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REDUCING SELF-INJURY AND CORRESPONDING SELF-RESTRAINT THROUGH THE STRATEGIC USE OF PROTECTIVE CLOTHING

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We examined the use of protective clothing to reduce a retarded male's face-punching and leg-kicking and two corresponding forms of self-restraint—arm and leg self-restraint. The resident was observed each day in three sessions of randomly ordered conditions (one condition per session): without any protective clothing, with a padded helmet, and with a padded helmet and padded slippers. Use of the padded helmet substantially reduced face-punching and arm self-restraint. The addition of padded slippers reduced leg-kicking and leg self-restraint. These results suggest a practical and effective means of controlling self-injury and self-restraint. They are also consistent with the possibility that the resident's arm restraint was maintained in part by escape or avoidance of face-punching and that his leg restraint was maintained in part by escape or avoidance of leg-kicking.

DESCRIPTORS: protective equipment, self-restraint, self-injurious behavior, negative reinforcement, retardation

Many retarded persons harm themselves by hitting or kicking their own bodies; interestingly, some of these people also exhibit behaviors that seem designed to prevent their individual forms of those self-injurious behaviors. It is an intriguing commentary on the nature of self-injury to see those persons struggle to reduce it, as if the behavior belonged to someone else.

Typically, the apparently protective behaviors are incompatible with self-injury: They involve entangling the aggressive limbs in clothing, furniture, or other persons, or placing them under other parts of their own bodies (Baroff & Tate, 1968; Favell, McGimsey, Jones, & Cannon, 1981; Rojahn, Mulick, McCoy, & Schroeder, 1978; Sommers, 1982; Traugott & Campbell, 1981). That provocative topography has attracted the label "self-restraint."

Observations of self-restraint encourage the guess that it maintains because it impedes self-injurious behavior (Baroff & Tate, 1968; Murphy, 1978, p. 199; Sommers, 1982, p. 4). This is tantamount to supposing that self-restraint is negatively reinforced by escape from or avoidance of self-injury. This interpretation requires experimental evaluation, if possible. But experimental evaluation requires the systematic removal of the opportunity for self-injury contingent on the behavior under study, and experimental reintroduction as a consequence of sufficiently long nonperformance of that behavior. When the event in question is another behavior of the person, as in this case, rather than some external stimulus event, that degree of experimental control may elude researchers. Affirmation of the consequent may seem the realistic alternative.

Rojahn et al. (1978) approached such an inferential analysis of self-restraint. They found that the head-hitting of a retarded man decreased when he was provided with a jacket with pockets into which he placed his hands. His self-restraint and self-injury may have covaried simply because of their physical near-incompatibility. But, was incompatibility their only relationship? If so, then an operation that eliminated self-injury without punishing

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or preventing self-restraint and without differential reinforcement of nonrestraint should leave self-restraint unchanged, or, perhaps, increase it, by making that time available for it.

But if self-restraint decreased when self-injury was eliminated in this manner, that would show that the behaviors were related in additional ways—if, for example, self-restraint was maintained by reduction or delay of self-injury. Once self-injury was efficiently removed, self-restraint could no longer diminish self-injury, and if that had been its only function, it should extinguish.

This experiment selectively reduced the face-punching and leg-kicking of a retarded male by using protective clothing (cf. Parrish, Aguerrevere, Dorsey, & Iwata, 1980; Rincover & Devany, 1982), to see what effect that would have on his two forms of self-restraint–self-restraint of his arms and of his legs.

(Although some authors have suggested that self-injury may decrease when protective equipment is applied because the self-injury was previously maintained by its sensory consequences, which are removed by the application of the protective equipment, we make no such assumptions about the causes of the self-injurious behavior in this resident.)

METHOD

Resident

A 13-year-old male who was profoundly retarded and legally blind participated in the study. He had been a resident of the Kansas Neurological Institute since age 7. His punches to the eyes and chin, kicks to the leg, and slams of the forearm against hard objects produced localized bruises and swelling.

Setting and Apparatus

Sessions were conducted in a small room while subject sat on a foam rectangular mat. In some subsessions, a Fisher-Price toy wind-up radio was used; it was modified to play only 10 seconds of music per wind. In other subsessions, wooden 2.54-cm cubes were used with a rectangular cardboard box, 43 cm × 76 cm × 18 cm. A circular aluminum dish, 2.5 cm in diameter and 7.6 cm deep, sunken in the top center of the box, was the receptacle for the blocks. A cassette recorder and home-made timer and relay played consecutive 10 seconds of a children's song ("Witches Brew") per switch operation.

