"Sense the story"

The effectiveness of an adapted version of Multi-Sensory Storytelling on the responsiveness of children, adolescents and young adults with Multiple Disabilities at a Children's Home in South Africa

Natalie Willems (3499839)

19th of November 2014, Utrecht

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Utrecht University, Master Child and Youth Psychology

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First supervisor: Mw. Dr. Yolanda van Beek
Second supervisor: Mw. Marthe Stoffer
                      (Development manager at Sizanani Children's Home in South Africa)

Abstract

The goal of the present study is to examine the effectiveness of an adapted version of Multi-Sensory Storytelling (MSST) on the responsiveness of Multi Disabled children, adolescents and young adults in a Children's Home and adjacent day-care centres located in a rural part of South Africa. MSST is a structured method in which caregivers read stories to individuals with multiple disabilities to motivate these children to interact and explore their environment, using sensory stimuli. In total 56 participants were selected, who received 8 MSST sessions. The outcome measurement is the responsiveness to a similar but untrained story, thereby measuring a generalisation effect. A matched control group design as well as a within group comparison with a baseline without MSST were used to investigate effectiveness. Although all groups showed an increase in the number of responses over time, this could not be clearly linked to MSST training. The level of responsiveness reached in the previous therapy period a year ago, was maintained after 7 months of low frequency MSST. Possible reasons for the lack of a further effect of MSST training are discussed and recommendations for future research are given.

Samenvatting

De huidige studie evalueert de effectiviteit van een aangepaste versie van Multi-Sensory Storytelling (MSST) op de responsiviteit van meervoudig gehandicapte kinderen, adolescenten en jongvolwassenen die woonachtig zijn in een kindertehuis en dichtbijgelegen dagopvangcentra's in de landelijke delen van Zuid Afrika. MSST is een gestructureerde methode, waarbij verzorgers persoonlijke verhalen voorlezen aan meervoudig gehandicapte kinderen met als doel ze te motiveren om hun omgeving te ontdekken en hiermee te interacteren. Hiervoor worden zintuiglijke stimuli gebruikt. In totaal zijn er 56 participanten geselecteerd, welke 8 MSST sessies hebben gekregen. Als uitkomstmaat is er naar de responsiviteit op een soortgelijk, maar ongetraind verhaal gekeken, zodat een generalisatie effect gemeten kon worden. Het therapie effect is vergeleken met een vergelijkbare controlegroep, maar ook middels een herhaalde meting, waarbij de therapie periode vergeleken werd met een voorafgaande periode zonder therapie in dezelfde groep. Hoewel een toename in responsiviteit is gevonden, kon deze toename niet duidelijk worden toegeschreven aan de MSST training. Wel is de toename tijdens de therapieperiode van vorig jaar behouden tijdens de 7 maanden daarna, waarin MSST met lagere frequentie werd gegeven. Mogelijke redenen voor de onverwachte bevindingen worden bediscussieerd met daarbij aanbevelingen voor toekomstig onderzoek.

Social–emotional skills develop early in life and allow individuals to participate in a range of social environments at home and in the community. Children with multiple disabilities miss fundamental abilities that they need in order to explore their environment and spontaneously interact with other people (Case-Smith, 2013). As a consequence of these disabilities, social skills might not be acquired at the same rate or in the same manner as their typically-developing peers (Malone & Langone, 1999). Without any help from the environment these social problems increase with age, leaving children more delayed and different from their same age peers. This may lead to less social acceptance and participation with peers (Lifter, Mason, & Barton, 2011; Case-Smith, 2013). Especially for Multiple Disabled children in developing countries like South Africa, social isolation and stigmatisation are a big problem, creating bad future perspectives. Therefore, implementing a structured intervention in order to improve social skills is really important. As most care workers in South Africa are not highly educated, interventions need to be easy to perform. An easy to use structured intervention that intents to improve social skills is Multi-Sensory Storytelling (MSST). The goal of this study is to examine the effectiveness of MSST for Multiple Disabled individuals in both a Children's Home and adjacent Daycares, located in the rural parts of South Africa.

MSST is a structured method in which caregivers read personalised stories to children with Profound Multiple Disabilities (PMD) to motivate these children to interact and explore their environment (Pamis, 2002; Multiplus, 2008). A story consists of 6 to 8 pages and every page includes 1 or 2 short sentences. Each page is supported by an object of reference, stimulating the different senses, to draw the child's attention, invite exploration and to support meaning making. The goal of MSST is to stimulate social interaction with the environment in order to develop social skills, using sensory experiences (Pamis, 2002; Multiplus, 2008; Penne, ten Brug, Munde, van der Putten, Vlaskamp, & Maes, 2012). As such, storytelling creates a place in which close interactions can be experienced and knowledge can be transferred (Multiplus, 2008; Young, Fenwick, Lambe, & Hogg, 2011; Young & Lambe, 2011).

Individuals with PMD suffer from both cognitive and motor disabilities, often accompanied by social and language disabilities (Maes, Lambrechts, Hostyn, & Petry, 2007; Petry & Maes, 2007; Jonckheere, 2008; Smedt, 2009; Ten Brug, Van der Putten, Penne, Maes, & Vlaskamp, 2012). As a result, they have a low mental age, up to 2 years, corresponding with the sensorimotor stage of Piaget's Theory of Cognitive Development (Piaget, 1951, 1952; Lancioni, Singh, O'Reilly, Oliva, Campodonico, & Groeneweg, 2003;

Petry & Maes, 2007; Berk, 2008, p. 224-235). Their disabilities and mental age are taken into account in MSST with respect to the *structure, objects of reference, multi-sensory stimuli, topic*, *length* and *language* used (Nispel & Vermeer, 2010; Pamis, 2002). All stories are told in the same order, using the same words, creating a strong repetitive component. This *fixed structure* makes the story more understandable and evokes a sense of having control over the environment. This benefits the relation between the caregiver and the child and raises the degree of involvement (Pamis, 2002; Brodin, 2005; Monaghan & Rowson, 2008; Smedt, 2009; Ten Brug et al., 2012; Penne et al., 2012). Piaget emphasises that within the sensorimotor stage, repetition of an activity leads to development (Piaget, 1951, 1952; Brodin, 2005). This is supported by research that found that rehearsal is associated with positive social outcomes in social skills interventions (Vaughn, Kim, Sloan, Hughes, Elbaum, & Sridhar, 2003). A fixed element within MSST are the *objects of reference*, used to attract the child's attention and invite the child to explore (Pamis, 2002; Arthur, 2004; Multiplus, 2008). These objects make the interaction during MSST more suitable for individuals with language disabilities (Arthur, 2004). Moreover, the objects of reference are not limited to objects only but include visual, auditory, olfactory, tactile, and gustatory experiences. Using *multi-sensory stimuli* is an attempt to enhance selective attention and awareness in order to elicit meaningful, behavioural responses (Pamis, 2002; Multiplus, 2008). It seems that without stimulation and an awakening of the senses, children with PMD find it almost impossible to make sense of their experiences (Longhorn, 1988; Hotz, Castelblanco, Lara, Weiss, Duncan, & Kuluz, 2006). Furthermore, multi-sensory training engages individuals with different learning styles and disabilities, because the information enters through different channels at the same time, which contributes to the apprehension of the story (Hogg, Cavet, Lambe, & Smeddle, 2001; Shams & Seitz, 2008; Farrell, 2012). Moreover, the story must be related to *daily life activities* and/or reflect aspects of the individual's personality or interests. One of the goals of MSST is to make the Multi Disabled children familiar with certain situations in their daily life to improve coping with sensitive topics (Pamis, 2002; Multiplus, 2008; Young et al., 2011). It is found that young children learn more effectively and efficiently when instructions are contextually relevant, developmentally appropriate, and instructions capitalises on the child's focus and interest (Sandall, Hemmeter, Smith, & McLean, 2005). Because of the short attention and concentration span, the stories must be *short* (Pamis, 2002; Multiplus, 2008). Lastly, the *language* is adapted to the cognitive abilities and the mental age of the child. Using short sentences, formulated in the present time, and using the same words more frequently might contribute to the apprehension of the story (Pamis, 2002; Penne et al.,

2012; Ten Brug et al., 2012). Moreover, providing child-friendly instructions promote social skill learning and has generated large positive outcomes (Vaughn et al., 2003).

As people with PMD suffer from different disabilities, they need others to compensate for their boundaries in order to develop social skills. Training caregivers seems to be an important key to success of MSST for children with PMD (Penne et al., 2012). Therefore, caregivers are given specific guidelines to optimise the chance of learning for individuals with PMD. First of all, caregivers must provide support and help individuals with PMD to perform tasks which they could not complete without any help, creating '*the zone of proximal development*' (Vygotsky, 1978; Goswami, 2008). During MSST, it is also important that the caregiver reminds the child to use earlier learned social skills, without helping the child too much. This scaffolding generates large effects and positive social outcomes in social interventions (Vaughn et al., 2003). It is very important that the caregivers reinforce the children immediately and consequently after a desired response, because the main goal of caregivers during MSST is to evoke meaningful, social responses to the stimuli offered. *Positive reinforcement* encourages the children to show such responses more often, which may facilitate the development of social skills (Gazzaniga et al., 2009). Caregivers also have an example function, because children in the sensorimotor stage learn through *observation* and *imitation* and learn by watching as much as by doing (Jonckheere, 2008; Gazzaniga, Heatherton, & Halpern, 2009). Furthermore, people with multiple disabilities communicate through small and hard to notice behavioural signals. It is important that caregivers are sensitive to these subtle behavioural signals (Petry, Maes, & Vlaskamp, 2005; Van der Putten, Vlaskamp, Reynders, & Nakken, 2005). *Intuitive parenting* is the term for being sensitive to the child's behavioural signals, adjusting to their developmental level by simplifying and exaggerating emotional messages in face and language (Papoušek, & Papoušek, 1995). Within motherese, an element of intuitive parenting, adults talk to children with a greater degree of prosodic variation, a higher pitch, a slower tempo, changes in rhythm, and exaggerating intonation. This sustains the child's attention to the story and highlights the important parts of the speech stream (Papoušek & Papoušek, 1995; Gogate, Bahrick, & Watson, 2000; Goswami, 2008; Shaffer, 2008). Due to the discrepancy between the calendar age and the lower mental age of individuals with PMD, it can be challenging to adjust to their level and manner of speaking (Penne et al., 2012; Vallotton, 2012).

