

Reflex Integration and Fostered Children with Emotional Regulation Difficulties Who Have Experienced Neglect

Sara Elizabeth O'Donnell

Head of Education, Research and Parent Support, Blue Skies Ahead, Wirral, United Kingdom

*Correspondence to:

Sara Elizabeth O'Donnell
Head of Education,
Research and Parent Support,
Blue Skies Ahead,
Wirral, United Kingdom.
E-mail: Sara@blueskiesahead.org.uk

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Abstract

Most primitive reflexes should be inhibited by twelve months of age. The process of inhibition can be interrupted in several ways including neglect. This can lead to developmental challenges in a range of areas including emotional regulation. Rhythmic movement training (RMT) is a reflex integration movement programme that aims to inhibit primitive reflexes and promote developmental maturity. No peer-reviewed research regarding reflex integration programmes and fostered children was found in the literature search. The primary objective of the study was to measure any associated outcomes of this reflex integration programme for fostered children experiencing significant emotional regulation difficulties. This study assessed thirteen fostered children for retained primitive reflexes (RPR) before and after an RMT reflex integration programme as well as the additional domains of challenging behaviors, independent activity, social participation and wellbeing. Each participant was given a reflex integration programme that took nine minutes per day to complete. The RMT reflex integration programme was updated every 4 - 6 weeks. After 3.2 months statistically significant changes were seen. The level of RPR reduced ($p < 0.001$), the level of challenging behaviors reduced ($p \approx 0.002$), social participation improved ($p < 0.001$), and wellbeing improved ($p < 0.001$). These changes were also clinically significant, they had a noticeable effect on daily life. These results suggest that an RMT reflex integration programme could be an effective intervention for fostered children experiencing emotional regulation difficulties.

Keywords

Fostered children, Reflex integration programme, Retained primitive reflexes, Emotional regulation, Challenging behaviors, Rhythmic movement training

Introduction

The research objective of this study was to investigate the associated effect, if any, of a reflex integration programme on children having significant difficulties regulating their emotions. As a result of these emotional regulation difficulties they were exhibiting challenging behaviors, particularly in their school setting. All study participants were CLA (Children Looked After by the local government authority) more commonly known as fostered children. This intervention was selected by the local government authority (Wirral, UK) who were looking to support CLA. The local government authority was having difficulties obtaining engagement in standard interventions (such as talking therapies) for this group. The researcher looked at the first six months of using a reflex integration programme with CLA.

Reflexes are involuntary responses of which there are several categories. Intrauterine reflexes emerge in utero and should not be present at birth. Primitive

reflexes are present at birth and should not be present after one year (with some exceptions). Transitional reflexes are not present at birth and should not be present after one year. Postural reflexes are not present at birth but should be present by one year. During optimal development primitive, intrauterine and transitional reflexes should become inhibited and postural reflexes become established. There is evidence from Melillo et al. [1] that this process is not fully completed for some individuals older than one year. Reflex integration programmes aim to reduce the number and severity of RPR. There are several reflex integration programmes in existence. Research from Sur-owinska et al. [2] discusses how retained reflexes help predict gross motor delays. Wang et al. [3] found that certain reflexes are more prevalent in those with an attention deficit hyperactivity disorder (ADHD) diagnosis. McPhillips and Sheehy [4] detailed how poor readers have more RPR than more skilled readers. Melillo et al. [5] study found that a reflex integration programme was associated with an improvement in mathematical skills in those with ADHD and Mohamed et al. [6] found that a reflex integration programme improved gross motor skills in participants with a cerebral palsy diagnosis.

The literature search found two studies from Grigg et al. [7, 8] and another from Perez-Rey et al. [9] that used RMT as the reflex integration method. RMT differs from other methods in that Blomberg and Dempsey [10], and Dempsey [11] added a rhythmic element to the movements used. The previous RMT studies looked at parent perceptions on the method [7], the impact on reading scores [8] and its effect on those with dyslexia [9].

