The Effects of Integration Therapy on Retained Primitive Reflexes

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Abstract

Researchers have found that retained primitive reflexes have a correlation with difficulties in sensory processing, attention span, visual perception skills and even motor skills. Studies have shown that there is a connection between integrating those retained primitive reflexes and improvement in a child's sensory processing, attention span, visual perception skills and motor skills. For this project, I focused on the effects of occupational therapy in integrating retained primitive reflexes to determine if it improves attention span, visual perception tasks, posture during handwriting, and performance of exercises (shooting star, tuck and extend, bridge, and prayer pose). I used data from 12 children who attended occupational therapy at a pediatric therapy clinic in the southeastern United States. I found that there was a significant correlation between how long the therapy was performed and fewer cues needed to prompt the child to improve or correct their attention span, visual perception tasks, posture during handwriting, and performance of exercises. The data suggests that there is a significant correlation between integrated retained primitive reflexes and attention span, visual perception skills, posture, and motor skills. Over a one-year period, there was a significant decrease in the number of cues needed to correct each child during therapy for their attention, posture, visual perception tasks, and the four exercises the child performed.

The Effects of Integration Therapy on Retained Primitive Reflexes

Every person is born with reflexes, instincts that your body automatically produces in response to certain stimuli. These instincts, or primitive reflexes, are present from birth until about one year of age, if a child develops typically. In order for the child to continue to develop typically, each primitive reflex must be replaced by a postural reflex as the brain matures (Taylor, Houghton, & Chapman, 2004). This process involves integrating the reflex into further areas of the Central Nervous System (CNS) that require more connection from the brain to the spine to process information (Villaneda, 2018). As the reflexes transition to being controlled by higher areas of the brain, like the frontal lobe, they integrate into controlled motor movements but never completely disappear (Melillo, 2016). Once the primitive reflexes are integrated, the child becomes more aware of his or her body and motor movements. Both primitive and postural reflexes modify different areas of the brain by opening neural pathways. These neural pathways are strengthened by repeating motor movements, which leads to integration (Grzywniak, 2017). However, if these reflexes are not replaced by the CNS and are retained past the typical period, it is considered abnormal (Andrich, Shihada, Vinci, Wrenhaven, & Goodman, 2018), and developmental issues with coordination, visual perception, attention, and sensory processing could be affected (Futagi, Toribe, & Suzuki, 2012). There are eight primitive reflexes that emerge from birth to one year: Moro Reflex, Tonic Labyrinthine Reflex (TLR), Asymmetrical Tonic Neck Reflex (ATNR), Symmetrical Tonic Neck Reflex (STNR), Plantar Reflex, Palmer Reflex, Rooting Reflex and Spinal Galant Reflex (Villaneda).

The Moro Reflex appears at birth and is the first to integrate, at typically 2 to 4 months old (Villaneda, 2018). The Moro Reflex is similar to the fight or flight response and is triggered by a threat or stress. The Moro Reflex is linked to the senses, so the response is easily generated because all the senses are involved in recognizing a threat. When presented with a threat, this reflex automatically causes the arms to jerk away from the body and freeze until the arms return to their resting body position (Taylor et al., 2004; Villaneda). To elicit this reflex in infants, any movement that rapidly moves the head relative to the spine can be performed (Blythe & Blythe, 2012). The Moro reflex requires stimulation of the vestibular and proprioceptive systems in order for there to be a strong response. The vestibular system senses motion of the body, spatial position, and is involved in balance. The proprioceptive system is aware of where the body is positioned in space. The vestibular system can be stimulated by movement in the semicircular canals of the ears, by moving the head. The semicircular canals are three fluid filled tubes in the inner ear that control balance. Movement of the neck can cause a stimulation for the proprioceptive system (Ince et al., 2019). Therefore, a common method performed to test the Moro reflex is holding the infant on its back and quickly dropping its head back while keeping the rest of the body stable. This stimulates both the vestibular system and the proprioceptive system causing the arms to jerk away from the body, eliciting the Moro reflex (Rousseau, Matton, Lecuyer & Lahaye, 2017). The Moro reflex can be initiated once the baby is born and usually is integrated by 6 months of age, but if it is elicited beyond 6 months of age, it is considered to be abnormal (Futagi et al., 2012).

