

A COMPARISON OF REMOTE MONITORING AND DIRECT OBSERVATIONS ON THE
IMPLEMENTATION OF A MOTIVATIONAL SYSTEM TO IMPROVE INDEPENDENT
LIVING SKILLS FOR PEOPLE WITH INTELLECTUAL AND DEVELOPMENTAL
DISABILITIES

By

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Abstract

An increasing number of people with intellectual and developmental disabilities have opportunities to live in apartments and homes in the community with assistance from other people. The purpose of this research was to examine whether a remote video monitoring system with cameras linked to an off-site facility, in conjunction with a token system, could be used to maintain a high level of cleanliness of three apartments. Two people with intellectual and developmental disabilities lived in each apartment. Data were recorded daily in the apartments using the video monitoring system as well as in-vivo observations. The token system was implemented in each of the homes within a multiple baseline design. Results indicated that the motivational system was effective with some of the participants. Additionally, the video monitoring system provided an estimate of the cleanliness of the apartments, but a more accurate measure of the cleanliness was obtained through in-vivo observations. Video monitoring systems may aid in the implementation of some interventions, but certain behaviors may require in-vivo observations to ensure precise and valid measurement.

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A Comparison of Remote Monitoring and Direct Observations on the Implementation of a Motivational System to Improve Independent Living Skills for People with Intellectual and Developmental Disabilities

As scientific and technological advancements continue to be made, an increasing number of people with intellectual and developmental disabilities (IDD) have opportunities to live in apartments and homes in the community with assistance from other people. Because more people with diagnoses of IDD are living in the community (Prouty, Alba, Scott, & Lakin, 2008), it is important to find ways to maximize their independence and help them to live a more meaningful and productive life. One of the ways to maximize independence is to develop methods that allow people with IDD to reduce the amount of assistance that is required for them to live in the community. Depending on the level of IDD, assistance may be provided in the form of prompting an individual to complete or engage in various tasks, providing transportation and opportunities for engagement in community activities, delivering medications, and teaching job-related skills. While there are a wide variety of areas and tasks that might require assistance, home maintenance/chore behaviors are important ones that can increase an individual's independence.

Home maintenance/chore behaviors may involve sweeping, washing dishes, vacuuming, making one's bed, and taking out the trash. When an individual with IDD who lives in the community does not independently engage in home-maintenance/chore behaviors, staff are often required to provide some level of assistance to help the individual complete the required tasks. Sometimes this involves the staff simply doing the task for him or her. While the staff are being paid to provide assistance to people with IDD who are living in the community, staff typically

also have a wide variety of responsibilities and people to whom they need to attend. When an individual is physically able to complete the required tasks, there are a number of interventions that can help him or her complete tasks independent of staff assistance, thus allowing staff to focus on other job-related responsibilities. One intervention is the use of a token economy.

Use of Token Economies to Teach and Motivate

Token economies are examples of a behavioral intervention that have been used to help individuals with IDD complete tasks independent of staff assistance (Kazdin & Bootzin, 1972). In a token economy, tokens such as coins and/or points are given contingent on specific behaviors to motivate an individual to engage in more useful behavior(s). After a pre-determined number of tokens are collected, the individual has the opportunity to exchange his or her tokens for a “backup” reinforcer.

In a landmark study, Ayllon and Azrin (1965) demonstrated that token economies could effectively motivate female patients living in a psychiatric ward to engage in a variety of desired behaviors both on the ward and off the ward. In a series of six studies, Ayllon and Azrin demonstrated that contingent token reinforcement was effective in maintaining the desired behaviors when compared to noncontingent token reinforcement. The pioneering work of Ayllon and Azrin caused a dramatic increase in research on the effectiveness of token economies (e.g., see reviews by Kazdin, 1977, 1982; Kazdin & Bootzin, 1972; O’Leary & Drabman, 1971). Within the token economy literature, however, there are some studies that specifically target home maintenance/chore behaviors with various populations and settings.

