Treatment of Pica Using a Pica Exchange Procedure with Increasing Response Effort

Stacy L. Carter
Texas Tech University

Abstract: The effects of a pica exchange procedure were evaluated on the pica of a female with severe mental retardation. A BAB design revealed that the pica exchange procedure was effective at reducing the occurrence of pica. In addition, the pica exchange procedure was effective throughout six increasingly more difficult response effort conditions. Results suggest that extended periods of treatment using successive approximations may overcome initial resistance to increases in response effort.

Response effort has been shown to be a factor in the development of treatments for automatically reinforced behaviors (Piazza, Roane, Keeney, Boney, & Abt, 2002; Shore, Iwata, DeLeon, Kahng, & Smith, 1997; Zhou, Goff, & Iwata, 2000). Piazza et al. examined the effects of response-effort on access to pica items and access to alternative items for three individuals. Response effort was manipulated for accessing the pica item and for accessing the alternative reinforcer. Overall, findings revealed that the allocation of pica and the alternative response shifted depending on the degree of response effort associated with each response.

Research on treatments for pica has been mostly limited to analog conditions which does not allow for an examination of the external validity of the findings (Piazza et al., 1998; Piazza et al., 2002). Goh, Iwata, and Kahng (1999) developed a pica exchange procedure comprised of differential reinforcement of an alternative response with response interruption which was implemented in the participants' natural setting. The procedure consisted of teaching the individuals to turn cigarettes over to staff in exchange for highly preferred edible items. While the pica exchange procedures were considered effective for three of the four participants across several settings and therapists, the procedure required that a therapist remain nearby with an outstretched hand ready to receive the pica item. The immediate availability of the therapist to exchange the pica item appeared to be a necessary component of treatment in order to maintain low response effort for the participants to complete the alternative response.

The current study attempted to evaluate varying levels of response-effort associated with a pica exchange procedure over an extended period of time within the participant’s natural environment. Pica exchange with increasing response effort was used to decrease the frequency of pica for a woman whose pica consisted of multiple substances. The study demonstrated how a pica exchange procedure could be developed into a topography of behaviors that would act upon the environment in a more effective manner while minimizing the need of a therapist to be immediately available to exchange the pica item.

Method

Participant and Setting

Barbara was a 72-year old woman who had lived in a state residential facility for persons with developmental disabilities for most of her life. Barbara had been diagnosed with profound mental retardation, diabetes, obesity, and bilateral cataracts. She ambulated by using a wheelchair and communicated using unintelligible vocalizations and pointing at...
items. She had been referred for treatment of pica based on staff observations and by x-ray of stomach content. Pica items consisted of small metal objects (paper clips, staples, etc.), strings of fabric, and candy wrappers. Functional analysis sessions were conducted in an observation room with a one-way mirror. All other sessions were conducted on the grounds of the residential facility during day programming activities and evening leisure activities.

Response Measurement and Reliability

Pica was defined as picking up and moving a non-edible item to within less than six inches of the mouth. Pica exchange was defined as Barbara placing a non-edible item in the hand of a staff member and receiving an edible item in return. Data on Barbara’s behaviors were collected using an event recording procedure with paper and pencil on preprinted 30-min interval data sheets. Inter-observer agreement was assessed by having a second observer independently collect data during 30% of training sessions (168/567) and 27% of days outside of training sessions (227/852). Agreement was calculated for pica and pica exchange by dividing the smaller frequency observed by the larger frequency observed and multiplying by 100%. Mean exact agreement for pica during training sessions was 98.6% and 94.1% outside of training sessions. Mean exact agreement for pica exchange was 84.7%. Inter-observer agreement was collected during 100% of the functional analysis conditions and the mean exact agreement for the nonoccurrence of pica was 100%. Data were evaluated using a BAB design with variations in the response effort associated with the treatment. This design was considered necessary in order to avoid withholding treatment. In addition, the withdrawal condition was initiated due to unavoidable circumstances related to Barbara’s health which limited her dietary intake and mobility during the 6th month following treatment. During the 7th and 8th month following treatment her health was considered stable, but treatment re-introduction was delayed due to concerns regarding her physician’s orders to limit physical exertion during this time period.

Functional Analysis

A functional analysis consisting of attention, demand, play, and alone conditions was conducted using procedures based on those outlined by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Throughout all conditions numerous inedible items which were previously identified as having been ingested by Barbara were placed around the room where they could be easily accessed by Barbara. In addition, a therapist remained in the room with Barbara at all times in order to intervene and prevent actual ingestion of a pica item if necessary. The presence of the therapist modified the alone condition to a no interaction condition with a therapist present. This modification was considered necessary to prevent injury and to address concerns regarding the ethical issue of attempting to elicit pica behavior during the functional analysis (see Hastings and Noone, 2005 for further discussion). Results of the functional analysis were inconclusive because no target behaviors occurred during five 10 minute sessions.

