Differential Reinforcement of Other Behaviour for the Reduction of Severe Nail Biting

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Abstract The effects of differential reinforcement of other behaviour (DRO) were investigated for the treatment of severe self-injurious nail biting in an individual diagnosed with autism. A functional behaviour assessment (FBA) identified that the behaviour was maintained by automatic reinforcement. Following the implementation of the DRO procedure and access to reinforcing stimuli that were believed to provide similar sensory feedback to that of the self-injurious nail biting, the results indicate that the nail biting was successfully reduced and maintained at near zero levels.

Keywords Nail biting · Differential reinforcement · Self injury · Automatic reinforcement

SIB, such as nail biting, can have serious implications for the individual if not effectively addressed and can lead to long lasting physical damage if left untreated (Long et al. 1998).

Implications for practice • DRO procedures can be used as a least-restrictive and non-intrusive intervention for addressing self-injurious behaviours (SIB) maintained by automatic reinforcement.

- In some cases, DRO can lead to frustration for the individual when access to reinforcement is denied due to occurrences of the behaviour.
- Using reinforcers that provide similar sensory feedback to that of SIB can potentially allow the individual to access the desired reinforcing properties from more socially acceptable materials, as opposed to engaging in the SIB.
- Combining a DRO procedure with access to reinforcers that provide similar sensory feedback can have positive outcomes for SIB in individuals with a diagnosis of autism.

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Self-injury that is maintained by automatic reinforcement can pose difficulties when treating the behaviour if an effective reinforcer has not been identified which can counteract the feedback received from the SIB (Cowdery et al. 1990). Often, the individual can become habituated to the SIB which can hinder the ability of practitioners to effectively address it. Many of the previous studies carried out on reducing self-injury utilised positive punishment procedures (Piazza et al. 1996), response blocking (Irvin et al. 1998; Reid et al. 1993) and the use of protective equipment (Mazaleski et al. 1994). While these studies displayed effective reductions in the SIB, the use of restrictive strategies may not be appropriate or necessary for young children in pre-school environments. Self-management treatments, such as habit reversal have been found to effectively reduce and maintain low levels of automatically maintained SIB, in particular nail biting (Delprato et al. 1977; Nunn and Azrin 1976). These studies, however, were typically carried out with adult participants and required comprehensive awareness training procedures with the participants.

While differential reinforcement procedures have been widely implemented to address inappropriate behaviour, the use of differential reinforcement for reducing automatically maintained self-injury appears to have been under-utilised in the literature (Cowdery et al. 1990). Some previous research has examined and found effective the use of providing alternative sensory activities that have topographical similarity to that of the SIB as part of differential reinforcement procedures (Favell et al. 1982; Goh et al. 1995; Patel et al. 2000). This is an important component in addressing automatically maintained self-injury as it provides alternative feedback which the individual is seeking, in a more socially acceptable way. The purpose of the current research was to further expand the limited research base to determine if a DRO procedure would result in a decrease in severe, self-injurious nail biting. In

addition, this research examined the effectiveness of providing reinforcers that were believed to provide similar sensory feedback to that of the SIB as part of the DRO procedure for reducing the SIB.

Method

John was a 4-year-old boy with a diagnosis of autism spectrum disorder. He attended an early intensive behavioural intervention (EIBI) pre-school setting. He engaged in severe SIB in the form of nail biting and it was reported by his parents that he also frequently engaged in the behaviour in the home environment and in the wider community. It was reported that he was most likely to engage in the behaviour when he was left alone. John's fingers exhibited visible tissue damage on the skin area around where the nail had been removed by his teeth. All sessions were conducted in the pre-school environment, 5 days per week for 4 h per day. John's SIB was defined as any time an attempt was made to place the fingernail past the plane of the lips, making contact with the teeth. Therapists conducted one-to-one intervention sessions with the participant and the therapist served as the primary data collector. Using a partial-interval recording measure, the therapist recorded the number of occurrences of nail biting. Inter-observer agreement (IOA) was assessed by having a second person record data simultaneously and independently with the primary observer during 35 % of the treatment evaluation sessions. IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements multiplied by 100 %. Agreement was defined as both observers recording either an occurrence or non-occurrences of nail biting. Overall agreement for the occurrence of self-injury averaged at 92 %.