Since MSST is a relatively new method, only very limited research has been done to examine the effectiveness. Promoting a More Inclusive Society (PAMIS), the developer of the MSST training, examined the effectiveness of MSST on children and young adults with PMD

(Pamis, 2002; not published, only available from Pamis site). They videotaped several sessions of the same story and scored these sessions by behavioural observations. They found more frequent and different behavioural responses from the initial reading to the eighth reading. Also the presentation of the stimuli provoked increased attention to both the stimuli and the storyteller across readings (Pamis, 2002). Jonckheere (2008; not published, only available from Pamis site) used questionnaires with rating scales to measure the effect of MSST on well-being and involvement. She found an increase in well-being and involvement during the MSST session, but this was temporary as this increment did not improve over 10 MSST sessions (Jonckheere, 2008). Lastly, the only published research (Young et al., 2011), examined the patterns of social and story-oriented interaction during storytelling, using semi-structured interviews and behavioural observations. Both instruments investigated the engagement with story and the social engagement as the outcome of MSST. The behavioural observations during the sessions showed positive changes in the engagement with the story, while the semi-structured interviews with parents and professionals indicated that most children could better cope with the sensitive topics (Young et al., 2011).

These findings seem promising, but it concerns only one published research and there are several methodological limitations that limit the proof of effectiveness. All studies used small samples and control groups were lacking (Pamis, 2002; Jonckheere, 2008; Young et al., 2011). Moreover, often subjective measurements were used to examine behaviour, like interviews or rating scales (Jonckheere, 2008; Young et al., 2011). Also, the observation scales did not contain all possible responses children can emit, for example 'positive facial expression' was not included (Young et al., 2011). These limitations make more research necessary in order to examine the effects of MSST.

In order to start empirical research to examine the effects of MSST on the responsiveness in the participants of the present study, a new instrument was developed. Due to the language barrier in the Children's Home, it was impossible to interview the caregivers or give them a questionnaire. Moreover, questionnaires are subjective and often result in social desirable answers. Therefore, behavioural observations of videotaped MSST sessions seemed the best option. Responsiveness was chosen to be the outcome measure of MSST, because it is the first step in exploration and it is necessary to have a reciprocal interaction, which enables to make use of the knowledge, support and stimulation of the other. All possible responses to social and sensory stimuli, that are usually seen in the sensorimotor stage, were taken into account to form the measure of responsiveness as used in the present study. Furthermore, also some more advanced responses, like 'functional manipulation of the

object', were included because the present study used an adapted version of MSST, including both participants with a low and moderate level of functioning.

Preliminary research was done in previous years by other graduate students (Halfens, 2011; Van Eck, Halfens, Van Beek, Magyarszeky, & Stoffer, 2014), who created the first version of this 'Responsiveness List (RL)'. Results showed significant effects on both social- and motor responsiveness after 10 MSST sessions, when compared to a control group. Van Eck et al. (2014) subsequently again found a positive effect using a pretest-postest design. Furthermore, they found that the responsiveness also increased in response to an untrained story, suggesting a generalisation effect (Van Eck et al., 2014).

Although these results seem promising, there were some methodological problems that needed to be taken into account for the present research. First of all, the reliability of the RL was not optimal (Van Eck et al., 2014), so the instrument was improved. Second, a larger matched control group design was used, which enlarged the power. Lastly, Van Eck et al. (2014) used untrained stories to test a generalisation effect during their research period. Because the participants were familiar with these stories, as they received them in the period prior to the research, this was not the best test for a generalisation effect. Therefore, the present research created new stories to measure a true generalisation effect by only scoring *untrained* and *unknown* stories to measure the effect of MSST on responsiveness. The present study tries to test a generalisation effect as this represents best whether the participants have learned new skills.

The Children's Home in South Africa has a fixed yearly intervention pattern. Every year research is done between February and June, with a high frequency of MSST (i.e., 2 or 3 sessions a week), combined with a lot of supervision. The rest of the year the participants receive MSST in a lower frequency, with less supervision. First of all, the present research examined the effects of MSST on the responsiveness after the re-intensification of MSST this year. Because matching was possible in the Home, a between matched control design was used. As previous years showed positive findings (Van Eck et al., 2014), it is expected that the level of responsiveness will improve more for the intervention group than for the control group. However, because matching of the participants is difficult in such a heterogeneous group, the group that was a control group in the first period, and received MSST in the second period, was used to test a repeated within control group effect. It is expected that these participants stay stable during the first period and improve their level of responsiveness during the second period when receiving MSST. New this year, was that MSST was also performed in the participants in the Daycares. The sub-research question is: Is there a

difference in effect of MSST on responsiveness between the Home and the Daycares? Because a control group was not possible in the Daycares, this is examined using a pretest-posttest design. Since the residents of the Home already receive MSST since the implementation in 2009 (Nispel & Vermeer, 2010), it is possible that the existing stories became too familiar. To prevent them from boredom and to create an optimal baseline for comparisons with the participants from the Daycares, new trainings stories were used for the Home as well as the Daycares. Creating new stories that are developmentally new for children with delays, might facilitate the active engagement in learning (Bloom & Tinker, 2000). As MSST is a newer intervention for the participants of the Daycares, and these participants are younger, a larger improvement in responsiveness is expected for them when compared to the Home participants.

The second research question examined both a short and long term maintenance effect of MSST on the level of responsiveness after a period with a lower frequency of MSST. The short term maintenance effect is examined by testing whether improvements in responsiveness during an intense period of MSST still exist after 6 weeks without MSST. The group in the Home that received MSST during the first period and subsequently had 6 weeks without MSST, was used for this purpose using a repeated within group design. The limited research on generalisation effects found that individuals with disabilities find it difficult to maintain their new skills (Frey & Kaiser, 2011; Case-Smith, 2013). As Halfens (2011) found a maintenance of the responsiveness level after a period of 6 weeks without MSST, largely using the same participants as in the present research, it is expected that the learned skills are again maintained. New in the present research is the examination of a long term maintenance effect of the learned skills. The long term maintenance effect is examined by comparing the level of responsiveness at the posttest in 2013 (Van Eck, 2013) with the level of responsiveness at this year's first measurements wave. It is expected that the level of responsiveness will maintain or slightly improve during this period, as the participants in between research periods received MSST in a lower frequency.

In summary, the present research examines the effectiveness of MSST using several analyses. Responses to untrained and unfamiliar stories are observed as outcome measure, thereby testing a generalisation effect. Moreover, both short and long term maintenance effects of the learned skills are tested. It is expected that MSST improves the responsiveness of the residents in both Children's Home and the Daycares in South Africa, and that these gains in responsiveness are maintained.

Methods

Participants

In the current study 56 children, adolescents and young adults (26 girls, 30 boys) of a Children's Home in South Africa were selected to participate. This Children's Home consists of three different divisions (Nispel & Vermeer, 2010). The first division is the Home, where residents live and receive 24-hour care. The second division is the Group Home that offers a guided living for (higher functioning) girls. All girls living at the Group Home originally came from the Home. For this study both the residents of the Home ($N = 35$) and Group Home, ($N = 5$) were taken together in a group called 'Home' ($N = 40$). The third division consists of 3 Daycares located at 3 different townships. These Daycares function as a day care from Monday until Friday for residents with multiple disabilities, living in the surrounding townships. Sixteen residents from these Daycares were selected to participate in this study.

MSST was originally developed for children with PMD with a low level of functioning and a mental age up to 2 years, corresponding with the sensorimotor stage of Piaget's Theory of Cognitive Development (Piaget, 1951, 1952; Berk, 2008, p. 224-235; Jonckheere, 2008; Multiplus, 2008). To reach a slightly broader target group, and take full advantage of the possibilities within MSST, the original MSST was adjusted to the needs and abilities of the residents of the Children's Home (Pamis, 2002; Nispel & Vermeer, 2010). Besides low functioning participants, also participants with a moderate level of functioning, with an estimated mental age between 2 and 3 years, were selected to participate to see if these participants could also benefit from MSST. All participants were selected by the development manager of the Children's Home, based on her professional judgement and earlier research findings concerning the level of responsiveness of the participants (Halfens, 2011; Van Eck et al., 2014).

The mean age of the participants from the Home was 22.13 ($SD = 7.38$) and for the Daycares the mean age was 6.13 ($SD = 2.71$). The participants of the Daycares were much younger because the Daycares only opened in 2012 and most of the participants of the Home already live there for the greater part of their lives.

As the Children's Home is located in a Third World country (South Africa), without a well organised care system, most participants were not officially diagnosed. The population will be described to the best of our knowledge. All participants had intellectual difficulties ranging from profound mental disabilities to mild mental disabilities, development delays, or learning disabilities. Besides these intellectual difficulties all participants, except one, had

motor problems, with most of them having a form of Cerebral Palsy (i.e., quadriplegia, hemiplegia or diplegia). The other participant suffered from Down Syndrome. Only 5 participants were able to speak. For 7 participants, these intellectual, motor and language problems were combined with neurological disabilities (i.e., Epilepsy, Hyperactivity or Hydrocephalus). Three participants suffered from other disorders (Autism and Charge Syndrome) and 5 participants suffered from visual and hearing impairments. Residents with serious health problems or residents who experienced discomfort when transferring to the therapy room, were excluded. The participants were individually matched to another participant in order to create a control group. These matches were based on the similarity in handicaps and on comparable intellectual and motor abilities by the development manager of the Children's Home in South Africa.