The hard plastic helmet had a clear plastic face mask (Danmar, 09821/FG-CL) and was thoroughly padded inside. In addition, 3-cm thick foam padding was placed over the outer surface of the helmet and the face mask, except for the mask's eye and mouth openings. A 1.9-cm thick (Cramer) forearm pad was attached to the back of each slipper (Payless Coasters) to cover all of each heel, extending 20.3 cm up the back of each leg.

Procedure

Each day the resident served in three randomly ordered conditions (one session per condition): (a) In Condition A, he did not wear the helmet or the slippers, (b) in Condition B, he wore the padded helmet, (c) in Condition C, he wore the padded helmet and the padded slippers. Otherwise, the three conditions were identical. Before and after each session, the resident wore that session's clothing for 1 minute.

Experimental sessions. Each session was divided into three successive 2-minute subsessions. In the first subsession, manipulate blocks, the resident sat on the mat by the cardboard box, and at 30-second intervals the experimenter placed a block in the receptacle on the mat in front of the resident and said "(Name), put the block in the can" and then tapped the aluminum dish (the can). Each block taken from the receptacle and placed in the can produced 10 seconds of music.

At 30-second intervals in the second subsession, wind radio, the experimenter wound the toy radio until two clicks were heard (which would produce 5 seconds of music) and placed it on a marked spot on the mat. Then, he said, "(Name), wind the radio," unless the resident was already winding the radio or music was playing at any 30-second point.

At 30-second intervals in the third subsession, stand and walk, the experimenter said, "(Name), stand up." Music was provided for 10 seconds each time the resident moved from a sitting to a standing position, or if at any time he moved his foot in a forward direction (while standing). Instructions were not given if he was standing.

Response definitions. Arm restraint was scored when the resident placed any portion of either hand between his pants and his body, or if his arm or hand was pinned between any part of his body and the mat. Leg restraint was scored when one or both legs, bent at the knee, was pinned down (on the mat or on the floor) by the weight of the trunk of the body, or if the legs were spread apart enough to form an angle of 90 degrees or more while standing or walking. The definition of leg restraint was amended on the 9th day to include instances when the resident's buttocks were on the mat, one or both legs was bent at the knee, and that leg's foot was on the mat, all at the same time.

Arm self-injury was divided into two categories: (a) punches with closed fists to the head or helmet, and (b) all hits (with closed fist), slaps (with open hand), or scratches (with fingernails) to nonhead body parts or objects including the toy radio, the floor, the helmet, or the cardboard box (the only hard objects available). Scratching was scored when a fingertip and fingernail was hit against the skin. Leg self-injury included kicks (with heel of foot) to any part of the body or to any object described above. A hand was considered to have touched the radio or a block when the palmar surface of any finger contacted it.

Recording procedures. Behaviors were recorded from the videotapes of each session, using a 10-second partial-interval recording system. Two observers independently scored every videotape. (Only one observer scored the two topographies of arm self-injury described previously. A second, new observer scored the tapes of seven randomly selected sessions.)

RESULTS

Figure 1 shows that the padded helmet decreased head- or helmet-punching and one-arm restraint. Percentages of intervals containing punches to the head or helmet are shown in the left-column graphs; percentages of intervals when the resident's arms were free from restraint are shown in the right-column graphs, for the successive wind radio, manipulate blocks, and stand and walk subsessions of Conditions A (open circles and dashed lines), B (solid squares and lines), and C (solid triangles and lines).

The resident punched his head consistently throughout the experiment when not wearing the padded helmet in Condition A. However, in Conditions B and C, the padded helmet virtually eliminated punches to the head or helmet. Also, at least one arm was free from restraint in substantially more intervals when the subject wore the padded helmet (Conditions B and C) than when he did not (Condition A).

Figure 2 shows that the percentage of intervals containing leg self-injury and leg self-restraint was reduced when the resident wore the padded slippers (represented by open circles and dashed lines during Condition A, open squares and dashed lines during Condition B, and solid triangles and solid lines during Condition C).

A new topography of self-injury emerged after some experience with the padded helmet: self-injury by the arms to parts of the body other than the head or helmet, mainly in the form of slapping the leg. It occurred in only 0.12% of the intervals (one interval) of Condition A (no protective clothing), but in 6.9% and 4.7% of the intervals of Conditions B and C, respectively, mainly between the 16th and 19th sessions.

