Aggression and the termination of ‘rituals’: A new variant of the escape function for challenging behaviour?

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ABSTRACT
Aggression and stereotyped behaviors are not uncommon among people with intellectual disabilities and they are often treated separately as operant behaviors. In this single case study, it is argued that the function of a young woman’s aggressive behavior appeared to be that of avoiding or escaping the termination of a chain of complex stereotyped behavior (or “ritual”). She became aggressive only when this chain of stereotyped behavior was terminated and the aggression appeared to extinguish when it no longer led to escape from the termination of the “ritual”. It is suggested that this is an example of a complex interaction between two behaviors and that it illustrates the need for very careful analysis of the functions of challenging behavior. Furthermore, it is proposed that the lengthening list of variables already documented as determinants of challenging behavior (provision of attention (verbal and physical), mechanical restraint, sensory or tangible events, escape from demands or from social attention, denials, escape from intrusive medical procedures, escape from task difficulty) be lengthened to include the possibility of escape from (or avoidance of) the interruption of a chain of complex stereotyped behavior or “ritual”.
INTRODUCTION
Aggression is a common form of challenging behavior among people with intellectual disabilities, occurring in between 11% to 18% of those in touch with services (Harris, 1993; Jacobson, 1982). Aggressive behavior is known to be one of the most likely precipitants for institutionalization (Pagel & Whitling, 1978; Sutter et al., 1980), so that the prevalence of aggression is higher in institutions than in the community (Eyman & Call, 1977; Harris, 1993). Help in reducing such challenging behavior must therefore be a priority for community-based services, in order to assist people to continue to live in the community.

It has been accepted for some time that aggressive behavior may be operant in nature and behavioral interventions have been demonstrated to be successful in bringing about a reduction in the behavior at least in the short term (Murphy, 1997). In the early years of operant treatment, however, the methods employed were often positive punishment procedures with scant regard for the function of the behavior (e.g., Birnbauer, 1968; Hamilton et al., 1967; Risley, 1968). More recently there have been a number of studies which have included an examination of the function of aggressive behavior, often by the use of analog conditions (Oliver, 1991) or by “brief functional analysis” (Northup et al., 1990) and it appears that the behavior frequently has the function of demand avoidance/escape (e.g., Carr et al., 1980; Slifer et al., 1986; Steege et al., 1989) or of social avoidance/escape (Murphy & Oliver, 1987), or the provision of contingent attention (e.g., Mace et al., 1986) or the provision of tangibles (e.g., Sasso et al., 1992).

Likewise, simple stereotyped behaviors, such as rocking and hand flapping, are also a common feature of the repertoires of people with severe/profound intellectual disabilities (Baumeister & Forehand, 1973; Berkson & Davenport, 1962; Berkson et al., 1992; Rojahn, 1986). They are probably also operant behaviors, frequently maintained by sensory consequences (Lovaas et al., 1987; Newsom & Lovaas, 1987), though this has also been disputed (Lewis et al., 1987).

More complex stereotyped behaviors with a relatively fixed sequence, referred to sometimes as “rituals”, are rarely described in any detail. Such behaviors (which may include repetitive cleaning, ordering, checking and collecting of items) have been reported as occurring in only
3.5% of people with intellectual disabilities, in some studies (Vitiello et al., 1989) but in 38% of individuals in others (Bodfish et al., 1995), even though the definitions employed did not seem to differ. Vitiello and colleagues termed these behaviors “compulsive,” using the DSM III-R definition of compulsions and concentrating on the observable behavioral components (since the “ego-dystonic” features normally considered part of compulsive behavior, could not be investigated). Anecdotally, Vitiello et al. noted that the interruption of the complex stereotypies (or “rituals” as they termed them) would often provoke aggressive behavior.

Complex stereotypies, of course, have always been considered one of the defining characteristics of autism (McBride & Panksepp, 1995; McDougle et al., 1995). Wing and Gould (1979), for example, reported that in their Camberwell study, 23 (31%) of the 74 children with social impairment engaged in “elaborate repetitive routines,” whereas none of the 58 sociable children did so. More recent estimates have provided even higher figures: for example, McDougle et al. (1992) reported that as many as 96% of people with autism showed complex stereotyped behaviors which they considered were symptoms of obsessive-compulsive disorder (OCD) (although it has been demonstrated that there are differences in the precise kinds of thoughts and behaviors shown by people with autism and those from the general population with OCD [McDougle et al., 1995]).

