RESEARCH IN PROGRESS

MEASURING EFFECTS OF DRUGS ON HUMAN SOCIAL BEHAVIORS

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Psychotropic drugs are widely prescribed for reducing problem behaviors in individuals with mental retardation (MR) and mental illness, but these drugs have received inadequate scientific attention. Clinical usage outpaces research, and efficacy studies seldom provide information on the behavioral selectivity of medications. That is, it is often unknown whether desirable behaviors also decrease as undesirable behavior decreases. Limited progress has been made toward developing a scientific knowledge base of behavioral selectivity, largely because of the difficulty and expense of reliable assessment. Studies of psychotropic medications have generally not included detailed measurement of social behavior in the natural environment. Yet normalization of social interactions is a primary goal of behavioral and drug therapies (DuPaul & Barkley, 1993); therefore, treatments that diminish the quantity and quality of social behaviors are counterproductive.

To our knowledge, we are conducting the first detailed study of psychotropic-medication effects on social interactions in persons with MR. For clinical purposes, the primary data of interest are the quantity and quality of social interactions. In addition, it is important to know whether the subject initiates interactions or merely responds to others. From a more analytic point of view, we would like to be able to identify antecedent events that may "trigger" aberrant or undesirable behavior, as well as those associated with desirable behavior. By measuring the occurrence of such antecedent events, we can determine whether medication changes the subject's response to them, or whether changes in the frequency of the antecedents themselves may be causing changes in target behavior. For example, during the drug trial there may be a reduction in aggression associated with work related demands. This could be due to a drug-related reduction in the aversiveness of demands, or to a coincidental reduction in the rate with which caregivers place work related demands on the subject. This differentiation requires a comprehensive measurement system for recording sequences of events.

METHOD AND RESULTS

We use a behavioral coding and analysis system developed for studying behavioral variables and interventions in classroom settings with behavior disordered children (Mahon, Shores, & Buske, 1999; Shores, Wehby, & Jack, 1999). This system allows for the collection of continuous, real-time data, preserving the sequence of multiple instances of behavior. Observers enter the codes into a hand-held microcomputer using the number keys. Each event is entered as a four-digit code. The first digit represents who emits a behavior (the actor), the second and third digits represent the topography of the behavior, and the fourth digit represents to whom the behavior is directed (the target). For example, if a caregiver asks the subject to stop screaming, the caregiver is the actor, the response is a negative mand, and the subject is the target. We record only caregiver and peer behavior directed toward the subject. A "stop" code is entered when there is no scoreable event for 10 seconds. Each code is time stamped. In addition, the system allows for the simultaneous recording of concurrent behavior, such as stereotyped behavior, and of changes in the environment, such as changes in caregiver or peer proximity.

For analysis we used a sequential interaction program (MOOSES; Tapp, Wehby, & Ellis, 1995 or see http://kc.vanderbilt.edu/~jont/mintro.html for a description) to produce conditional probabilities of target behavior. We also used a second program (SCOPE; available from the authors) which separates the behavior stream into interaction sequences and non-interaction sequences and analyzes the rates of and time spent in the different classes of interactions (e.g.,

