tests and that confidentiality is highly protected. The post tests conducted at the centers are part of regular organizational protocol. Hence there was no special modifications for this research to anyone involved.

Informed consent has been acquired by all participants. It has been ensured that the research conforms to highest recognized ethical standards, which includes respecting the dignity, rights, safety and well-being of the people who take part. Utmost data confidentiality is maintained at all times and no one part-taking in research had access to any identifying information of the records, only access to required data and demographics such as age, gender, diagnostic status. It is ensured that identity of all participants is absolutely anonymous at all times.

2.2. Intervention protocol

This is a non-funded study.

Study Rationale – To be able to quantify progress of children post 3 months of therapies at centers across different geolocations of India. Quantitative analysis was conducted pre- and post 3 months on a standardized Neurodevelopmental model.

2.3. Sampling

A sample size of 50 children has been taken from 20 centers across different geolocations, including cities and small towns.

2.4. Inclusion criteria

- **Age** – Between 2 to 12 years of children.
- **Diagnosis** – Children with ASD, ADHD, LD, ID, Global delays, CP, Sensory processing disorder or co-morbidities of these disorders.
- **Therapies undertaken at centers** – Children were attending Speech, Occupational or Behavior therapy or a combination depending on individual needs and financial capacity for access to the interventions.

2.5. Exclusion criteria

Children over 12 years, disorders other than the ones mentioned above in the inclusion criteria.

Any child's data who was not taking the therapies consistently or was on a break for a prolonged period or there was some prolonged illness was not being considered, as it would not be a true representation of the effect of therapy. Also, non-consenting families were excluded.

2.6. Instruments to assess

Nosologically, systems like Diagnostic and Statistical Manual (DSM) and International Classification of diseases (ISD) were used to ascertain diagnosis. Among various measures, Developmental Profile 3 is the common tool used during the study. Majority of the studies used one structured tool for assessment and diagnostic ascertainment, for ensuring diagnostic validity, establishing the parameters that are being measured by a standardized assessment tool that is best suited for the particular research design. This was the strategy we used as well.

Standardized assessment tool used – Developmental Profile 3, measures development across 5 parameters, namely Physical, Adaptive-Behavior, Social-Emotional, Cognitive and Communication, includes 180 items describing a particular skill for yes or no answers. Reasons we chose this comprehensive tool to be used for our study is as follows. "DP3 is a tool that has been standardized based on a sample of 2,216 children. In terms of the reliability two-thirds of the correlation are .90 or above. Test-Re-test correlation ranges between .81 to .92 for the five scales and the General development score.

Standardization of clinical process and implementation – For ensuring clinical standardization, the clinical teams constituted of different mental health professionals qualified for administering those particular therapies were employed at the centers, who were trained to provide the intervention for Speech Therapy, Occupational Therapy and Special education following the MBITP center-based intervention. However, subjective and human variability is assumed. The goal was to assess, regardless of the aforementioned factors if there is a significant effect due to the intervention and quantification of the effect of MBITP intervention from pre to post.

2.7. Type of study

This is a quantitative research, with a pre-post study design. The Pre-assessment data was taken retrospectively, in a random manner. In the study the raw scores were acquired by administering the DP3 standardized assessment tool on the children first at day 1 and then after 3 months of intervention. That was when the post 12-weeks intervention

progress was to be measured. The analysis of the effect size was done based on these raw scores. It is mention worthy that even though the sample was taken from retrospective records, there are no missing data points or unrecorded variables. Every required data point is thoroughly accounted for.

2.8. Sample Characteristics

The study was predominantly conducted on children, who had Global delays or children with ASD just by virtue of a greater number of children naturally falling in those two categories, or children who could be classed as slow learners or with a lower IQ. Male to female ratio varied by 37:13. That means only 35% out of the entire sample was girls, even though the sample was completely random and we did not have any selectivity bias to ensure that there should be a 50-50 split in the sample, else that would be biased. We took a sample population out from a data set of 110 pre-tests of children randomly and we later verified the gender. A sample of 50 children was randomly provided based on data from consenting families by the 20 MB Centers and at the post 12 weeks intervention point the post-assessments were conducted.