Token economies that specifically target home-maintenance/chore behaviors have been

effectively used in community homes for juvenile delinquents (Phillips, 1968; Barkley, Hastings, Tousel, & Tousel, 1976). In both of these studies, the researchers used a point system to increase bathroom cleaning and completion of daily chores, as well as other behaviors. Christopherson, Arnold, Hill, and Quilitch (1972) taught parents how to use a point system within their home to motivate their children to complete household chores (i.e., making beds, straightening bedroom, washing dishes, and taking out the trash) and decrease whining and bickering. Finally, Feallock and Miller (1976) showed that use of a token economy effectively motivated college undergraduate and graduate students living in a communal setting to complete chores.

There also have been a number of studies using token economies to improve home maintenance/chore behaviors for adults with IDD. For example, Nelson and Cone (1979) used a token economy to increase the overall number of participants' completion of personal hygiene behaviors (i.e., washing face, combing hair, shaving, and brushing teeth), personal management tasks (i.e., dressing neatly, making bed, cleaning bed drawer, and exercising), ward work (e.g., cleaning ashtrays, folding linens, and dusting), and social skills. Participants included 16 institutionalized male psychiatric patients on a locked ward in a state hospital in Missouri. The participants ranged in age from 19 to 61 years old, had been hospitalized for 1.2 to 41.4 years, and were diagnosed as psychotic or mentally retarded. Ward staffing typically consisted of three staff members during the day, two staff members in the evenings, and two staff members throughout the nights. Additionally, a physician, a nurse, and a social worker made daily rounds throughout the ward. The researchers provided tokens following the occurrence of target responses, and tokens could be exchanged for a variety of different items (i.e., hot and cold beverages, fruit, cookies, candy, ice cream, cigarettes, phonograph records, wallets, stockings,

toiletries, and other miscellaneous items) in a centrally located token store on the ward during three 15-min periods each weekday. Nelson and Cone introduced the token economy in a multiple-baseline design across four groups of target behaviors for all of the participants. A substantial improvement was found in the performance of most target behaviors for all individuals following the implementation of the token economy.

Jarman, Iwata, and Lorentzson (1983) used a token economy to address six morning tasks with individuals who lived in a 450-bed residential facility for people diagnosed with intellectual and developmental disabilities. The participants ranged in age from 14 to 57 years and all were classified as having moderate to severe mental retardation. The unit director, four additional supervisors, and 12 attendants provided supervision of the program. The targeted tasks included toileting, showering, dressing, toothbrushing, cubicle duties (the removal of trash and clothing from the bed, dresser, and nightstand tops, and floor), and bed linen removal (including placement of linens in a clothes hamper). Researchers provided plastic tokens to each participant for completing the specific tasks and residents were allowed to exchange tokens twice weekly at a canteen area located away from the unit. Jarman and colleagues used a multiple baseline design across skills for all of the participants and were able to increase the residents' completion of the six target behaviors through both a single-response (i.e., providing one token after completion of one task) contingency and a chained contingency (i.e., providing tokens after the completion of all tasks).

Strouse (1985) designed and evaluated a token economy for individuals diagnosed with IDD, between the ages of 23 and 51, who lived in a semi-independent apartment program in the community. The apartment program was located in a low-income apartment development, and

the individuals with IDD were living in apartments interspersed throughout the complex. Each apartment consisted of a kitchen, a living room, bathroom, and two bedrooms. The apartment program staff consisted of a supervisor who lived on-site and three full-time teaching staff who implemented a structured intervention program based on adaptations of the Teaching Family Model (Sherman, Sheldon, Morris, Strouse, & Reese, 1984). The investigator targeted three behaviors: interrupting in family conference, turning in menu plans on time, and bathroom cleaning. During weekly scheduled visits (with at least one day of advance notice), the investigator delivered various amounts of points to each participant contingent on the cleanliness of thirteen bathroom items (i.e., bathtub, faucets, sink, soap dishes, toilet, medicine cabinet, mirror, walls, ceiling, door, windows, and window sills and/or shelves). Backup reinforcers included the ability to have visitors in the apartment, visit other apartments, engage in group activities and individual leisure-time activities with staff, rent items such as sports equipment, videos, tapes, and board games, and purchase items such as tickets to a sporting event. Using a multiple baseline design across four participants and a reversal design with one, Strouse showed that the motivational system was responsible for increasing the number of bathroom areas that were cleaned. The Strouse study demonstrated that a token economy could be used to motivate individuals with IDD living semi-independently in a very structured apartment program with a great deal of staff support and supervision.