The Moro reflex is often mistaken for the startle reflex, but they are different. These two are often confused because they both have similar reactions. The startle reflex causes the eyes to blink and the arms to immediately retract to the body in response to the stimulus (Rousseau et al., 2017). The Moro reflex causes a slower abduction of the arms, where the arms move away from the body rather than moving towards the body, like in the startle reflex. There is also no significant change in pO_2 and pCO_2 measurements during the Moro reflex like there is in the startle reflex, meaning that there is no sudden intake or outtake of breath when the Moro reflex takes place (Rousseau et al.). In the startle reflex, habituation will occur such that the response will diminish after repeated stimulation, which does not occur with the Moro reflex. However, Rousseau et al. did find that in their study of 13 newborns, all exhibited the Moro reflex after the startle reflex. This study supports the idea that the Moro reflex is not solely a reflex. Therefore, they suggested that the Moro reflex is intending to communicate to the mother. By throwing their arms back, the infants are trying to get their mothers to hold them to feel secure (Rousseau et al.). Fugati et al. (2012) also explained that one purpose of the Moro reflex could be linked to the action of a mother holding her young, so the Moro reflex is activated to protect the baby from falling when the baby is being held.

Because the Moro Reflex is one of the first to integrate, it appears that this reflex acts as a gateway to the other reflexes (Taylor et al., 2004). If the Moro Reflex does not integrate properly, then most likely the other reflexes will not be able to integrate properly either. Therefore, if retained Moro reflexes could be integrated, the other retained primitive reflexes could then be integrated. This developmental process suggests that the retained Moro reflex is the first reflex that needs to be targeted to integrate.

The presence of retained primitive reflexes is associated with visual skill deficits (Andrich et al., 2018). Children who have retained reflexes often have difficulty with hand-eye coordination, visual perception, visual memory, and balance. These can make children in school fall behind with handwriting and attention. Andrich et al. explain that integrating these primitive reflexes that have still been retained until school age could improve skills in academic performance and further opportunities in life. Konicarova and Bob (2012) state that persistent primitive reflexes are also linked to Attention Deficit Hyperactivity Disorder (ADHD) symptoms. Though this study did not test it, the authors suggest that integrating retained reflexes could improve ADHD symptoms, such as attention span, hyperactivity, and impulsiveness. In another study done by Konicarova and Bob (2013), they found that the cases of ADHD linked with retained primitive reflexes likely occur because of an opposition between the lower and higher areas of both the brain and the motor systems. This disconnection between the lower and higher levels can lead to discoordination, imbalance, and attention issues. Therefore, by connecting those two areas of the brain, one can integrate the primitive reflexes and improve those areas of difficulty that the child is facing.

Gieysztor, Sadowska, Choińska, & Paprocka-Borowicz (2018) indicate that posture problems and repeated behaviors could be caused by primitive reflexes that have not been integrated. Blythe & Blythe (2012) also explain that a retained Moro reflex can increase sensitivity due to the development of an exaggerated startle reflex as children grow older. Therefore, through therapy to help integrate retained primitive reflexes, participants can improve their posture and sensitivity.

Gieysztor, Choinska, and Paprocka-Borowicz (2018) performed a study on healthy preschoolers' retained primitive reflexes to show that most preschoolers who were included in the study had at least one retained primitive reflex. They found that although most preschoolers had retained reflexes, if the preschoolers went through reflex therapy, their brain could sequence through the developmental stages that were missed the first time. The authors concluded that the treatment should focus on integrating the reflex, not on fixing the symptoms like motor, attention, and sensory problems. Instead of focusing on fixing the symptoms that are caused by the retained primitive reflex, they could focus on fixing the root of the problem: integrating the retained reflexes. By integrating the reflex, the symptoms will diminish. This study supports the notion that therapy can help integrate retained reflexes.