This study involves the assessment and analysis of the aggressive behavior of a young woman with autistic features. The young woman also showed complex stereotyped behaviors and initial staff interviews suggested that these behaviors, the stereotypies and the aggression, were closely linked.

**METHOD**

*Participant*

Ms. G. was a woman of 38 years of age who had severe intellectual disabilities and a history of encephalitis and meningitis in childhood (at age 14 months and age 18 months, respectively), followed by epileptic seizures at the age of 6 years. Ms. G. had been hospitalized from the age of 9 years to the age of 33 years, when the hospital closed (her parents lived out of the country). Her hospital discharge report noted that she showed all the symptoms of autism, with very poor eye
contact, stereotyped behaviors, aloof social interaction and very limited speech (four or five single words only). She was noted to “live in a world of her own.”

After discharge from the hospital, Ms. G. was resettled in the community and she lived in a house with 4 other people at the time of the study. She had major communication difficulties and used only a few words of speech, which were not often meaningful, according to her staff (she would say “ball,” “dog,” “bogata” but rarely in any particular context). She was socially impaired, ignoring her co-residents and having no friends of her age. Ms. G. spent much of her time wandering about the house, engaging in simple and complex stereotypies (see below for details) and avoiding the other people living in the house. Ms. G was also sometimes physically aggressive, hitting other residents and/or staff. She was prescribed antipsychotic medication (Haloperidol) by the local psychiatrist in an attempt to reduce her aggression but it seemed to have had little effect. Ms. G. was also receiving anticonvulsants for her epilepsy.

The house where Ms. G. lived had 24-h staff support but staff found Ms. G. hard to engage as she would not initiate any activities, would often resort to stereotyped behaviors (see below) and seemed to have very poor concentration. In terms of self-care and domestic skills, Ms. G. was known to be relatively able, in that she could dress, wash and eat unaided and could make tea, wash up, dry up and operate the washing machine with verbal and gestural prompts, but only completed these tasks when pressed.

Ms. G. was referred by her residential staff for advice about how to manage her complex stereotypies and her aggression. When her residential staff were interviewed, it transpired that Ms. G’s preferred activity was to acquire papers or magazines and spend hours in the toilet with them, ripping them up into tiny pieces and then flushing them away. Ms. G. had frequently broken the flushing mechanism by overenthusiastic flushing and had also been known to enter the toilet while other residents were using it, completely ignoring them and posting items into whatever part of the toilet bowl she could reach, then flushing the toilet while they still sat there. She also had a number of other unusual behaviors, including collecting and hiding mechanical objects (such as the house mobile phone and bleep), decorating her clothes with safety pins and asking visitors, staff and other residents to tap her out-stretched hands in a particular rhythm.
In addition, she often engaged in hand flapping, waving the fingers of both hands rapidly in front of her eyes, for periods of a few seconds at a time.

Procedure
Staff interview suggested that the event most likely to set off Ms. G.’s aggression was being prevented from flushing items down the toilet. Staff were unable to identify times when Ms. G. was more likely to tear and flush objects but suggested that if Ms. G. saw pieces of paper lying around the house, that seemed to set off the behavior. They had also noticed that she became agitated on occasions when trying to flush an item away that would not disappear: she would repeatedly flush the toilet, being reluctant to leave the area and sometimes breaking the flushing mechanism. Staff recalled one day when this had happened and they had tried to distract Ms. G. by a long walk in the park, but she made straight for the toilet on return, as though to check if the item was still there (she then proceeded to resume flushing).

The following hypotheses were therefore set up:

1. Pieces of paper were an establishing operation for the tearing and flushing behavior.
2. The reinforcer for the tearing behavior might be sensory (the sound or sight of paper tearing) or might be contingent attention (in that staff did sometimes go and prevent her from flushing items if they saw her tearing paper on the way to the toilet) or might be reinforced as part of a chain (completed by flushing - see below).
3. Likewise, the reinforcer for flushing might be positive sensory reinforcement (the sound or sight of the paper disappearing or the sight of the water swirling) or might be negative sensory reinforcement (the paper being an aversive stimulus which has to be removed) or might be contingent staff attention (for the same reason as above).
4. Ms. G.’s aggression was occasioned by being prevented from flushing items away, i.e., the staff intervention acted as an establishing operation for the aggression.
5. The reinforcer for Ms. G.’s aggression might be avoidance of or escape from staff who were preventing her from tearing paper and flushing it away (this in itself made contingent attention less likely as a reinforcer for paper tearing and flushing).

