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Naloxone Attenuates Self-Abusive Behavior in Developmentally Disabled Clients

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The opiate antagonist naloxone was effective in reducing self-abusive behavior in two mentally retarded clients with an extensive history of such behavior. Three doses of naloxone (0.1, 0.2, 0.4 mg) were compared with a vehicle solution in a double-blind, crossover design. Naloxone greatly attenuated self-abusive episodes in one client and eliminated them entirely in the second client. In addition, use of self-restraining behavior by one client was reduced. The findings suggested that some clients with self-injurious behavior may have disturbances of the endogenous opiate system. Maintenance of self-abuse by tonically elevated pain threshold and/or by the putative addictive characteristics of such behavior was discussed.

Self-injurious behavior (SIB) is a dramatic behavioral aberration occurring in about 10% of the severely mentally retarded population (Bryon, Sakati, Nyhan & Fish, 1971). Behavioral treatment approaches, focusing on contingent manipulation of primary reinforcers (e.g., food treats) or attention and social relations, have been moderately successful in controlling this severe behavioral disturbance, but when successful, apparently the effect only persists for a short period of time (Romanczyk & Goren, 1975). Although rare diseases with components of self-abuse, such as the Lesch-Nyhan syndrome, have genetic or physiological correlates (Castells, Chakrabarti, Winsberg, Hurwic, Perez & Nyhan, 1979), the more common disorder, with apparent heter-

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ogenous etiology, has neither a known genetic nor physiological substrate.

There are no definitive studies examining the pain threshold in clients exhibiting SIB. The anecdotal reports are mixed, suggesting that some self-injurious clients may experience pain "normally" while others may not. The present study was designed to test the possibility that an opiate antagonist, naloxone, may block SIB. One action of low doses of naloxone is to produce hyperalgesia, or lowered pain threshold (Buchsbaum, Davis & Bunney, 1977; Grevert & Goldstein, 1977). Thus, if self-injurious behavior is related to blunted nociception and is maintained by the endorphin system, treatment with naloxone may result in a decline in these episodes.

METHOD

Clients

Two developmentally disabled clients were selected for treatment. R.T. was a black, nonverbal, 26-year-old man who developed a calloused thickening of his skull, "cauliflower ear" and ecchymosis of his right eye from years of self-abuse. He became a resident of the institution at age 11. He was born prematurely with a weight of 3 pounds, 2 ounces. His developmental milestones were markedly slow. Current testing revealed that his cognitive functioning was roughly equivalent to 19 months. His behavioral-adaptive age was 22 months. He had a history of congenital heart disease and had difficulty maintaining his weight. The EEG was normal with no signs of epilepsy. The diagnostic impression was Profound Mental Retardation due to gestational disorder.

A.G. was a nonverbal, 20-year-old hispanic who had developed a "cauliflower ear," partial separation of his left ear lobe and multiple scars and abrasions from self-abuse. He has been a resident of the institution since the age of 11 years. There were sketchy details regarding A.G.'s birth except that he was approximately 6 pounds. His developmental milestones were significantly slow. Current testing of cognitive aptitude suggested that A.G. functioned at 19 months of age. His adaptive skills were much better and were assessed at 32 months. The EEG was normal and there were no medical complaints except those related to his SIB. The diagnostic impression was Profound Mental Retardation associated with unknown prenatal influences.

One client (R.T.) had a higher frequency (50 SIB/hour) of self-abuse than the other client (A.G.) (8.6 SIB's/hour). Although both clients used self-restraint,¹ the lower frequency self-abuser utilized this behavior extensively.

¹"Self-restraint" in this context does not refer to the conventional connotation of the term, i.e., controlling one's self via discipline or "will power," but rather the practice of physically positioning the limbs, without devices, so that self-injurious actions are prevented.

Both clients had a clinical history of "paradoxical" responses to analgesic agents. Thus, both clients exhibited excitation rather than sedation to standard doses of narcotics, sedatives and hypnotics. Neither client had well developed social or interpersonal skills.