An FBA was conducted with staff members and the participant's parents. The FBA concluded that the target behaviour was maintained by automatic reinforcement. Following this, a single stimulus presentation preference assessment was carried out (Hagopian et al. 2001) to identify the participant's most preferred reinforcers. The participant was presented with an array of reinforcer options, including dried rice, pasta, cereal and lentils, which had been identified as potentially providing similar sensory feedback to that of the SIB. The participant would insert his fingers into the different containers and move his fingers back and forth through the materials. The most preferred reinforcer options were then included on a reinforcer menu for the participant. Before starting, the participant was informed that if he exhibited no nail biting during the specified time interval he would receive access to his preferred items. The participant was then presented with a visual representation of his class rules and was directed to read the rules out loud with his therapist. The participant then chose his desired reinforcer from the reinforcer menu. Following this,

the auditory timer was started by the therapist. When the timer sounded at the end of the DRO interval, in the absence of nail biting, the participant was presented with social praise from the therapist and was given access to 30 s with the chosen reinforcer. Initially, the DRO interval was fixed at a dense schedule of 20 s. This was to provide the participant with multiple opportunities per minute to interact with competing reinforcers as an alternative to engaging in the SIB. The auditory timer was also used to indicate to the participant how long he had access to the reinforcer. If the behaviour occurred at any stage throughout the DRO interval, the therapist redirected the participant's hands to a neutral position, the timer was stopped and the therapist informed the participant that they had not followed their rules and that the timer would be re-started. The participant was directed to re-read the rules and the timer was re-started. Criteria for thinning the DRO schedule were set as two consecutive sessions of five or less occurrences of nail biting throughout the session. Follow up probes were conducted on a weekly basis over a subsequent 2-month basis until sessions finished for the school year and the participant graduated (Fig. 1).

Results and Discussion

In baseline, the average frequency of nail biting was 38 instances per session. Following the introduction of the DRO procedure, at a 20-s time interval, an initial high rate of nail biting was observed during the first session with 33 instances recorded. A subsequent decrease in SIB was observed during the following sessions with an average of five instances of nail biting. The specified criteria levels were achieved by session 7. The following intervention phases continued to systematically thin the DRO schedule while the nail biting continued to remain below set criteria levels with an average of two occurrences of SIB across sessions. Once the DRO reached 60 min, it was removed and the reinforcers were introduced to the participant's natural environment. Following intervention sessions, subsequent probes were conducted to ensure that low levels of SIB were maintained across the pre-school session. Post checks displayed an average of one occurrence of SIB across sessions. While data was not collected across other environments, it was reported anecdotally by the participant's parents that instances of nail biting had reduced significantly in the home setting and that nail growth had been observed for the participant.

The results indicate support for the use of a DRO procedure to address automatically maintained SIB. There are several important implications to consider in relation to this research. While there is a dearth in the literature on studies that have utilised DRO for addressing automatically maintained SIB, the current study has illustrated how DRO can effectively reduce SIB. Another important consideration is that this

Fig. 1 Frequency of nail biting behaviour for John across intervention phases. *Dashed lines* indicate changes to the DRO intervals

research supports the use of reinforcement procedures for addressing SIB, as opposed to the use of more restrictive, punishment procedures. It is also noteworthy that much of the previous research on SIB has evaluated treatment effects over brief time intervals, whereas the current research conducted the intervention across the participant's whole pre-school day. Finally attention should be drawn to the assessment and use of different types of reinforcing stimuli in the current study. It is noteworthy that using stimuli that were thought to produce similar sensory stimulation of the SIB could potentially have enabled the participant to access the reinforcing properties from more socially acceptable materials, as opposed to engaging in the previous self-injurious nail biting.