Some researchers have documented reflex integration programmes and the impact on emotions and behavior. Pecuch et al. [12] linked a programme with emotional regulation benefits for preschoolers. Tatarinova et al. [13] examined those with a variety of neurological disorders and found; “a decrease of hypervigilance, an increase in stress resilience, behavioural and emotional regulation improvements, a more positive emotional state” (p. 1358) after a reflex integration programme. While McWhirter et al. [14] found a link between a particular RPR and impulsivity. Masgutova and Masgutov [15] talk of the particular reflexes that are retained in those who have experienced trauma. Retention of the moro reflex has been identified as significant consideration when supporting those who have experienced trauma [15].

There are around 84,000 CLA in England [16]. Short- and long-term outcomes for CLA are poor by comparison to their peers. They are half as likely to reach academic standards [17]. Murray et al. [18] showed that they are more likely to experience poor health outcomes in the long term. In addition, Murray et al. [19] found that within this group there are higher rates of death due to self-harm, accidents and mental and behavioural causes. 40% have results that are a cause for concern in standard emotional and behavioural health questionnaires [16]. The literature search found Weiner et al. [20], and Cohen et al. [21] work on trauma-informed cognitive behavioural therapy for this group as well as Gusler et al. [22] study of their carers. Other work suggests cognitive behavioural therapy is more effective in adolescents than chil-

dren. Carer/relative carer nurture courses are reported by Lee and Brown [23] as effective.

This study might be considered significant in three regards. Firstly, peer-reviewed research relating to CLA undertaking a reflex integration programme was not found in the literature search. Secondly, although there were three peer-reviewed studies that use RMT as the method of reflex integration in the literature search [7-9] none of the three studies relate to RMT and emotional regulation. Thirdly, peer-reviewed research regarding reflex integration programmes with therapy outcome measures (TOMs) as the method of measuring outcomes were not found in the literature search. To summarize, the significance of the study lies in the use of a UK standardized outcome measure in regard to a reflex integration programme, measuring the impact of a reflex integration movement programme on CLA and recording the impact of RMT on emotional regulation.

Reported here is the impact of a reflex integration programme on individuals who have CLA. The outcomes have been measured via two mechanisms: firstly, using TOMs. This outcome measure uses domains to evaluate the impact of a particular intervention on a range of areas of function, thus giving a wider perspective on an individual pre and post intervention. As well as measuring the impairments themselves it also measures the additional domains of independent activity, social participation and wellbeing. All TOMs scores make a comparison with the typical function of peers of the same age, gender and culture. Secondly, questionnaires were sent to all carers and professionals involved with the CLA (including school staff and social workers). This was to gain insight into the changes, if any, noted by those who support the CLA [24].

Methodology

The mixed method study design explored RPR and challenging behaviors in CLA with emotional regulation difficulties. CLAs were referred to by the local government authority who have parental responsibility. They were referred due to significant emotional regulation difficulties resulting in challenging behaviors. In all cases the home and/or school placement were struggling to find effective support strategies for them. Violent behavior towards self and/or others was reported by school placement and/or home placement.

Each pilot study participant underwent a reflex assessment. 19 reflexes were tested (1 intrauterine, 2 transitional, 3 postural, and 13 primitive). The researcher had a particular interest in the reflexes that are related to an individual's emotional development. Details of the reflexes assessed the potential challenges they relate to, and the tests used can be found in the supplementary material file. Each reflex was given a color. This was red if the response was far from an age-appropriate response, orange if it was close to an age-appropriate response and green if it was an age-appropriate response. All checks were explained and demonstrated to the participant. They were given the option to decline any test at the initial and subsequent assessments. As all the participants were older than 3 years old primitive, intrauterine and transitional reflex-

es should not be present and postural reflexes should be present. This determined what was an age-appropriate response to each reflex test. This allowed the severity of the RPR to be gauged and an appropriate reflex integration programme to be devised. The assessment included an interview with a member of the school staff who is well known to the participants. This was usually the class teacher but sometimes a school counsellor or similar. In addition, the participants' social workers and carers were interviewed. An RMT reflex integration programme was set up by a qualified RMT consultant. Details of the movements used and the reflexes that they aim to integrate can be found in the supplementary material file. The reflex integration programme was demonstrated to the carer or teaching assistant who was to implement the RMT reflex integration programme. The programme given consisted of three RMT movements, took nine minutes per day to complete and it was recommended to be completed 5 - 7 days per week. The participant then returned to the consultant every 4 - 6 weeks. At these appointments the same reflexes were assessed in the same way by the same consultant. Based on the results of the follow-up assessment the RMT reflex integration programme was altered to reflect the changing priorities of the participants' gaps in reflex integration. Research notes were made of the reported changes in the study participants as well as the level of completion of the RMT reflex integration programme. This process of follow-up assessments and alterations to the reflex integration programme every 4 - 6 weeks was repeated over the six-month period of the pilot study.

