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The Effect of Differential Reinforcement of Other Behaviour with Self-Monitoring on Motor Stereotypy and Self-Injurious Behaviours

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Abstract

The aim of the present study was to evaluate the effectiveness of differential reinforcement of other behaviour with a self-monitoring component on the motor stereotypy and self-injurious behaviour (hand biting) of a 12 year old boy with autism. The study employed an AB design where the participant received reinforcement following specified intervals of time without engaging in the target behaviours. The participant was initially trained to self-manage the DRO procedure and self-administer reinforcement. The results showed that the intervention was effective in decreasing motor stereotypy to near-zero occurrences and decreasing hand biting to zero levels, which was maintained over several sessions. The results support the research literature on the effectiveness of differential reinforcement on reducing problem behaviour. The findings are discussed in terms of procedural limitations along with recommendations for future research.

Key words: differential reinforcement, autism, motor stereotypy, self-injurious behaviour, self-monitoring

The Effect of Differential Reinforcement of Other Behaviour with Self-Monitoring on Motor Stereotypy and Self-Injurious Behaviours

Differential reinforcement procedures are used widely to address a variety of undesirable behaviours in those with developmental disabilities (Vollmer, Iwata, Zarcone, Smith & Mazaleski, 1993).

In particular behaviours such as self-injurious behaviour (SIB) or aggression may be maintained by social positive reinforcement in the form of attention. Therefore differential reinforcement of other behaviour may be a beneficial procedure where reinforcers are delivered in the absence of such problem behaviours and are withheld contingent upon the occurrence of the undesirable behaviour.

Repetitive, stereotyped behaviours are also a prevalent feature of those individuals diagnosed with an autism spectrum disorder (ASD) and represents one of the diagnostic criteria for ASD (Lewis & Bodfish, 1998). Murphy, Healy and Leader (2009) reported that 72% of children with autism engaged in some form of stereotypy. Additionally Soke, Rosenberg, Hamman, Fingerlin, Robinson, Carpenter, Giarelli, Lee, Wiggins, Durkin and DiGuiseppi (2016) showed that SIB occurred in more than 30% of children with autism across a large population-based sample of children with ASD in the United States.

Evidence also shows that motor stereotypy can further impact upon a child's learning, particularly skill acquisition, at school (Koegel and Covert 1972; Varni, Lovaas, Koegel, & Everett, 1979; Pierce and Courchesne 2001). Extended periods of time engaged in this behaviour may have a negative impact upon not only a child's education but also their socialisation (Lofin, Odom & Lantz, 2008). For instance Loftin *et al* (2008) reported that students with autism who engage in high levels of repetitive motor behaviours experience difficulties initiating social interactions with their peers. Social stigmatisation in the form of negative reactions from peers and other members of society may also occur (Jones, Wint, &

Ellis, 1990). Family functioning and well-being may also be affected which can lead to increases in stress (Bishop, Richler, Cain & Lord, 2007). Altogether, these adverse effects have the potential to contribute to later detrimental developmental outcomes Therefore, the need for an evidence-based intervention targeted towards the reduction of these behaviours is essential.

According to Marcus and Vollmer (1996), differential reinforcement is one of the most common approaches for decreasing problem behaviour in those with developmental disabilities. Based on this procedure, reinforcement is provided contingent upon the occurrence of responses which meet a specific criterion across frequency, topography, magnitude, latency or duration (Cooper, Heron & Heward, 2007). Differential reinforcement of alternative behaviour (DRA), differential reinforcement of incompatible behaviour (DRI), differential reinforcement of low rates (DRL) and differential reinforcement of other behaviour (DRO), are the four procedures most commonly researched (Cooper, Heron & Heward, 2007). Reynolds (1961) first described DRO as a procedure which reinforces the absence of the targeted behaviour during or at specific times. Therefore any behaviour other than the targeted one results in reinforcement (Thompson & Iwata, 2005).

Vollmer *et al* (1993) compared the use of DRO and non-contingent reinforcement (NCR) on the SIB of three adult females. SIB took the form of head hitting, head banging, body hitting and hand mouthing. The DRO procedure involved the delivery of attention for 10 seconds following a specified time interval where the participant did not engage in SIB, with the timer being reset contingent upon the occurrence of SIB. During the NCR condition, attention was delivered for 10 seconds on a fixed-time interval irrespective of the occurrence of SIB. This schedule was faded from a rate of 6 per minute to a rate of 0.2 per minute (i.e. one delivery per 5 min). The results showed that both interventions were effective for reducing the frequency of SIB socially medicated by positive reinforcement. For one

participant in particular, suppression of SIB was more consistent when DRO was in effect. For the other two participants, NCR and DRO were equally effective.