As the experiment progressed, the resident began to interact with the available materials while in restraint. He did this primarily in Condition A sessions and usually by placing his arm down and inside the front of his pants, and down, through, and out the bottom of a pant leg, thus freeing his hand to touch the radio or blocks while the arm remained in enough restraint to prevent head abuse. Sometimes, he placed his hands down and inside the front of his underpants, out the bottom of an underpant leg, and then up and out of the top of his pants, thus freeing his hand while keeping his forearm close to his waist.

Figure 3 shows that these behaviors increased progressively across the course of the experiment. It shows the percentage of intervals in which both

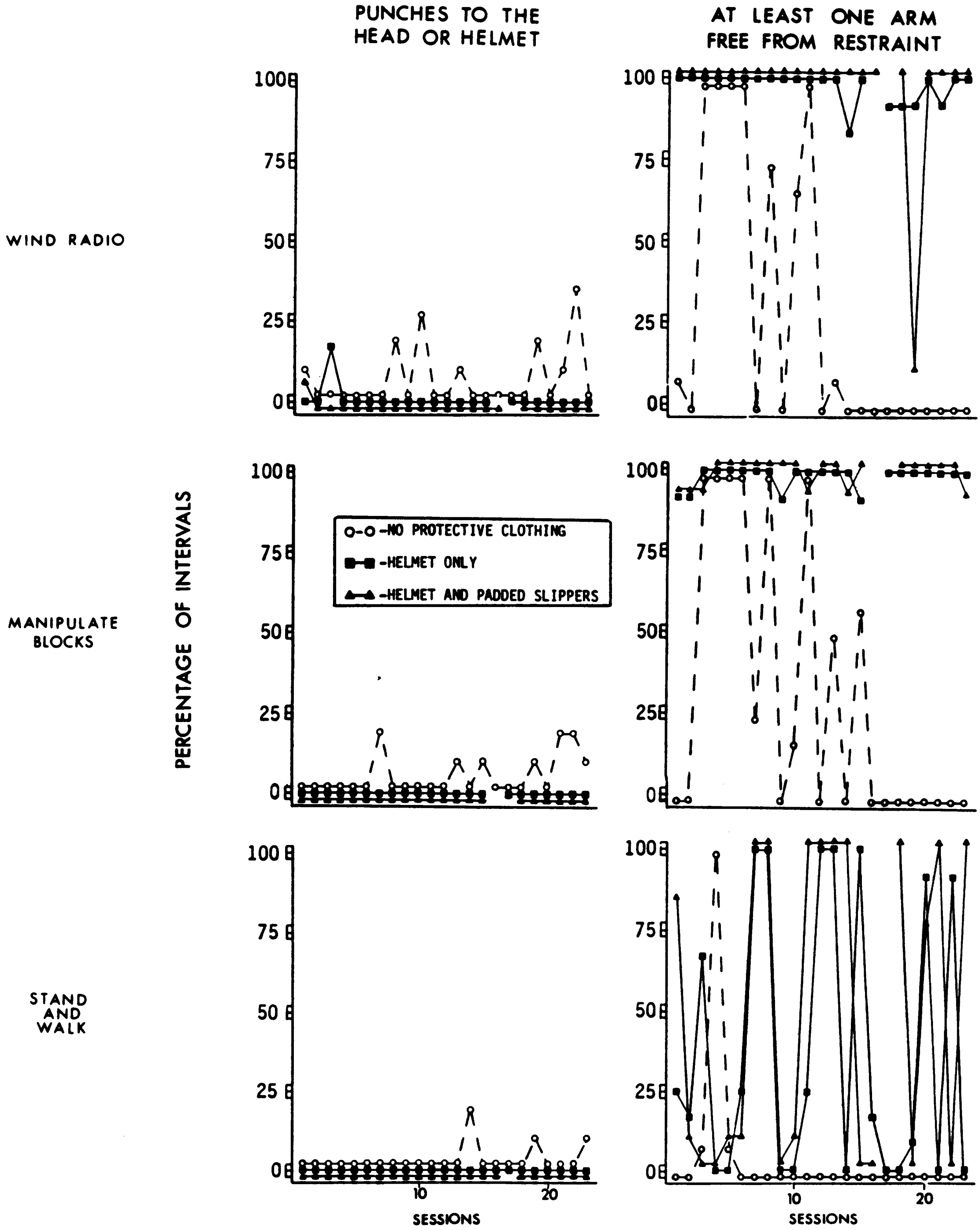

Figure 1. Percentage of intervals during which the resident punched his head or helmet (left column) and throughout which at least one arm was free from restraint (right column) in successive subsessions (wind radio, manipulate blocks, and stand and walk) of the three conditions.