As more people with IDD are living in apartments and homes in the community, it is likely that token economies will continue to be used to motivate these people to engage in meaningful behaviors. While token economies have proven to be effective with a variety of populations and settings, the transition to more semi-independent settings with less structure and

staff support provides individuals with easier access to preferred items and activities. Because these semi-independent settings allow the individual to be more independent, with unrestricted access to preferred items and activities, it is important that the use of token economies to motivate people with IDD continues to be evaluated.

Use of Technology for Remote Monitoring Purposes

Concurrent with the move of people with IDD from large institutions to the community, technology has continued to progress such that it may now play an integral role in assisting and providing support for dependent populations to remain in the community. The advancement of technology has allowed community programs to progress from providing support solely in a face-to-face manner to providing some services over the telephone, to utilizing cameras that record behaviors, to using devices that permit real life communication through TV devices. This distance-based telecommunication technology is commonly referred to as telecare.

Telecare has been defined as the use of electronic information and telecommunication technologies to provide care to clients in their own home from a distance (Taber-Doughty, Shurr, Brewer, & Kubik, 2010). These remote monitoring systems have major implications for organizations that provide services and assistance to people in the community because they may reduce the need for staff to be on-site, allow the consumers to live a more independent life, further protect the consumers' safety and well-being, and reduce the organization's cost of providing services. While this technology has only recently been implemented in community programs for adults with IDD, there is some research with elder adults that suggests it may have considerable utility for other populations as well.

As people age, they often need more health care and may even require more long-term or intensive supports such as having a caregiver in his or her home or moving to a residential facility. Investigators have implemented various telecare programs with elder adults. Mahoney, Tennstedt, Friedman, and Heeren (1999) used an automated computer-based telecommunications system that calls a person and asks for responses to various questions, transforms touchtone keystroke information to a written document, and stores the information in a database. The telephone monitoring system documents elder adults' functional status according to the Activities of Daily Living (ADL) (i.e., the level of assistance needed to bathe, dress or undress, eat, use the toilet, manage bladder/bowel control, get in and out of bed or a chair, and get around in the house), the Instrumental Activities of Daily Living (IADL) (i.e., the level of assistance needed to prepare meals, do housework, do the laundry, go shopping, take medicine, arrange transportation, and manage money), and whether the individual was receiving assistance for those needs. The authors reported that the automated telephone monitoring system showed excellent test-retest reliability for collecting information about an elder adult's functional status.

Recently, more advanced telecare systems have been described in the literature. For example, Mahoney (2004) describes a telecare system that provides caregivers with both a "low-technology" and "high-technology" component to monitor and help support elder adults residing in their own homes in the community. The low-technology component consists of a nurse-facilitated internet support group that is limited to participants and offers a medium to exchange messages about caregiving issues and receive peer and nurse advice. The high-technology component uses computational sensor monitoring in the homes to monitor specific functional health patterns (e.g., nutrition, activity/exercise, sleep/rest, elimination, etc.) based on the

caregivers' area(s) of concern, a nursing assessment, and the elder adult's preferences. The system allows the family member or caregiver to log in to a secure web server to receive an update regarding the elder adults activities. If a designated event (e.g., nutrition, activity/exercise, sleep/rest, elimination, etc.) does not occur, the system automatically sends this information to the caregiver via a page alert or direct notice to the worker's computer. While Mahoney (2004) described an innovative remote monitoring system, unfortunately, she provided no objective or reliable data on the dependent measures, nor did she experimentally evaluate the remote monitoring system.