In addition, Tiger, Fisher and Bouxsein (2009) evaluated the use of DRO on the self-injurious chronic skin picking behaviour of a 19 year old participant with a diagnosis of Asperger's syndrome. Awareness training was initially carried out to prompt the participant to identify when he was engaged in the self-injurious behaviour. The participant was subsequently taught to self-monitor their behaviour by setting the timer for 10 minutes, reset it following an instance of skin picking and place a ticket into an envelope when the timer sounded. These tickets could then be exchanged for money after each specified time interval without occurrences of SIB. The results demonstrated a functional relationship between the DRO with self-monitoring intervention and the SIB, where skin picking occurred during 56.3% of intervals during baseline and reduced to 0% once DRO was implemented. Near baseline instances of skin picking then occurred when the treatment was withdrawn. These results were maintained after extending the DRO interval and when implemented in novel settings.

Differential reinforcement may also be an applicable tactic to address stereotypical behaviours in those individuals with developmental disabilities. For instance, Lanovaz, Rapp, Maciw, Pregent-Pelletier, Dorian, Ferguson and Saade (2014) conducted a series of experiments examining the effect of multiple interventions on both vocal stereotypy and motor stereotypies. Across the experiments, twelve children and adults participated aged from 4 years to 63 years with diagnoses of autism, profound intellectual disability, global developmental delays, language disorders and downs syndrome. The first experiment showed that differential reinforcement of an alternative behaviour where reinforcement was provided on a variable-interval schedule contingent upon engagement in the targeted appropriate behaviour, produced a reduction in both vocal stereotypy for two participants and reduced

motor stereotypy in one participant. In the second experiment DRO was implemented where the participants received a reinforcer (edibles or access to music) contingent upon not emitting vocal stereotypy for an entire interval. The results were mixed demonstrating a reduction in stereotypy for two participants, with no effect on the third participant on either reducing stereotypy or increasing appropriate behaviour.

Ringdahl, Andelman, Kitsukawa, Winborn, Barretto and Wacker (2002) further evaluated the use of DRO on the motor stereotypy in the form of hand flapping, of an adolescent boy. Initially, verbal reminders to refrain from hand flapping were used which were delivered on fixed-time schedules. When DRO was in effect a preferred item was delivered contingent upon pre-determined time intervals without the occurrence of the behaviour. The results showed that verbal reminders were ineffective whereas the DRO procedure led to near-zero levels of hand flapping behaviour.

DRO procedures may additionally be used in conjunction with self-management techniques. For instance, Koegel and Koegel (1990) implemented a treatment package consisting of the delivery of reinforcement when participants accurately recorded the absence of stereotypy. As a result, the frequency of stereotypy decreased for all participants. Similarly, Shabani, Wilder and Flood (2001) showed that motor stereotypy in the form of body rocking was effectively reduced as a result of a combination of discrimination training, a non-resetting five minute DRO schedule and self-monitoring in a 12 year old male diagnosed with autism. The results showed that the intervention was successful in eliminating the body rocking behaviour.

Therefore based on prior research findings, the purpose of the present study was to examine the effect of differential reinforcement of other behaviour along with self-monitoring on the self-injurious behaviour and motor stereotypy of a 12 year old boy with a diagnosis of autism.

Method

Participant

The participant was a 12 year old boy with a diagnosis of an autism spectrum disorder and attention deficit hyperactivity disorder. He was a listener and a speaker and had emergent reader and writer behaviours in repertoire. He also had a wide repertoire of mands and tacts with autoclitics and a large community of reinforcers from natural to prosthetic reinforcers. His English learning objectives included using correct pronouns, describing characters and writing simple lists. Math learning objectives included telling the time, identifying more and less quantities and paying for items. He earned pennies for academic responding which could be exchanged for items from his reinforcer catalogue. The participant emitted high levels of motor stereotypy behaviour throughout the day and also frequently engaged in self-injurious behaviour in the form of hand biting. The participant also previously engaged in head hitting behaviour; however the last instance of this behaviour was recorded several months ago.

Setting

The study took place at a CABAS® (Greer, 2002) School in England, an independent day school for pupils with an autism spectrum disorder. The schools opening hours were 9.15am through till 3.30pm or 3.45pm Monday to Friday. The school runs a 1:1 pupil to teacher ratio with a supervisor overseeing each class. Once a week, a school-wide assembly took place run by a different class each week. The class timetable also included weekly group Topic sessions, PE and off-site trips. Individualised instruction was carried out daily along with activity time at the end of the day such as ICT, reading in the library or the playground. The study primarily took place in the pupil's classroom where the pupil worked at an individual table opposite their teacher. In the classroom there was a leisure area as well as computer desks accessible to the pupils and teachers.