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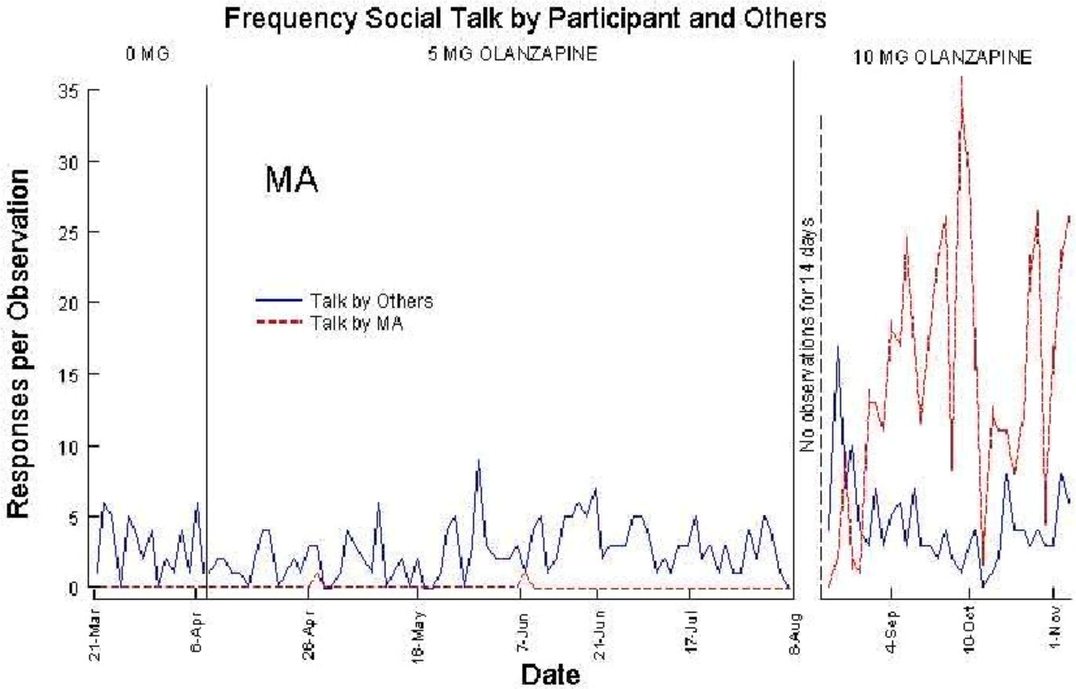

Figure 1

desirable and undesirable interactions, interactions initiated by the participant or by others). By definition, an interaction follows a stop code and involves a coded behavior initiated by one actor followed by a code with a different actor (i.e., subject talks to caregiver followed by caregiver talks to subject). The first code after a stop code is used to classify the interaction as initiated by subject or other and to calculate the relative frequency of subject initiations. Sequences without these reciprocal behaviors are not included in the interaction analysis.

This complex data collection system requires intensive observer training to generate reliable data. In our experience, it is possible to train observers on a system of 25 behavior codes (resulting in over 100 initiator-behavior-target combinations) in about 6 weeks, given a consistent, programmatic approach. Our criterion for training is interobserver agreement (IOA) scores of 80% or higher on each code. In well-trained observers, IOA reliably exceeds 90%. Data presented below were collected by a very experienced observer, but reliability was taken by trainees. Mean occurrence IOA was 76% ranging from 0 to 100% across 43 obtained code combinations.

The use of these measures is demonstrated with data from a 53-year-old woman with mild mental retardation who was diagnosed with major depression. She was withdrawn, rarely spoke, and preferred to stay in bed and socially isolated. She had been highly social prior to the diagnosis of depression. She had been treated with a wide variety of antidepressant, antipsychotic, and mood stabilizing medications without change, and was scheduled for a trial with the atypical neuroleptic olanzapine. We typically conduct 30-minute observations in settings and activities that occur daily and in which other people are available for social interactions. For MA, lunchtime was chosen.

Figure 1 shows the frequency of “social talk” between MA (both initiations and responses) and hospital staff and peers. After a 2-week period without olanzapine, 5 mg was administered daily for 12 weeks. There was no change in the frequency of talk. After the increase to 10 mg, however, there was a marked increase in MA’s frequency of “spontaneous” talking.

Figure 2 shows the percentage of observation time spent in interactions initiated by MA and by others for the last 10 observations under 5 mg and 10 mg. For the lack of better descriptions, we call