Mahoney, Mahoney, and Liss (2009) describe a remote-monitoring system that was specifically developed to address family members, caregivers, and users concerns in an independent living residence (ILR) (i.e., high rise apartment buildings with predominantly one-bedroom apartments with staff and other services available) for elder adults. The authors held a focus group to identify what the residents, family members, and staff members wanted installed in terms of remote monitoring technology. The remote-monitoring system installed in the ILR consisted of motion sensors in each room to monitor activity of an elder adult's living space, a water sensor in the bathroom to monitor toilet overflows, and a system that allowed the elder adult to enable/disable the system. Each system included four motion sensors placed in the elder adult's residence that sent data to the project server every 15 minutes. Additionally, a website was available for caregivers to check the status of their family member's activity as it was recorded through the motion sensors and provided a means for the remote monitoring system to post status indicators and send emails to alert caregivers to potential issues (e.g., low activity measured) with the elder adults. Mahoney et al. reported through pre- and post-intervention

assessments, that elder adults believed the system met their needs and was not intrusive but would not be a replacement for staff. The authors reported that, overall, the majority of family members would recommend the monitoring system to other elder adults. Unfortunately, the authors only provided self-report measures and no objective or reliable data on the dependent measures, nor did they experimentally evaluate the effectiveness of the remote monitoring system.

Reder, Ambler, Philipose, and Hedrick (2010) used remote monitoring sensor technology (i.e., a wireless bracelet, postage-stamp-sized Radio Frequency Identification tags, and matbox-sized battery-powered wireless shake sensors) to monitor meal preparation, physical activity, vitamin use, and personal care in twelve elder adults' homes. These wireless sensors communicated via the internet to the elder adults and their family caregivers through electronic picture frames that updated roughly once an hour throughout the day in each of the elder adult's homes and provided summary information for the past hour, day, and week. The authors used elder adults self-report data to assess whether the remote-monitoring system was able to measure or increase elder adults' completion of the targeted behaviors. Through a series of in-person and telephone interviews, Reder et al. found that all of the elder adults not only used the technology but also reported that the reminders were useful in helping them complete the required tasks. Additionally, the authors reported that caregivers and family members found the technology to provide greater "peace of mind" because they felt the elder adults were safer living alone. Unfortunately, the researchers provided no objective or reliable data on the dependent measures, nor did they experimentally evaluate the effectiveness of the remote monitoring system.

There has been a considerable amount of telecare research, conducted in retirement

facilities for elder adults, that involves remote sensing tools that allow for the monitoring of various health and safety conditions and the signaling of staff when dangerous behaviors occur (e.g., Alexander et al., 2011; Demiris, Oliver, Dickey, Skubic, & Rantz, 2008; Galambos, Skubic, Wang, & Rantz, 2013; Krampe, Miller, Echebiri, Rantz, & Skubic, 2013; Popescu, Li, Skubic, & Rantz, 2008; Rantz et al., 2012; Rantz et al., 2013; Rosales, Skubic, Heise, Devaney, & Schaumburg, 2012; Skubic, Alexander, Popescu, Rantz, & Keller, 2009; Stone & Skubic, 2011; Wang, F. et al., 2009; Zhou, Stone, Skubic, Keller, & He, 2011). For example, Stone and Skubic (2011) compared the use of an inexpensive depth camera device (i.e., Microsoft Kinect) to a web-camera based system, both of which passively administered a fall risk assessment; these two systems were compared to a Vicon motion capture system where elder adults wore devices with markers that allowed for the accurate determination of temporal and spatial gait parameters. Researchers found good agreement between gait measurements computed using the Microsoft Kinect as compared to those measurements computed through the Vicon motion capture system and the web-camera based system. Additionally, the authors reported the Microsoft Kinect system significantly reduced the cost of a fall risk assessment system.