Procedures

The schedule for testing the clients is presented in Table 1. As is apparent from the table, an extensive adaptation period preceeded the experimental phase. During the initial 4 week phase, the experimenters, equipped with video tape and display apparatus, were stationed in the hospital residence from 9 to 11:30 A.M. During this phase all of the measurements critical for the experiment were made. The effect of this intrusion had a considerably disruptive effect on the residence where R.T. and A.G. were assigned. During the first week, most of the clients (12 on the residence) were insatiably curious about the equipment and the procedures employed. Since the purpose of this phase was to habituate the clients to our presence, the phase was extended until we were no longer disruptive. By the end of the fourth week the disruption was no longer apparent. In the fifth week, phase II was initiated. The purpose of this phase was to habituate R.T. and A.G. to the stress of injection. At 8:50 A.M. each client was injected with the vehicle solution. From 9 to 11:30 A.M. measurements and video recording was done. Since the procedure of injection was a significant stressor for the clients (some resistance was evident) during the first two sessions, data from these days, as well as the final habituation day, were not included in the data analysis.

TABLE 1
Protocol for study of the Opiate Antagonist, Naloxone,
on Self-Injurious Behavior

Week	Time	Client R.T.	Client A.G.
Week 1	9:00-11:30	adaptation to video	adaptation to video
Week 2	9:00-11:30	adaptation to video	adaptation to video
Week 3	9:00-11:30	adaptation to video	adaptation to video
Week 4	9:00-11:30	adaptation to video	adaptation to video
Week 5	8:50-10:30	adaptation to video and placebo	adaptation to video and placebo
Week 6	8:50-10:30		
Day 1		0.1 mg naloxone	placebo
Day 3		0.2 mg naloxone	placebo
Day 5		0.4 mg naloxone	placebo
Week 7	8:50-10:30		
Day 1		placebo	0.1 mg naloxone
Day 3		placebo	0.2 naloxone
Day 5		placebo	0.4 mg naloxone

The experimental phase consisted of comparing 3 doses of naloxone with the vehicle solution in a double blind, crossover design. During the first week, on alternate days, R.T. received intramuscular injections of naloxone (0.1, 0.2, or 0.4 mg) and A.G. received the vehicle. The order of treatment was reversed during the second week of the experimental phase. The injections were begun at 8:50 A.M. and the observations were conducted between 9:00–10:30 A.M. The observations were one minute samples taken every 10 minutes for 90 minutes. The sampling period within the 10 minute window was determined randomly.

The video tapes of the clients were scored by four different observers before the treatment code was broken. Two groups of two observers each rated the tapes for incidents of self-abuse, number of social interactions and time (in seconds) of self-restraining behavior. Other behaviors were also evaluated but none of them were emitted with sufficient frequency to be consequential. The observations within and between the groups of observers were made independently. Disagreements within each pair of observers (which were absent in one group and few in the second, since the behavior is fairly obvious) were resolved by replaying the tapes of the episodes in question to ensure that proper counts were made. With this procedure reliability between the two groups was perfect.

Initially, duration of a self-abusive episode was considered as a potentially useful measurement. However, in the clients studied the self-abusive behaviors were discrete events. Even though the self-directed attacks sometimes entailed repetitious behavior, the frequency of these attacks was highly related to their duration. It is possible that in other clients, with more complicated behaviors, the duration of an episode would be a more sensitive index than frequency.

RESULTS

Figure 1 presents the data for R.T., in terms of self-abusive episodes (1a) and self-restraint (1b). It is apparent from Figure 1a that treatment with naloxone (collapsed across doses) diminished the number of self-abusive episodes compared with placebo. The data suggest that the effect of naloxone is evident within the first 10 minutes and begins to diminish by 70–80 minutes. A suggestive trend indicates that the lowest dose (0.1 mg) is the most effective in controlling self-abusive episodes in this client. Measures of self-restraint (Figure 1b) in this client are not influenced as dramatically as are self-abusive episodes.

The data for A.G. are illustrated in Figure 2. As is apparent from Figure 2a, self-abusive episodes are virtually eliminated after treatment with naloxone. Self-restraint in this client is nearly continuous when treated with placebo. However, a dramatic decrease in self-restraint (Figure 2b) is evident after

