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Reduction of automatically maintained self-injurious behavior

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ABSTRACT
Self-injurious behaviour (SIB) is highly prevalent in the population of children with autism spectrum disorders (ASD), with one-third of the sample engaging in it and in most cases, SIB is automatically reinforced. Therefore, the aim of this paper is to examine the effectiveness of the noncontingent matched stimulation (NCRMS) procedure in combination with wearing wrist weights on reducing automatically reinforced SIB in an 11-year-old participant with ASD and epilepsy who exhibited high rates of head and chin SIB, as well as to examine the effectiveness of the isolated application of those two procedures. NCRMS procedure alone leads to immediate SIB reduction for head SIB of 75% on average while for chin SIB leads to 90% of reduction on average. Wrist weight wearing alone was not as efficient, since it led to head SIB reduction of 31% on average and chin SIB reduction with an average of 51%. A combination of those two procedures was proven to be successful in reducing SIB, with the average success rate of 93% for head SIB and 98% for chin SIB. We believe that wearing wrist weights only increased response effort for engaging in problem behaviour, while the NCRMS procedure matched the reinforcing properties of SIB and consequently reduced it. It is important to examine the practical aspect of wearing massagers outside of the house because it can lead to attracting negative attention from others and future research might examine the acceptability of NCRMS procedure implementation that involves the use of certain objects that are not socially acceptable for public use.

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INTRODUCTION

Problem behavior is defined as behaviors that are considered aberrant and occur across all behavior dimensions and can affect safety of the person itself or its significant others (Emerson & Einfeld, 2011). Problem behavior is something that is frequently exhibited by children with autism spectrum disorders (ASD), especially self-injurious behavior (SIB), that is highly prevalent among population of children with ASD (Jang et al., 2011; Luiselli, 2008; Singh et al., 2011; Tiger et al., 2009). It is believed that one third of the population of children with ASD exhibits SIB (McTiernan et al., 2011; Murphy et al., 2009) and that SIB is up to five times more frequent in population of children with ASD, in comparison to other developmental disorders (Alimović, 2013; Emerson, 2003).

Possible functions of any problem behavior are considered to be access to tangibles or attention, escape or delaying the task and auto stimulation (Iwata et al., 1994), therefore the same refers to SIB. The procedure of determining the behavioral function is called functional behavior assessment (FBA) and is an experimental procedure where all those conditions are manipulated in order to see which condition would have the highest rates of problem behavior. However, if problem behavior occurs in all four assessment conditions, it is believed that the function is auto stimulation or that the behavior is automatically reinforced

(Cooper et al., 2007, p. 505). Automatically reinforced SIB has been hypothetically linked to a number of controlling variables and research suggests that treatment of automatically reinforced SIB is more difficult than SIB reinforced by other factors (Rooker et al., 2018).

There are several interventions that were successfully used in automatically reinforced SIB reduction in participants diagnosed with ASD, such as wearing protective equipment (Mazaleski et al., 1994), differential reinforcement procedures (Toussaint & Tiger, 2012), as well as punishment procedures (Thompson et al., 1999). However, research suggests that reinforcement-based interventions are proven to be more successful in SIB reduction, rather than punishment-based procedures (Rooker et al., 2018), especially non contingent reinforcement (NCR) procedure (Marcus & Vollmer, 1996) and matched stimulation (MS) procedure (Davis et al., 2013).

The aim of this paper is to examine the effectiveness of noncontingent matched stimulation (NCMRS) procedure in combination with wearing wrist weights on reducing SIB in a participant with ASD, as well as to examine the effectiveness of isolated application of those two procedures.

METHODS

Participant

Participant is a 13 year-old boy diagnosed with ASD and epilepsy. At the time of the procedure implementation, the boy attended remote education, due to COVID-19 pandemic regulations. He received focus treatment from a therapist six times a week in duration of one hours per session (six hours a week in total). His focus treatment consisted of stimulus-stimulus pairing procedure for inducing vocal speech (Stock et al., 2008; Sundberg et al., 1996), toilet training and SIB reduction.