Recently, researchers have investigated the use of telecare technology in programs that provide services to adults with intellectual and developmental disabilities. Brewer, Taber-Doughty, and Kubik (2010) conducted an assessment with multi-stakeholders (i.e., clients, advocates, service provider administrators, and independent case coordinators) on the privacy, safety, and security of a home-based telecare system used by remote caregivers to monitor adults with developmental disabilities throughout the night in place of on-site support staff. The telecare system was installed in homes for people diagnosed with a developmental disability and

included “some or all of the following components: a broadband connection to the internet using either cable or a digital subscriber line (DSL), a camera with pan, tilt, zoom capabilities, voice over IP (VOIP) communications between the client and the remote care provider, a carbon monoxide sensor, smoke detection sensors, temperature sensor, door and window break sensors, and motion detection sensors” (p. 266). Motion sensors and video cameras were used to alert remote caregivers when there was activity in the home that might require direct attention. Through a series of survey and interviews with the stakeholders, Brewer et al. found the telecare system to be perceived as safe, secure, and private as having the staff in the home.

Digennaro Reed & Reed (2013) describe a comprehensive service model utilizing cameras in community residential facilities for people who have intellectual and developmental disabilities that involves remote monitoring and support. The specific technology described by Digennaro Reed and Reed involves professionals in a central monitoring suite monitoring 24 hours a day a customizable package of technology that is tailored to the supports that a specific individual needs and allows those professionals to increase the assistance or support for that individual only when needed. While this technology is installed and currently being used in the organization described by Digennaro Reed & Reed, there has been very limited research conducted that evaluates the effectiveness of this technology.

Courtemanche (2012) designed and evaluated a multi-component intervention to reduce self-injury for adults diagnosed with profound IDD/autism in the natural environment. Once the effectiveness of the intervention was demonstrated, Courtemanche evaluated a staff-training package (i.e., written instructions, modeling, role-play, feedback, and contingent money) to train teachers and staff on the implementation of the intervention. After successfully demonstrating

that the teachers and staff could be taught the intervention to reduce self-injury in the researcher's presence, remote monitoring technology was used to evaluate whether teachers and staff continued to implement the intervention in the researcher's absence and after feedback and contingent money were provided less frequently. Through the use of the remote monitoring technology, Courtemanche was able to determine that teachers and staff continued to implement the intervention in the absence of the researcher even when they received less feedback and contingent money.

As technological advancements continue to be made, it is likely that the use of remote-monitoring systems by community programs that provide services and assistance to others will become more prevalent. While this technology can provide a number of benefits to the organization and to the people whom the organization serves, it is important that the accuracy and validity of these systems be assessed and compared to in-vivo observations. Additionally, if these remote-monitoring systems are going to serve as either a support or replacement for in-person services, it is important that the quality of care remains high.

In the present study there were two primary purposes. First, the primary investigator developed a motivational system to help adults with intellectual and developmental disabilities, who were living in a semi-independent apartment community, to complete a number of home-maintenance tasks independent of staff prompting and assistance. A token economy was implemented to increase the number of home maintenance skills completed. A second purpose of the study was to assess the validity of a remote video monitoring system in the measurement of the cleanliness of the apartments. To assess the validity of the remote video monitoring system, the primary investigator measured the cleanliness of each participant's kitchen, living

room, and dining room in two ways: observations were made using a remote-video monitoring system that utilized cameras installed throughout the targeted rooms of each participant's apartment and also using direct in-vivo observations by human observers.

Methods

Participants

The primary investigator recruited individuals from a not-for-profit organization that serves individuals with intellectual and developmental disabilities in the mid-western United States. To participate in the study, participants had to be over the age of 18, have a diagnosis of an intellectual and developmental disability, have the ability to complete the required home maintenance tasks independently (but did not reliably do so without staff prompting), live in an apartment or home for which they were responsible for maintaining the cleanliness, and where all members of the living arrangement agreed to participate in the study. Before beginning the study, the primary investigator obtained approvals from the university human subjects committee as well as the human rights committee of the community program where the participants resided.