Materials

Materials included a timer, data sheet, marker pen and a computer or laptop.

Definition of behaviour

Motor stereotypy is defined as any instance of non-contextual or non-functional repetitive movements (Farber, 2010). Examples included flicking fingers or hands, hand flapping and pinching skin on fingers or hands. Self-injurious behaviour is defined as a class of behaviours an individual directs towards themselves that results in physical injury and tissue damage (Tate & Baroff, 1966). SIB took the form of hand bites, defined as closure of the upper and lower teeth on the flesh on either of his hands or fingers.

Data collection

Occurrences of motor stereotypy were collected using 1 minute partial interval recording for 10 minute sessions and collected four times daily. Data were graphed as the percentage of intervals with motor stereotypy. Self-injurious behaviour in the form of hand bites were collected using event recording and graphed as the number of occurrences. Antecedent-behaviour-consequence (ABC) data were additionally collected on the occurrence of hand bites. During the DRO training phase, data were collected as learn units (Greer & McDonough, 1999). Learn units describe the interaction between the teacher and student, representing a three-term interlocking contingency comprising an antecedent, behaviour and consequence which can predict student learning (Greer & McDonough, 1999).

Procedure

Baseline

During baseline, contingent upon any occurrence of hand biting behaviour the participant was instructed to place gloves on his hands and wear them for 5 minutes. Once 5 minutes had elapsed without hand biting behaviour they were removed. If motor stereotypy occurred during instructional times, the teacher instructed the participant to keep their hands still. Occurrences during non-instructional times, for example play times, were not consequated. ABC data were additionally collected on hand biting behaviour. Through this observational procedure, the antecedent was recorded as the setting event where the participant was immediately prior to the emission of hand biting. The behaviour was recorded as the exact behaviour that occurred and the consequence was recorded as what occurred immediately after the behaviour.

Treatment

The participant was initially taught to monitor their own behaviour using a three interval DRO board. In the first phase a probe was conducted to determine whether the participant could monitor their own behaviour independently using the DRO procedure. Learn units were then used to teach the participant to stop the timer upon hearing the beep, record a tick, restart the timer, to stop the timer upon emitting the target behaviours, record a cross and re-set the timer. Three intervals were initially targeted with each one 3 minutes in duration. Vocal praise was delivered if the participant independently completed any of the steps. If the participant did not complete any of the steps correctly or no response occurred (e.g. not stopping the timer upon hearing the beep), least-to-most prompting was used beginning with a gestural prompt to either the timer or DRO board and then a vocal prompt if the participant still did not respond correctly. Incorrect responses were not reinforced.

Criterion was set at 18 out of 20 correct responses to learn units for two consecutive sessions. Following five sessions a decision was made to provide a gestural prompt to the DRO board when the participant was required to deliver themselves a tick or a cross and a gestural prompt to the timer to restart/reset. Once criterion was met, the prompts remained in place; however the duration of each interval was increased to 5 minutes. Following criterion, the participant was required to complete all steps without additional prompts to record a tick or cross or reset the timer. Following five sessions, the participant was still unable to complete all steps to independently record their behaviour. Therefore a written text prompt was introduced which stated the steps the participant was required to complete. During corrections, least-to-most prompting was used beginning with a gestural prompt. Once criterion was met, intervals remained 5 minutes in length; however the number of intervals was increased to 5. The participant was also required to complete all steps without a written or gestural prompts.

While the DRO was in effect (instructional times only), the participant received reinforcement contingent upon not emitting the target behaviours (motor stereotypy and hand biting) throughout each of the specified intervals. At the end of each interval the participant gave himself a tick on the DRO board. After the specified number of intervals had elapsed without occurrence of the target behaviours he received his reinforcer which was printing pictures off the computer to take home. If any of the target behaviours occurred with in an interval, the participant recorded a cross on the DRO board and reset his timer. If two crosses were recorded the entire board was restarted.

Design

An AB design (Hersen, Michael & Barlow, 1976) was used to examine the effect of the DRO plus self-monitoring on the target behaviours.

Interobserver agreement

No interobserver agreement was obtained.

Results

Figure 1 shows the percentage of correct responses to learn units for monitoring own behaviour. The initial probe showed that the participant could not accurately monitor their own behaviour using the DRO procedure with an overall accuracy of 44% for one session. Following an additional 12 sessions the participant met criteria for monitoring their own behaviour using a three interval DRO board at 3 minutes in duration each. At session 7, gestural prompts were provided to prompt the participant to restart/reset their timer and record a tick or cross on the DRO board. At session 14 all steps were targeted without prompts for using a three interval DRO board at 5 minutes in duration each. After five variable data paths ranging from 55% to 85% accuracy, the data did not reveal a clear trend. In the next phase a written text prompt was introduced. The participant met criterion after three sessions ranging from 65% to 100% accuracy. In the next phase the written text prompt was removed. Criterion was met following six sessions ranging from 80% to 100% accuracy. In the final phase the number of intervals was increased to 5. The data showed that the participant was able to independently complete all steps with 95% accuracy.

