

## The Effects of a Motor Training Package on Minimally Assisted Standing Behavior in a Three-Month-Old Infant

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### Abstract

Behavior analysts have spent relatively little time in designing interventions to enhance motor development in typically developing infants and children. This study examines the effect of a motor training package consisting of opportunity to respond and practice (standing the infant and letting her hold the fingers of the experimenter), conditioned leg kicks (using Fischer Price's Kick and Play) and buttocks and trunk lifts (stimulated by contingent imitation of the infants responses) on minimally assisted standing behavior in a three month old infant. Using an ABAB reversal design, we were able to dramatically increase the amount of time the infant stood and decrease the infant's rate of wobbling while standing. Future directions for this research are discussed.

Key words: Opportunity to respond, practice, standing, infant, cusp skills, and motor development

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Thelen and Fisher (1982) reignited interest in environmental variables that affect infants motor development. Behavioral theories of development tend to hold that development is the product of person-environment interactions (Novak & Pelaez, 2004) and that learning plays a central role in development (Gewirtz & Pelaez-Nogueras, 1994). While behavior analysts and behavioral educators have completed research on many areas of development including adaptive physical education with school aged children (Magill, 1993; Schmidt, 1991), infant motor development appears to have lagged behind.

One concept that holds considerable promise for infant motor development is opportunity to respond (Greenwood, Carta, Hart, Kamps, Terry, Arreaga-Mayer, Atwater, Walker, Risley, & Delquadri, 1992). Opportunity to respond has potential in facilitating children's language development (Hart & Risley, 1995) and has significant implications for cognitive development (Greenwood, Delquadri, & Hall, 1984; Greenwood, Hart, Walker, & Risley, 1994). However, a literature search on the term, using psycho-info, produced no results for the area of motor development.

We became interested in the subject matter of opportunity to respond, as well as sensory reinforcement for motor behavior, because it was: (1) simple enough to track; (2) susceptible to environmental influences; and (3) a fun series of activities for parents to do with typical infants. The current study represents an on going extension of our work on motor development.

### *Methods*

#### Participant

Participant: is a three-month-old female. She is typically developing. She is the same subject as previously described in Cautilli and Dziewolska (2005). At birth subject was 9lbs 15 ounces and 22 inches placing her in the 99%ile for weight and 98%ile for height. At the time of the study she was approximately 18lbs and 26 inches long.

## Procedure

### Intervention Package

The package consisted of a daily routine. This routine included:

- Two to three periods of approximately 20 minutes in the Fischer Price Kick and Play©. The Kick and Play uses visual and auditory reinforcement in the form of flashing lights and common children's tunes for kicking responses. The tunes are played on an intermittent schedule with brief segments of sound played for kicks that do not achieve full reinforcement of a song.
- 10-15 standing episodes. These episodes involve the infant grabbing on to the two index fingers of the experimenter. The infant is then lifted to the standing position. The fingers represent an assist to give the infant an opportunity to respond. While in the standing position, the experimenter would look very excited by raising eyes, making exaggerated facial expressions, and talking to the infant – praising her for standing.
- Two 15-minute episodes of contingent imitation for trunk and buttocks lifting. This procedure was identical to the procedure used in Cautilli & Dziewolska (2005). The infant would engage in approximately 10-25 trunk/buttocks lifts per session.

### Behavior targets defined

Minimally assisted standing is defined as lifting the infant to the upright position while infant holds to the experimenter's index fingers. In the standing position the infant is supporting her own body while on both feet with no other part of the body touching ground.

Wobbling behavior is defined as a rotation or movement of the hips.

### Probe procedure

The first standing session was taking place in the morning, approximately half an hour after the infant awoke and was breastfed. The probe data was graphed (See Graphs 1&2) and formed the basis for the results provided in this study Figures 1-5 are pictures of an actual probe session.

FIGURES 1-5, NEXT PAGE!