To recruit people to participate in the study, the primary investigator asked the Chief Operating Officer (COO) of the community organization to identify any individuals who met the inclusion criteria described above. The COO provided a list of these individuals to an administrative assistant. The primary investigator provided the administrative assistant with assembled informational packets that included a brief introductory letter that described the study, two copies of the appropriate consent form, and a stamped and addressed envelope to return a signed copy of the consent form if the parents or guardians wanted their son/daughter/ward to

participate in the study or, for those individuals who were their own guardian, a signed consent indicating that the individual wanted to participate in the study himself or herself (see Appendix A for the recruitment packets). The administrative assistant mailed the packets to all of the potential participants or their parents or guardians; thus, the primary investigator was not aware of any of the potential participant's identity prior to the parent, guardian, or individual consenting to participation in the study. Parents, guardians, or individuals who wanted to participate in the study mailed the signed consent forms from the packet directly to the primary investigator.

Ten signed consent forms were returned to the primary investigator. After receiving the signed consent forms, the primary investigator met with the administrative assistant to obtain the potential participant's contact information. The primary investigator then scheduled a time to meet with all of the participants. For those participants who were not his or her own guardian, the primary investigator obtained assent by verbally describing the study using the university human subjects committee approved description and asking if he or she wanted to participate.

Either consent or assent was obtained from all ten participants who began participation in the study. During the study, two participants moved away. Additionally, one parent/guardian withdrew consent. This automatically excluded both members of the apartment because both participants were required to participate to be included in the study. Therefore, six participants completed the study.

At the beginning of the study, Drew was 21 years old and diagnosed with mental retardation, attention-deficit hyperactivity disorder, and bi-polar disorder. Drew had a full-scale intelligent quotient (IQ) of 64 and had deficits in reading, math, and self-help skills. Charles was

21 years old and was diagnosed with attention-deficit hyperactivity disorder, mild mental retardation, pervasive developmental disorder – autism, delusional disorder, and severe and persistent mental illness. Adam was 25 years old and was diagnosed with behavioral disorders, attention deficit disorder, autism, gastroesophageal reflux disease, and had deficits in the area of social interactions. Greg was 20 years old, had an IQ of 101, had a traumatic brain injury, was diagnosed with attention-deficit hyperactivity disorder, schizoaffective disorder, post-traumatic stress disorder, depression, asthma, and enuresis. Allen was 21 years old, had an IQ of 62, was diagnosed with attention-deficit disorder, pervasive developmental disorder not otherwise specified, mild mental retardation, and had deficits in the areas of making friends, finding activities, learning day-to-day living skills, and allergies. Finally, Ryan was 23 years old and was diagnosed with attention-deficit disorder, autism, and depression. No IQ measures were available for Charles, Adam, and Ryan.

Setting

Interventions took place in the participants' apartments. All of the participants lived in a semi-independent apartment program operated by the organization within a large apartment complex in the community. Two individuals with intellectual and developmental disabilities occupied each apartment and both individuals participated in the study. The original participant pairings changed three months into the study due to circumstances that were outside of the primary investigator's control.

The primary investigator conducted observations in the kitchens, living rooms, and dining rooms of the apartments. Each apartment had two cameras that were placed in the living areas of the apartment (living room/dining room). Cameras were placed on walls near the ceiling

on both sides of the room. Although the two cameras showed the majority of the apartment, depending on how the participants arranged the furniture in their apartment, different parts of the apartment were visible through each of the cameras. Additionally, each apartment had two cameras placed in the kitchen. The cameras in the kitchen were placed on the wall near the ceiling on the same side of the kitchen and were angled in a way to provide different views of the kitchen. All of the cameras throughout the apartments were connected to an off-site monitoring facility operated by the organization.