This pilot study details those participants involved in this process between December 2022 and July 2023, $n = 21$. The criteria for analysis are those who; 1) Attended at least one appointment post assessment; 2) Reported implementation of the RMT reflex integration programme; and 3) Had challenging behavior as an impairment. 13 met these criteria. The individuals started the process at different times during the six-month period. 12 of the 13 were not undergoing any other therapy or pharmacological treatments during this time. 1 had been taking medication for ADHD for the 13 months before the study and continued throughout the study. The 13 study participants were aged between 4 years and 13 years at the time of their initial assessment with a mean average age of 9 years (8 were male and 5 were female).

Survey

All the professionals (teachers, other school staff, social workers, and local government authority staff) and carers involved with the CLA were sent a questionnaire at the end of the six-month pilot study period. They were asked if they agreed with the statement; 'I found the information regarding the CLA's uninhibited/RPR helpful'. They were asked if they agreed with the statement 'I have seen positive changes in the CLA I am involved with since undertaking an RMT reflex integration programme'. They were asked if they would like to make a comment about anything they have noticed.

TOMs

Outcomes associated with the RMT reflex integration programmes were captured using TOMs.

Enderby [25] described TOMs; thus, 'The TOMs is based on the international classification of functioning (ICF), Disability and Health developed by the World Health Organization, which provides a structure to reflect issues beyond that of the impairment alone. The TOM was designed to be a simple, reliable, cross-disciplinary, and across-client group method of gathering information on a broad spectrum of issues related to the objectives of services and relevant to all clients receiving speech and language therapy. The TOM allows the clinician to describe the relative abilities of an individual across four dimensions. These follow the dimensions used by the ICF of impairment, activity restriction, and social participation. The dimension of the individual's wellbeing was added to the TOM, since many goals in therapy aim to improve the emotional status of the child and, where appropriate, the carer' (p. 438). It is widely used in the UK particularly in the field of speech and language therapy, demonstrated by Moyses et al. [26].

Enderby [25] also explained that; 'Outcome measurement is different to assessment, in that the latter aims to assess the deficits and abilities in specified areas, whereas an outcome measure aims to identify whether an individual has benefited (or otherwise) from an intervention, (p. 437).

TOMs measures impairments on an 11 point ordinal scale. Written descriptors are given for points 0, 1, 2, 3, 4, and 5. Half points are used when the best fit for a given individual lies between two descriptors. In addition to an impairment/impairments TOMs measures other domains. They are independent activity, social participation and wellbeing. By giving a wider view of an individual researchers gain the ability to capture any additional benefits that may be associated with an intervention such as a reflex integration programme. Median and modal averages are the correct averages to use with ordinal data. However, it is common practice, illustrated by Palmer et al. [27], to use the mean with TOMs data and all are presented here. TOMs were developed by Professor Pam Enderby and Alex John and is widely used in the UK National Health Service [28].

A change of 0.5 on any of the TOMs domain scales is clinically significant and defined by Enderby and John [28] as 'the practical importance of a treatment effect where it has a real genuine, palpable, noticeable effect on daily life' (p. 03). Further guidance, also from Enderby and John [28], is provided by thinking of a 0.5 change as an 'arm's length change' (p. 10) and considering 'would this change be evident to another person?' (p. 10).

Adapted TOMs scales have been created to provide further clarification to the descriptors for impairments. The UK developmental practitioner's association steering committee created adapted scale descriptors for the impairment of RPR. This impairment along with an additional impairment of challenging behaviors were recorded. The additional domains of independent activity, social participation and wellbeing were recorded at the time of the initial assessment as well as in July of 2023 (six months later). All are measured pre and post intervention and all make a comparison with typical function of peers of the same age, gender and culture. Table 1, table 2, table 3, table 4, and table 5 are the TOMs descriptors for the domains used in this pilot study.