Figure 2 shows the percentage of intervals with motor stereotypy across baseline and treatment phases. During baseline, occurrences of motor stereotypy were variable and ranged from 20% to 39% of intervals with stereotypy, with a mean of 29.5%. Following implementation of the DRO, the percentage of intervals with stereotypy ranged from 0% to 50% with a mean of 7.3%. Figure 3 shows the number of occurrences of self-injurious behaviour in the form of hand bites. During the baseline phase, the data were variable and ranged from 0 to 4 occurrences, with a mean of 1.72. After introduction of the DRO, the number of occurrences ranged from 0 to 2 occurrences with a mean of 0.3. The remaining nine sessions showed zero occurrences of this behaviour.

The ABC data showed that the majority of the antecedents to the hand biting behaviour included during instructional times in the classroom and during break times in the playground. Behaviours observed were consistent with one or multiple hand bites. The consequences for this behaviour were also consistent with the participant's behaviour guidelines where the teacher instructed the participant to wear their gloves for five minutes.

Discussion

The present study demonstrates the effectiveness of a differential reinforcement procedure with self-monitoring on the self-injurious behaviour and motor stereotypy of a 12 year old boy with autism. Prior to implementation of treatment, the participant engaged in high levels of motor stereotypy which occurred throughout the day and across settings. The ABC data did not reveal a single underlying antecedent prior to the emission of self-injurious behaviour. However, on the whole the participant appeared to emit this behaviour more frequently in the classroom when it was noisy or in the playground when he was engaged in energetic play or during periods of down time in the classroom. This suggests that the motivation for this behaviour was not escape from a demand task or to gain attention from his teachers.

After the DRO was introduced, occurrences of this motor stereotypy initially increased beyond baseline levels before stabilising and decreasing to near-zero occurrences. This initial increase may have been due to the participant adjusting to the DRO contingency and the self-monitoring component by detecting instances of his own motor stereotypy and hand biting behaviour. The participant also frequently engaged in self-injurious behaviour on a daily basis. This behaviour quickly stabilised following implementation of the DRO, with instances of the behaviour occurring during sessions 19, 21 and 22. This behaviour now remains at zero occurrences.

The effectiveness of this intervention contributes to the research literature on differential reinforcement as a tactic to reduce problem behaviour. The added self-management component is advantageous in that this can minimise the need for continuous staff observation to input the tactic. This would also therefore be effective in settings with low staff to pupil ratios or in other environments such as the home setting, making it easier to

implement, particularly when a thin schedule of reinforcement is still able to produce the desired outcomes in behaviour.

However, despite the positive results reported by the present study, there are a few limitations which should be considered. Firstly, a functional analysis was not carried out prior to implementing a treatment plan. By conducting a functional analysis this may have enabled a more effective intervention for stereotypy and consequently a more rapid reduction in stereotypic behaviours may have been observed. It is also possible that motor stereotypy and self-injurious behaviour may have been maintained by entirely different consequences, in which case different tactics could have been sought to target these two behaviours individually. The findings from this study indicated that motor stereotypy may have been maintained by automatic reinforcement due to the prevalence of the behaviour throughout the day, across both instructional sessions and playtimes during baseline. Therefore the effectiveness of the DRO intervention may have been due to the reinforcement received for not emitting the behaviour, competing with the automatic reinforcement served by the stereotypy.

A further limitation concerns whether it was differential reinforcement which produced the reductions in the behaviours or the self-monitoring component. A component analysis may therefore be required to determine which aspect of this type of intervention may produce the greatest effects. For instance, Fritz, Iwata, Rolider, Camp and Neidert (2012) reported that self-recording alone was insufficient at maintaining low levels of stereotypy and that a history of reinforcement for the absence of the problem behaviour was additionally necessary for reductions in stereotypy to occur. On some occasions in the present study, the participant still required some prompting to record a cross when the target behaviours were emitted, i.e. a gestural prompt to the DRO board when he engaged in stereotypy.

Discrimination training may therefore have been beneficial for this participant to ensure that he was fluent in the self-monitoring component of the intervention.

Additionally, a functional relationship cannot be determined from these findings as the intervention was not withdrawn. However, due to the nature of the self-injurious behaviour (large scars were visible on the participants hands due to hand biting) it may have been unethical to withdraw treatment when this behaviour in particular had reached zero occurrences and had maintained at this level for several sessions.