Response definition and data collection

Self-injurious behavior was defined as any instance of forceful physical contact inflicted upon oneself with an open palm or fist, directed towards the head or chin.

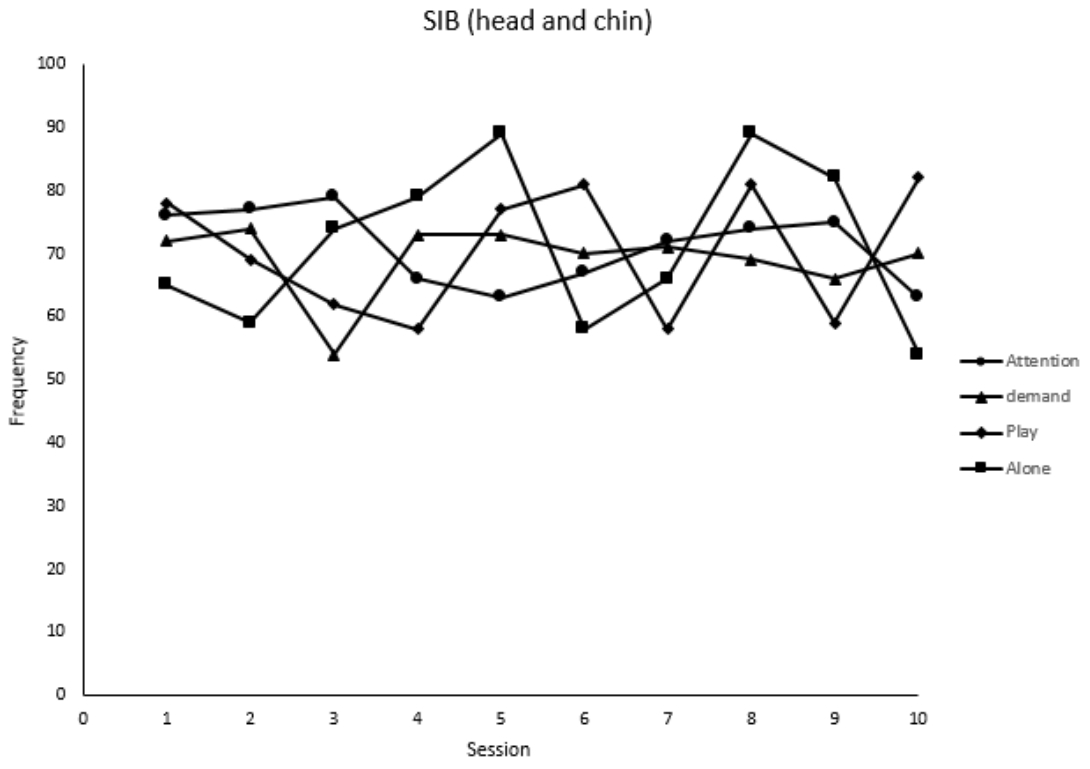

Figure 1. FBA results

FBA procedure was used to collect data about the function of SIB. We collected frequency data on SIB for both head and chin combined during 10 ten-minute sessions and SIB averaged from 54-89 (*Figure 1*). Based on the inspection of the graph, we determined that SIB was automatically reinforced, due to its occurrence across all four conditions at similar rates.

Procedures

NCRMS was delivered on a fixed one minute interval (FI1) for a duration of 10 seconds. The vibrating massager was provided and the therapist prompted the participant to press it against the places where SIB was exhibited (head or chin).

Wrist weights

Upon the beginning of a session, 0.5 kg wrist weights were put on a participant's wrists, in order to examine if increasing response effort would lead to SIB reduction. Prior to using them, it was observed whether wearing wrist weights would affect participants overall hand mobility and concluded that it did not constrict his movements while performing regular everyday activities.

NCRMS and wrist weights

The NCRMS and wrist weights condition consisted of the participant wearing wrist weights, while using a vibrating massage device noncontingently on a fixed interval (FI) 1 schedule for a duration of 10 seconds.

