Behavioural and Cognitive Psychotherapy, 2002, 30, 237–241
Printed in the United Kingdom DOI: 10.1017/S1352465802002138

USING A HAND-TAP RESPONSE WITH A VIBRATION MICROSWITCH WITH STUDENTS WITH MULTIPLE DISABILITIES

Giulio E. Lancioni

University of Leiden, The Netherlands

Nirbhay N. Singh

Virginia Commonwealth University, USA

Mark F. O'Reilly

University College Dublin, Eire

Doretta Oliva

Lega F. D'Oro Research Centre, Osimo, Italy

Abstract. Selecting a convenient response, and a microswitch suitable to it, is critical to successfully introduce students with multiple disabilities to a microswitch-aided programme. This study evaluated the use of a hand-tap response with a vibration microswitch with two students. Both students increased the frequency of the hand-tap response during treatment and maintained such an increase at 3-month follow-up. Procedural issues, practical implications of the findings, and measures for promoting long-term response maintenance/ extensions were discussed.

Keywords: Hand-tap response, multiple disabilities, vibration microswitch.

Introduction

Over the last two decades, a number of studies have examined microswitch-aided programmes to help persons with severe and profound multiple disabilities obtain desired environmental events and reduce their level of isolation (Crawford & Schuster, 1993; Gutowski, 1996; Sullivan, Laverick, & Lewis, 1995). Microswitches are tools that can be operated

Reprint requests and requests for extended report to G. E. Lancioni, Department of Psychology, University of Leiden, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands. E-mail: Lancioni@fsw.leidenuniv.nl

through relatively simple responses, such as a light hand pressure or a specific head movement (Ko, McConachie, & Jolleff, 1998; Lancioni, O'Reilly, & Basili, 2001).

Essential steps for introducing students with multiple disabilities to a microswitch-aided programme include the selection of convenient responses, the adoption of microswitches suitable to such responses, and the use of potentially reinforcing environmental stimuli (Lancioni et al., 2001). With regard to convenient responses, one generally refers to responses that are either available or highly likely, do not require excessive physical effort, and can be produced fairly reliably. For example, hand tapping on a table top might be more convenient (in terms of performance efforts and coordination requirements) than pressing on a specific microswitch placed on the table or reaching a specific microswitch with the head (cf. Langley, 1990; Sullivan et al., 1995). A hand-tap response could be detected by means of a vibration microswitch (i.e., a microswitch activated by the response-generated vibrations of a table top). Activations of the microswitch could lead to brief periods of stimulation.

Although the aforementioned combination of response and microswitch may be quite useful (particularly for students who possess the response), no experimental evidence is so far available to support it. This study was to evaluate such a combination with two girls with profound multiple disabilities.

Method

Participants

The two girls (Susan and Emily) were 13.9 and 6.9 years old respectively, lived at home with their parents, and attended daily special educational centres. Susan was born prematurely and had cerebropathy, spastic tetraparesis, epilepsy, lack of speech, and blindness in one eye and undetermined (limited) residual vision in the other eye. She had satisfactory head and trunk control, and reacted to familiar sounds and songs and vibrotactile stimulation by alerting (turning/widening her eyes) or smiling. Emily had Aicardi syndrome, with epilepsy, generalized psychomotor delay, lack of speech, and episodes of sleepiness. She had satisfactory head and trunk control, possessed functional residual vision and reacted to various visual stimuli (by alerting and following them). Both girls were rated in the profound range of intellectual disability, were confined to a wheelchair, and showed some hand-tap responses. The parents had consented to the study.

Microswitch and control system

An adapted version of a commercial vibration microswitch (Adaptivation, Inc., Sioux Falls, SD 57105, USA) was used. It consisted of a battery-powered device of 11 × 8 × 3.5 cm that could turn a specific table top into a tap sensitive area. The microswitch was linked to a control system (a case of 13 × 10 × 6 cm) which, during treatment, was linked to different environmental stimuli (e.g., audio-tapes with songs and light sources). When the participant produced the hand-tap response and activated the vibration microswitch, some of the stimuli connected to the system would be activated for 7 seconds.

Selection of stimuli to be used contingent on the hand-tap response

Interviews with parents and caregivers, preliminary observations, and a stimulus preference screening served for selecting the environmental stimuli to be used contingent on the hand-tap response (Crawford & Schuster, 1993). Eventually, eight types of stimuli were selected for each participant (e.g., audio-tapes with familiar songs, audio-tapes with loud noises and alarm sounds, vibrating pillows, flickering lights, light fibre compositions, and light tubes with bubbling effects).

Setting, sessions and data collection

The study was carried out in a special educational centre. The participants received averages of four or five sessions per day, 5 or 6 days a week. The sessions typically lasted 10 minutes, but for Emily they could be terminated earlier if seizures or sleepiness occurred. Two research assistants implemented the sessions and recorded the number of hand-tap responses. Their percentages of agreement on recording the responses (checked in 12% of the sessions, and computed by dividing the smaller reported number by the larger reported number and multiplying by 100%) were between 86 and 100, with means exceeding 97.

Experimental conditions

The study was carried out using a non-concurrent multiple baseline design across participants. The treatment phase for Emily started after she had received nearly twice the number of baseline sessions used for Susan. A follow-up check also occurred.

Baseline. The microswitch and control system were in use, but no stimuli/consequences occurred for the responses. Yet, during the last four sessions, the research assistant presented (noncontingently) the stimuli to be used during treatment at intervals of about 30 seconds. This served to check whether an increased level of stimulation would produce an increased level of responding. Every session started with the research assistant guiding the participants to perform a hand-tap response. Guidance would be repeated after periods of non-responding of about 2 minutes.