Further research is needed to determine whether a thinner schedule of reinforcement would lead to similar positive outcomes. This would be particularly beneficial in applied settings in order to produce the least disruption as possible to learning. In addition the DRO procedure does not teach an appropriate, alternative behaviour. For example, Lanovaz *et al* (2014) found that DRA decreased motor stereotypy, particularly body rocking and finger moving. The effectiveness of DRO can further be improved by combining it with an additional differential reinforcement procedure. For example, Wacker, Steege, Northrup, Sasso, Berg, Reimers, Cooper, Cigrand and Donn (1990) combined DRO with DRA to reduce body rocking behaviour by allowing access to an exercise bike or rocking chair which produced the same sensory consequences as the behaviour. Fellner, Laroche and Sulzer-Azaroff (1984) also combined DRO with DRI with an interruption component which effectively reduced motor stereotypy. Thus, teaching an alternative behaviour is important to produce long-term positive outcomes that will have the potential to generalise across environments. Another variable which may be considered concerns the rate of skill acquisition in the classroom. In this study, by effectively reducing the frequency of motor stereotypy, comparable increases in the number of learn units presented to the participant may have occurred. It is evidenced that engagement in high levels of this problem behaviour

can interfere with learning; therefore future research may consider measuring the rate of instruction and skill acquisition pre- and post-intervention.

Overall, the differential reinforcement procedure with self-monitoring was successful in decreasing both problem behaviours. The function of behaviour should also not be ignored which could reliably inform what tactic may be most appropriate in order to produce the most rapid changes. The pre-requisite skills of individuals also need to be taken into account which could further influence how effective a self-management component of a particular treatment may be. Future research may therefore seek to identify what participant characteristics are necessary to acquire an accurate self-management repertoire. Behavioural interventions should also take into account the social importance of addressing repetitive, stereotyped behaviours. Research has shown that social skills training in the form of peer training and social initiation instruction (Lofti *et al*, 2008) may be a beneficial component of strategies targeted towards these behaviours which could be considered by future research.

References

Bishop, S. L., Richler, J., Cain, A. C., & Lord, C. (2007). Predictors of perceived negative impact in mothers of children with autism spectrum disorder. *American Journal of Mental Retardation, 112 (6),* 450–461.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). Applied Behavior Analysis (2nd ed.)New Jersey: Pearson Education Inc.

Farber, R. (2010). The effects of response interruption and redirection and differential reinforcement of other behavior on motor stereotypy. *Master's Thesis, Boston, MA.*

Fellner, D. J., Laroche, & Sulzer-Azaroff, B. (1984). The effects of adding interruption to differential reinforcement on targeted and novel self-stimulatory behaviors. *Journal of Behavior Therapy and Experimental Psychiatry, 15,* 315-321.

Fritz, J. N., Iwata, B. A., Rolider, N. U., Camp, E. M., Neidert, P. L. (2012). Analysis of self-recording in self-management interventions for stereotypy. *Journal of Applied Behavior Analysis, 45,* 55-68.

Greer, R.D. (2002). Designing Teaching Strategies: An Applied Behavior Analysis System Approach. San Diego, CA: Academic Press.

Greer, R.D. & McDonough, S. H. (1999). Is the learn unit the fundamental unit of pedagogy? *The Behavior Analyst, 20,* 5-16.

Hersen, Michael & Barlow, & David H. (1976) *Single-case Experimental Designs: Strategies for Studying Behavioral Change*. Pergamon, New York.

Jones, R. S. P., Wint D., & Ellis, N. C. (1990). The social effects of stereotyped behavior. *Journal of Mental Deficiency Research, 34*, 261-268.

Koegel, R. L., & Covert, A. (1972). The relationship of self-stimulation to learning in autistic children. *Journal of Applied Behavior Analysis, 5*, 381-387.

Koegel, R. L., & Koegel, L. K. (1990). Extended reductions in stereotypic behavior of

students with autism through a self-management treatment package. *Journal of Applied Behavior Analysis, 23,* 119–127.

Lanovaz, M. J., Rapp, J. T., Maciw, I., Pregent-Pelletier, E., Dorion, C., Ferguson, S., & Saade, S. (2014). Effects of multiple interventions for reducing vocal stereotypy: Developing a sequential intervention model. *Research in Autism Spectrum Disorders, 8,* 529-545.

Lewis, M. H., & Bodfish, J. W. (1998). Repetitive behavior disorders in autism. *Mental Retardation and Developmental Disabilities Research Reviews, 4,* 80-89.