It was therefore decided to investigate the function of Ms. G’s aggressive and stereotyped
behavior, using the following analog conditions: **FN** (flushable paper, not stopped) where Ms. G. would have free access to paper and would not be prevented from flushing it; **FS** (flushable paper, stopped), where Ms. G. would have free access to paper but would be prevented from flushing it and would be prompted to place it in the bin; **UN** (unflushable polystyrene, not stopped), where Ms. G. would have free access to polystyrene and would not be stopped from flushing it; **US** (unflushable polystyrene, stopped), where Ms. G. would have free access to polystyrene but would be prevented from flushing it and would be prompted to place it in the bin. Thus there were in effect 4 conditions, each combining two factors (flushable versus nonflushable items and prevention versus nonprevention of flushing). The intention was to run the conditions, each one to last 5 min, in sets of four, to repeat the sets five times, counterbalancing the order so that in one set the flushable conditions were first and in the next set unflushable conditions were first. Two researchers (GM and SM) were present in all conditions: GM did not interact with Ms. G. in the FN and UN conditions but, in FS and US conditions, she prevented Ms. G. from ripping and flushing, as described above; SM did not interact at all with Ms. G. but videoed all sessions.

In the event, during the first two sessions, Ms. G. only flushed one tiny piece of paper and she seemed to spend considerable time looking from the paper to staff (as though waiting “for the coast to be clear”), presumably because she had in the past been prevented from taking paper. It was therefore decided to alter the conditions slightly by directly offering Ms. G. an A4 size piece of paper or polystyrene at the beginning of each condition. (It is recognized that this is not entirely desirable to employ an antecedent that probably rarely occurred naturally. However, we would argue that it did not change the function of her behavior, though it may have increased the overall rate.) This seemed a better arrangement as Ms. G. always accepted the item immediately and usually made straight for the toilet (see results section). With this slight alteration to the conditions described above, 6 sets of conditions were run: Set A (**FN, FS**), set B (**FN, FS, UN, US**), set C (**UN, US**), set D (**FN, FS, UN, US**), set E (**UN, US, FN, FS**), and set F (**FN, FS, UN, US**). Each condition ran for 5 min with a short gap between conditions (usually of less than 30 s, to get ready for the next condition) and the sets normally contained all 4 conditions (some had to be curtailed to two conditions for practical reasons).
All sets of conditions were recorded on videotape and direct observations were completed afterwards. The observation method involved continuous real-time recording, using a hand-held microcomputer, the Epson HX20. The software allowed behaviors to be recorded as either events or durations (Repp et al., 1989) and all data were transferred to a Viglen 386 processor afterwards for analysis, using software developed by Hall and Oliver (1997). The categories of behavior coded are given in Table 1 (E signifies behaviors coded as events, with a notional one second duration, and D signifies behaviors coded as durations). Some other behaviors of Ms. G.’s were also recorded (e.g., putting her hand out to be tapped, vocalizing) but they were of very low frequency and will not be included here.

All six sets of conditions were videotaped and coded (by SM). A second observer (GM) also coded 4 of the 20 conditions. Interobserver agreement was calculated for each behavior on a 10-s interval basis. Occasionally Ms. G. was not visible on the videotape because she ran at great speed between rooms at times, so that the camera operator had difficulty keeping up. These periods were coded as “out of vision” and were very brief when they occurred (mean of 5 s, range 2 to 12 s) in 8 of the conditions.