Multi-Sensory Storytelling Intervention

Multi-Sensory Storytelling (MSST) originates from Park's 'multisensory interactive drama' (Park, 1998) and Chris Fuller's 'Bag books' (Fuller, 1999) and was further developed by Pamis (2002). MSST is a structured method in which caregivers read personalised stories to children with Profound Multiple Disabilities (PMD) to motivate these children to interact and explore their environment (Pamis, 2002; Penne et al., 2012). These stories are related to daily life activities and/or reflect aspects of the individual's personality or interests. Each page of the story is supported by an object of reference stimulating the different senses to promote a more effective way of learning, because the information enters through different channels (Shams & Seitz, 2008; Penne et al., 2012).

The way MSST is executed at the Children's Home in South Africa was developed and implemented by Nispel and Vermeer in May 2009 (Nispel & Vermeer, 2010) and is performed by the staff, also called the 'childcare workers'. To prevent high costs, all stories are about general topics that could be used by more participants during research periods, instead of using individualised and personalised stories. Since MSST is implemented, the same stories circulated (Nispel & Vermeer, 2010). The participants knew these stories very well, which made it difficult to examine further growth. Is seems that children pay more attention to activities that are developmentally new than to those that are relatively well known (Bloom & Tinker, 2000). Therefore, new stories were created for the present research to optimise the chance of learning new skills. Another reason for using new stories is to enable a good comparison between the Daycares, who never received MSST, and the Home, by offering stories that were new to both groups.

For the present study, 9 different stories were used (see Appendix 1 for an example of a story). All 9 stories were put in red boxes to improve the recognisability for the participants and consisted of 6 to 8 A3-cardboard pages with only 1 or 2 sentences. The stories took between 6 and 10 minutes. It was important to guarantee the continuity of the MSST sessions, because this contributed to the recognisability of the story and could raise the degree of involvement (Pamis, 2002; Penne et al., 2012; Ten Brug et al., 2012). To this end, a checklist was designed (See Table 1).

Table 1.
Checklist with General Guidelines for the Multi-Sensory Storytelling Session

	Before the MSST session
✓	Get the red box
✓	Go to a quiet and familiar room for the participant
✓	Take all the pages and objects out of the red box
✓	Check the presence of all pages and objects (check low batteries; juice in cup)
✓	Place the pages and objects in the right order on a table within reach
✓	Get the participant and position the participant in a comfortable way that makes eye contact possible
	During the MSST session
✓	Read the story to one participant at the time
✓	Tell the story in the language the child speaks best (Zulu or English)
✓	Show the red box and encourage the participant to touch it
✓	Read the sentences on the pages out loud, without changing the words
✓	Show all pages and objects in the right order
✓	Present the objects within reach, earshot and eyesight
✓	Give the participant enough time to explore the objects
✓	Sing the 'end song'
	Other general guidelines
✓	Encourage the participant to respond to the stimuli offered
✓	Reward the participant after a desired response
✓	Tell the story in a expressive manner

Due to the diversity in functioning of the participants, the 9 stories were divided into two levels (See Table 2). The 'level 1' stories were for the profoundly handicapped participants, whom fully depended on the childcare workers in order to experience the story and the sensory stimuli ($N = 48$). For this group, MSST was originally developed. The 'level 2' stories required actions of the participants to experience the sensory stimulation of the objects of reference belonging to the story. All participants that received the level 2 stories went to a special needs school and were at best pre-school skilled ($N = 8$). All analyses presented in the result sections were also conducted controlling for level. Level did not seem

to influence outcomes, so only findings for the complete group were reported. Because only 8 participants were selected for level 2, no definite conclusions can be drawn from these analyses. See Appendix 7A for these analyses.

Table 2.
Titles of the Stories Used in the Present Study, Separated by Level

Level 1 stories	Level 2 stories
Making music	Going to a concert
Taking a bath	Going to school
Massage	Church
Nature walk	Cinema
To the beach	

Procedure

The Children's Home in South Africa has a fixed yearly intervention pattern. Every year research is done between February and June. During this research period the frequency of MSST is intense (i.e., 2 sessions a week), combined with a lot of supervision. This intense research period is followed by a vacation of a couple of weeks without any MSST and then a 4 month period until December with a low frequency of MSST (i.e., 1 session in 14 days) and less supervision. Further, in December and January the residents do not receive MSST as a consequence of the summer vacation. After the summer vacation the research period starts again with a high frequency of MSST.

Because of the lower frequency of MSST prior to the research period, the implementation of new stories for the present research, and in order to make sure MSST was given as intended, the childcare workers received a refreshment workshop about the MSST guidelines before the start of the present research. During this workshop, the new stories and corresponding objects of reference were shown and also the general guidelines corresponding with Table 1 were again stressed. All information was supported by a PowerPoint presentation (See Appendix 2).

Research was done between February and June 2013. All participants in this study were matched to one childcare worker to ensure the continuity of the storytelling. This matching was also important to establish a good and trusting relationship and to enhance the recognisability of the childcare worker in detecting and understanding the subtle signals these participants show when communicating (Petry et al, 2005). These matches were made by the development manager of the Children's Home in South Africa, based on her professional judgement.

The MSST sessions took place between 2.00 pm and 3.30 pm from Monday until Friday. The participants in this study received 2 sessions a week. Cancelled sessions due to illness, absence of the childcare worker, or other reasons were caught up later. As a result, participants sometimes received 3 MSST sessions a week. MSST sessions took about 5 to 15 minutes. The MSST sessions took place in the units of the participants as this was a familiar surrounding where the participants felt comfortable. The positioning (i.e., lying of sitting) depended on the abilities and the deformations of the bodies of the participants (Pamis, 2002; Young et al., 2011).

Instruments

Responsiveness was scored using videotapes of the therapy sessions. The distance between the camera and participants was approximately 2 meters. For those participants that only showed very subtle reactions (e.g., small eye movements and facial expressions) the camera was placed at a distance of approximately 1 meter.

The 'Responsiveness List (RL)' was used to observe the level of responsiveness. The RL was designed in 2011 by Halfens (2011) and originally consisted of 13 items (see Appendix 3). For the current study the RL was improved and consisted of 11 items (See Table 3). This reduce in items was a consequence of some infrequent items (wave, positive nod/shake no, clap hands, pointing) that were taken together and labelled as 'Symbolic Gestures (SG)'. Furthermore, the item '(Attempt to) Sing, repeat or say words (SRSW)' was included to measure vocal responses. The item 'Positive Facial Expression (PFE)' was scored by means of duration instead of frequencies. For a detailed scorings form and a more extensive explanation of the items used of the current RL, see Appendix 4 and 5.

Table 3.
All the Items of the Responsiveness List Used for The Present Research Period

Items on the Responsiveness List
1. Positive facial expression (PFE)
2. Happy vocalisations (HV); Laughing, happy sounds
3. Looking at the page (LP)
4. Looking at the object (LO)
5. Looking at the childcare worker (LCW)
6. Symbolic Gestures (SG); Waving, positive nod/shake, clap hands, pointing
7. Reaching for the object of page (ROP); Attempt
8. Short touching (ST); Stroking, hitting, touching less than 2 seconds without gasping
9. Manipulation (M); Holding object at least 2 seconds
10. Functional manipulation (FM); Using object in functional manner (i.e., functional play)
11. (Attempt to) Sing, repeat or say words (SRSW); Attempt, not necessary pronounced correctly

The scoring started from the moment the page was shown to the participant until the page was put away. All items, except for PFE, were scored using the frequency of the occurrence of the response at each page. The total frequency score on an item was divided by the total time in minutes the page was used, so that the outcome measure indicated the frequency of responses per minute. The item PFE was scored by a Likert-Scale measuring the percentage of time that the participant showed a positive facial expression per page (0% = score 0, 1-10% = score 1, 10-40% = score 2, 40-60% = score 3, >60% = score 4). Adding the Likert-scores per page and dividing this score by the total number of pages, showed the same variation range as the other items that used the frequency of responses per minute. By adding all 11 scores the total RL score was obtained. Cronbach's Alpha of the total RL was between .61 and .64 for all three waves used for this study. The Cronbach's Alpha did not improve when deleting items and is considered acceptable for this sample size and target group as these participants show great diversion in the type of possible reactions. Because the item PFE was scored differently, all analyses were also conducted without the item PFE as well as separately for the item PFE. These analyses did not result in different findings so only the findings for the complete scale will be reported. See Appendix 7B and 7C for more details concerning these analyses.

To test the inter-observer reliability of the RL, ten randomly selected therapy sessions of participants from last year's research were selected. The items that remained the same this year were scored as in last year's research (Van Eck, 2013). The inter-observer reliability, was $r = .723$, $p < .001$. The inter-observer reliability for the changed items, PFE and SRSW, were tested with another researcher at the Children's Home. For PFE it was $r = .997$, $p < .001$ and for item SRSW it was $r = .999$, $p < .001$.

Apart from the level of responses, we also examined whether the participants learned new ways to respond to the stimuli presented. To this end, the number of *different* reactions was calculated ranging from 0 to 11.

Design

Eight sessions of MSST per participant were performed by the childcare workers. Figure 1 shows the designs that were used for this study. The sample sizes for the different analyses differ because participants dropped out as a result of illness, vacation or death. Responsivity was measured by scoring the level of responsiveness with an unfamiliar and untrained story instead of scoring the trained story (i.e., generalisation effect).