Table 1: TOMs descriptors for the impairment of RPR.

TOM score	Level of RPR	Impairment one
0	Profound	Some primitive reflexes may not be evident, or they are all fully retained (81 - 100% fully or almost fully retained). All postural reflexes totally underdeveloped.
1	Severe	A significant majority of primitive reflexes are fully or almost fully retained (61 - 80% fully or almost fully retained). Most postural reflexes are totally or mostly underdeveloped.
2	Severe/moderate	Around half of the primitive reflexes are fully or almost fully retained (41 - 60% fully or almost fully retained). Some postural reflexes may be developing.
3	Moderate	Many primitive reflexes are partially inhibited (21 - 40% fully or almost fully retained). Many postural reflexes are developing/fully developed.
4	Mild	Nearly all primitive reflexes are partially or fully inhibited (1 - 20% fully or almost fully uninhibited). The majority of postural reflexes are developed/developing.
5	No	All primitive reflexes are fully inhibited. All postural reflexes are fully developed.

Table 2: TOMs descriptors for the impairment of challenging behaviors.

TOM score	Level of challenging behavior	Impairment two
0	Profound	Daily expression of serious physical aggression/self-injurious behavior. Regular and frequent use of abusive language. Regular and frequent destruction of significant elements of the environments such as doors, windows, and items of furniture.
1	Severe	Frequent serious physical aggression/self-injurious behavior. Sustained (several times per week) use of verbal attacks using language which some find offensive. Sustained (several times per week) destruction of significant elements of the environment such as doors, windows, and items of furniture.
2	Severe/moderate	Prone to physical aggression/self-injurious behavior. Frequent use of verbal threats to self and others, and/or offensive language. Frequent (weekly) destruction of significant elements of the environments such as doors, windows, and items of furniture.
3	Moderate	Occasional physical aggression/self-injurious behavior when provoked. Occasional (monthly) use of verbal threats to self or others and/or offensive language. Very occasional tendency to destruction of any aspect of the environment.
4	Mild	Occasional tendency to physical aggression/self-injurious behavior but uses strategies to modify, very occasional use of aggression or offensive language. Regulates, mostly successfully, tendency to destroy structures in the environment.
5	No	Emotionally regulated, clear ability to relate to self and others.

Table 3: TOMs descriptors for independent activity. The comparison is being made with the typical function of those of the same age, gender, and culture.

TOM score	Independent activity
0	Totally dependent/unable to function.
1	Assists/cooperates but burden of task/achievement falls on professional or caregiver.
2	Can undertake some part of task but needs a high level of support to complete.
3	Can undertake task/function in familiar situations but requires some verbal/physical assistance.
4	Requires some minor assistance occasionally or extra time to complete task.
5	Independent/able to function.

Table 4: TOMs descriptors for social participation. The comparison is being made with the typical function of those of the same age, gender, and culture.

TOM score	Social participation
0	No autonomy/isolated/no social/family life.
1	Very limited choices, contact mainly with professionals, no social or family role, and little control over life.
2	Some integration, value, and autonomy in one setting.
3	Integrated, valued, and autonomous in limited number of settings.
4	Occasionally some restrictions in autonomy, integration or role.
5	Integrated, valued, and occupies appropriate role.

Ethical considerations

Ethical approval was sought via the UK Medical Research Council and NHS Health Research Authority using the Policy Frameworks for Health and Social Care Research’s website [29]. It uses the defining research board from the Research Ethics Service. According to their online assessment tool this study is not considered research and did not require ethical approval (certificate available upon request). Informed consent was sought via the local government authority who have legal parental responsibility for the CLAs in this study. Verbal consent for the reflex assessments were sought from the CLA at every reflex assessment. All data is shared here anonymously.

Statistical analysis

The null hypothesis is that the mean difference in the TOMs domains pre and post intervention is zero ($H_0: \mu = 0$) and the alternative hypothesis is that the mean difference in the TOMs domains pre and post intervention is not zero ($H_a: \mu \neq 0$). Using the mean and standard deviation the T statistic will be calculated and used to estimate the p values for each domain.

Table 5: TOMs descriptors for wellbeing. The comparison is being made with the typical function of those of the same age, gender, and culture.