After this data coding and basic analysis of percent duration data (using the Repp et al., 1989, software), the conditional probability of aggressive behaviors (“struggle” and “hit”), before, during and after “prevention” were calculated (Lerman & Iwata, 1993; Hall & Oliver, 1997). This was done by calculating the proportion of time during which “hit” (or “struggle”) occurred in the 10 s prior to the onset of “prevention”, the proportion of time during which “hit” (or “struggle”) co-occurred with “prevention”, and the proportion of time during which “hit” (or “struggle”) occurred in the 10 s after the offset of “prevention”. (Note: if periods of time between occurrences of “prevention” were less than 20 s, then a 10 s period of time following an occurrence of “prevention” would overlap with a 10 s period of time preceding the next occurrence of “prevention”, producing anomalous results. In order to overcome this problem, where periods of time between occurrences of “prevention” were less than 20 s, whatever time was available between occurrences was split, the first half being assigned to the period following the first occurrence of “prevention” and the second half being assigned to the period preceding the second occurrence of “prevention”). In order to take account of the possibility that
associations between the variables may have occurred by chance simply because one category of behavior was occurring more frequently than the other (Lerman & Iwata, 1993), the magnitude of the association between “hit” (or “struggle”) and “prevention” was gauged by calculating a Yule’s Q statistic (Bakeman & Quera, 1995) for each conditional probability. Similar analyses of the conditional probability of Ms. G.’s other behaviors (“ripping”, “flushing”, “running to the toilet” and “wandering”) were also completed in relation to periods before, during and after “prevention”.

RESULTS

Interobserver reliabilities
The interobserver reliability levels were calculated (as in Murphy, 1987). Levels of R tot varied between 85.7% and 100% for each behavior in each 5-min condition coded and R non-occ varied likewise between 81.5 and 100%. R occ was lower for some behaviors in some 5-min conditions, as might be expected with low rate behaviors (Murphy, 1987), but the R occ means for each behavior when averaged across conditions were above 70%. Kappa was 0.79 or above for all behaviors.

Outcome of analog conditions
Table 2 shows the percentage duration of the behaviors coded in each type of condition (FN, FS, UN, US). It can be seen that Ms. G. spent considerable periods of time wandering and sitting/lying down. She was very rarely appropriately engaged overall (less than 10% of the time) and was occupied more by ripping paper/polystyrene and running from toilet to toilet to flush items away than by any other activity, especially in some of the conditions.

The graphs in Figs. 1, 2 and 3 show the sequence of behaviors in some of the 20 conditions: each second for which a behavior occurred is shown by a vertical black bar, continuous bars indicating that the behavior occurred every second and blank sections indicating nonoccurrence of the behavior (each condition is shown separately and only behaviors which were recorded during that condition are included; conditions which occurred consecutively are shown on the same figure). By scanning down across behaviors within each of the figures for each condition, it is
possible to see which behavior followed which (see examples described below). One example of the original analog conditions, where paper was left on the floor of Ms. G.’s living area (see Method section) is shown (condition 01). In all the remaining conditions Ms. G. was offered the paper at the beginning of each condition (see Method section).

++++++++++ Table 2 here +++++++++++

Set A. It can be seen in Fig. 1 that, in set A, condition 01 (FN) (pilot, using paper and not stopping Ms. G. from flushing it), which lasted almost 10 min, Ms. G. began by wandering, then sitting and resuming wandering again. She picked up the piece of paper after about 4 min (this is labeled “offer paper” in Fig. 1 for comparability to the other conditions but was more accurately described as “take paper” in this condition). Ms. G. then went straight to the toilet, ripped it and flushed the paper several times. She then resumed her wandering and finally sitting. At no time was she engaged in more constructive activities. In the immediately following condition 02 (FS), Ms. G. was offered a piece of paper at the beginning of the session, she then went to the toilet, ripped the paper, tried to open the toilet lid (not separately coded), was prevented from doing so, struggled with the researcher, rushed to another toilet and repeated this series of actions, then going to the third toilet, again ripping paper, being prevented from flushing it, struggling and hitting the researcher, before going back to other toilets she had already visited and finally managing to flush a piece of paper before the researcher could prevent her. This all occurred in less than 4 min.

++++++++++ Figure 1 here +++++++++++

Set B. The following day, in set B (see Fig. 2), condition 03 (FN), when Ms. G. was offered the paper, she approached the toilet almost immediately, ripped up some of the paper, flushed twice, ripped some more paper, again flushed twice, and then wandered back to sit down. In the following condition 04 (FS), on the same day, Ms. G.’s behavior was very similar to that in condition 02 (see above). In condition 05 (UN) Ms. G. was offered a piece of polystyrene and she behaved very much as in condition 03 (see above). In condition 06 (US), Ms. G. again took the polystyrene, went to the toilet, was prevented from flushing the polystyrene and subsequently
visited the other toilets four times, in an apparent attempt to flush the material, much as in conditions 02 and 04 (see above).