Loftin, R.L, Odom, S.L., & Lantz, J. F. (2008). Social interaction and repetitive motor behaviors. *Journal of Autism and Developmental Disorders, 38 (6),* 1124-1135.

Marcus, B. A., & Vollmer, T. R. (1996). Combining noncontingent reinforcement and differential reinforcement schedules as treatment for aberrant behavior. *Journal of Applied Behavior Analysis, 29,* 43-51.

Murphy, O., Healy, O., & Leader, G. (2009). Risk factors for challenging behavior for 157 children with autism spectrum disorder in Ireland. *Research in Autism Spectrum Disorders, 3,* 474–482.

Pierce, K., & Courchesne, E. (2001). Evidence for a cerebellar role in reduced exploration and stereotyped behavior in autism. *Biological Psychiatry, 49,* 655–664.

Reynolds, G. S. (1961). Behavioral contrast. *Journal of the Experimental Analysis of Behavior, 4,* 57-71.

Ringdahl, J. E., Andelman, M. S., Kitsukawa, K., Winborn, L. C., Barretto, A., & Wacker, D. P. (2002). Evaluation and treatment of covert stereotypy, Behavioral Interventions, 17 (1), 43-49.

Shabani, D. B., Wilder, D. A., & Flood, W. A. (2001). Reducing stereotypic behavior through discrimination training, differential reinforcement of other behavior and self-monitoring. *Behavioral Interventions, 16,* 279–286.

Soke, G. N., Rosenberg, S. A., Hamman, R. F., Fingerlin, T., Robinson, C., Carpenter, L., Giarelli, E., Lee, L. C., Wiggins, L.D., Durkin, M. S., & DiGuiseppi, C. (2016). Brief Report: Prevalence of self-injurious behaviors among children with autism spectrum disorder- A population-based study. *Journal of Autism and Developmental Disorders, 46 (11),* 3607-3614.

Tate, B. G., & Baroff, A. S. (1966). Aversive control of self-injurious behavior in a psychotic boy. *Behaviour Research and Therapy, 4,* 281-287.

Tiger, J. H., Fisher, W. W., & Bouxsein, K. J. (2009). Therapist and self-monitored DRO contingencies as a treatment for the self-injurious skin picking of a young man with Asperger syndrome. *Journal of Applied Behavior Analysis, 42,* 315-319.

Thompson, R. H., & Iwata, B. A. (2005). A review of reinforcement control procedures. *Journal of Applied Behavior Analysis, 38,* 257-278.

Varni, J. W., Lovaas, O. I., Koegel, R., & Everett, N. (1979). An analysis of observational learning in autistic and normal children. *Journal of Abnormal Child Psychology, 7,* 31–43.

Vollmer, T. R., Iwata, B. A., Zarcone, J. R., Smith, R. G., & Mazaleski, J. L. (1993). The role of attention in the treatment of attention-maintained self-injurious behavior: non-contingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavior Analysis, 26 (1),* 9-21.

Wacker, D. P., Steege, M.W., Northrup, J., Sasso, G., Berg, W., Reimers, T., Cooper, L, Cigrand, K., & Donn, L. (1990). A component analysis of functional communication

training across three topographies of severe behavior problems. *Journal of Applied Behavior Analysis, 23,* 417-429.