TOM score	Wellbeing
0	Severe constant: Distress/upset/concern/frustration/anger/embarrassment/withdrawal/severe depression/or apathy, and unable to express or control emotions appropriately.
1	Frequently severe: Distress/upset/concerns/frustration/anger/embarrassment/withdrawal/severe depression/or apathy. Becomes concerned easily, requires constant reassurance/support, needs clear/tight limits and structure, and loses emotional control easily.
2	Moderate consistent: Distress/upset/concern/frustration/anger/embarrassment/withdrawal/severe depression/or apathy in unfamiliar situations, frequent emotional encouragement, and support required.
3	Moderate frequent: Distress/upset/concern/frustration/anger/embarrassment/withdrawal/severe depression/or apathy. Controls emotions with assistance, emotionally dependent on some occasions, vulnerable to changes in routine, and spontaneously uses methods to assist emotional control.
4	Mild occasional: Distress/upset/concern/frustration/anger/embarrassment/withdrawal/severe depression/or apathy. Able to control feelings in most situations, generally well-adjusted/stable (most of the time/most situations), and occasional emotional support/encouragement needed.
5	Not inappropriate: Distress/upset/concern/frustration/anger/embarrassment/withdrawal/severe depression/or apathy. Well adjusted, stable and able to cope emotionally with most situations, good insight, accepts and understands own limitations.

Results and Discussion

Survey results

In response to the question ‘I found the information regarding the CLA uninhibited/RPR helpful’ the 24 professionals and carers stated that; 67% strongly agreed, 19% agreed, 4% neither agree nor disagreed, 4% disagreed and 8% strongly disagreed (percentages are rounded to the nearest integer). This suggests that knowledge of RPR was helpful for most. This may be because understanding the involuntary nature of reflexive responses helped staff to have more realistic expectations of the CLA in their care.

In response to the question ‘I have seen positive changes in the CLA I am involved with since undertaking a reflex integration programme’ the 24 professionals and carers stated that; 42% strongly agreed, 21% agreed, 25% neither agree nor disagreed, 4% disagreed and 8% strongly disagreed (percentages are rounded to the nearest integer). This suggests that this intervention is associated with noticeable positive changes for the CLAs in most cases.

The survey asked if the carers and professionals would like to make a comment about the process. Below are the responses.

School special educational needs coordinator: The child has been able to identify much earlier when they are entering a time of crisis. This has allowed school to implement strategies to minimize the effect of such occasions.

Carer: He seems a lot calmer and school has been good. No fighting with anyone and three positive behavior points in one week.

Carer: They have not bitten anyone since their last visit and his balance has improved so much that he has not fallen over recently.

School CLA coordinator: He seems more able to explain what he actually needs or what may go wrong before it does.

Headteacher: One thing that has changed is that she is controlled when angry now and the calming down process is taking a lot less time.

School inclusion manager: While she still has significant challenges, they are ones that we can manage within school.

Carer: Although there are still very challenging times there are some nice changes in impulse control and understanding of others' emotions.

School form tutor: There have been no instances of emotional breakdowns in school for two months. They involved going to the floor and crying uncontrollably.

Carer: They have been really mature of late and there has been no fighting with siblings. She is thriving and everything seems very positive.

School special educational needs coordinator: The child's ability to self-regulate has improved. The child no longer freezes in stressful situations.

Class teacher: Increase in ability to manage the demands of school. Increased sense of wellbeing and reduction of distress. Reduction in trauma responses being apparent in a school setting.

Educational progress officer: Positive changes in impulse control and understanding emotions.

Class teacher: The reports and insight have been so useful for staff and helps us to understand what each child is facing. Also helpful to be able to use this knowledge to support other children.

Carer: The child was very emotional when he came to live with us. He would take himself off and sit down, hug his knees and would not tell you what was wrong. He did not like to be hugged or comforted and seemed very distant. He had outbursts if he couldn't complete things, which led to him hitting himself. He was not sleeping well, coming in to us at least two or three times in the night for reassurance on what we were doing the following day even though this had been discussed before bed. Since we started using the movements assigned to us each session he is like a different child. He no longer has outbursts or hits himself. He is very loveable, loves cuddles and does not feel the need to be reassured of what we are doing several times through the night anymore. He seems a lot happier within himself. He is like a different child who we have

watched grow hugely and are extremely proud of his progress.