++++++++++ Figure 2 here +++++++++++

Set C. Three days later, in set C, condition 07 (UN) Ms. G. was offered polystyrene, walked to the toilet but came out again when she saw the researcher was following. She subsequently found a button on the floor and spent the rest of the condition sitting, rolling it between her fingers and this continued throughout condition 08 (US). The data from these conditions are not shown.

Sets D, E, F. Over the following two weeks, three further sets took place, each set consisting of four conditions and separated from the next set by three or four days: in set D, conditions 09 (FN), 10 (FS), 11 (UN), 12 (US) were run; in set E, conditions 13 (UN), 14 (US), 15 (FN) and 16 (FS); in set F, conditions 17(FN), 18 (FS), 19 (UN) and 20 (US). The results were similar to those for set A and set B (see Figs. 1 and 2 above), with Ms. G. going straight to the toilet to rip and flush in the N (“not stopped”) conditions (whether or not the item would flush away) and doing the same but being prevented from ripping and flushing in the S (“stopped”) conditions, where she rapidly learnt to put the item in the bin. For brevity only the last set, set F (conditions 17, 18, 19, 20) are shown, in Fig. 3. Ms. G. put the paper/polystyrene into the bin spontaneously in some conditions (e.g., 13, 15) where she was not prevented from flushing nor prompted to use the bin, suggesting some generalization. In conditions 16 and 18 there was some recurrence of struggling, hitting and rushing from toilet to toilet, when Ms. G. was prevented from flushing items and prompted to put items in the bin (see graph). In addition, in some conditions (e.g., 13, 16, 20) Ms. G. found other items lying around the house after flushing/putting the paper or polystyrene in the bin (these included staff shift plan lists and cigarette butts). On all occasions these were treated as though they were the original items in terms of the analog conditions.

++++++++++ Figure 3 here +++++++++++

Fig. 4 shows a graph of the number of hits per minute, the percentage duration of struggling and the percentage duration of running to the toilet(s) in each of the conditions (01 to 20, excluding
conditions 07 and 08). It can be seen that “hitting” and “struggling” only occurred in “prevention from flushing” conditions and that “running to toilet” occurred at a higher rate in the “prevention from flushing” conditions.

Finally, Fig. 5 shows Yule’s Q values for the conditional probability of “struggle” and “hit” before, during and after “prevention”, Yule’s Q values for the conditional probability of “ripping” and “flushing” before, during and after “prevention” and Yule’s Q values for “running to the toilet” and “wandering” before, during and after “prevention”. It can be seen that the probability of hitting and struggling was far higher than would have been expected by chance during “prevention”, the probability of running to the toilet was high preceding, during and following “prevention”, whereas the probability of wandering was particularly low during “prevention”, and the probability of ripping items was high both before and during prevention.

**DISCUSSION**

*Hypotheses considered*

From the results, it appeared that Ms. G. was very rarely engaged in appropriate activities and spent much of her time ripping and tearing paper or polystyrene, when these were available, and flushing them away (Table 1 and Figs. 1–3). When she was prevented from flushing her paper, Ms. G. would struggle, sometimes hitting the researcher, and often rushing to another toilet, where she would then repeat this process (Figs. 1–3). This behavior, of rushing to other settings where she might flush the material, did reduce over time (Fig. 4) as did her aggressive behavior (Fig. 4). Furthermore, Ms. G. appeared to gradually learn to place the material in the bin (part of the “prevention” procedure), instead of flushing it, this seeming to generalize to conditions where she was not prompted to do so. It had appeared that visible paper might act as an establishing operation for Ms. G.’s tearing and flushing but, on its own, it was not a powerful stimulus (hypothesis 1). However, being given a piece of paper clearly acted as an establishing operation for tearing and flushing it, in that every time Ms. G. was given paper or polystyrene, she
immediately ran or walked to the toilet to tear and flush it, apart from on one day (session C) when she found a button and spent the session time holding the paper in one hand and rolling the button in between the fingers of the other hand.

The function of Ms. G’s tearing and flushing of paper and polystyrene can be considered with reference to the hypotheses (outlined in the Method section above). Ms. G. did not rip or flush paper more in FS and US (“stopped”) than in FN and UN (“not stopped”) conditions - see Table 1. It seems unlikely, therefore, that the provision of social attention was the crucial reinforcer for ripping or flushing (cf. hypothesis 2 and 3). It is more likely that the reinforcer for flushing was sensory (cf. hypotheses 2 and 3) and it is possible that the slightly higher rates of flushing in UN than in FN conditions indicated an extinction burst in the former.