Figure 1. *An Overview of the Designs Used for This Study Separated by the Home Groups and the Daycares group*

| **Home group 1** | *Wave 1* | | *Wave 2* | | *Wave 3* |
| *(MSST group)* | *(N = 18)* | 8 MSST sessions | *(N = 17)* | | *(N = 17)* |

| **Home group 2** | *Wave 1* | | *Wave 2* | | *Wave 3* |
| *(Control group)* | *(N = 17)* | | *(N = 16)* | 8 MSST sessions | *(N = 14)* |

| **Daycares** | *Wave 1* | | *Wave 2* |
| | *(N = 16)* | 8 MSST sessions | *(N = 15)* |
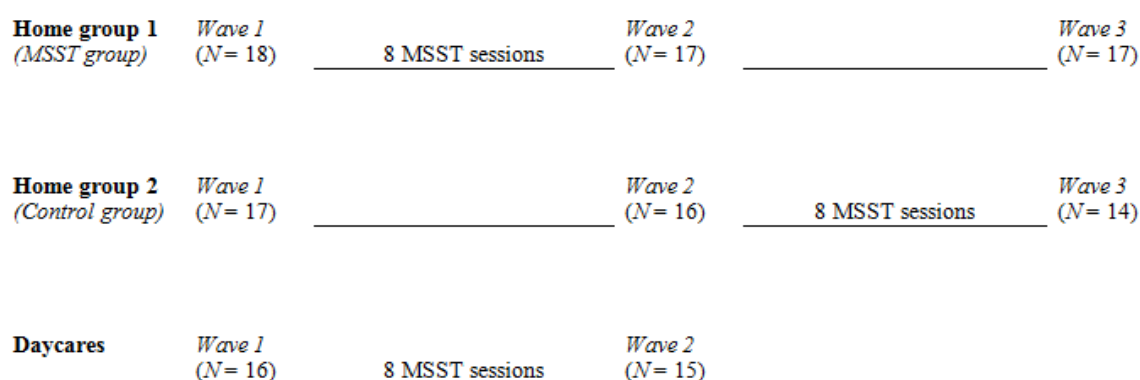
Note: At each wave responsivity was measured, using an unfamiliar story.

 To examine the effects of MSST on responsiveness, three different analyses were used. The first analysis was a between group comparison of MSST in the Home Group, using a pretest-posttest matched control group design. After the individual matching procedure described earlier, participants were randomly selected for the MSST or control group. The second analysis calculated a within group comparison of MSST in the Home group, using a within control group design for the Home Group that received MSST in the second period. The growth in responsiveness in the second period was compared to the changes in responsiveness in a similar 6 week baseline period without MSST. Lastly, we examined whether the effect of MSST differed between the Home and the Daycares, using a pretest-posttest design comparing the first two waves of the Day-care participants with the first two waves of the Home group that received MSST during the first period.

 To examine the maintenance effect of the learned skills, two analyses were done. The first measured the short term maintenance effect of MSST using a within group control design for the Home group that received MSST during the first period, but not in the second. The second analysis studied the long term maintenance effect of MSST after 7 months of lower frequency of MSST, by comparing the responsiveness of 32 participants from Van Eck's posttest (May 2013) and this year's first measurement.

Data analyses

 Normality checks of the RL indicated a rightly skewed distribution. For all the conducted analyses using both operationalisations of responsiveness (level of responsiveness and number of *different* reactions), square root transformations were performed to normalise

the distribution. Tables will contain means before the square root transformation. Because of the small sample size, also trends with a *p* between .05 and .01 were reported.

Results

Effect of MSST on Responsiveness

The effect of MSST on responsiveness was analysed by means of between group designs as well as a within group design.

Home.

Home versus control. To examine the effect of MSST on responsiveness, a repeated measures ANOVA was conducted. The frequency scores on the RL at the pre- and posttest were used as the dependent variable and group, MSST- versus control, as the independent variable. As shown in Table 4, the level of responsiveness at the first measurement from both Home groups did not significantly differ, which represents a good match between both groups. For MSST to have a positive influence on the responsiveness of the participants, it is expected that the responsiveness of the MSST group increases significantly more than the responsiveness of the control group. Table 4 seems to show a slight increase in mean frequencies in both groups between the pretest and posttest. However, no significant differences between groups were found.

Table 4.
Mean Frequency of Responses per Minute, Mean Number of Different Reactions at the Pretest and Posttest, Separated by Group (MSST versus control)

	Means (SD) pretest	Means (SD) posttest
Frequency of responses		
MSST	7.09 (4.64)	7.32 (5.17)
Control	7.91 (5.43)	8.25 (4.65)
Different reactions		
MSST	6.06 (2.82)	5.71 (1.90)
Control	5.63 (2.33)	5.81 (2.51)

Also for the number of different reactions, no significant differences in reactions were found after conducting a repeated measures ANOVA.

Within group comparisons. To examine possible within group effects, the mean frequency scores on the RL at all three waves were used as the dependent variables for the group that was a control group in the first period (T1 to T2) and received MSST in the second period (T2 to T3; $N = 14$). The means for responsivity are shown in Table 5. An overall significant within effect was found, $F(2,26) = 8.761$, $p = .001$. Table 5 shows an increment in

the level of responsiveness at the RL, and particularly in the second period, as indicated by a significant linear effect, $F(1,13) = 16.524$, $p = .001$ and a quadratic trend $F(1,13) = 3.385$, $p = .089$. Post-hoc analyses for each period separately, using Sidak's correction, showed expected increments of responsiveness from T1 to T3 ($p = .004$) and from T2 to T3 ($p = .004$).

Table 5.
Mean Frequency of Responses per Minute, Mean Number of Different Reactions at all 3 Waves for the Home Group Receiving MSST Between Wave 2 and 3

Responsivity	Mean frequencies (SD)	Mean different reactions (SD)
T1	8.56 (5.47)	5.93 (2.27)
T2	8.50 (4.86)	6.07 (2.56)
T3	11.85 (5.33)	6.57 (2.10)

Note: The mean frequencies at T1 and T2 differ from Table 4, for the group that was a control group during the first period, as a result of participants dropping out.

The same analysis for number of different reactions did not result in any significant findings.

Daycares.

Daycares versus Home. As there was no control group in the Daycares, another repeated measures ANOVA was conducted to examine the differences in the level of responsiveness after receiving MSST between the Home versus the Daycares. The Home group that received MSST during the first period (T1 to T2) was used for this analysis. The frequency scores on the RL at the pre- and posttest were used as the dependent variable and group, Home versus Daycares, as the independent variable. The means for responsivity are shown in Table 6. An overall significant within effect was found, $F(1,30) = 5.476$, $p = .026$, showing an increase in the level of responsiveness. Table 6 shows that this increase on responsiveness seems to be mainly achieved in the participants of the Daycares, but no significant interaction effect between group and the increase of responsiveness was found. However, after conducting a pre- and posttest in the Daycares only, a significant within effect was found, $F(1,14) = 5.036$, $p = .042$, showing an increase on responsiveness after MSST.

Table 6.

Mean Frequency of Responses per Minute, Mean Number of Different Reactions at the Pretest and Posttest Separated by Group (Home versus Daycares)

	Mean (SD) pretest	*Mean (SD) posttest*
Frequency of responses		
Home	7.09 (4.64)	7.32 (5.17)
Daycares	5.17 (4.07)	6.90 (4.48)
Different reactions		
Home	6.06 (2.82)	5.71 (1.90)
Daycares	4.53 (2.33)	5.20 (2.54)

The same analysis for number of different reactions did not result in any significant findings.

Maintenance Effect

Short term maintenance effect. To examine the short term maintenance effect of MSST on the level of responsiveness, after a period with higher frequency of MSST, a repeated measures ANOVA was conducted. The outcome measures all three waves that were used as the dependent variables for the group that received MSST during the first period (T1 to T2; $N = 17$). As this Home group only received MSST during the first period, the second period (T2 to T3) is used to measure a short term maintenance effect. The means for responsivity are shown in Table 7. An overall significant within effect was found, $F(2,32) = 18.603$, $p < .001$, with a linear effect, $F(1,16) = 21.597$, $p < .001$, and a quadratic effect, $F(1,16) = 11.286$, $p = .004$. The Post-hoc analyses using Sidak's correction, however, against predictions, showed a stable level of responsiveness during the first period with MSST and a significant increase in the level of responsiveness between T1 & T3 ($p = .001$) and T2 & T3 ($p < .001$).

Table 7.

Mean Frequency of Responses per Minute, Mean Number of Different Reactions at all 3 Waves for the Home Group Receiving MSST Between Wave 1 and 2

Responsivity	*Mean frequencies*	*Different reactions*
T1	7.09 (4.64)	6.06 (2.82)
T2	7.32 (5.17)	5.71 (1.90)
T3	10.60 (6.86)	6.82 (2.48)

Similar results were found for number of different reactions, with an overall significant within effect $F(2,32) = 4.9$, $p = .014$, as well as a positive linear trend, $F(1,16) = 4.2 92$, $p = .055$, and a quadratic effect, $F(1,16) = 5.537$, $p = .032$. The Post-hoc analyses,

using Sidak's correction, showed an increment of different reactions between T2 & T3 ($p = $ .018).

Long term maintenance effect. The long term effect of MSST after a year of low frequency MSST was examined by comparing the total frequency scores on the RL of the posttest in 2013 (Van Eck, 2013) with the total RL scores of this year's first measurements wave. For this analysis 32 participants were included that showed an increase in responsiveness after MSST in 2013. The mean frequency scores on the RL at the posttest were 6.5 ($SD = 3.81$). The mean frequency scores on the RL of this year's first measurement wave were 7.93 ($SD = 6.41$). After conducting a repeated measures ANOVA, no significant difference in RL scores was found after approximately 7 months of low frequency MSST, indicating a long term maintenance effect but no further growth in performance.