Materials, setting and research design

Materials used for the procedure were tally counter for frequency measurement, vibrating massager with soft round top, 0.5 kg wrist weights and data sheets for frequency data collection.

All sessions were conducted in a home environment by a therapist and, as it was stated previously, the sessions occurred six days a week in duration of one hour each.

We decided to use alternating design, in order to examine which intervention would be the most effective in SIB reduction. However, even though reversal design would be more appropriate in achieving experimental control, we decided to use alternating design instead, because of the ethical considerations regarding removal of an effective intervention for severe behaviors that cause harm to the individual (Morley, 2021), such as SIB.

RESULTS AND DISCUSSION

Baseline data was taken during three sessions (*Figure 2*) and head SIB ranged from 246-302 (mean of 277), while chin SIB ranged from 175-196 (mean of 184). X axis represents number of sessions, while Y axis represents rate per hour of SIB.

NCRMS procedure alone lead to immediate SIB reduction for the head SIB of 75% on average (SIB ranged from 45-84 per hour, with the mean of 68), while for chin SIB lead to 90% of reduction on average (SIB ranged from 15-24, with the mean of 19 per hour).

Wearing wrist weights was not as efficient, therefore we implemented this procedure for only four sessions. It led to head SIB reduction of 31% on average (range from 182-201, mean of 191 per hour), while the chin SIB reduction seemed to be more successful in problem behavior reduction with the average of 51% (range from 78-101, mean of 90 per hour).

Combination of those two procedures was proven to be successful in reducing SIB, with the average success rate of 93% for head SIB (range from 15-24, mean of 19 per hour) and 98% for chin SIB (range from 1-8, mean of four per hour).

Even while baseline data was variable, we decided to start with intervention implementation, because we believed it was unethical to collect any more baseline data for behavior that posed a health risk to the

individual. Baseline data suggested that head SIB appeared at higher rates than chin SIB and during the treatment phases, it remained that way, with the use of both procedures, as well as combination of the both.