One study was done by Grigg, Fox-Turnbull, & Culpan (2018) on RMT (Rhythmic Movement Training), which is a type of therapy meant to help with integrating reflexes by focusing on rhythmic motor movements. Grigg et al. found that because of this therapy, the participants had better handwriting and improved writing abilities, as well as improved reading skill. Another study that Grzywniak (2017) discusses was done at an elementary school and found that students who had reading or writing problems displayed retained primitive reflexes. Through an integration exercise program that was done both at school and at home, they found that the students made significant improvements in areas related to their education. This supports the claim that integrative therapy can help with handwriting and visual perception tasks and could highly benefit students who struggle with this in schools.

Although there are many studies done on retained primitive reflexes, there is not much research done on the effect that integration therapy has on improving the symptoms of retained primitive reflexes, so that is what this research is studying. Instead of using a certain treatment program, I worked with occupational therapists to see if occupational therapy improves the effects of retained primitive reflexes. Although many studies show a correlation between attention, visual perception, motor skills, and coordination difficulties with a presence of retained primitive reflexes in children, there is little research done on the actual effect of integration treatment on those difficulties. The purpose of this study was to look at the effect of longitudinal integration therapy on retained reflexes. The study looked at whether therapy significantly improved attention span, visual perception tasks, posture during handwriting, and performance of exercises (shooting star, tuck and extend, bridge, and prayer pose) that show the presence of retained Moro reflexes. This study was conducted over a 12-month period with 12 children who have retained Moro reflexes.

Method

Participants

The participants of this study were patients at a pediatric therapy clinic in the southeastern United States. Two occupational therapists recorded data from their patients who attended occupational therapy weekly whom they had already tested for retained primitive reflexes. The two therapists chose patients to be tested based on whether they were able to understand what was being asked and able to control their behavior to be tested. There were 12 children participating in the study who ranged in age from 5 to 13. The two therapists worked with their patients once a week to work on integrating the child's retained primitive reflexes.

Research Questions and Null Hypotheses

RQ1: Do the number of attention cues during therapy decrease significantly over time?

Null Hypothesis 1: The number of attention cues do not significantly change over time.

RQ2: Do the number of cues correcting posture during handwriting tasks decrease significantly over time?

Null Hypothesis 2: The number of cues correcting posture during handwriting tasks do not significantly change over time.

RQ3: Do the number of cues during visual perception tasks decrease significantly over time?

Null Hypothesis 3: The number of cues during visual perception tasks do not significantly change over time.

RQ4: Do the number of cues while performing exercises decrease significantly over time?

Null Hypothesis 4: The number of cues while performing exercises do not significantly change over time.

Data Analysis

For all four research questions, a Pearson Correlational Coefficient was used to calculate the strength and direction of the relationship and was measured for significance. SPSS Version 25 was used for the analysis. Significance levels under a .05 value were considered significant.

Materials and Procedure

This study was done with longitudinal data over a one-year period. The therapists tested each of their patients for retained primitive reflexes in October 2018. Each child's data varied between 10 to 12 months, though the majority of the participants' data was collected for 12 months. This was due to the differences in the progress of integrating their primitive reflexes. Some participants integrated their reflexes in less than a year, so their data was only collected for 10 or 11 months. There were 5 exercises used to test whether they had retained primitive reflexes. The first one is the duck walk where the child is instructed to walk in a line with their feet turned out. If they have a retained Moro reflex, then they raise their arms and turn their arms outward, or they are not able to turn their feet outward at all. The second test is the pigeon toe walk, where the child turns their feet inward and walks in a straight line. If the child raises their arms and turns them inward or cannot turn their feet in at all, then they have a retained Moro reflex. The third test is the startle test, where the child stands in front of the therapist and holds their arms lightly across their chest. They are instructed to close their eyes and fall backwards. If their arms fly outward, then they have the retained Moro reflex. The fourth test is the balance test that tests if the child's balance is underdeveloped by having the child balance on each foot with their arms out. The last test is the crossover test, where the child crosses one leg over the other and bends over to touch the floor. If they lose balance during this exercise, there is most likely a disconnection between the two sides of their brain (Villaneda, 2018). By performing these tests, the therapists could see which of their patients had retained the Moro reflex.