**Figure 1. Assisted Standing Sequence**



**Figure 2. Assisted Standing Sequence**



**Figure 3, Assisted Standing Sequence**



**Figure 4. Assisted Standing Sequence**



**Figure 5. Stimulus Generalization of Minimally Assisted Standing**

#### Inter-Observer Agreement

The experimenters calculated the inter-observer agreement on both wobbles and duration of standing. The experimenters counted the number of wobbles on three separate sessions. The total number of agreements was 28 and disagreements 4. IOA was calculated by the equation of agreements / agreements + non-agreements multiplied by 100. An 87.5% coding agreement occurred between the experimenters. Duration of standing was defined as the time from when the infant was assisted to standing until the time the infant sat. The experimenters measured duration using stopwatch. The time on the stopwatch was viewed by both experimenters, which allowed for an IOA score of 100%

#### Design

The primary purpose of experimental research is to examine relationships between independent and dependant variables (Connell & Thompson, 1986; Kearns, 1986; McReynolds & Thompson, 1986). Within subject-designs are flexible in that an experimenter can tailor the design to the phenomenon being studied (Connell & Thompson, 1986). This study used a reversal (A/B/A/B) design. The reversal design is the most straightforward illustration of experimental logic. The basic logic underlying single subject research is that the experimenter controls for extraneous variables by comparing the individual's performance under intervention to the performance on the baseline (McReynolds & Thompson, 1986). In this study, the reversal design offered a procedure for investigating the effects of the motor training package on infant's standing behavior.

The experimenters compared the behavior of the subject during the baseline condition, to the intervention condition. The experimenters assumed that the subject's performance during baseline 1 & 2 condition would predict future performance if no intervention occurs (see



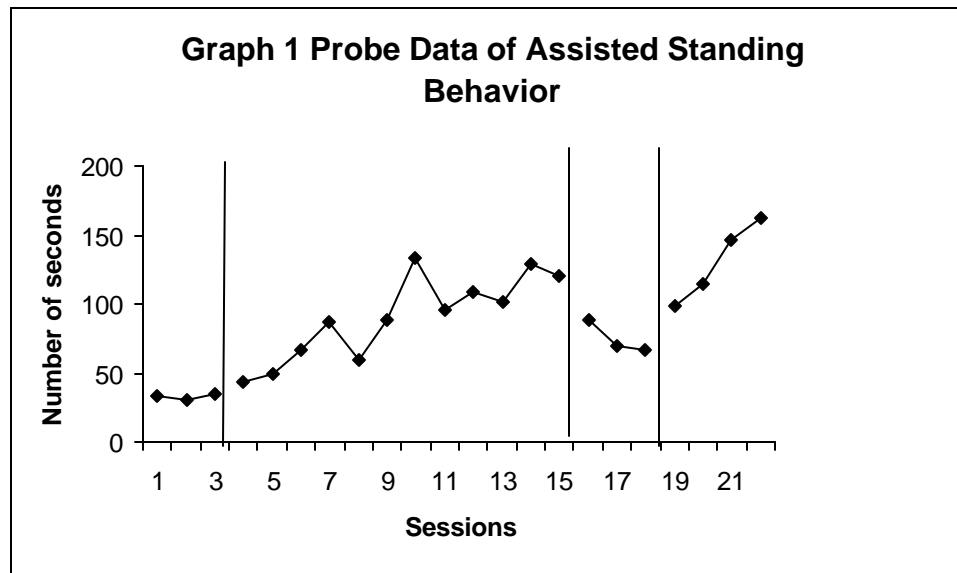
McReynolds & Thompson, 1986). After an initial baseline, in which the child was probed daily the experimenters introduced the intervention package. The AB phase shows if an effect exists; however, the simple AB phase does not allow the experimenters to demonstrate internal validity.

An internally valid design is one in which the researcher presents evidence that any differences in performance are not due to extraneous conditions (McReynolds et al. 1986). While the variables impinging on the subject during baseline are at least similar to those during intervention, the experimenter must demonstrate they are the same. It is always possible that some third variable unknown to the experimenter is actually responsible for the change (Kearn, 1986). In this study, the author observed for extraneous variables that might better explain the results and none were found; however, it is the reversal condition, which allows the experiment to have internal validity.