Ms. G. became aggressive, struggling and hitting out, only in the FS condition, when the researcher intervened to prevent Ms. G. flushing items away, suggesting that staff intervention of this kind was an establishing operation for the aggression when the material was flushable (cf. hypothesis 4). Moreover, Fig. 5 confirms this: it shows that the probability of struggling and hitting were at their highest during “prevention.” Ms. G. showed less struggling and hitting across successive conditions (see Fig. 4), suggesting that the prevention of the majority of attempts at flushing may have resulted in an extinction of the aggression (hypothesis 5). One possible interpretation of this was that Ms. G.’s aggressive behavior had the function of avoiding/escaping from the prevention of flushing. Interestingly, this relationship between Ms. G.’s behaviors and the behavior of others would not have appeared if the more traditional analog conditions had been employed (Carr, 1994; Iwata et al., 1982; Vollmer, 1995), confirming Carr’s view that unless a range of stimuli are tested in functional analysis, the relevant stimuli operating may not become clear (Carr, 1994).

**Complex stereotypies and rituals**

It is interesting to consider why Ms. G. ran from toilet to toilet when prevented from flushing and why she became aggressive when prevented from flushing. An exclusively operant analysis might suggest that the behavior of running to a toilet, ripping and flushing formed a chain, which when the putative reinforce (disappearance of the paper) was no longer presented, resulted in an
extinctionburst (of the behaviors which formed the chain) and that the aggressive behaviour was occasioned by the prevention from flushing or removal of the putative reinforcer (i.e., “prevention” was an establishing operation for aggression). The alternative view is that the behaviors, running to a toilet, tearing items and flushing them, formed part of a “routine” or “ritual”, in the sense that Wing and Gould (1979) defined it: “stereotyped repetitive activities involving the organization of materials or people” (p. 11), or a “compulsion” or “ritual” in the sense that Schultz and Berkson (1995) defined it: “insistence on adherence to an unusual, specific, ordered/sequential way of performing certain activities” (p. 390). From this perspective, it could be argued that when Ms. G. was prevented from completing her “ritual”, she appeared to struggle to remove the person who was preventing her from completing it and would hit out at times, presumably for the same reason. The evidence for this was that struggling and hitting only occurred when Ms. G. was being prevented from flushing (flushable) items down the toilet. Her struggling and hitting behavior could not simply be explained as demand avoidance since this would not account for Ms. G’s running from toilet to toilet; it could be argued that completion of the “ritual” was the goal and struggling and hitting may have had the function of avoiding the interruption of the “ritual” before its completion.

Interestingly, although Ms. G. had engaged in these behaviors (posting items down the toilet, breaking the toilet flush mechanism; aggression to others) for years, she seemed to learn a more appropriate behavior (putting items in the bin) without difficulty once she was no longer allowed to escape from the interruption of the “ritual”. Moreover, she generalized this positive behavior to sessions where it was not prompted to occur (conditions 13 and 15), at least in the presence of the researcher. While this could not be considered to constitute an intervention as such, it did suggest that an intervention involving response prevention (Baer & Minichiello, 1990) and reinforcement of other behaviour might be effective in reducing the complex stereotypy or ritual (cf. Cuvo, 1976; Hiss & Kozak, 1991; Hurley & Sovner, 1984; Matson, 1982), rather than medication which has been proposed as a method of treatment in much of the recent literature (e.g., Bodfish & Madison, 1993; Cook et al., 1992; Lewis et al., 1995).
Acknowledgments
We are very grateful to Ms. G. and her care staff for participating in this study. We would also like to thank Peter McGill for his comments on an earlier draft of this paper.

References


Pagel, S., & Whitling, C. (1978). Readmission to a state hospital for mentally retarded persons:
Rojahn, J. (1986). Self-injurious and stereotypic behaviour of non-institutionalised mentally retarded
Table 1. Behavioral observation codes

Behavior of Ms. G.

*Engagement (D):* Any appropriate active engagement, including leisure (e.g., throwing and catching a ball, looking through a magazine), domestic (e.g., preparing food, using the washing machine) or self-care (e.g., dressing, brushing her hair or teeth, eating, or drinking). Watching TV only coded (as leisure) if Ms. G. actively watching the screen when the TV was on.