The demographics of the family background of children could be ranging from high to middle to low income families, some could also be paying through Mom's Belief insurance plan; as they may not be able to bare the entire expenses.

2.9. Study set up and Design

The study was conducted at various MB Centers, from over 100 + centers that Mom's Belief is partners with all across India, these 20 centers were randomly chosen to get the data. This was a Randomized trial. Some of the locations of centers are Gurgaon, Goregaon, Pune, Indore, Kolkata, Noida, Bilaspur, Rajkot etc. So the locations are in metropolitan cosmopolitan locations to towns to smaller cities, bigger cities. Replication of the study results across various socio-economic and cross-cultural familial set ups has been taken care of. The demographic of families consists of a very diverse spread of the Indian demographic of families and of the various sub-cultures within the Indian subcontinent.

The prevalence of chief complaints were examined by trained Child psychologists and the neurodevelopmental profiling was conducted using standardised assessment tool Developmental Profile-3. As the scores needed to be obtained from centers, that was the best source to collect the required data. Duration of participation required was only the time when pre-and post-assessments was conducted. That would be a net total of 2.5 hours per participant for assessment time. This pre and post assessment taking is a regular part of the intervention progression over time.

2.10. Intervention Protocol

Procedure – Literature review was done and proposal was submitted for research and ethics approval. Ethics approval was granted. Study was fully formulated, designed and conducted. Informed consent was acquired from all participants. Required data was acquired through Retrospective Random Sampling method. Statistical analysis conducted based on the Hypothesis, a one tailed paired sample T-test analysis was done. The research was then written up, publications were identified to submit paper to get the study published.

2.11. Description of the Interventions provided at the centers

- **Speech therapy** – Standard speech and oral motor therapy provided by trained Speech pathologists.
- **Occupational therapy** – Understanding the sensory profile of the children and based on the individual fine and gross motor physical capacity and capabilities, occupational therapy is provided by trained Occupational therapists.
- **Special Education** – Focuses on skill enhancement for the developing Neurodivergent minds across various developmental domains, including working on relevant academic based goals as well, for enhancing academic abilities.
- **Behaviour Therapy** – Focuses on resolving the behavioural challenges exhibited by children, which is inclusive of socio-emotional issues as well by behaviour interventionists.

In terms of the exposure of therapies of the children, that was anywhere between 2 to 7 hours in a week. There was no bias to choose children who particularly took more number of hours, because we as researchers didn't even have that information in the first place of who exactly got how many hours between 2 to 7 hours of intervention within our data set, for confidentiality purposes.

We could not have controlled for number of hours per child per week, as that was a pre-decision based on ongoing progress shown by the child, by their respective heads of intervention providers.

2.12. Data Collection and measurement

The study was conducted as per the aforementioned inclusion and exclusion criteria and the data was collected using the Developmental Profile 3 screening tool.

The pre and post data scores were taken by trained child psychologists, who did not have anything to do with the research, they did not even know that there would be research conducted based on the assessments they were doing.

To ensure optimum bias-free sampling the Psychologists who conducted the pre-tests were not the same as those who conducted the post-tests. Neither group of Psychologists were aware that this data could potentially be used for research, at the time that the data was collected in real time. Hence, this is a single blinded study. Out of all the pre-post test results, we got received the data of 50 children randomly to assess the effectiveness of the intervention.

2.13. Data analysis

One-tailed paired sample T test analysis was conducted based on the premise of our hypotheses. The statistical evaluation is based on the significance level 0.01.

3. Results

The analysis based on the level of significance, which was taken as 0.01 in order to enforce stringent parameters of statistical integrity demonstrates that, all 5 key areas obtained a p value less than 0.01. This shows that all the domains have significant positive difference, only post 3 months (12-weeks) of intervention. All the t-stat values were greater than the t-critical values.