Reflex assessments

While the change in TOMs score gives an overview of the change in the overall level of RPR it was interesting to note that the reflex that previous researchers [15] linked with emotional regulation challenges was present in all of the participants in this study. The moro reflex was present in all those assessed. Post-intervention, the level of retention of the moro reflex had reduced in 11 of the 13 participants (the assessment color had changed from red to orange or from orange to green).

TOMs results

Table 6 shows pre and post intervention TOMs assessment scores for the two impairments (RPR and challenging behaviors) as well as the other TOMs domains; independent activity, social participation and wellbeing. The age of the participants is also listed.

The word descriptors for the TOMs scores provide further clarity to an individual's associated outcomes. 0 = Profound; 1 = Severe; 2 = Severe/moderate; 3 = Moderate; 4 = Mild; and 5 = Within typical limits. This allows statements such as child J's challenging behaviors went from severe/moderate to mild in three months, Child I's wellbeing challenges went from severe to moderate in three months and child F's level of RPR went from severe to moderate in five months to be made.

Table 7 shows the changes in TOMs scores over the study period as well as the number of post assessment follow up appointments. A change of 0.5 is considered clinically significant. Clinically significant is a noticeable change in daily life [28]. This is supported by the survey feedback. Table 8 shows the average changes in TOMs scores over the pilot study.

Figure 1, figure 2, figure 3, figure 4, and figure 5 show how many study participants experienced a clinically significant change (0.5) or more in each domain. From this the percentage has been calculated. For RPR it was 100%, for challenging behaviors it was 69%, for independent activity it was 8%, for social participation it was 69% and for wellbeing it was 92%. Each study participant experienced a clinically significant change in at least one domain. This means that all participants benefited from clinically significant associated benefits from this intervention.

Analysis of the TOMs data shows statistically significant changes in four of the five TOMs domains: RPR ($p < 0.001$), challenging behaviors ($p \approx 0.002$), social participation ($p < 0.001$) and wellbeing ($p < 0.001$). The change in independent activities was not statistically significant ($p \approx 0.2$). Table 9 gives the mean, standard deviation, T statistic and estimated p values for all the TOMs domains.

These outcomes advance the current system in several regards. Firstly, the association of a reflex integration programme with an improvement in emotional regulation and then a reduction in challenging behaviors. Secondly, the use of a reflex integration programme as a novel intervention for CLA. Thirdly, the use of the TOMs adapted scale for RPR to measure associated benefits of a reflex integration programme for children in a wider range of areas of function (impairments, independent activities, social participation, and wellbeing).

The implications of these findings are that an RMT reflex integration programme could be considered as an effective intervention for CLA struggling to access mainstream education. It could be helpful for younger CLA in particular as research suggests that current interventions for CLA are more effective with adolescence [23]. Another implication is that

Table 6: Initial and last pre publishing TOMs assessment scores.

Child	Age of child	TOMS scores at initial assessment					TOMS scores at last assessment pre publishing				
		Impairment 1 (uninhibited/primitive reflexes)	Impairment 2 (challenging behavior)	Independent activity	Social participation	Well-being	Impairment 1 (uninhibited/primitive reflexes)	Impairment 2 (challenging behavior)	Independent activity	Social participation	Well-being
A	5	1.0	1.5	2.0	1.5	1.0	1.5	1.5	2.0	1.5	1.5
B	10	1.0	1.5	3.5	1.5	0.5	2.5	2.0	3.5	2.0	1.5
C	11	1.0	1.5	4.0	2.0	1.0	3.0	3.0	4.0	3.0	2.0
D	11	2.5	1.5	2.0	1.0	0.5	3.0	2.0	2.0	1.0	1.0
E	11	2.0	1.5	4.0	2.5	1.5	2.5	3.5	4.0	3.5	3.0
F	6	1.0	2.0	4.0	2.0	1.0	3.0	4.5	4.0	3.0	4.0
G	13	1.0	1.5	4.0	2.0	1.5	2.5	3.0	4.0	3.0	3.0
H	8	1.5	2.5	2.0	2.0	2.5	2.0	2.5	2.5	2.5	3.0
I	4	1.5	1.5	4.0	2.0	1.0	2.5	3.0	4.0	3.0	2.0
J	10	1.5	2.0	4.0	2.5	1.5	3.0	4.0	4.0	3.0	3.0
K	6	1.0	1.5	3.0	1.5	0.5	2.0	1.5	3.0	1.5	1.0
L	9	1.5	1.5	4.0	1.5	1.0	3.0	1.5	4.0	1.5	1.0
M	12	1.5	2.0	3.0	2.5	1.5	2.5	3.0	3.0	3.5	3.0
Mean Avg	9	1.4	1.7	3.3	1.9	1.2	2.5	2.7	3.4	2.5	2.2