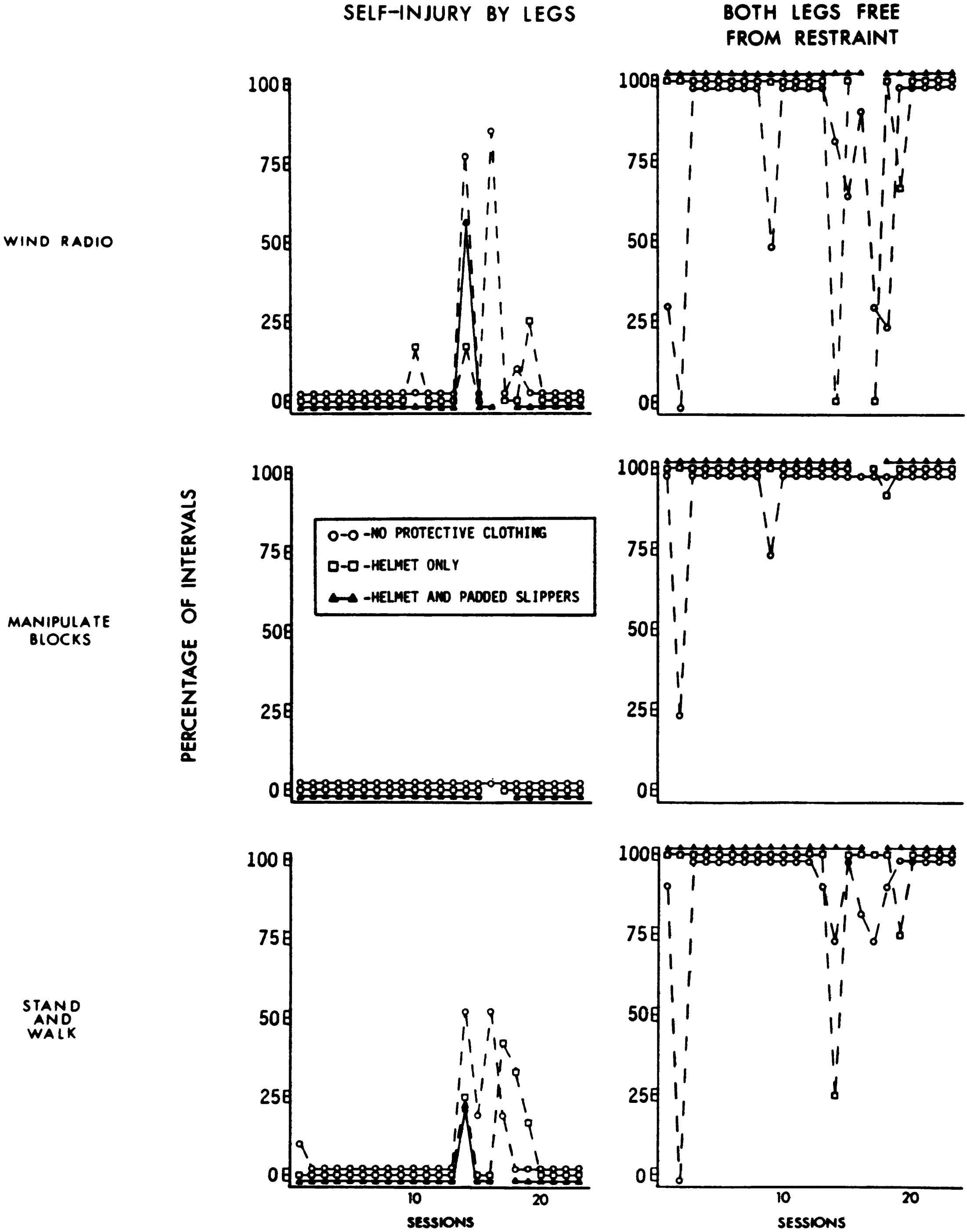

Figure 2. Percentage of intervals during which the resident's legs engaged in self-injury (left column) and throughout which both legs were free from restraint (right column) during successive subsessions of the experiment.