There are several limitations in this study that should be highlighted. It is difficult to conclude the generality of this study due to the inclusion of only one participant. While this intervention provided evidence of the effectiveness of a DRO for reducing SIB, it is important to note that for other individuals engaging in similarly severe SIB, a DRO may not maintain low or zero levels of the target behaviour. A second limitation is that this procedure was time consuming for staff to implement with the participant and to collect data and it required an extended period of implementation across the participant's whole pre-school day. While this allowed the behaviour to be frequently targeted, it required an intensive amount of monitoring. As discussed above, IOA was assessed for treatment evaluation sessions, however further treatment integrity monitoring would be recommend for similar DRO procedures to ensure reliable and accurate implementation. While it is often assumed that a DRO procedure is a least-restrictive and non-intrusive intervention for addressing SIB, it can at times become frustrating for the individual should they not successfully complete the DRO interval and gain access to their preferred reinforcing stimuli (Cowdery et al. 1990). To maximize the probability of the participant being able to gain access to their preferred stimuli in the current research, the materials that were chosen to be

engaged with by the participant were selected as they were believed to produce similar feedback to that of the SIB. Therefore, these reinforcers may potentially have increased the participant's motivating operation to refrain from engaging in the nail biting. Finally, as data was not taken on nail growth for the participant during this study, any reports of nail growth was anecdotal. It would be beneficial for future research to take nail growth into consideration as part of the data collection system for addressing nail biting as it would provide an observable physical permanent product. Combining a DRO procedure and providing reinforcers that were believed to provide similar sensory feedback to that of the SIB can have positive outcomes for SIB in individuals with a diagnosis of autism. The current research has added weight to the use of differential reinforcement as treatment for automatically maintained behaviours. While DRO procedures do provide an alternative, positive practice to addressing automatically maintained SIB, further research is required to extend its use and to explore its generality with different populations, specifically children with developmental disabilities, and also incorporating the use of reinforcing stimuli as part of a differential reinforcement procedure.

Compliance with Ethical Standards All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflict of Interest The authors declare that they have no competing interests.

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

References

- Cowdery, G. E., Iwata, B. A., & Pace, G. M. (1990). Effects and side effects of DRO as treatment for self-injurious behaviour. *Journal of Applied Behaviour Analysis*, 23, 497–506.
- Delprato, D. J., Aleh, E., Bambusch, J., & Barclay, I. A. (1977). Treatment of fingernail biting by habit reversal. *Journal of Behavior Therapy and Experimental Psychiatry*, 8, 319.
- Favell, J. E., McGimsey, J. F., & Schell, R. M. (1982). Treatment of self-injury by providing alternate sensory activities. *Analysis and Intervention in Developmental Disabilities*, 2, 83–104.
- Goh, H., Iwata, B. A., Shore, B. A., DeLeon, I. G., Leman, D. C., Ulrich, S. M., & Smith, R. G. (1995). An analysis of the reinforcing properties of hand-mouthing. *Journal of Applied Behavior Analysis*, 28, 269–283.
- Hagopian, L. P., Rush, K. S., Lewin, A. B., & Long, E. S. (2001). Evaluating the predictive validity of a single stimulus engagement preference assessment. *Journal of Applied Behavior Analysis*, 34, 475–485.
- Irvin, D. S., Thompson, T. J., Turner, W. D., & Williams, D. E. (1998). Utilizing increased response effort to reduce chronic hand mouthing. *Journal of Applied Behavior Analysis*, 31, 375–385.
- Long, S. E., Miltenberger, R. G., & Rapp, J. T. (1998). A survey of habit behaviors exhibited by individual with mental retardation. *Behavioral Interventions*, 13, 79–89.
- Mazaleski, J. L., Iwata, B. A., Rodgers, T. A., Vollmer, T. R., & Zarcone, J. R. (1994). Protective equipment as treatment for stereotypic hand mouthing: Sensory extinction or punishment effects? *Journal of Applied Behavior Analysis*, 27, 345–355.
- Nunn, R. G., & Azrin, N. H. (1976). Eliminating nail-biting by the habit reversal procedure. *Behavior Research and Therapy*, 14, 65–67.
- Patel, M. R., Carr, J. E., Kim, C., Robles, A., & Eastridge, D. (2000). Functional Analysis of aberrant behaviour maintained by automatic reinforcement: assessments of specific sensory reinforcers. *Research in Developmental Disabilities*, 21, 393–407.
- Piazza, C. C., Hanley, G. P., & Fisher, W. W. (1996). Functional analysis and treatment of cigarette pica. *Journal of Applied Behavior Analysis*, 29, 437–450.
- Reid, D. H., Parsons, M. B., Phillips, J. F., & Green, C. W. (1993). Reduction of self-injurious hand mouthing using response blocking. *Journal of Applied Behavior Analysis*, 26, 139–140.