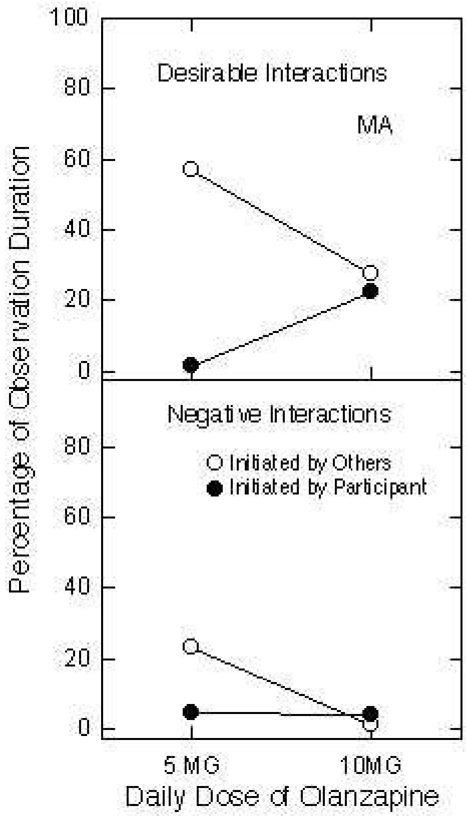

Figure 2

any interaction that includes an undesirable behavior a negative interaction and other interactions "desirable." While interactions occurred for the majority of the observations, MA initiated virtually none of these interactions under 5 mg. Under 10 mg more than 20% of the observation time was spent in desirable interactions initiated by MA. The decrease in negative interactions is also notable.

Table 1 shows, for the five most likely interaction initiations during the last 10 sessions under 5 mg and 10 mg and in order of probability, the initiator, the type of behavior, and the target in each interaction. The only initiated interactions in the 5 mg condition were by other people, and 60% of those were requests or physical prompting to perform specific tasks. In the 10 mg condition, however, MA was the initiator for three of the five most probable initiations, and task related requests by others constituted only 20% of the initiations. Subject and staff behavior indicative of normal conversation, which never occurred under 5 mg, comprise the remainder of the most probable initiation behavior under 10 mg.

DISCUSSION

In the absence of a dosage reversal, it is unclear whether the changes shown with this participant are due to olanzapine treatment or other factors. Our purpose here is to show that the observation system can be used to measure clinically-important changes in social behavior in adults with MR and mental illness. Because we can record the rates of a range of undesirable behavior targeted for reduction, as well as a range of desirable behavior topographies, selectivity of drug effects can be assessed.

In addition, we hope that this line of work might begin to reveal some behavioral mechanisms of drug actions. The sequential analysis allows us to detect changes in sequential dependencies of events. For example, a reduction in self-injurious behavior (SIB) under drug conditions may be traceable to a reduced probability that task demands are followed by SIB. This outcome may be interpreted as a selective reduction of escape/avoidance-related SIB. That is, these measures can indicate which topographical and functional classes are affected by the medication (see Symons et al., 2001). Although there are other methods of obtaining functional and topographical measures (e.g., analog procedures), direct measurement of naturally occurring behaviors has the advantage of being minimally intrusive and having high external validity.

A clinically interesting feature of these data is that they can be interpreted as showing improvement of so-called negative symptoms (i.e., not speaking, poverty of vocalizations and interactions, etc.) characteristic of depression. These measures may also be used to provide a wealth of information on the effects of drugs used in other populations (e.g., children), as well as in applied and basic behavioral research on social behavior.

We are currently using this observation system as part of a double blind, placebo-controlled study of the atypical neuroleptic risperidone. To our knowledge, this is one of the few attempts to assess the selectivity of such drugs in reducing undesirable behavior. The work takes a first critical step in the development of an informative literature on the effects of psychoactive medications in individuals with mental retardation. Evidence that a drug has selective effects may ultimately inform efforts to

Table 1

Five most probable behaviors initiating interactions following a stop code under the 5 mg and 10 mg conditions.

			Conditional probability	
Initiator	Initiating behavior	Recipient	5 mg	10 mg
Other	Mand	Subject	0.495	0.200
Other	Physical guidance	Subject	0.105	0.003
Other	Negative physical	Subject	0.039	0.000
Other	Positive physical	Subject	0.032	0.006
Other	Compliment	Subject	0.029	0.028
Other	Question	Subject	0.000	0.158
Subject	Talk	Other	0.000	0.107
Subject	Question	Other	0.000	0.104
Subject	Compliment	Other	0.000	0.069

discover brain-behavior relations. For example, the clinical efficacy of a drug with specific neurochemical effects is often taken as evidence to support theories of specific neurotransmitter theory of the behavior's etiology. This logic is critically dependent on the selectivity of the drug's effect on the aberrant behavior.

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