The pattern that has emerged in terms of maximum progress is in the Physical domain with ($p = 0.0000378$), Socio-emotional domain with ($p = 0.0000899$) and cognitive domains with ($p = 0.0007782$), with highest gains in the physical and socio-emotional arena. Then in the communication and adaptive-behaviour domains, with ($p = 0.0008462$ and 0.0056167) respectively. Table 1 demonstrates the results with the p values for each domain. Each subdomain of development showing significant progress only after 3 months of face-to-face therapies.

Table 1 Mean scores in pre vs post intervention with the p values for each domain.

Category	n	Mean scores		t critical value	t stat	df	p value
		Pre-test	Posttest				
Physical	50	18.26	20.44	2.404891	4.3217844	49	0.0000378
Adaptive Behaviour	50	14.34	15.4	2.406581	2.6371205	49	0.0056167
Social Emotional	50	12.96	14.98	2.406581	4.0606572	49	0.0000899
Communication	50	11.76	13.1	2.406581	3.3265200	49	0.0008462
Cognitive	50	15.04	17.02	2.406581	3.3552797	49	0.0007782

It was hypothesized that positive significant changes will be demonstrated after 3 months of intervention and that is what has been demonstrated. The fact that all the domains have shown the effect is very highly unlikely that it is just due to chance, in a random sample. Significant difference was seen with mean increase of 2.18, 1.06, 2.02, 1.34 and 1.98 in the physical, adaptive-behaviour, social-emotional, communication and cognitive domains respectively. Both Figures 1 and 2 clearly emphasize the trend of progress for each of the domains of development. They show the consistency and the difference, with the maximum pre to post difference shown for the Physical abilities, then the socio-emotional abilities. Positive effect of changes are then seen in Cognitive and Communication domains. Adaptive behaviour skills being given least priority showing significant but least changes out of all 5 domains.