*Wandering (D):* Wandering or pacing in house and garden, apparently aimlessly, often twirling her body and/or flapping at the same time.

* Sitting (D):* Sitting or lying down in the house or in the garden.

*Rip (D):* Turning paper/polystyrene into position for ripping, ripping, or tearing paper/polystyrene into small pieces, dropping pieces into toilet (recorded when Ms. G. in the toilet but also while running between toilets).

*Run/walk to toilet (D):* Walking or running towards any of the three toilets (two were downstairs and one upstairs).

*Sit toilet (D):* Sitting on toilet with all clothes on. (If Ms. G. prepared to use the toilet appropriately, researchers to withdraw; in fact, never necessary).

*Flush (E):* Pulling down the flush handle on the toilet.

*Struggle (D):* Pulling or trying to pull her hand away from the researcher (GM), turning her back and writhing her body away when physically prompted to place the paper/polystyrene in the bin.

*Hit (E):* Hitting or pushing anyone forcefully with flat of either hand.

*In bin (E):* Ms. G. putting items in the rubbish bin (verbal and physical prompts were recorded separately).

Behavior of researcher

*Offer (E):* Offering Ms. G. the paper or polystyrene, at the beginning of each researcher (GM) condition.

*Prevention (D):* Preventing Ms. G. from flushing items down the toilet (included verbal instructions, such as “No, not down the toilet” and “Put it in the bin”), physical prevention
of Ms. G. from raising the lid of the toilet, physical prompting of Ms. G.’s hand (in which she held the paper or polystyrene) to put paper/polystyrene in bin.
Table 2. Mean percentage duration or rate per minute of behaviors in FN, FS, UN, and US conditions and overall means

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean FN (conditions 01, 03, 09, 15, 17)</th>
<th>Mean FS (conditions 02, 04, 10, 16, 18)</th>
<th>Mean UN (conditions 05, 11, 13, 19)</th>
<th>Mean US (conditions 06, 12, 14, 20)</th>
<th>Mean overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engaged</td>
<td>7.6%</td>
<td>2.5%</td>
<td>10.3%</td>
<td>10.3%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Sitting</td>
<td>36.6%</td>
<td>14.1%</td>
<td>13.4%</td>
<td>41.4%</td>
<td>26.4%</td>
</tr>
<tr>
<td>Wandering</td>
<td>32.7%</td>
<td>29.7%</td>
<td>21.3%</td>
<td>39.1%</td>
<td>30.7%</td>
</tr>
<tr>
<td>Flushing</td>
<td>0.32/min</td>
<td>0.12/min</td>
<td>0.45/min</td>
<td>0.06/min</td>
<td>0.24/min</td>
</tr>
<tr>
<td>Ripping</td>
<td>8.2%</td>
<td>8.4%</td>
<td>13.0%</td>
<td>0.6%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Running to toilet</td>
<td>1.6%</td>
<td>10.8%</td>
<td>1.6%</td>
<td>4.4%</td>
<td>4.6%</td>
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<td>Prevention</td>
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<td>22.4%</td>
<td>0%</td>
<td>2.1%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Hit</td>
<td>0/min</td>
<td>0.12/min</td>
<td>0/min</td>
<td>0/min</td>
<td>0.03/min</td>
</tr>
<tr>
<td>Struggle</td>
<td>0%</td>
<td>8.2%</td>
<td>0%</td>
<td>0%</td>
<td>2.1%</td>
</tr>
<tr>
<td>In bin</td>
<td>0.04/min</td>
<td>0.11/min</td>
<td>0.05/min</td>
<td>0.15/min</td>
<td>0.09/min</td>
</tr>
</tbody>
</table>
Fig. 1. The sequence of behaviors in conditions 01 (FN) and 02 (FS) in set A.
Fig. 2. The sequence of behaviors in conditions 03 (FN), 04 (FS), 05 (UN) and 06 (US) in set B.
Fig. 3. The sequence of behaviors in conditions 17 (FN), 18 (FS), 19 (UN) and 20 (US) in set F.
Fig. 4. Number of hits per minute, percentage duration of struggling and running to toilet in each of the 20 conditions. Conditions 7 & 8 are not shown (see text).
Fig. 5. Yule’s Q statistic for “hit,” “struggle,” “ripping,” “flushing,” “running to toilet,” and “wandering” before, during, and after “prevention.”