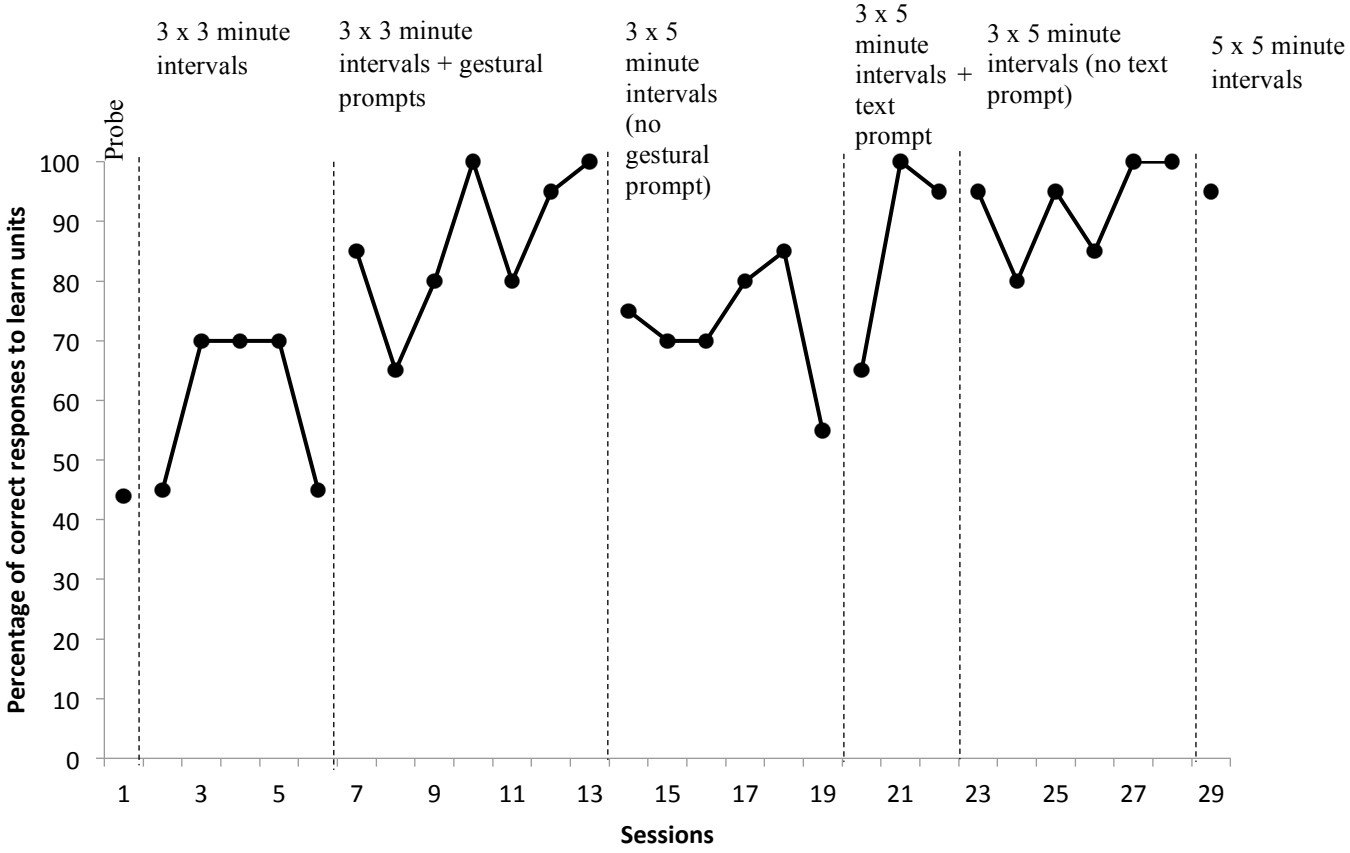

Figure 1: Percentage of correct responses to learn units for monitoring own behaviour programme