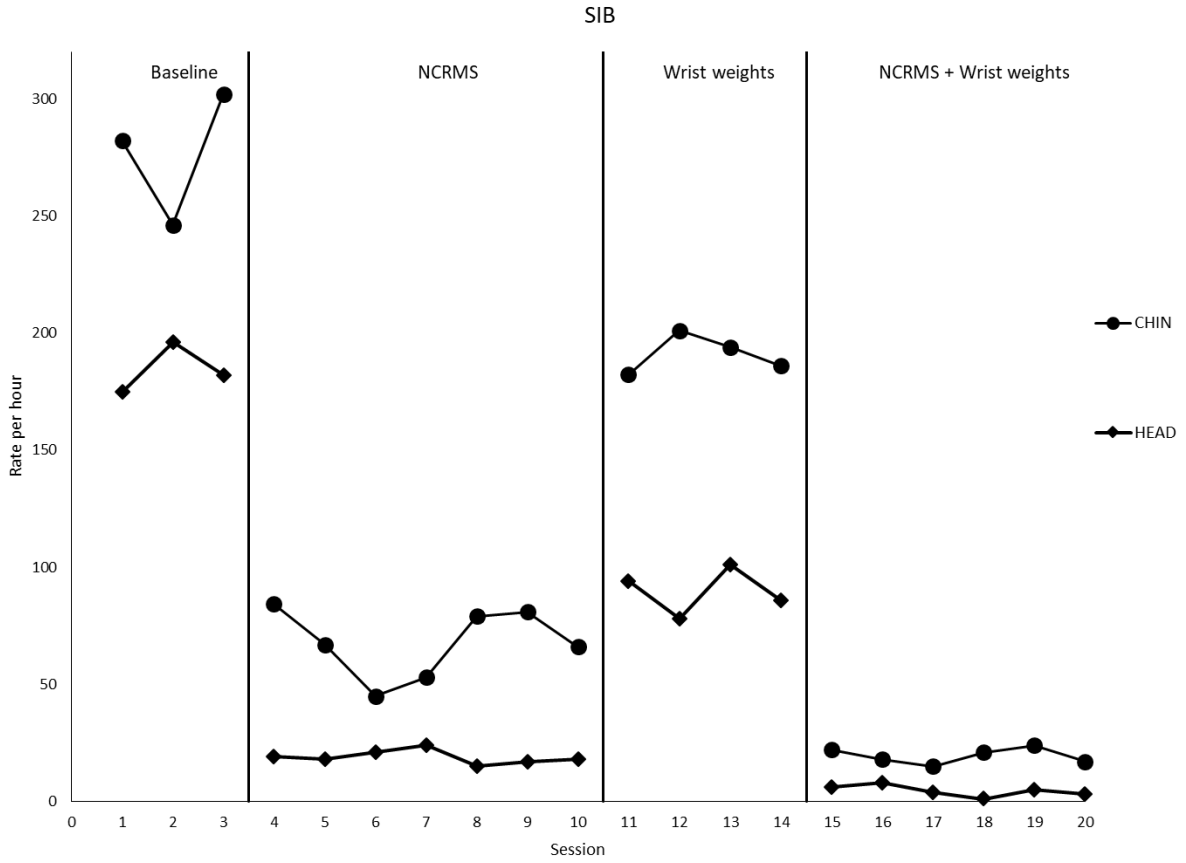

Figure 2. Intervention results

Both interventions in isolation lead to reduction of SIB. However, wearing wrist weights alone did not reduce SIB to acceptable levels. We believe that wearing wrist weights only increased response effort for engaging in problem behavior, therefore it reduced it by 41% on average for both types of SIB, which was insufficient. NCRMS procedure lead to significant SIB reduction, with the average of 83% for both types of SIB. However, the combination of the two lead to 96% of both SIB behavior reduction on average, which is an acceptable level.

SIB exhibited by the participant was of intensity and frequency that was severe and produced jaw line deformities. When a behavior is automatically reinforced, it is unethical to use punishment based procedures in order to eliminate reinforcing properties of the behavior (Jones, 1991) and SIB exhibited by our participant was also automatically reinforced, we decided to match the reinforcing properties of SIB, however in a way that does not pose any harm to the individual. We determined that the NCRMS procedure was effective in matching the reinforcing properties of SIB and consequently reducing SIB.

Follow up sessions were conducted six months after the procedure implementation and the SIB maintained at low level, compared to the baseline results. However, the participant did not use wrist weights, he used only the vibrating massager that was available to him in his home environment whenever he wanted it. It is important to examine the practical aspect of carrying a massager outside of the house, because it can lead to attracting negative attention from others. Future research may focus on alternating NCRMS, wrist weights and differential reinforcement procedures, such as DRI or DRO in order to compare the effectiveness of each in reducing SIB in participants with different diagnoses.

CONCLUSION

The NCRMS procedure alone resulted in a reduction in both head SIB and chin SIB. Meanwhile, the use of weights on the wrist alone is not that efficient, because it causes a smaller reduction in both head SIB and chin SIB. The combination of the two procedures has been shown to be successful in reducing SIB, with an average success rate of 93% for head SIB and 98% for chin SIB. The results showed that the noncontingent matched stimulation (NCMRS) procedure combined with the use of wrist weights was effective in reducing SIB in ASD participants.

REFERENCES

Alimović, S. (2012). Emotional and behavioral problems in children with visual impairment, intellectual and multiple disabilities. *Journal of Intellectual Disability Research, 57*(2), 153–160.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis (2nd ed.).* Upper Saddle River, NJ: Pearson Education.

Cullinan, D., Epstein, M.H., & Loyd, J., (1982). School behavior problems of learning disabled and normal girls and boys. *Learning Disability Quarterly, 4*(2), 163–169. https://doi:10.2307/1511001

Davis, T. N., Dacus, S., Strickland, E., Machalicek, W., & Coviello, L. (2013). Reduction of automatically maintained self-injurious behavior utilizing noncontingent matched stimuli. *Developmental neurorehabilitation*, *16*(3), 166-171.