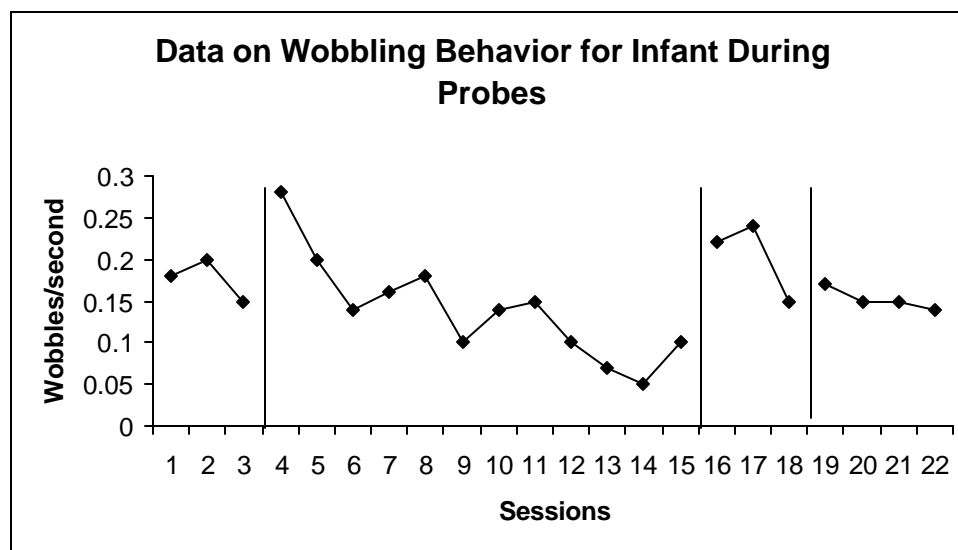
After the initial treatment package phase, the experimenter initiated the withdrawal phase. In this phase, the infant was only lifted for the probes. She was not placed on the Fischer Price Kick and Play © and was not engaged in the contingent imitation for trunk lifts. This lasted for three days. After this condition, the experimenter reinstated the motor intervention package. In this within subject study, the experimenter considered extraneous influences equally present during the baseline and intervention phases (see Kearns, 1986). Clearly, a possible role for maturation was considered but did not materialize.

When the experimenter initiates the within-subject replication, it allows the researcher to make a statement of a functional relationship (Alberto & Troutman, 1999; Bergan & Kratochwill, 1990). Thus, in a reversal design, the experimenter first achieves a stable baseline. When this occurs, then intervention phases begin. If the change in the behavior is in the predicted direction, then the experimenter has confirmed the effect. This is followed by a return to baseline phase in which the intervention is withdrawn. The prediction is that without the intervention the rates of the behavior would decline and return near the original baseline. If this occurs, it verifies the original baseline. In the final phase, the experimenter restores the intervention and this verifies the initial experimental effects. Thus, the sequence was baseline, prediction + verification (intervention 1), return to baseline (prediction + verification), and finally intervention (prediction + verification of prediction).

Graphs 1&2, Next Page!



Graph 1: Probe data graph, Assisted Standing Behavior



Graph 2: Probe data graph, Wobbling Behavior

### *Results*

In the initial baseline phase, the mean length of standing was 32.7 seconds. The average rate of infant wobbles/second during baseline was .18. In the initial phase of introducing the motor package the mean length of assisted standing during the probes was 90.2 seconds. The average rate of wobbles/second during the probes was .14. In the withdrawal (return to baseline phase), the mean length of standing during the probe session was 74.3 seconds. The average rate of wobbles/second was .20. In the reinstitution of the training package, the mean during the probe increased to 130.8 seconds. The average rate of wobbles/second was .15.

### Discussion

Growing evidences exists to support learning as having a major role in the behavioral development of children (Gewirtz & Pelaez-Nogueras, 1994). In this case, it is clear that the package facilitated minimally assisted standing behavior in this infant. In addition, we were surprised not to find any evidence of maturation during the return to baseline phase. The latter concerns us because it brings up questions as to how durable the effect will be.

The number of subjects in the study limits the generality of these results. Thus, the study awaits replication. We are continuing the current level of intervention to determine if it will eventually facilitates unassisted standing and possibly walking behavior.

While motor development in a typical infant probably is not a major concern for most parents, standing and walking could be considered critical cusp skills (Rosales & Baer, 1994). As a behavioral cusp, this skill could hold the key to prevention of problems from developing or to ameliorate the impact of problems (Bosch & Hixson, 2004). One area that could profit from this type of intervention package could be for children with Down syndrome.