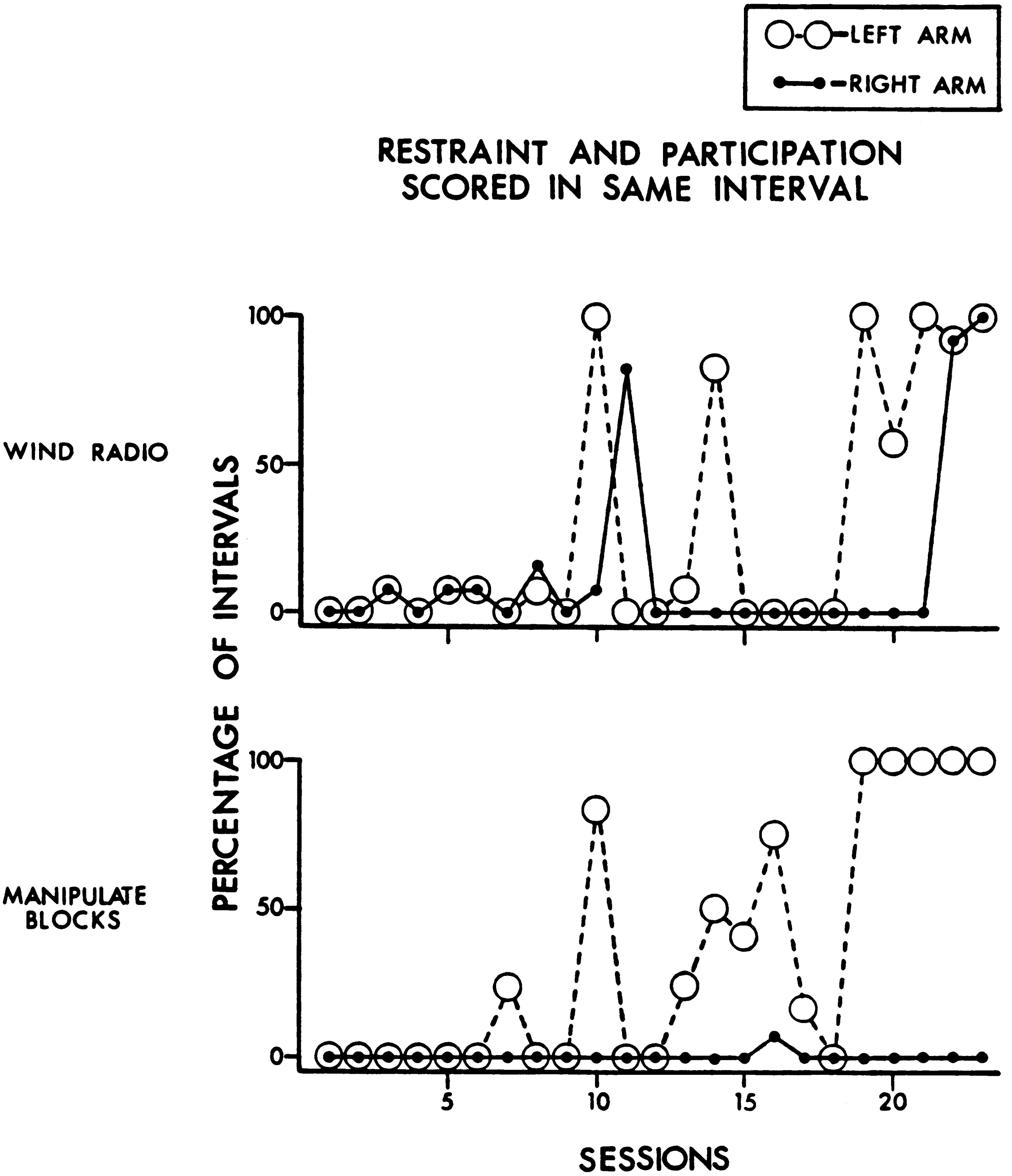

Figure 3. Percentage of intervals in which both arm restraint and participation were scored in the same interval during successive subsessions of Condition A (no protective clothing).

arm restraint and participation in the available activity occurred in the same interval during Condition A. The top and bottom graphs show responses during the wind radio and manipulate blocks subsessions, respectively. Open circles are left-arm responses; solid circles, right-arm responses.

Finally, Table 1 shows that the amount of left- and right-arm freedom varied as a function of the activity available during Conditions A, B, and C (left, middle, and right columns, respectively) for the wind radio, manipulate blocks, and stand and walk subsessions. The table shows responding averaged over the entire experiment. Arm freedom was greatest during the wind radio subsession, less during the manipulate blocks subsession, and least during the stand and walk subsessions.