Preference Assessment

A formal preference assessment using forced choice methods outlined by Piazza, Fisher, Hagopian, Bowman, and Toole (1996) was used to determine possible items for use during training sessions. Both edible and inedible items were included in forced choice pairings. Results showed that chocolate, cookies, coffee, crackers, and diet soda were highly preferred and these items were preferred over inedible items.

Training

Training for pica exchange was conducted using the procedures outlined by Goh et al. (1999) in which Barbara had to use a pica item placed within arms reach to perform the exchange within 10 s of an initial verbal request. After 10 s a sequence of gestural, verbal, or physical prompts were used to ensure the exchange. Any attempt to ingest a pica item was physically blocked. The need to increase the response effort associated with exchanging the pica item was considered necessary to shape the pica exchange procedure into a
topography of behaviors that would act upon the environment in a more effective manner. Essentially, Barbara would need to perform the pica exchange at times when a staff member was not immediately available to receive the pica item and deliver the edible.

Procedures similar to those used by Shore et al. (1997) were incorporated to measure response effort using the approximate distance Barbara had to roll her wheelchair to complete the pica exchange. The distances evaluated for completing the pica exchange were as follows: 1 m, 2 m, 2.74 m, 3.35 m, 3.66 m, and 5.18 m. In addition, at 3.66 m Barbara could not see the therapist and at 5.18 m she had to enter another room in order to complete the pica exchange. Twenty trials per day were conducted during the first three distances, while at 3.35 m and 3.66 m the number of trials was reduced to 10 per day and at 5.18 m the number of trials was reduced to four per day.

**Results and Discussion**

Figure 1 shows the frequency of pica across the varied treatment conditions and the withdrawal condition. Pica was observed to occur at lower frequencies during all of the treatment conditions in comparison to the withdrawal condition. Immediately following each increase in response effort, except for the 3.35 m condition, the occurrence of pica increased from the previous condition. Each increase in number of pica occurrences was followed by a month with a lower number of pica occurrences within that same response effort condition. Figure 2 shows the percentage of independent pica exchanges. The percentage of pica exchanges decreased following each increase in response effort except for the 3.35 m condition. Pica exchange ranged from 65% independent performance to 100% independent performance.

Previous findings reported by Piazza et al. (2002) suggested a negative correlation between the allocation of responding with pica or an acceptable alternative behavior and levels of response effort. This study demonstrated some similar results but emphasized that associated diminishing allocation of appropriate responses with increased response-effort may be temporal in nature. Following
all but one condition of increasing response effort (3.35 m), an increase in the frequency of pica was observed. This increase in pica was shown to be temporal or reactionary to the initial increase in response effort by lower observed frequencies of pica under the same response effort conditions and subsequent higher response effort conditions.

External validity has been a limitation of several previous studies on pica (Piazza et al. 1998; Piazza et al. 2002). The current study addressed this limitation by evaluating a pica exchange treatment across several settings within the participant’s natural environment. Additionally, pica behavior was reduced over a two year period using a pica exchange procedure. While reinforcer preference has been demonstrated to vary over time (Bowman, Piazza, Fisher, Hagopian, & Kogan, 1997; Stafford, Alberto, & Fredrick, 2002), the current study demonstrated stability of reinforcement over a two year period, similar to findings reported by Zhou, Iwata, Goff, and Shore (2001).

One limitation of this study was that the procedure took a long period of time to produce near zero rates of pica. This was considered acceptable in this situation due to the potentially long history of reinforcement associated with pica and the health restrictions that limited the quantity and quality of food reinforcement available. Another limitation was that the withdrawal of the pica exchange procedure was not planned but was rather a result of health related issues which prevented the continuation of the procedure. Her health issues introduced some confound to the interpretation of the data during the first month of the withdrawal of treatment, although during the following two months in which the treatment was withdrawn, her health was stable and there were no obvious confounds noted with these data.

Future studies should evaluate the possibility that a negative correlation between response allocation and response effort may be temporal. The possibility of a temporal nature of these correlations may be most evident in behaviors considered to have an automatic function. Vollmer (1994) indicated that behaviors referred to as having an automatic function are not controlled by therapists but

Figure 2. Percentage of independent pica exchanges.
Responses are allocated based on the reinforcement received from performing the behavior. Piazza et al. (2002) indicated that automatically reinforced behaviors produce a choice arrangement in which an individual may choose to engage in the automatically reinforced behavior or another behavior based on the parameters associated with each such as quality, volume, etc. Individuals displaying automatically reinforced behavior may have the potential to shift their response allocation over a lengthy period of time to a response requiring higher response effort. Future research should examine the behavioral economics of automatically reinforced behaviors over extended periods of time.

References


Received: 1 October 2007
Initial Acceptance: 1 December 2007
Final Acceptance: 5 March 2008