Conclusion & discussion

The present research examined the effects of MSST on the responsiveness of individuals with multiple disabilities in a Children's Home and adjacent day-care centres, located in South Africa. A positive effect for the intervention group was expected after re-intensifying MSST, but this effect stayed out when comparing them to the control group. Because the participants in the Children's Home form a heterogeneous group, matching is difficult, so this lack of finding may be due to the differences between these groups in learning potential. To overcome this problem, the control group that received MSST during the second period was compared to its own baseline. It was found that the level of responsiveness stayed stable during the first period and improved significantly after receiving MSST in the second period, suggesting a positive generalisation effect. However, since the same pattern (i.e., learning curve) was also found in the group that received MSST in the first period, findings seem to indicate a learning effect in the repeated outcome measures, instead of a generalisation of the learned skills due to the intervention. In short, all Home participants showed an exponential growth in responsiveness after receiving the untrained box for the third time. It is possible that this steep learning curve can be explained by the new implemented stories that triggered the motivation to learn, resulting in more participation during the story. Another explanation may reside within the childcare workers. They might have needed some time to get familiar with the new stories in order to tell the stories in the right way, resulting in more responses in the participants. Furthermore, all participants were matched to one childcare worker. Correctly interpreting the subtle reactions of individuals with multiple disabilities and knowing how to evoke positive social responses is a difficult process and might have taken a couple of weeks (Petry, Maes, & Vlaskamp, 2005; Van der

Putte et al., 2005). Both explanations, new stories and a learning effect caused by an increase in quality of the MSST training, can clarify the increase in responsiveness during the second period regardless of the timing of the training. Shortly, for the Home the growth in responsiveness seems not to depend on MSST training. However, what is missing in the present study is the possible increase in responsiveness in the trained story. Maybe for these stories growth in responsiveness was much larger, and did we now find a relatively small learning effect and lack of clear generalisation effect, because such a true generalisation effect requires much more training and repetition (Pamis, 2002; Brodin, 2005; Monaghan & Rowson, 2008; Smedt, 2009; Frey & Kaiser, 2011; Ten Brug et al., 2012; Penne et al., 2012; Case-Smith, 2013)

It must be taken into account that the residents at the Children's Home already received MSST for 4 years (Nispel & Vermeer, 2010), so maybe further growth is limited or slower for this group, or conversely, they know the' trick' so well that they do not need much training to show an increase in responsiveness to new stories. The present study implemented and examined MSST in the Daycares for the first time, so it was expected that they would profit more from the training. For them we did find that responsiveness increased from wave 1 to wave 2. However, when comparing this increase between Daycare and the Home groups, no significant differences in the effect of MSST were found, despite the fact that the increase was significant for the Daycare group and not for the Home group. This comparison is however not ideal, as apart from the difference in therapy history, the group in the Daycares was much younger and their initial responsiveness level was lower as well. For the Daycare group further research is therefore recommended, using a comparable control group as well as a baseline without therapy, in order to test whether the increase resulted from the MSST training.

The present study had several strengths. It used 56 participants, which is considered a big sample size when investigating Multiple Disabled individuals. Another strength is the use of a control group in the present research, as most previous research investigating the effect of MSST lacked a control group (Pamis, 2002; Jonckheere, 2008; Young et al., 2011). Moreover, the present research improved the RL, creating a reliable measurement scale to measure responsiveness. The present study attempted to examine a generalisation effects of the learned skills, because this represents best whether the participants have learned new skills, and this is generally lacking in most other studies (Lifter, Mason, & Barton, 2011; Case-Smith, 2013). Despite the multiple strengths of the present study, it is however not certain whether the MSST training resulted in a growth in responsiveness. The lack of a

control group for the Daycare group, and the lack of measures of responsiveness for the trained story limit the interpretation of findings.

Besides the effects of MSST, also maintenance effects were examined. A short term maintenance of a positive intervention effect is alienated, because the level of responsiveness of the intervention group in the first period did not increase after MSST in the present study. This is unexpected, as Halfens (2011) found a maintenance of the responsiveness level after a period of 6 weeks without MSST, largely using the same participants as in the present research. A long term maintenance effect was examined using the posttest of last year's research (Van Eck et al., 2014) and the first measurement wave of the present research. Both a maintenance and a further improvement in the level of responsiveness during this 7 month period was expected. Results indeed showed a maintenance of the learned skills from last year's research. As the first measure of this year used new and untrained stories, this maintenance finding indicates that the participants were able to maintain their level of responsiveness from the old stories and could transfer their learned skills from last year's research to the new and untrained stories of the present research. Because Multiple Disabled individuals have troubles in generalising skills to similar situations this was unexpected, however it clarifies why a further improvement stayed out. Because new and untrained stories were used to examine maintenance, it is not clear whether a plain maintenance effect is found or whether the new implemented stories triggered the motivation to learn, resulting in long a maintenance effect. Therefore, future research should both use the trained story of last year's research and a new and untrained story to examine maintenance effects.

Overall it is not clear whether MSST has contributed to the growth in the level of responsiveness or not. To test whether the increase in RL for the participants of the Daycares truly represent an increase due to MSST training, future research should also use a control group from the Daycares, and compare growth with a baseline as well. Moreover, growth in responsiveness as well as maintenance effects should be measured for both trained and untrained stories. Another important explanation for the limited positive findings is the preparation of the childcare workers prior to the research period, which might not have been optimal. To prevent that the childcare workers still learn how to work during the training, a more intensive training period should be organised using both role-playing and/or practicing the new stories with residents not participating in the actual research. More generally, the childcare workers seem an important key to success of MSST for individuals with PMD (Pamis, 2002; Multiplus, 2008; Penne et al., 2012). It is possible that the effects of MSST were influenced by differences in the quality of the behaviour of the childcare workers.

Therefore, it is recommended that future research creates a scale to measure the quality of the childcare workers and the integrity of the MSST training, executing MSST as prescribed by PAMIS (2002), to see what the effective elements of MSST are (see Appendix 6 for a pilot study during the present research period examining the quality of the childcare workers). This scale can also clarify the role of the quality of the actions of the childcare workers in the improvements in responsiveness of the participants. This way, it can be made clear whether the participants improve due to MSST or due to increases in the childcare workers' skills to evoke responses.

Besides these important issues, also some minor suggestions for improvements are recommended. Firstly, the newly developed stories were not optimal. One of the goals of the original MSST is to make participants familiar with certain situations in their daily life (Pamis, 2002; Multiplus, 2008; Young et al., 2011). The new stories were not always specifically about daily life activities, and therefore future researchers should create new stories corresponding better with the interests and activities of the participants. Secondly, the fact that responsiveness increased regardless of training, may also indicate that, at least for the somewhat higher level functioning participants, the stories may not have been challenging enough. Although we did use two levels of stories and did not find a difference between level 1 and level 2 participants, further research should investigate this suggestion in more detail using larger groups. Ideally, the MSST stories should be tailored to the individual learning potential and goals of the participants.

In sum, the present study indicated that all participants from both the Home and Daycares grew significantly in a short period, but this increase could not be clearly linked to MSST training. However, due to the limitations of this study, we cannot yet conclude that MSST does not work. Further research is necessary, taking the recommendations stemming from this study into account.

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Appendix 1: An Example of a Story, 'Going to the Beach', Used During a Multi-Sensory Storytelling Session

1. Objective: Suncream
Karabo is going to the beach!
Let's take the suncream out!
(Storyteller holds the cream under his nose)
Can you smell it, Karabo?

2. Objective: Suncream
We need to put it on your skin.
(Storyteller puts suncream on his arm)
Can you feel it?

3. Objective: Torch
The sun is shining.
(Storyteller holds the torch)
Can you see the sun, Karabo?

4. Objective: Sunglasses
Ooh, the sun is too bright.
Let's put your sunglasses on.
(Storyteller puts his sunglasses on).
Is it better now Karabo?

5. Objective: Container with sand
You are lying on the beach.
(Storyteller puts toes or/and hands in the sand)
Can you feel the sand?

6. Okusetshenziswayo: Voicepad
Ulwandle lukwatile kakhulu.
Ingabe uyezwa umsindo wegagasi , Karabo?
(Umxoxi ugcindezela ikinobho le voicepaid)

7. Objective: Salt Water
The water in the sea is salty.
(Storyteller gives him a bit of salt water on the lips)
Can you taste the salt?

8. Objective: Juice
Let's take some juice to refresh!
(Storyteller gives him juice to drink)
Can you taste the sweetness?

Appendix 2: Power Point Presentation for the Childcare Workers 25-02-2013

Multisensory storytelling

This presentation

1) Multisensory storytelling (MSST)
   – Important components

2) New MSST stories: level 1
   – Repeating important components

3) New MSST stories: level 2

MSST: important components

- *Environment*
  – Calm / No noise

- *Preparation*
  – Good sequence of pages / object

- *Time*
  – Therapy: 4 á 6 minutes
  – Exploring of the obects: ±5 seconds

MSST: important components

- *Repetition*
  – Red box
  – Greetings

- *Language*
  – Short sentences
  – Repeating the child's name
  – Right language
  – Enthousiastic

MSST: important components

- *Childcare workers*
  – Objects should be reachable
  – Eyecontact
  – Compliments

It should be fun for you and the child!

Appendix 3: Original Responsiveness List for Multi-Sensory Storytelling

Unit:
Name:
Story:
Group: (control vs. MSST)
Measurement: (pre-measurement, post-measurement or follow-up)

Emotional responses

Behaviour	Red box	1	2	3	4	5	6	7	Total/8 =
Positive facial expression									
Happy vocalisations									

Attention

Behaviour	Red box	1	2	3	4	5	6	7	Total/8 =
Looks at object									
Looks at page									
Looks at storyteller									

Motor responses

Behaviour	Red box	1	2	3	4	5	6	7	Total/8 =
Wave									
Positive nod/shake no									
Clap hands									
Pointing									

Manipulations of Objects and Page

Behaviour	Red box	1	2	3	4	5	6	7	Total/8 =
Reaching for the object/page									
Short touching									
manipulation									
Functional manipulation									

Explanation of the use of this observation scheme: A videotape is made from every session. These schemes are completed with the help of the video. The responses can only be scored during MSST, indicating times that a page, box or object is presented to the child or the story is read. Every time the behaviour is seen, one mark is written down in the table next to the response and under the right page (1-7). When there is no box or page or object presented to the child no response can be scored. All responses per response are added and divided by the number of pages of the story plus one. Some stories have six pages and other stories contain seven pages. The total score per response will give an average of the responses shown during the MSST session.