Almost all of the patients tested positive for retaining the Moro reflex. The therapists decided to focus on this reflex since it is the first one to integrate. To integrate the Moro reflex, the child has to perform certain exercises both at therapy and at home. These four exercises are the shooting star, the tuck and extend exercise, the bridge exercise, and the prayer pose exercise. The shooting star exercise involves the child lying flat on his or her back in an x position, then crossing and bringing their arms to their chest while they cross and bring their legs to their chest as well. They hold this position for five seconds and then release their arms and legs back into an x position for five seconds. They repeat this three to five times for each side. The tuck and extend is a similar exercise, where the child lies flat on his or her back with their legs straight out and their arms above their head, and they hold this for five seconds. The child then brings his or her knees to their chest and puts their arms around them for five seconds. They repeat this exercise 5 to 10 times. The bridge exercise involves the child lying on their back with their knees bent and their arms on the ground by their side. They lift their bottom in the air and hold it for about 30 seconds and repeat this 5 to 10 times. The prayer pose is similar to the bridge exercise, but they move their arms with their bottom. When their bottom is up in the air, their hands are together in a prayer position in front of their chest and as their bottom comes down, their arms release out to an x position (Villaneda, 2018). These exercises are supposed to help integrate the retained reflexes by connecting the different areas of the brain together and by repeating the specific motor movements. The patients were instructed to perform these exercises three to five times a week at home as well in order to improve their progress.

After testing the patients to see who they would implement the integrative therapy for, the therapists began to measure and document progress on each child's attention span, visual perception tasks, posture during handwriting, and performance on the previously mentioned exercises. They continued to record this data once a month, so about every four visits, until the fall of 2019. I used the monthly data points to analyze whether there was a significant impact of the interventions over a 12-month period.

Results

A Pearson Correlation Coefficient was computed to test the bivariate correlation among the variables of month and the outcome. There were four different outcomes tested.

Research Question 1

The results of the analysis showed a negative correlation between Month (*M* = 6.03*, SD* = 3.30) and the Number of Attention Cues Necessary During Therapy (*M* = 8.23, *SD* = 3.96) [*r(*128) = -.505, *p* <.001]. Because of this analysis, the null hypothesis for Research Question 1 is rejected. In general, the results suggest that the number of attention cues necessary decreased over time during therapy.

Correlations

			Month	Number of Cues Given
Pearson's r	Month	Correlation Coefficient	1.000	-.505**
		Sig. (1-tailed)		.000
		N	130	130
	Number of Cues Given	Correlation Coefficient	-.505**	1.000
		Sig. (1-tailed)	.000	
		N	130	130

* r^2 = .255
** Correlation is significant at the .001 level

Research Question 2

The results of the analysis showed a negative correlation between Month (*M* = 6.16*, SD* = 3.25) and the Number of Cues Correcting Posture Necessary During Handwriting Tasks (*M* = 2.69, *SD* = 1.46) [*r*(97) = .-.516, *p* <.001]. As a result of the analysis, the null hypothesis for Research Question 2 is rejected. The results show that the number of cues correcting posture necessary during handwriting tasks decreased over time.

Correlations

			Month	Number of Cues Given
Pearson's r	Month	Correlation Coefficient	1.000	-.516**
		Sig. (1-tailed)		.000
		N	99	99
	Number of Cues Given	Correlation Coefficient	-.516**	1.000
		Sig. (1-tailed)	.000	
		N	99	99

*r^2 = .266
** Correlation is significant at the .001 level

Research Question 3

The results of the analysis showed a negative correlation between Month (*M* = 5.78*, SD* = 3.23) and the Number of Cues Necessary During Visual Perception Tasks (*M* = 5.51, *SD* = 3.08) [*r*(77) = -.365, *p* <.01]. As a result of the analysis, the null hypothesis for Research Question 3 is rejected. Overall, the results imply that the number of cues necessary during visual perception tasks decreased over time during therapy.