Table 7: The change in TOMs score for all domains over the study period.

Child	Appointments post initial assessment	Changes measured				
		Impairment 1 (uninhibited/primitive reflexes)	Impairment 2 (challenging behavior)	Independent activity	Social participation	Wellbeing
A	4	0.5	0.0	0.0	0.0	0.5
B	3	1.5	0.5	0.0	0.5	1.0
C	5	2.0	1.5	0.0	1.0	1.0
D	5	0.5	0.5	0.0	0.0	0.5
E	2	0.5	2.0	0.0	1.0	1.5
F	5	2.0	2.5	0.0	1.0	3.0
G	3	1.5	1.5	0.0	1.0	1.5
H	2	0.5	0.0	0.5	0.5	0.5
I	3	1.0	1.5	0.0	1.0	1.0
J	3	1.5	2.0	0.0	0.5	1.5
K	3	1.0	0.0	0.0	0.0	0.5
L	3	1.5	0.0	0.0	0.0	0.0
M	3	1.0	1.0	0.0	1.0	1.5

Table 8: Mean, median, and modal TOMs score changes.

TOM domain	Mean TOM change	Median TOM change	Modal TOM change
Uninhibited/RPR	1.2	1.0	0.5 and 1.5
Challenging behavior	1.0	0.5	0.0
Independent activity	0.0	0.0	0.0
Social participation	0.6	0.5	1.0
Wellbeing	1.1	1.0	0.5 and 1.5

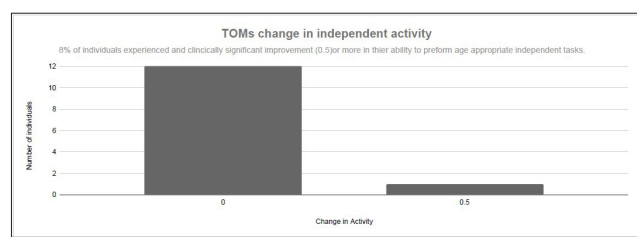


Figure 3: TOMs scores change in independent activities.

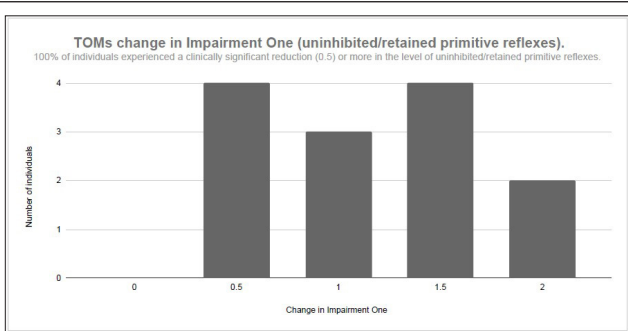


Figure 1: TOMs scores change in impairment one RPR.

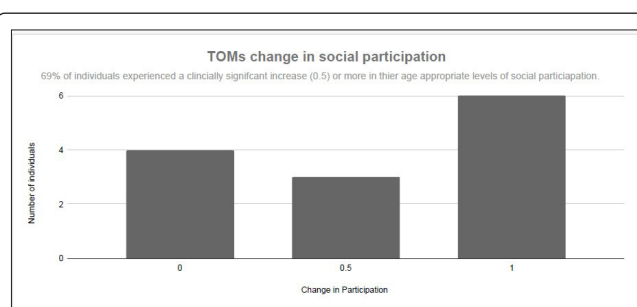


Figure 4: TOMs scores change in social participation.