On average, infants with Down syndrome walk about 1 year later than typically developing infants. Currently, only one evidenced based practice exists for facilitating motor development with Down syndrome children and this involves the infant stepping response. The infant stepping response is well established (Peiper, 1929, 1969). Ulrich, Ulrich, Angulo-Kinzler, and Yun, (2001) found that using a tread mill, which provides the opportunity to respond and to practice the stepping reflex, the experimental group learned to walk with help and to walk independently at a significantly faster rate (73.8 days and 101 days, respectively) than the control group. This produced, statistically, a large effectsize for the group differences. Since infant walking is clearly a cusp skill, this may have some benefit on cognitive and social development in these children. The latter remains to be assessed.

### References

- Bergan, J.R. & Kratochwill, T.R. (1990). *Behavioral consultation and therapy*. Plenum Press.
- Bosch, S. & Hixson, M.D. (2004). The final piece to a complete science of behavior: Behavior development and behavioral cusps. *The Behavior Analyst Today*, 5(3), Page 244-252.
- Cautilli, J.D. & Dziewolska, H. (2005). Brief Report: Can contingent imitation reinforce trunk lifting in a three-month-old infant? *The Behavior Analyst Today*, 6, 250-262.
- Connell, P.J. & Thompson, C.K. (1986). Flexibility of single-subject experimental designs. Part III: Using flexibility to design or modify experiments. *Journal of Speech and Hearing Disorders*, 51, 214-225.



- Gewirtz, J.L. & Pelaez-Nogueras, M. (1994). In the context of gross environmental and organismic changes, learning provides the main basis for behavioral development. In S. Bijou & Ribes, I. (Eds.) *New Directions in Behavioral Development*. Context Press. Reno: NV
- Greenwood, C. R., Carta, J. J., Hart, B., Kamps, D., Terry, B., Arreaga-Mayer, C., Atwater, J., Walker, D., Risley, T., & Delquadri, J. (1992). Out of the laboratory and into the community: 26 years of applied behavior analysis at the Juniper Gardens Children's Project. *American Psychologist*, 47, 1464-1474
- Greenwood, C. R., Delquadri, J., & Hall, R. V. (1984). Opportunity to respond and student academic performance. In W. Heward, T. Heron, D. Hill, & J. Trap-Porter (Eds.), *Behavior analysis in education* (pp. 58-88). Columbus, OH: Merrill.
- Greenwood, C. R., Hart, B., Walker, D., & Risley, T. R. (1994). The opportunity to respond revisited: A behavioral theory of developmental retardation and its prevention. In R. Gardner III, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshleman, & T. A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 213-223). Pacific Grove, CA: Brooks/Cole.
- Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Brooks.
- Kearns, K. (1986). Flexibility of single subject experimental designs. Part II: Design selection and arrangement of experimental phases. *Journal of Speech and Hearing Disorders*, 51, 204-213.
- Magill, R. A. (1993). *Motor learning: Concepts and applications*. (4<sup>th</sup> ed.). Madison, WI, Brown and Benchmark.
- McReynolds, L.V. & Thompson, C.K. (1986). Flexibility of single-subject experimental designs. Part I: Review of the basics of single participant designs. *Journal of Speech and Hearing Disorders*, 51, 194-203.
- Novak, G. & Pelaez, M. (2004). *Child and adolescent development: A behavioral systems approach*. SAGE Publications: Thousand Oaks: London.
- Peiper, A. (1929). Die schreibbewegungen der neugeborenen. *Monatsschrift fur Kinderheilkunde* 45, 444.
- Peiper, A. (1961). *Cerebral Function in Infancy and Childhood*. Consultants Bureau, New York.
- Rosales-Ruiz, J & Baer, D.M. (1994). A behavior-analytic view of development. In S. Bijou & I. Ribes (Eds.). *New Directions in Behavioral Development*. Context Press: Reno: Nevada.
- Schmidt, R. A. (1991). *Motor learning & performance: From principles to practice*. Champaign, IL: Human Kinetics.
- Thelen, E., & Fisher, D. M. (1982) Newborn stepping: An explanation for a "disappearing

reflex". *Developmental Psychology*, 18, 760- 775

Ulrich, D.A., Ulrich, B.D., Angulo-Kinzler, R.M., and Yun, J. (Nov, 2001). Treadmill training of infants with Down syndrome: Evidence-Based developmental outcomes. *Pediatrics*, 108 (5), p. e84-e88 <http://pediatrics.aappublications.org/cgi/content/full/108/5/e84>

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