Appendix 4: This Year's Improved Responsiveness List for Multi-Sensory Storytelling

Unit: Story:
Date: Group:
Name + number childcare worker: Measurement:
Name + number child: Total therapy time:

	Red box	1	2	3	4	5	6	7	8	End song	Total time
Total time											

Emotional responses

Positive facial expression	0	1	2	3	4
	Never (0%)	Rarely (1-10%)	Occasionally (10-40%)	Half of the time (40-60%)	More than half-Always (>60%)

Behaviour	Red box	1	2	3	4	5	6	7	8	End song	Freq/time
Positive facial expression											
Happy vocalisations											

Attention

Behaviour	Red box	1	2	3	4	5	6	7	8	End song	Freq/time
Looks at object											
Looks at page											
Looks at storyteller											

Symbolic gestures

Behaviour	Red box	1	2	3	4	5	6	7	8	End song	Freq/time
Wave, positive nod/shake no, clap hands, pointing											

Manipulations of objects and page

Behaviour	Red box	1	2	3	4	5	6	7	8	End song	Freq/time
Reaching for object/page											
Short touching											
Manipulation											
Functional manipulation											

Verbal responses

Behaviour	Red box	1	2	3	4	5	6	7	8	End song	Freq/time
(Attempt to) sing, repeat or say words											

Explanation of the use of this observation scheme: A videotape is made from every session to help completing this observation form. Responses can only be scored during times that a page, box or object is presented to the child or the story is read. When there is no box, page or object presented to the child, no response can be scored. Every time the behaviour is seen, one mark is written down in the table next to the response and under the right page (1-8), except for the item 'Positive facial expression'. The item PFE was scored by a Likert-Scale measuring the percentage of time that the participant showed a positive facial expression per page (0% = score 0, 1-10% = score 1, 10-40% = score 2, 40-60% = score 3, >60% = score 4). Adding the Likert-scores per page and dividing this score by the total number of pages, showed the same variation range as using the frequency of responses per minute. By adding all 11 scores the total RL score is obtained. The total score gives an average of the responses shown during the MSST session.

Appendix 5: Descriptions of the Responsiveness List used this year

11 items	Definition
1. Happy facial expressions *	Smile: form one's features into a pleased, kind, or amused expression, typically with the corners of the mouth turned up and the front teeth exposed.
2. Happy vocalisations *	Laughing or other happy sounds.
3. Looks at the page** 4. Looks at the object** 5. Looks at the childcare worker**	Eyes are focused on page, object or (face of the) storyteller and/or head is turned towards that direction.
6. Symbolic gestures *** - Waving ***	Combination of different (motor) reactions - Move one's hand back and forth in greeting or as a signal.
- Positive nod/shake no ***	- As a positive response to the object/storyteller, for example imitation of the same behaviour performed by the childcare worker or answering a question Nod: lower and raise one's head slightly and briefly (especially in greeting, assent, or understanding) Shake no: move head from left to right side or vice versa.
- Pointing ***	- When a child uses the outstretched arm and index finger to focus attention on a particular referent. For children who cannot use their index finger or other finger, this part is not necessary.
- Clapping hands ***	- Brings two hands together and puts them on each other in one movement. Sound is not necessary.
7. Reaching for the object/page****	Extend one's hand or arm in an attempt to touch or grasp the object/page.
8. Short touching****	Stroking the object/page, hitting the object, touching the object for less than two seconds, without grasping the object/page.
9. Manipulation****	Holding the object/page, rattle the object for at least two seconds.

10. Functional manipulation****	Press the button, or relating to the way in which the object works or operates (i.e., using it in a functional manner). The manipulation of objects to construct or to create something. The child may take on a role of someone else, or may be engaged in pretend activity, such as imitating the sound of a driving car while playing with a toy car.
11. (Attempt to) Sing, repeat or say words *****	Every attempt a child makes to say, sing or repeat words. Words do not have to be pronounced correctly. *Note:* this item is different than 'Happy vocalisations'.

Note: * Indicates that this response is included in the subscale 'Emotional Responses'. ** Indicates that this response is included in the subscale 'Attention'. *** Indicates that this response is included in the subscale 'Symbolic Gestures'. **** Indicates that this response is included in the subscale 'Manipulations of objects and page'. ***** Indicates that this response is included in the subscale 'Verbal Responses'. Because the behavioural items are broader then social behaviour the scale is re-named to Responsiveness List (RL) in the present study.

Appendix 6: A pilot study (Integrity Scale i.e., the Quality of the Therapy as Given by the Childcare Workers)

A pilot study was performed to examine the quality of MSST as given by the childcare workers. For this pilot study both a new measurement scale, the Integrity Scale, and descriptions for interpreting the Integrity Scale were made (Appendix 6A & Appendix 6B).

To determine the inter-observer reliability on the RS, ten random selected therapy sessions of participants from this year's research were selected and scored by the Development Manager of the Children's Home, and Natalie Willems (Willems, 2014). The inter-observer reliability was found to be good r = .975, $p < .001$.

Due to homogeneity and normality issues, no analyses could be conducted. The Integrity Scale and description can be adapted and used for future research examining the quality of MSST as given by the childcare workers.

Appendix 6: A pilot study (Integrity Scale i.e., the Quality of the Therapy as Given by the Childcare Workers)

Appendix 6A: Observation Schedule

Unit: Name + number childcare worker:
Date: Name + number child:
 Group: Story:
Measurement:

1. Procedural mistakes

	Preparation of the therapy session	Sequence of pages	Sequence of objects	Forgot a page	Forgot to show a object	Object still there during the next page	Using the same page twice	Forgot to show the red box/sing the end song	**Total**
Mistakes									

2. Time for initiative / exploring

	Red box	1	2	3	4	5	6	7	8	End song	**Total**
Total time showing within earshot, eyesight, reach											

3. Positive & direct reinforcement

	Red box	1	2	3	4	5	6	7	8	End song	**Total**
Direct positive reinforcement											

4. Positivity childcare worker

	Red box	1	2	3	4	5	6	7	8	End song	**Total**
Positive facial expression											
Eye contact											
(positive) Physical contact											

5. Sensitivity to negative reactions

	Red box	1	2	3	4	5	6	7	8	End song	**Total**
Insensitivity to the child (hitting, avoiding, yelling, crying, saying 'no')											

Appendix 6: A pilot study (Integrity Scale i.e., the Quality of the Therapy as Given by the Childcare Workers)

Appendix 6B: Descriptions of Integrity Scale used this year

1)   Repetition/procedural mistakes: The therapy sessions must have a certain structure with fixed elements, which should be the same for all sessions (e.g., sequences of the pages/objects, showing all pages/objects, showing the red box and singing the end song to the participant). Every mistake is scored as one mistake and all mistakes are added afterwards. The total score on the subscale ´repetition´ is scored using a five-point Likert scale.

Preparation of the therapy session: All disturbing sounds are scored as one mistake. It is also scored as a mistake when the childcare worker prepares the story after the red box is already shown (i.e., preparing the story between the red box and the first page of the story) or when the childcare workers has to look for the correct object or page (i.e., if the childcare worker does this more often during the session, only score one mistake on 'preparation'). Also one mistake is scored when the battery of an object is low or when there is no juice in the cup.

Sequence of pages: Switching the sequences of pages by the childcare worker is scored as one mistake (i.e., 'fault sequence of page'). If the childcare worker forgets the page afterwards, score another mistake (i.e., 'forgot to show a page').

Object is there during the next page: Sometimes the childcare workers let the participants hold the objects longer than is prescribed (e.g., holding the branch of nature walk for more than one page), this should be scored as one mistake.

Using the same page twice: Using the same page twice by the childcare worker, is only scored as one mistake the first time this happens (i.e., most of the time when this occurs, the childcare workers used the wrong sequence of pages as well).

Forgot to show the red box/sing the end song: Score one mistake if the childcare worker forgets this of when she sings the end song after a hint.

2)   Positive & direct reinforcement: Positive and direct reinforcement is when a desired response is strengthened by the presentation of a positive or rewarding stimulus of the childcare worker, after a desirable response occurs (Shaffer, 2008).

A desired response of the participant can be any response scored on the Responsiveness List: smiling, happy vocalisations, looking at a object/page/storyteller etc. The reinforcement can be both verbal or non-verbal (e.g., smiling, nodding, touching, cuddling etc.), but must occur immediately after the desired response.

3)   Time for initiative / exploring: The participant is given enough time (i.e., minimal 3 seconds) to take initiative or to explore the stimuli offered within earshot, eyesight and reach. Exploring an object consists of 2 behaviours; time to look at an object when held by the childcare worker (visual exploring time) and exploring the object when the participant holds the object himself (physical exploring time). Physical time can be both active (the participant explores the object their self) or passive (the participant is unable to explore the object their self, so the childcare worker makes sure that the participant can explore the object with their help). These two behaviours are scored by measuring the total time in seconds.

4) **Positivity childcare worker:** The childcare worker has a positive facial expression, prosody and mimicry to stimulate and encourage the participant to feel comfortable and explore the environment. Also eye contact with the participant is important.

Positive facial expression: When a childcare worker has a constant positive facial expression time during a page, score this item once. If the childcare worker still has the same positive facial expression the second page, score this once again, as it is a new page.

Eye contact: It is not necessary for the participant to look back at the childcare worker, as this scale only measures the childcare worker. It is about the attempt of the childcare worker to make eye contact. When the childcare worker looks away from the participant for more than one second and looks back, score again.

Positive physical contact: All physical contact is scored, except for negative contact like hitting. Negative physical contact is scored at 'sensitivity to negative reactions'. For example, both helping a participant to touch the voice pad and hugging are scored for this item.

5) **Sensitivity to negative reactions:** The childcare worker is accommodating to the participant when necessary (e.g., not touching the participant anymore after the participant shows negative reactions while being touched, stop showing an object when a participant is screaming).

Every time the childcare worker is not stopping her own behaviour after a obvious negative reaction of the participant, it is scores as one mistake (e.g., if the childcare worker puts sunglasses on after the participant tries to avoid it).

Scoring:
Subscale 1: Dividing the total score by the total time of the therapy session.
Subscale 2: Tracking the total time with a stopwatch.
Subscale 3: Dividing the total score by the total RL score of that participant at the same wave.
Subscale 4: Dividing the total score by the total time of the therapy session.
Subscale 5: Dividing the total score by the total time of the therapy session (recoding is necessary as this item measures a negative behaviour of the childcare worker).