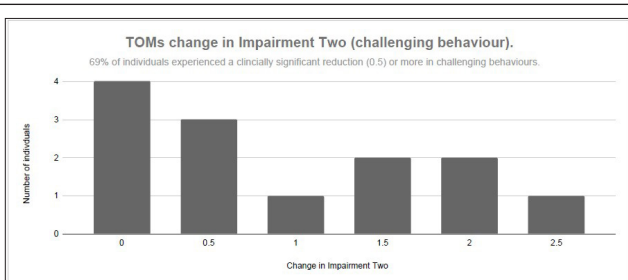


Figure 2: TOMs scores change in impairment two challenging behaviors.

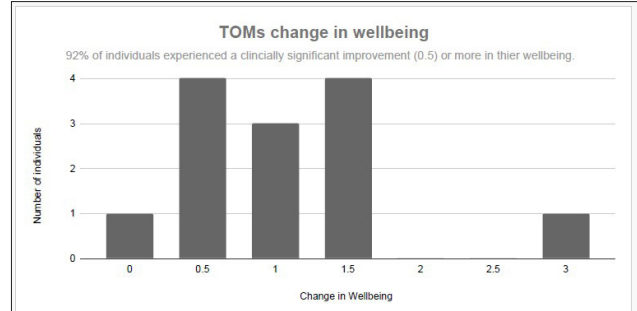


Figure 5: TOMs scores change in wellbeing.

use of the RPR adapted TOMs impairment scale could improve the understanding of the potential benefits of any reflex integration programme on any other impairments as well as

independent activity, social participation, and wellbeing.

Table 9: Mean, standard deviation, T statistic, and p values.

TOM domain	Mean	Standard deviation	T statistic	p value
RPR	1.15	0.55	74.75	< 0.001
Challenging behaviors	0.92	0.85	3.90	≈ 0.002
Independent activity	0.04	0.14	0.02	≈ 0.2
Social participation	0.58	0.45	4.68	< 0.001
Wellbeing	1.08	0.76	5.13	< 0.001

Limitations

One limitation of this study is the small number of participants. There is also the lack of control groups who did not undertake a reflex integration programme. Another limitation is the often-uncertain nature of the circumstances of CLA. Some had only recently been removed from the care of their parents while others had been placed with their foster carers for many years. This means that the changes in TOMs scores may have been impacted by wider life circumstances rather than the reflex integration programme. An additional limitation is that the participants did not undergo a psychological assessment prior to the study in order to ascertain if they have a behavioral disorder that may have caused their emotional regulation challenges.

Conclusion

This pilot study suggests that an RMT reflex integration programme is associated with a reduction in the level of RPR, a reduction in the level of challenging behaviors, an increase the level of social participation and an increase in wellbeing in fostered children. The level of independent activity was not impacted. There were 13 fostered children with a mean age of 9 years in this study.

Each study participant experienced a clinically significant change (a real genuine, palpable, noticeable effect on daily life) in at least one domain. For RPR this was 100%, for challenging behaviors 69%, for independent activity 8%, for social participation 69%, and for wellbeing 92%.

Statistical analysis of these results shows statistically significant changes in four of the five TOMs domains: RPR ($p < 0.001$), challenging behaviors ($p \approx 0.002$), social participation ($p < 0.001$) and wellbeing ($p < 0.001$). The change in independent activities was not statistically significant ($p \approx 0.2$) (Table 9).

The importance of finding effective interventions for this group has implications as they typically have poor short- and long-term outcomes [16-19]. The survey comments gave further insight into the benefits of RMT for this group. Comments such as 'Increase in ability to manage the demands of school. Increased sense of wellbeing and reduction of distress. Reduction in trauma responses being apparent in school setting.' from the class teacher highlighted how this intervention was sufficient for some participants to make their school placement viable.

Potential future directions could include repeating this study with a control group. It would also be beneficial to repeat this study with a group who have challenging behavior as an impairment but are not CLA, to see if the associated effect is the same. Is an RMT reflex integration programme helpful for all struggling with emotional regulation? Future studies could measure associated effects of an RMT reflex integration programme over longer periods of time with CLA and other groups. Is there an optimal amount of time to implement this intervention for? Future work could follow up the study participants and conduct TOMs assessments to ascertain if the associated benefits of this intervention remained over time?

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Conflict of Interest

None.

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