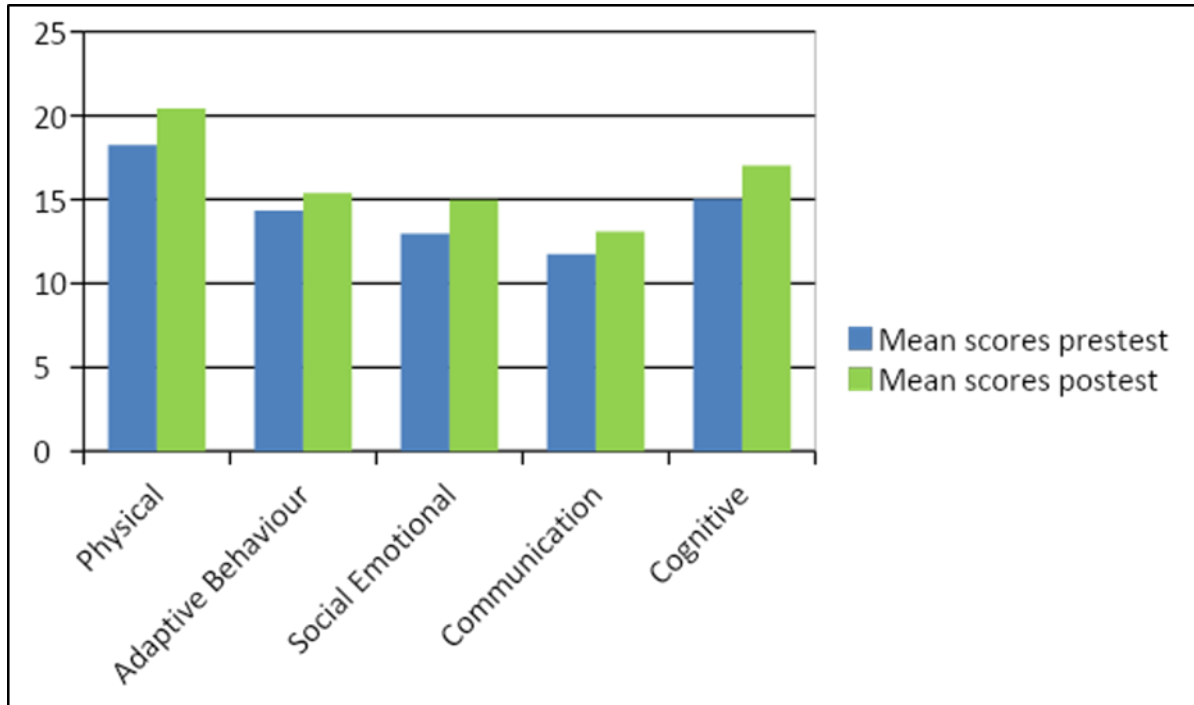


Figure 1 Bar graph representation of pre-post test scores for every domain of development measured by DP3

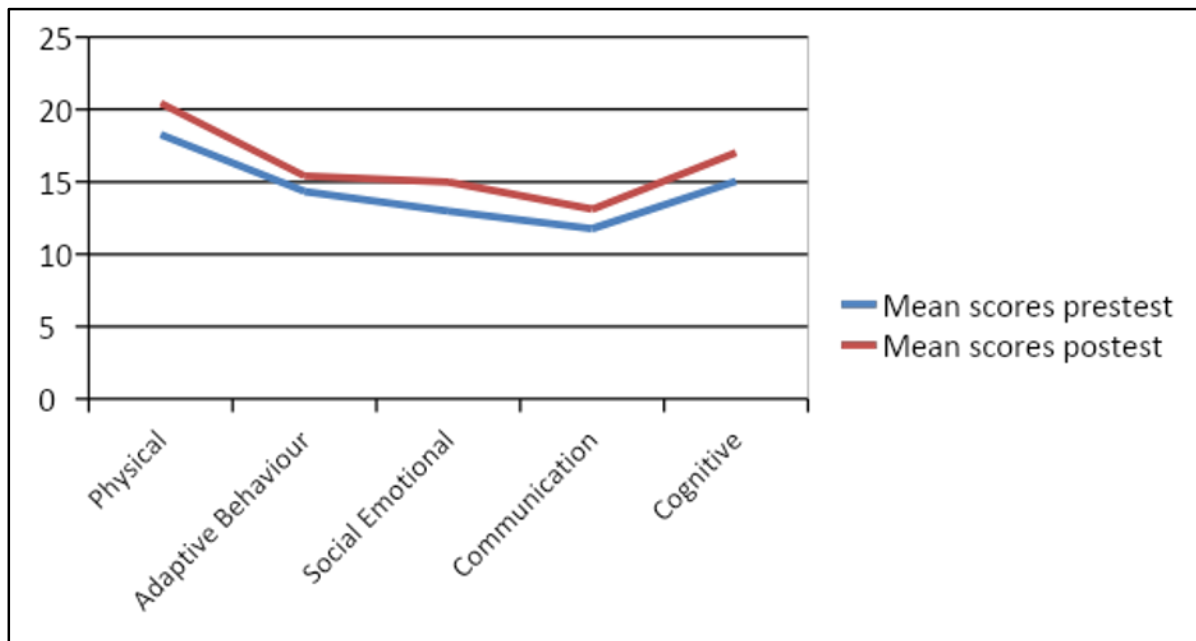


Figure 2 Line graph representation of pre-post effect of intervention.

4. Discussion

The key findings of this study are strong despite following factors. There is high variability within the study population, which has been gathered from 20 different center locations. Regardless of different therapists taking sessions, across varied geographies of the Indian subcontinent. The sessions were conducted for different purposes yet with the same greater goal of empowering the child’s developmental abilities, because of this there is no therapist specific bias that is possible. That the results could be due to specifically really good therapists who are able to demonstrate progress and others not so much, this factor was already controlled for by total non-selectivity and randomization of therapists.

Moreover, even though there is variability of total number of hours the children actually received therapies, there is no bias of effect of any one type of therapy out of any of the four therapies. That is part of the MBITP as an intervention model.