Appendix 7A: Results of Analysis Including Level as Between Factor (Item PFE Included)

Effect of MSST on Responsiveness
Home. *Home versus Control:*

Within-Subjects Factors

Responsiveness	Dependent Variable
1	SQRT_SRS1
2	SQRT_SRS2

Between-Subjects Factors

			Value Label	N
Level	1		Level 1	25
	2		Level 2	8
group	1		Groep 1	17
	2		Groep 2	16

Descriptive Statistics

	Level	group	Mean	Std. Deviation	N
	Level 1	Groep 1	2,4476	,94372	13
		Groep 2	2,3794	,92135	12
		Total	2,4148	,91411	25
	Level 2	Groep 1	2,5256	1,46013	4
SQRT_SRS1		Groep 2	3,4867	,43968	4
		Total	3,0061	1,12270	8
	Total	Groep 1	2,4659	1,03386	17
		Groep 2	2,6562	,95206	16
		Total	2,5582	,98419	33
	Level 1	Groep 1	2,3865	,82246	13
		Groep 2	2,6324	,76054	12
		Total	2,5046	,78680	25
	Level 2	Groep 1	2,9847	1,49074	4
SQRT_SRS2		Groep 2	3,1536	,94036	4
		Total	3,0691	1,15738	8
	Total	Groep 1	2,5273	,99620	17
		Groep 2	2,7627	,80953	16
		Total	2,6414	,90426	33

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Responsiveness	Pillai's Trace	,020	,583[b]	1,000	29,000	,451
	Wilks' Lambda	,980	,583[b]	1,000	29,000	,451
	Hotelling's Trace	,020	,583[b]	1,000	29,000	,451
	Roy's Largest Root	,020	,583[b]	1,000	29,000	,451
Responsiveness * Level	Pillai's Trace	,001	,025[b]	1,000	29,000	,875
	Wilks' Lambda	,999	,025[b]	1,000	29,000	,875
	Hotelling's Trace	,001	,025[b]	1,000	29,000	,875
	Roy's Largest Root	,001	,025[b]	1,000	29,000	,875
Responsiveness * group	Pillai's Trace	,043	1,317[b]	1,000	29,000	,260
	Wilks' Lambda	,957	1,317[b]	1,000	29,000	,260
	Hotelling's Trace	,045	1,317[b]	1,000	29,000	,260
	Roy's Largest Root	,045	1,317[b]	1,000	29,000	,260
Responsiveness * Level * group	Pillai's Trace	,196	7,055[b]	1,000	29,000	,013
	Wilks' Lambda	,804	7,055[b]	1,000	29,000	,013
	Hotelling's Trace	,243	7,055[b]	1,000	29,000	,013
	Roy's Largest Root	,243	7,055[b]	1,000	29,000	,013

a. Design: Intercept + Level + group + Level * group
 Within Subjects Design: Responsiveness

b. Exact statistic

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Responsiveness	1,000	,000	0	.	1,000	1,000	1,000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + Level + group + Level * group
 Within Subjects Design: Responsiveness

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Sphericity Assumed	,077	1	,077	,583	,451
	Greenhouse-Geisser	,077	1,000	,077	,583	,451
	Huynh-Feldt	,077	1,000	,077	,583	,451
	Lower-bound	,077	1,000	,077	,583	,451
Responsiveness * Level	Sphericity Assumed	,003	1	,003	,025	,875
	Greenhouse-Geisser	,003	1,000	,003	,025	,875
	Huynh-Feldt	,003	1,000	,003	,025	,875
	Lower-bound	,003	1,000	,003	,025	,875
Responsiveness * group	Sphericity Assumed	,173	1	,173	1,317	,260
	Greenhouse-Geisser	,173	1,000	,173	1,317	,260
	Huynh-Feldt	,173	1,000	,173	1,317	,260
	Lower-bound	,173	1,000	,173	1,317	,260
Responsiveness * Level * group	Sphericity Assumed	,927	1	,927	7,055	,013
	Greenhouse-Geisser	,927	1,000	,927	7,055	,013
	Huynh-Feldt	,927	1,000	,927	7,055	,013
	Lower-bound	,927	1,000	,927	7,055	,013
Error(Responsiveness)	Sphericity Assumed	3,810	29	,131		
	Greenhouse-Geisser	3,810	29,000	,131		
	Huynh-Feldt	3,810	29,000	,131		
	Lower-bound	3,810	29,000	,131		

Tests of Within-Subjects Contrasts

Source	Responsiveness	Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Linear	,077	1	,077	,583	,451
Responsiveness * Level	Linear	,003	1	,003	,025	,875
Responsiveness * group	Linear	,173	1	,173	1,317	,260
Responsiveness * Level * group	Linear	,927	1	,927	7,055	,013
Error(Responsiveness)	Linear	3,810	29	,131		

Home. *Within group comparisons***:** No significant findings.

Daycares. *Home versus Daycares:* Not enough participants to conduct this analysis.

Maintenance Effect
Short term maintenance effect:

Within-Subjects Factors

Responsiveness	Dependent Variable
1	SQRT_SRS1
2	SQRT_SRS2
3	SQRT_SRS3

Between-Subjects Factors

		Value Label	N
Level	1	Level 1	13
	2	Level 2	4

Descriptive Statistics

	Level	Mean	Std. Deviation	N
SQRT_SRS1	Level 1	2,4476	,94372	13
	Level 2	2,5256	1,46013	4
	Total	2,4659	1,03386	17
SQRT_SRS2	Level 1	2,3865	,82246	13
	Level 2	2,9847	1,49074	4
	Total	2,5273	,99620	17
SQRT_SRS3	Level 1	3,0453	,87991	13
	Level 2	3,2005	1,76676	4
	Total	3,0819	1,08192	17

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Responsiveness	Pillai's Trace	,527	7,802[b]	2,000	14,000	,005
	Wilks' Lambda	,473	7,802[b]	2,000	14,000	,005
	Hotelling's Trace	1,115	7,802[b]	2,000	14,000	,005
	Roy's Largest Root	1,115	7,802[b]	2,000	14,000	,005
Responsiveness * Level	Pillai's Trace	,503	7,078[b]	2,000	14,000	,008
	Wilks' Lambda	,497	7,078[b]	2,000	14,000	,008
	Hotelling's Trace	1,011	7,078[b]	2,000	14,000	,008
	Roy's Largest Root	1,011	7,078[b]	2,000	14,000	,008

a. Design: Intercept + Level
 Within Subjects Design: Responsiveness

b. Exact statistic

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Responsiveness	,552	8,324	2	,016	,691	,789	,500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + Level
 Within Subjects Design: Responsiveness

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Sphericity Assumed	2,593	2	1,297	13,486	,000
	Greenhouse-Geisser	2,593	1,381	1,878	13,486	,001
	Huynh-Feldt	2,593	1,577	1,644	13,486	,000
	Lower-bound	2,593	1,000	2,593	13,486	,002
Responsiveness * Level	Sphericity Assumed	,482	2	,241	2,507	,098
	Greenhouse-Geisser	,482	1,381	,349	2,507	,120
	Huynh-Feldt	,482	1,577	,306	2,507	,113
	Lower-bound	,482	1,000	,482	2,507	,134
Error(Responsiveness)	Sphericity Assumed	2,884	30	,096		
	Greenhouse-Geisser	2,884	20,715	,139		
	Huynh-Feldt	2,884	23,655	,122		
	Lower-bound	2,884	15,000	,192		

Tests of Within-Subjects Contrasts

Source	Responsiveness	Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Linear	2,477	1	2,477	15,614	,001
	Quadratic	,116	1	,116	3,444	,083
Responsiveness * Level	Linear	,009	1	,009	,057	,814
	Quadratic	,473	1	,473	14,067	,002
Error(Responsiveness)	Linear	2,380	15	,159		
	Quadratic	,504	15	,034		

Long term maintenance effect: Last year's research did not have levels , so this analysis could not be conducted

Appendix 7B: Results of Analysis Excluding the Item Positive Facial Expression

Effect of MSST on Responsiveness

Home. *Home versus Control:* No significant effects.

Home. *Within group comparison:*

Within-Subjects Factors

TweeC	Dependent Variable
1	SQRT_SRS1
2	SQRT_SRS2
3	SQRT_SRS3

Descriptive Statistics

	Mean	Std. Deviation	N
SQRT_SRS1	2,5113	,86355	14
SQRT_SRS2	2,4706	,76818	14
SQRT_SRS3	3,0078	,74272	14

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
TweeC	Pillai's Trace	,676	12,516[b]	2,000	12,000	,001	,676	25,032	,981
	Wilks' Lambda	,324	12,516[b]	2,000	12,000	,001	,676	25,032	,981
	Hotelling's Trace	2,086	12,516[b]	2,000	12,000	,001	,676	25,032	,981
	Roy's Largest Root	2,086	12,516[b]	2,000	12,000	,001	,676	25,032	,981

a. Design: Intercept
 Within Subjects Design: TweeC

b. Exact statistic

c. Computed using alpha = ,05

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TweeC	,788	2,863	2	,239	,825	,929	,500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept
 Within Subjects Design: TweeC

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
TweeC	Sphericity Assumed	2,505	2	1,252	7,324	,003	,360	14,648	,908
	Greenhouse-Geisser	2,505	1,650	1,518	7,324	,006	,360	12,083	,860
	Huynh-Feldt	2,505	1,859	1,347	7,324	,004	,360	13,614	,891
	Lower-bound	2,505	1,000	2,505	7,324	,018	,360	7,324	,706
Error(TweeC)	Sphericity Assumed	4,446	26	,171					
	Greenhouse-Geisser	4,446	21,448	,207					
	Huynh-Feldt	4,446	24,165	,184					
	Lower-bound	4,446	13,000	,342					

a. Computed using alpha = ,05

Tests of Within-Subjects Contrasts

Source	TweeC	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
TweeC	Linear	1,725	1	1,725	11,612	,005	,472	11,612	,882
	Quadratic	,779	1	,779	4,029	,066	,237	4,029	,460
Error(TweeC)	Linear	1,932	13	,149					
	Quadratic	2,514	13	,193					

a. Computed using alpha = ,05

Pairwise Comparisons

(I) TweeC	(J) TweeC	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	,041	,188	,995	-,474	,555
	3	-,496[*]	,146	,014	-,895	-,098
2	1	-,041	,188	,995	-,555	,474
	3	-,537[*]	,129	,003	-,891	-,184
3	1	,496[*]	,146	,014	,098	,895
	2	,537[*]	,129	,003	,184	,891

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Sidak.