Correlations

			Month	Number of Cues Given
Pearson's r	Month	Correlation Coefficient	1.000	-.365**
		Sig. (1-tailed)		.001
		N	79	79
	Number of Cues Given	Correlation Coefficient	-.365**	1.000
		Sig. (1-tailed)	.001	
		N	79	79

*r^2 = .133

** Correlation is significant at the .01 level

Research Question 4

The results of the analysis showed a negative correlation between Month (*M* = 6.00, *SD* = 3.29) and the Number of Cues Needed to Perform Exercises (*M* = 14.38, *SD* = 6.79) [$r(127) = -.429$, $p < .001$]. As a result of the analysis, the null hypothesis for Research Question 4 is rejected. In general, the results convey that the number of cues needed to perform exercises decreased over time.

Correlations

			Month	Number of Cues Given
Pearson's r	Month	Correlation Coefficient	1.000	-.429**
		Sig. (1-tailed)		.000
		N	129	129
	Number of Cues Given	Correlation Coefficient	-.429**	1.000
		Sig. (1-tailed)	.000	
		N	129	129

*$r^2 = .184$
** Correlation is significant at the .001 level

Discussion

The study found that using occupational therapy to integrate retained primitive reflexes does have a significant effect on the individual. Over the twelve-month period, the integration therapy was performed by the occupational therapists once a week. Over time, there was a significant decrease in the number of cues needed to correct each child during therapy for their attention, posture, visual perception tasks, and the four exercises the child performed. The results supported my hypotheses and found that through integration therapy, the number of attention cues, posture correcting cues, visual perception cues, and performance of exercises cues decreased over a twelve-month period. These results are similar to other research results. There is a correlation that has been found between integrating retained primitive reflexes and improving attention span, visual perception, and motor skills.

There were limitations and confounding variables to this study, however. Since we only had 12 participants in the study, the results may not have much external validity. If we had more participants, we would be able to generalize the results further. Also, each child is unique. Each child in the study had different struggles and difficulties than the other participants. Integration therapy might have been harder for some participants than others. The therapists instructed the children and parents to perform the four exercises three to five times a week at home. However, it was difficult to make sure that each child had done their homework. There were some children who reported that they had not done any exercises at home. Because they had not done their homework, their progress was much slower than individuals who had performed the exercises three to five times a week at home. Throughout the ten to twelve months, each child was also getting their usual occupational therapy along with the integration therapy. This could have affected how effective the integration therapy was. Because the therapists were also performing their usual occupational therapy, there was not always the same amount of time dedicated to integrating the retained reflexes each week. There was one month for a participant that the therapist did not get to perform any of the exercises during therapy because another assessment for their occupational therapy took priority. This month, the child and parent were instructed to continue to perform exercises at home and they checked on their progress the next month.

For the exercises that the participants performed, the therapists' goal was to incorporate breathing coordination into the exercises. This showed that the retained primitive reflex had been fully integrated. When the therapist gave corrective cues while the child was performing the exercises, the therapist first focused on having the child just master the motor skills of the exercise. Once the child had mastered the motor skills of the exercise, the therapist implemented coordinating breathing with the motor skills.

These results inform the psychological community of the effect of retained primitive reflexes in children. If a child has primitive reflexes that have not been integrated during development, then they likely will have difficulties with motor skills, attention, and visual perception. This research shows that there are different therapies that can target those retained reflexes and can improve the child's attention skill, posture, motor skills, and visual perception skills. Further research should be done on whether solely focusing on the integration therapy alone for three to five times a week could improve these skills in even a shorter time period than that found in this study. Rewarding the participants with an incentive of some kind for performing the exercises at home would encourage the participants to work on the exercises outside of the occupational therapy office. It would be interesting to see how quickly the participants would progress when they performed the integration exercises at home. Also, it would be interesting to know how integrating the Moro reflex specifically would affect the integration of other primitive reflexes. Larger scale studies need to be done to further understand the effects of integration therapy on retained primitive reflexes.

This research could change how we treat disorders such as ADHD, Autism, Sensory Processing Disorder, and other disorders in children. If we know that primitive reflexes could alter a child's development, then we could focus more on integrating those reflexes from the start and trying to improve their symptoms from the root of the problem.

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