Treatment. Hand-tap responses were followed by the selected stimuli, automatically activated through the control system (see above). Three to six stimuli were automatically rotated within the sessions. The number of sessions varied across participants based on their availability. Guidance by the research assistant occurred as in baseline except in the first three or five sessions, where it could occur every 30–60 seconds (if no independent responding was present) so as to increase exposure to the contingent stimuli.

Follow-up. The follow-up check was carried out 3 months after the end of treatment (according to treatment conditions) and included 10 sessions.

Results

The upper panel of Figure 1 shows the data for Susan, the lower panel the data for Emily. During baseline, Susan had a mean frequency of about 1.7 responses per minute (independent of guidance from the research assistant). The frequency did not seem to change

https://doi.org/10.1017/S1352465802002138 Published online by Cambridge University Press

during the last four baseline sessions (when an increased level of stimulation was used). During treatment, her mean frequency of responding was about twice her baseline level. Emily had a mean baseline frequency of about 1 response per minute (with no visible changes during the last four sessions). During treatment, she had a gradual and clear increase in responding; her mean frequency was more than three times her baseline level. Both participants maintained the treatment gains at 3-month follow-up.

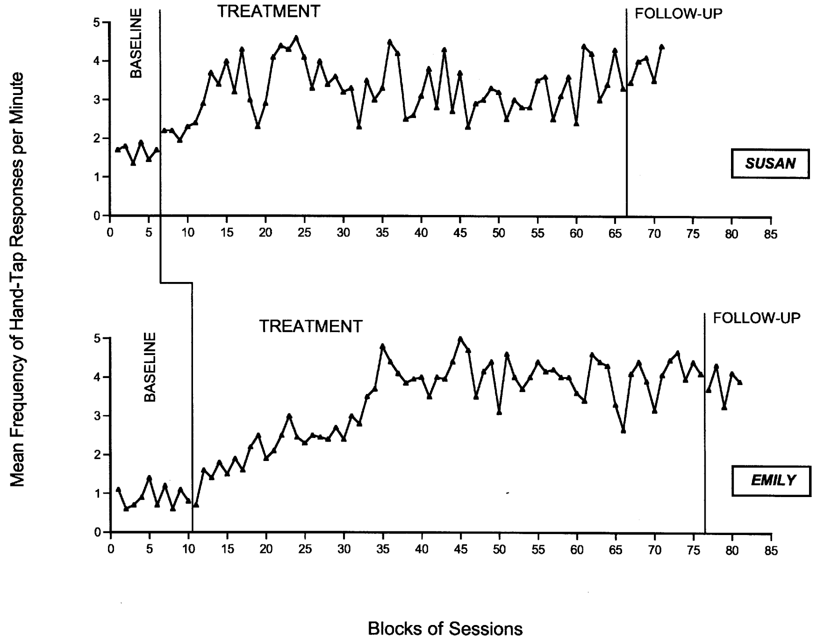

Figure 1. The upper panel shows the data for Susan, the lower panel the data for Emily. Each data point represents the mean frequency of hand-tap responses per minute (performed independent of any guidance) over a block of two sessions. Only the last point of a phase can include a single session.

Discussion

The data indicated that the hand-tap response and vibration microswitch were appropriate (functional) for the two participants of this study. These data could have important practical implications for parents and staff developing programmes for students with a limited range of behaviours. Since the design of the study did not include a reversal phase, the role of the contingent stimuli in increasing responding was not specifically assessed. Nonetheless, this role seemed critical. In fact, a few (initial) instances of guidance by the research assistant could hardly have ensured an increased level of responding for both participants (Miltenberger, 1997; O'Brien, Glenn, & Cunningham, 1994). The gradual progress of Emily might be interpreted as a sign of slow learning consolidation or difficulty in reaching performance control (Sullivan et al., 1995).

The variety of stimuli available and their systematic rotation across sessions may have been very important in preventing possible problems of satiation during the study. The

https://doi.org/10.1017/S1352465802002138 Published online by Cambridge University Press

continuation of the programme (or a likely extension of it with new responses and microswitches) would probably require new, preferred stimuli to be introduced from time to time.

New research should assess the replicability of the present findings with other persons with multiple disabilities, and determine strategies and guidelines for expanding the treatment programme to additional responses and microswitches (Lancioni et al., 2001; Sullivan et al., 1995).

References

Crawford, M. R., & Schuster, J. W. (1993). Using microswitches to teach toy use. *Journal of Developmental and Physical Disabilities*, *5*, 349–368.

Gutowski, S. J. (1996). Response acquisition for music or beverages in adults with profound multiple handicaps. *Journal of Developmental and Physical Disabilities*, *8*, 221–231.

Ko, M. L. B., McConachie, H., & Jolleff, N. (1998). Outcome of recommendations for augmentative communication in children. *Child: Care, Health and Development*, *24*, 195–205.

Lancioni, G. E., O'Reilly, M. F., & Basili, G. (2001). Use of microswitches and speech output systems with people with severe/profound intellectual or multiple disabilities: A literature review. *Research in Developmental Disabilities*, *22*, 21–40.

Langley, M. B. (1990). A developmental approach to the use of toys for facilitation of environmental control. *Physical and Occupational Therapy in Pediatrics*, *10*, 69–91.

Miltenberger, R. (1997). *Behavior modification: Principles and procedures*. New York: Brooks/Cole.

O'Brien, Y., Glenn, S., & Cunningham, C. (1994). Contingency awareness in infants and children with severe and profound learning disabilities. *International Journal of Disability, Development and Education*, *41*, 231–243.

Sullivan, M. W., Laverick, D. H., & Lewis, M. (1995). Fostering environmental control in a young child with Rett syndrome: A case study. *Journal of Autism and Developmental Disorders*, *25*, 215–221.