Daycares. *Home versus Daycares:*

Within-Subjects Factors

msst	Dependent Variable
1	SQRT_SRS1
2	SQRT_SRS2

Between-Subjects Factors

		Value Label	N
group	0	geen groep	15
	1	Groep 1	17

Descriptive Statistics

	group	Mean	Std. Deviation	N
SQRT_SRS1	geen groep	1,9927	,82301	15
	Groep 1	2,2258	,93109	17
	Total	2,1165	,87596	32
SQRT_SRS2	geen groep	2,3227	,82564	15
	Groep 1	2,3063	,92216	17
	Total	2,3140	,86419	32

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
msst	Pillai's Trace	,150	5,282[b]	1,000	30,000	,029	,150
	Wilks' Lambda	,850	5,282[b]	1,000	30,000	,029	,150
	Hotelling's Trace	,176	5,282[b]	1,000	30,000	,029	,150
	Roy's Largest Root	,176	5,282[b]	1,000	30,000	,029	,150
msst * group	Pillai's Trace	,061	1,952[b]	1,000	30,000	,173	,061
	Wilks' Lambda	,939	1,952[b]	1,000	30,000	,173	,061
	Hotelling's Trace	,065	1,952[b]	1,000	30,000	,173	,061
	Roy's Largest Root	,065	1,952[b]	1,000	30,000	,173	,061

a. Design: Intercept + group
 Within Subjects Design: msst

b. Exact statistic

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
msst	1,000	,000	0	.	1,000	1,000	1,000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + group
 Within Subjects Design: msst

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
msst	Sphericity Assumed	,671	1	,671	5,282	,029	,150
	Greenhouse-Geisser	,671	1,000	,671	5,282	,029	,150
	Huynh-Feldt	,671	1,000	,671	5,282	,029	,150
	Lower-bound	,671	1,000	,671	5,282	,029	,150
msst * group	Sphericity Assumed	,248	1	,248	1,952	,173	,061
	Greenhouse-Geisser	,248	1,000	,248	1,952	,173	,061
	Huynh-Feldt	,248	1,000	,248	1,952	,173	,061
	Lower-bound	,248	1,000	,248	1,952	,173	,061
Error(msst)	Sphericity Assumed	3,813	30	,127			
	Greenhouse-Geisser	3,813	30,000	,127			
	Huynh-Feldt	3,813	30,000	,127			
	Lower-bound	3,813	30,000	,127			

Tests of Within-Subjects Contrasts

Source	msst	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
msst	Linear	,671	1	,671	5,282	,029	,150
msst * group	Linear	,248	1	,248	1,952	,173	,061
Error(msst)	Linear	3,813	30	,127			

Maintenance Effect
Short term maintenance effect:

Within-Subjects Factors

TweeC	Dependent Variable
1	SQRT_SRS1
2	SQRT_SRS2
3	SQRT_SRS3

Descriptive Statistics

	Mean	Std. Deviation	N
SQRT_SRS1	2,2258	,93109	17
SQRT_SRS2	2,3063	,92216	17
SQRT_SRS3	2,8275	,97962	17

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
TweeC	Pillai's Trace	,623	12,370[b]	2,000	15,000	,001	,623	24,740	,985
	Wilks' Lambda	,377	12,370[b]	2,000	15,000	,001	,623	24,740	,985
	Hotelling's Trace	1,649	12,370[b]	2,000	15,000	,001	,623	24,740	,985
	Roy's Largest Root	1,649	12,370[b]	2,000	15,000	,001	,623	24,740	,985

a. Design: Intercept
 Within Subjects Design: TweeC
b. Exact statistic
c. Computed using alpha = ,05

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TweeC	,803	3,283	2	,194	,836	,922	,500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept
 Within Subjects Design: TweeC
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
TweeC	Sphericity Assumed	3,628	2	1,814	17,104	,000	,517	34,209	,999
	Greenhouse-Geisser	3,628	1,671	2,170	17,104	,000	,517	28,590	,998
	Huynh-Feldt	3,628	1,844	1,968	17,104	,000	,517	31,532	,999
	Lower-bound	3,628	1,000	3,628	17,104	,001	,517	17,104	,972
Error(TweeC)	Sphericity Assumed	3,394	32	,106					
	Greenhouse-Geisser	3,394	26,744	,127					
	Huynh-Feldt	3,394	29,496	,115					
	Lower-bound	3,394	16,000	,212					

a. Computed using alpha = ,05

Tests of Within-Subjects Contrasts

Source	TweeC	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
TweeC	Linear	3,077	1	3,077	20,315	,000	,559	20,315	,988
	Quadratic	,550	1	,550	9,081	,008	,362	9,081	,807
Error(TweeC)	Linear	2,424	16	,151					
	Quadratic	,970	16	,061					

a. Computed using alpha = ,05

Pairwise Comparisons

(I) TweeC	(J) TweeC	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-,080	,093	,781	-,327	,166
	3	-,602[*]	,133	,001	-,957	-,246
2	1	,080	,093	,781	-,166	,327
	3	-,521[*]	,105	,000	-,801	-,241
3	1	,602[*]	,133	,001	,246	,957
	2	,521[*]	,105	,000	,241	,801

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Sidak.

Long term maintenance effect: No different significant findings.

Appendix 7C: Results of Analysis only using the item Positive Facial Expression

Effect of MSST on Responsiveness

Home. *Home versus Control:* No significant effects.

Home. *Within group comparisons:*

Within-Subjects Factors

Responsiveness	Dependent Variable
1	PFE1
2	PFE2
3	PFE3

Descriptive Statistics

	Mean	Std. Deviation	N
PFE1	1,5569	1,32730	14
PFE2	1,8526	1,14113	14
PFE3	2,2894	1,29122	14

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Responsiveness	Pillai's Trace	,488	5,712[b]	2,000	12,000	,018
	Wilks' Lambda	,512	5,712[b]	2,000	12,000	,018
	Hotelling's Trace	,952	5,712[b]	2,000	12,000	,018
	Roy's Largest Root	,952	5,712[b]	2,000	12,000	,018

a. Design: Intercept
 Within Subjects Design: Responsiveness
b. Exact statistic

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Responsiveness	,994	,078	2	,962	,994	1,000	,500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept
 Within Subjects Design: Responsiveness
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Sphericity Assumed	3,803	2	1,901	6,580	,005
	Greenhouse-Geisser	3,803	1,987	1,914	6,580	,005
	Huynh-Feldt	3,803	2,000	1,901	6,580	,005
	Lower-bound	3,803	1,000	3,803	6,580	,024
Error(Responsiveness)	Sphericity Assumed	7,513	26	,289		
	Greenhouse-Geisser	7,513	25,834	,291		
	Huynh-Feldt	7,513	26,000	,289		
	Lower-bound	7,513	13,000	,578		

Tests of Within-Subjects Contrasts

Source	Responsiveness	Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Linear	3,756	1	3,756	12,102	,004
	Quadratic	,046	1	,046	,174	,684
Error(Responsiveness)	Linear	4,035	13	,310		
	Quadratic	3,478	13	,268		

Pairwise Comparisons

(I) Responsiveness	(J) Responsiveness	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-,296	,202	,422	-,849	,257
	3	-,733[*]	,211	,012	-1,309	-,156
2	1	,296	,202	,422	-,257	,849
	3	-,437	,197	,128	-,975	,101
3	1	,733[*]	,211	,012	,156	1,309
	2	,437	,197	,128	-,101	,975

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Sidak.

Daycares. *Home versus Daycares:* No significant effects.

Maintenance Effect

Short term maintenance effect:

Within-Subjects Factors

Responsiveness	Dependent Variable
1	PFE1
2	PFE2
3	PFE3

Descriptive Statistics

	Mean	Std. Deviation	N
PFE1	1,3167	1,06229	17
PFE2	1,2018	,95412	17
PFE3	1,7015	1,31633	17

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Responsiveness	Pillai's Trace	,257	2,593[b]	2,000	15,000	,108
	Wilks' Lambda	,743	2,593[b]	2,000	15,000	,108
	Hotelling's Trace	,346	2,593[b]	2,000	15,000	,108
	Roy's Largest Root	,346	2,593[b]	2,000	15,000	,108

a. Design: Intercept
 Within Subjects Design: Responsiveness
b. Exact statistic

Mauchly's Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Responsiveness	,747	4,374	2	,112	,798	,873	,500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a. Design: Intercept Within Subjects Design: Responsiveness
b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Sphericity Assumed	2,329	2	1,164	3,253	,052
	Greenhouse-Geisser	2,329	1,596	1,459	3,253	,065
	Huynh-Feldt	2,329	1,745	1,334	3,253	,060
	Lower-bound	2,329	1,000	2,329	3,253	,090
Error(Responsiveness)	Sphericity Assumed	11,456	32	,358		
	Greenhouse-Geisser	11,456	25,540	,449		
	Huynh-Feldt	11,456	27,921	,410		
	Lower-bound	11,456	16,000	,716		

Tests of Within-Subjects Contrasts

Source	Responsiveness	Type III Sum of Squares	df	Mean Square	F	Sig.
Responsiveness	Linear	1,259	1	1,259	2,557	,129
	Quadratic	1,070	1	1,070	4,781	,044
Error(Responsiveness)	Linear	7,874	16	,492		
	Quadratic	3,582	16	,224		

Pairwise Comparisons

(I) Responsiveness	(J) Responsiveness	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	,115	,148	,833	-,280	,510
	3	-,385	,241	,340	-1,026	,256
2	1	-,115	,148	,833	-,510	,280
	3	-,500	,216	,099	-1,074	,075
3	1	,385	,241	,340	-,256	1,026
	2	,500	,216	,099	-,075	1,074

Based on estimated marginal means

a. Adjustment for multiple comparisons: Sidak.

Long term maintenance effect: Results stayed the same.