It is encouraging that all these variables are influencing the results, yet there is significant progress. The intervention has been shown to be overall effective per child for their individual treatments and as a collective effect. It is not likely by any measure to be by chance but rather a true effect of what is being studied for, which is the effectiveness of the intervention provided, that too at the highest p value of 0.01.

It can be understandable that parents who pay privately and take their children to the therapy centers at least every other day, if not every day of the week are relying to a great extent on the progress from the sessions itself. Hence that onus is actually largely on the therapist to bring about the changes, that too in such a small duration of time. All above discussed points are strengths of this study and of the results that are shown.

Ideally, a larger sample size could have been taken, but that was not the goal for this pilot study in the first place. It is imperative to be transparent of the limitations that were posed during the study conceptualization. This was a retrospective data set and at that time there was no control group for comparison. However, it is important to note that this is a real-world challenge where most families do not really take up 12 weeks pre-and post assessment when specifically asked that they cannot take any therapies for their child within this span of time, that too to get 50 such families. This posits a challenge which needs to be overcome for future studies of this nature. Having said so it is important to state that regardless of the limiting circumstantial aspects, the results found from baseline to post analysis difference is still significant and that doesn't undermine the power of the effect shown in this study.

This research has important implications in that it gives an indication that good quality and timely intervention in children can show effective changes, even in the short term, that can be sustained with a consistent approach and translated into long-term benefits and potentially even greater positive changes as there is a cumulative effect on the developmental profile of each child. Further, this study's robustness is testified because of the diversity of the population sample; which may be somewhat suggestive that regardless of the background, genetic variance, socio-economic background or even diagnostic variance the effect of the comprehensive therapy demonstrated is promising. It lays ground work for further research of this nature to build upon. To test the effectiveness of in person therapy by trained professionals across the Indian subcontinent despite reports of multi-varied experiences reported often by families gives the needed hope for striving even harder in the right direction. At a higher perspective the implications are to identify MBITP as an effective therapeutic solution that can be implemented at a large-scale level in a way that provides an accessible therapeutic service not just across India but globally to touch lives everywhere. Especially where there is a dire need for short- and long-term access for positive developmental benefits to enhance quality of life.

The most effective way to avoid loss of developmental potential of over 200 million children in the developing world alone has been said to be by providing programs which give direct consistent learning experience to children and families targeted towards younger and disadvantaged children, providing quality therapies and care, available for longer durations, which are higher intensity; integrating family support, health, nutrition and education system and that which is able to provide financial relief to utmost support for the needs of families (Engle et al., 2007). Even though such a robust ecosystem sounds too good to be true. The MBITP intervention at centers provides this ecosystem of support. Hence, the positive findings from the study are not surprising. Research also finds that parental satisfaction maybe influenced by numerous factors and is directly related to the rate of quantified progress seen in the child post intervention and relationships with the service provider. This seems to be a particularly important factor determining this satisfaction of the experience (Rodger et al., 2008). This is a benchmark study in terms of the results that we got, despite the fact that the children received anywhere between 2-7 hours of therapy per week, which is much lesser than the recommended intensive therapy of at least 30 to 40 hrs. per week. This is a very positive surprise that is highly encouraging and one that gives us hope that a lot is already being achieved and more can be done to make the lives of the Neurodivergent individuals blossom and flourish. To bring back the UNICEF statistic, millions of these children who will become adolescents desperately need intervention that is able to accelerate their development, explore their unique potential and strengths and give them the bright future they all deserve.

5. Conclusion

The primary outcome of this particular study is that it shows how face-to-face therapies provided consistently for 12 weeks based on the Mom's Belief specialized holistic intervention protocol demonstrated significant overall Neurodevelopmental progress. This study benefits by providing evidence of the power of Neuroplasticity of the brain

when timely and consistent Neurodevelopmental therapies are provided for children with Neurodivergent needs and conditions, regardless of the nature of developmental issues.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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