Occurrence and nonoccurrence reliabilities averaged over the entire experiment (agreements divided by agreements plus disagreements × 100) for every response category were generally above 90%. However, occurrence reliabilities for leg self-injury ranged from 67% to 100% and averaged 88%. Nonoccurrence reliabilities for "both legs free from restraint" of Condition A were 88%, 75%, and 83% for the wind ratio, manipulate blocks, and stand and walk subsessions, respectively.

Table 1
Percentage of Intervals Throughout which Arms were Free from Restraint in the Three Kinds of Subsessions

	Condition A		Condition B		Condition C	
	Left	Right	Left	Right	Left	Right
Wind radio	26	21	96	82	95	81
Manipulate blocks	33	0	98	27	98	18
Stand and walk	5	4	36	19	49	32

DISCUSSION

The strategic use of protective clothing is a practical and simple means of reducing self-injury and self-restraint. Perhaps the freeing of restrained limbs will provide the opportunity to develop new and more desirable behaviors. If that happens, perhaps the protective clothing can then be faded gradually, leaving the newly developed behaviors intact. To prevent the emergence of new or rare forms of self-injury, as observed late in this experiment, reinforcement contingencies should be used as well to develop behaviors with the newly freed limbs that compete with new forms of self-injury.

Perhaps more important, this experiment carries further the inferential analysis of self-restraint: In this study, self-restraint showed the selective characteristics that it should if its function were to escape, avoid, hinder, or delay self-injurious behaviors (cf. Gardner & Lewis, 1976; Herrnstein & Hineline, 1966). That is, the specific forms that decreased in each condition were exactly the forms that should have decreased, given that corresponding forms of self-injury had been eliminated (cf. Barrett & Spealman, 1978; Spealman, 1979). Yet, this plausible account of self-injury as the negative reinforcer for self-restraint still lacks definitive proof. Self-injury could be a discriminative stimulus for self-restraint rather than a negative reinforcer. Perhaps a chain beginning with self-injury and followed by self-restraint was developed and maintained by escape and avoidance of demands. But the resident interacted with the materials and followed instructions readily even while in restraint, as shown in Figure 3. Self-restraint increased in the no-protective-clothing conditions with no signs of self-injury preceding those increases, as would be expected if self-restraint was maintained by *avoiding* self-injury. Still, it could be argued that the observation code of this study did not recognize behaviors that were discriminative for self-restraint and were prevented by the helmet (e.g., stroking the head).

Even so, the data of this experiment could have disproved the notion that the function of self-restraint is to diminish self-injury; they did not. Instead, they affirm a consequent of that hypothesis (cf. Sidman, 1960, pp. 137–147). Thus, the argument needs more experiments that evaluate other logical consequences of the argument; perhaps they can dispel the alternative interpretations proposed above, which are enabled or clarified by the present data. For example, if self-injury is a negative reinforcer, then other responses may be maintained by the contingent use of any device that prevents self-injury. In fact, mechanical restraint is a reinforcer for some self-injurious persons (Favell, McGimsey, & Jones, 1978; Favell et al., 1981; Foxx & Dufrense, 1984). Is mechanical restraint a reinforcer *only* when self-injury is possible?

If self-injury is typically the negative reinforcer for self-restraint, important implications for the treatment of self-restraint and self-injury emerge:

(a) Because self-restraint can be seen by caretakers as a form of self-stimulation or as a means of avoiding or escaping demands, it may be targeted for reduction, even by punishment. Yet its successful elimination may well leave clients defenseless against their self-injurious behavior. Its proper treatment may be to eliminate the self-injury. (b) Client-selected topographies of self-restraint are often bizarre. If possible, other, more acceptable topographies of self-restraint should be found or developed by caretakers to diminish self-injury. The transfer of those responses from control by caretaker-imposed contingencies to the negative-reinforcement contingency of diminishing the client's self-injury should prove generalized and durable, particularly if the new responses are not incompatible with such self-help behaviors as dressing or toileting.

The generality of these results across other self-injurious persons who engage in self-restraint remains to be evaluated. If the effects are found to be general, then the strategic (not blanket) use of protective clothing may represent a valuable addition to the present techniques useful in reducing self-injury and self-restraint (especially because their generality is limited). Perhaps a more important advance is the step closer to an accurate general characterization of the relationship between self-restraint and self-injury. If there is a general one, it may well guide the development of much more effective techniques to treat self-injurious behavior—techniques that yield greater effects that are more widely generalized and more durable.

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