Došen, A. (2005). Mentalno zdravlje djece s mentalnom retardacijom. *Medicina, 42*(41), 101-106.

Emerson, E. (2001). *Challenging behavior: Analysis and intervention in people with severe intellectual disabilities.* Edinburgh: Cambridge University Press.

Emerson, E., Einfeld, S.L. (2011). *Challenging behavior.* Cambridge, UK: Cambridge University Press.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of applied behavior analysis*, *27*(2), 197-209.

Jang, J., Dixon, D. R., Tarbox, J., & Granpeesheh, D. (2011). Symptom severity and challenging behavior in children with ASD. *Research in Autism Spectrum Disorders, 5*(3), 1028-1032. doi:10.1016/j.rasd.2010.11.008

Jones, R. S. (1991). Stereotypy: Challenging behavior or adaptive response. *Cognitive Behavior Therapy*, *20*(1-2), 25-40.

Luiselli, J. (2008). *Antecedent (preventive) intervention.* In J. K. Luiselli, D. C. Russo, W. P. Christian, & S. M. Wilczynski (Eds.), Effective Practices for Children with Autism, Educational and Behavioral Support Intervention that Work (pp. 393-412). New York: Oxford University Press.

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*(1), 43-51.

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*(2), 345-355.

McTiernan, A., Leader, G., Healy, O., & Mannion, A. (2011). Analysis of risk factors and early predictors of challenging behavior for children with autism spectrum disorder. *Research in Autism Spectrum Disorders, 5(*3), 1215-1222. doi:10.1016/j.rasd.2011.01.009 36.

Morley, J. (2021). The ethical status of social impact bonds. *Journal of Economic Policy Reform*, *24*(1), 44-60.

Murphy, O., Healy, O., & Leader, G. (2009). Risk factors for challenging behaviors among 157 children with autism spectrum disorder in Ireland. *Research in Autism Spectrum Disorders, 3*(2), 474-482. doi:10.1016/j.rasd.2008.09.008

Oatly, K., & Jenkins, J. M. (2003). *Razumijevanje emocija.* Naklada Slap, Jastrebarsko.

Rooker, G. W., Bonner, A.C., Dillon, C.M., & Zarcone, J.R. (2018). Behavioral treatment of automatically reinforced SIB: 1982-2015. Journal of Applied Behavior Analysis, 51(4): 974–997. doi:10.1002/jaba.492.

Singh, N. N., Lancioni, G. E., Winton, A. S., & Singh, J. (2011). *Aggression, tantrums, and other externally driven challenging behaviors*. In J. L. Matson & P. Sturmey (Eds.), International Handbook of Autism and Pervasive Developmental Disorders (pp. 413-435). New York: Springer.

Stock, R.A., Schulze, K.A., & Mirenda, P. (2008). A comparison of stimulus-stimulus pairing, standard echoic training and control procedures on the vocal behavior of children with autism. *Analysis of Verbal Behavior, 24*, 123-133.

Sundberg, M.L., Michael, J., & Partington, J.W. (1996). The role of automatic reinforcement in early language acquisition. *The Analysis of Verbal Behavior, 13,* 21-37.

Thompson, R. H., Iwata, B. A., Conners, J., & Roscoe, E. M. (1999). Effects of reinforcement for alternative behavior during punishment of self-injury. *Journal of Applied Behavior Analysis*, *32*(3), 317-328.

Tiger, J.H., Fisher, W.W., Toussaint, K.A., & Kodak, T. (2009). Progressing from initially ambiguous functional analyses: Three case examples. *Research in Developmental Disabilities, 30*(5), 910–926. https://doi.org/10.1016/j.ridd.2009.01.005.

Toussaint, K. A., & Tiger, J. H. (2012). Reducing covert self-injurious behavior maintained by automatic reinforcement through a variable momentary DRO procedure. *Journal of Applied Behavior Analysis*, *45*(1), 179-184.