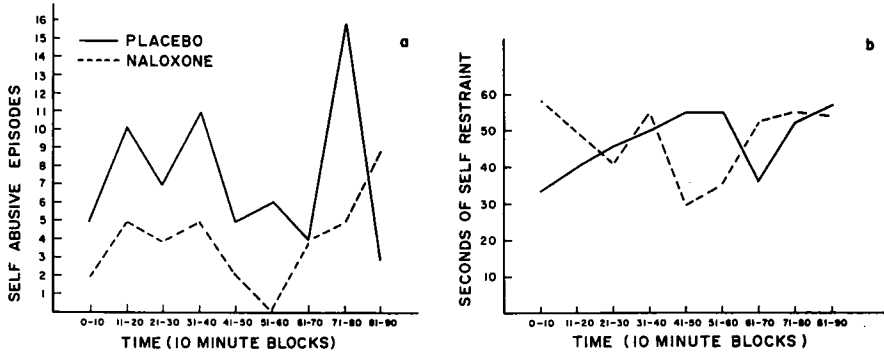


FIGURE 1. Panel (a) illustrates the frequency of self-abusive behavior over a 90 minute period after treatment with naloxone or placebo. Panel (b) describes the time of self-restraint in a 60 second sampling period after treatment with naloxone or placebo.

treatment with naloxone. Consistent with the self-abusive episodes of R.T., the restraint data of A.G. indicates that the influence of naloxone dissipated by about 70-80 minutes. There is no evidence of dosage effects for A.G.

Analysis of the videotapes indicates that neither of the clients developed ancillary adaptive or maladaptive behavior after treatment with naloxone. However, notes collected during the study suggested A.G. exhibited more interpersonal and play behavior during the week he received naloxone. Although there was no evidence of sedation in either client, the evening staff (who were unaware of the treatment conditions) reported that R.T. slept better the nights he received naloxone during the day. This was not confirmed by systematic observation.

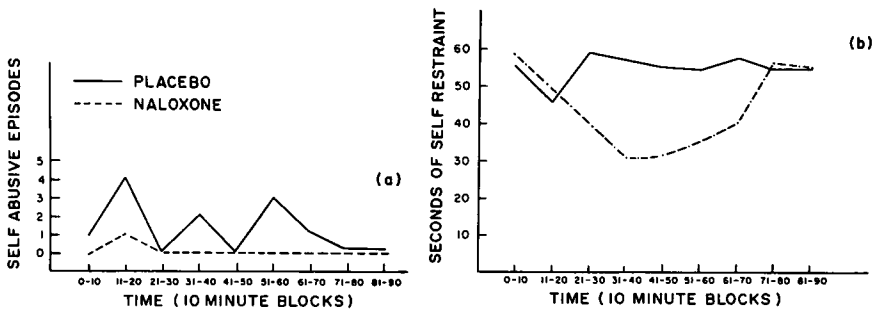


FIGURE 2. Panel (a) illustrates that naloxone virtually suppresses self-abusive episodes (in a low frequency self-abuser) over the 90 minute observation period. Panel (b) indicates that self-restraining behavior is attenuated by treatment with naloxone.

DISCUSSION

The opiate antagonist naloxone was effective in reducing self-abusive episodes in two clients with an extensive history of such behavior. Since naloxone can block the effects of opiates, including the endogenous morphine-like β -endorphin, and increase the perception of pain (Buchsbaum et al., 1977), it is conceivable that the effects observed in the present study are due to the induction of hyperalgesia. Thus, SIB may be maintained by a disruptive opiate system producing a relatively tonic level of pain insensitivity in some SIB clients. This possibility is consistent with previous studies which indicated that congenital insensitivity to pain (Yanagida, 1978) and disordered hypothalamic functioning coexisting with disturbed nociception (Dunger, Leonard, Wolff & Preece, 1980) were reversible by treatment with naloxone.

It is also possible that the effects of naloxone in this study are due to the elimination of the putative reinforcing properties of endorphins (Belluzi & Stein, 1977). In this context, SIB may be viewed as the catalyst for the production and release of endorphins. The SIB may increase the release of endorphins and be a means of attaining a euphoric state associated with opiates. Thus, SIB may be a symptom of addiction to endogenous opiate-like substances.

Both of these speculative interpretations suggest the possibility of a disordered opiate system. It may be important that both of the clients in this investigation evidenced paradoxical responses to analgesics. Thus, perhaps, response to analgesics is a marker which will predict a favorable reaction to an opiate antagonist. This possibility and the search for endogenous opiate antagonists such as MSH/ACTH fragments from the pituitary gland (Amir & Amit, 1979; Bertolini, Poggioli & Ferrari, 1979; Sandman & Kastin, 1981) or MSH-inhibiting factors from the hypothalamus (MIF) (Kastin, Nissen, Zadina, Schally & Ehrensing, 1980; Kastin, Olson, Ehrensing, Berzas, Schally & Coy, 1979) are promising areas for further study.

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