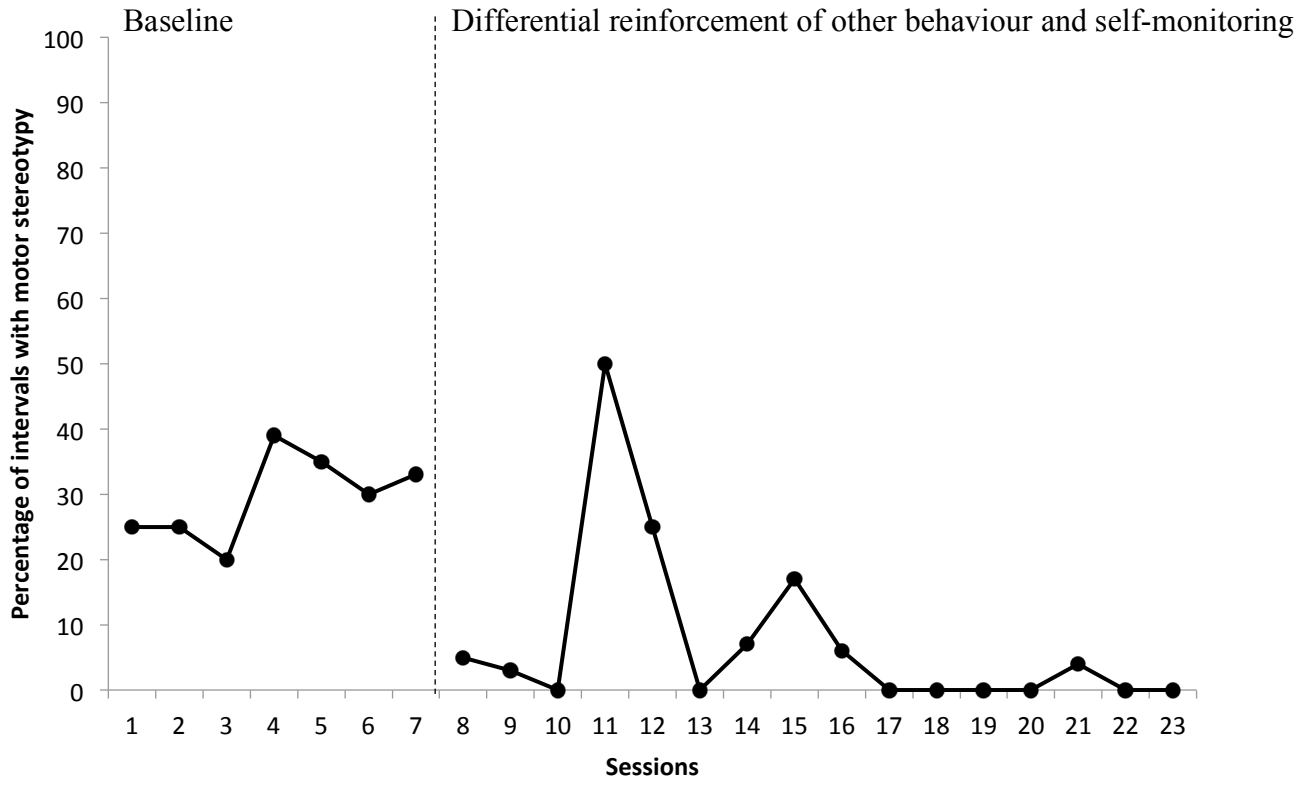

Figure 2: Percentage of intervals with motor stereotypy across baseline and treatment phases.

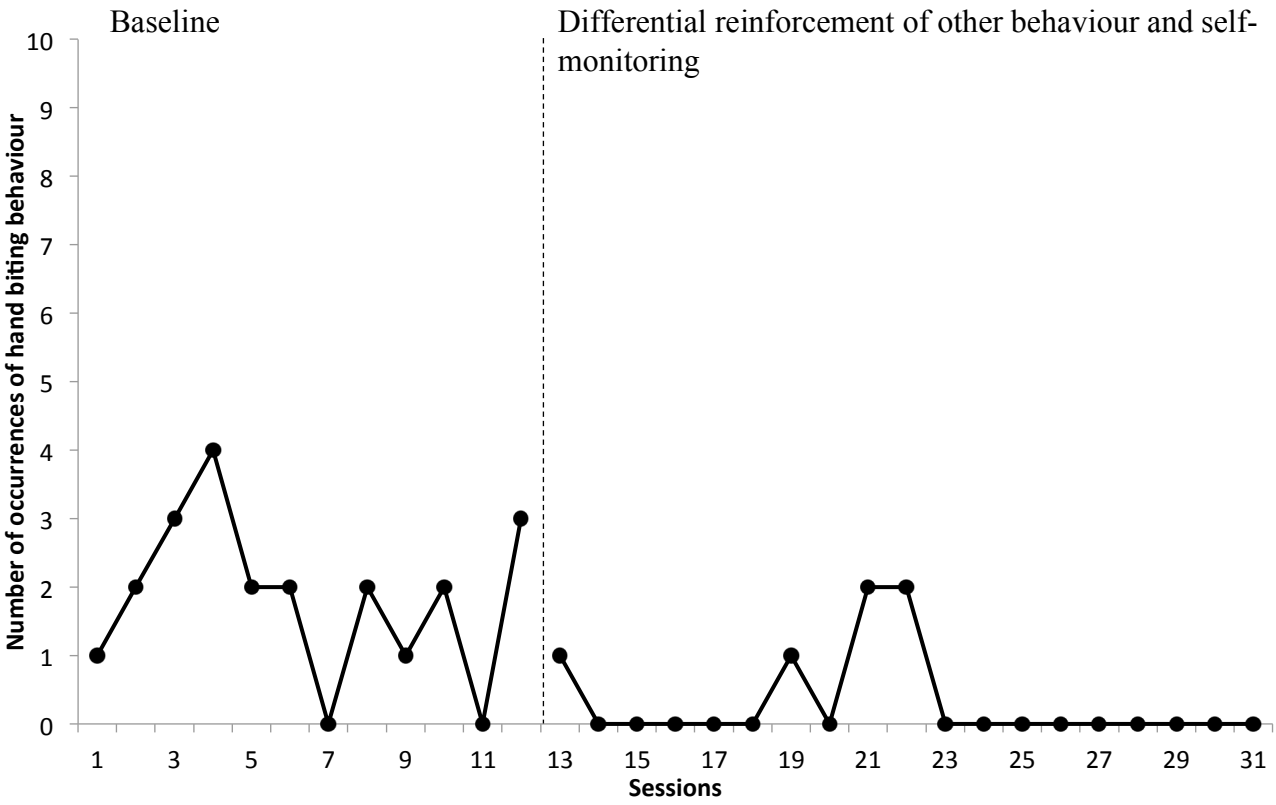

Figure 3: Number of occurrences of self-injurious behaviour (hand biting) across baseline and treatment phases.