Data Collection

The primary investigator collected data on the cleanliness of the apartments in two ways: in-vivo and from video recordings of the apartment through the remote video monitoring system during the same time as the in-vivo visit occurred but scored later. (The checklist used to measure the cleanliness of the apartments is shown in Appendix B.) Through in-vivo unannounced visits to the apartments four or five times a week during the morning and afternoons of most weekdays, the primary investigator collected data on the cleanliness of the apartments. These visits varied in length from five to twenty minutes. Because these visits were unannounced, on some days the primary investigator arrived at the apartment to record behavior and neither of the participants living in the apartment were at home; therefore, no in-vivo data were collected on those days.

The remote video monitoring system consisted of cameras in the apartment that fed a live stream to the organization's secure off-site monitoring facility. The remote-video monitoring system was on 24-hours a day, seven days a week. All of the video footage was automatically saved for at least one month. Weekly, the primary investigator visited the off-site monitoring

facility to collect data through the remote-video monitoring system. Because the video monitoring system saved all of the video, the primary investigator used the system to access retrospectively each participating apartment at the exact same time the unannounced in-vivo observations had been conducted. The primary investigator alternated between each of the four camera views in each apartment to collect data on the cleanliness of the apartment and recorded data using the same data sheet that was used in the in-vivo observations. The organization provided the primary investigator with a backup disk to save the video from the remote-video monitoring system so the tapes could be viewed at a later date, if needed.

Dependent Measures

Cleanliness Checklist. The primary investigator collected data on the cleanliness of various parts of the kitchen and living room/dining room. In the kitchen, the following areas were scored:

- Dishes, containers, and cookware stored appropriately;
- Counter and stoves tops free of personal items and cleaning supplies;
- Counter and stove tops clean;
- Sink clean;
- Hand soap and paper towels (or clean hand towel or napkins) are available;
- No overflow of trash in trash can;
- Floor free of extra items;
- Floor tile clean;
- Floor rugs clean.

In the living room/dining room, the following areas were scored:

- No overflow of trash in trash can;
- Room free of dishes;
- Room free of beverages excluding single-serving, re-sealable containers;
- Room free of food;
- Furniture (e.g., couch, chair, etc.) free of extra items (e.g., magazines, video games, boxes, bags);
- Floor free of extra items (e.g., magazines, video games, boxes, blankets, pillows, etc.);
- Floor carpet clean;
- Floor rugs clean;
- Floor tile clean;
- Surfaces (e.g., tables, shelves, mantle, entertainment center, etc.) free of clutter;
- Surfaces (e.g., tables, shelves, mantle, entertainment center, etc.) clean;
- Kitchen/Dining Room table clean;
- Kitchen/Dining Room table free of personal items and cleaning supplies

(See Appendix C for complete checklist definitions.)

Inter-observer Agreement

The primary investigator calculated inter-observer agreement (IOA) on at least 35% (ranging from 35% to 52%) of all in-vivo and remote-video monitoring observations for each apartment. A second independent observer (reliability observer) collected data, at the same time as the primary investigator, on the cleanliness of the apartment using his own copy of the same

written checklist. Reliability for the in-vivo observations was conducted during the observations of the apartment when both the primary investigator and reliability observer were present, and reliability for the remote-video monitoring observations was conducted at an off-site monitoring facility with both the primary investigator and reliability observer observing the same tapes. The primary investigator did not discuss the cleanliness of the apartment with the secondary observer during any of the in-vivo or remote-video monitoring observations. The reliability observer's data were compared to the data of the primary investigator. The cleanliness of each area of the rooms included on the checklist was compared, and the reliability calculation was the number of agreements divided by the number of agreements plus disagreements for each observation. The primary investigator then multiplied that number by 100 to get the percentage of agreement for each observation. The total results of these reliability evaluations are shown in Table 1.

Design

The primary investigator used a multiple-baseline design across apartments to evaluate the effects of the motivational system (Baer, Wolf, & Risley, 1968). Because there were two participants living in each of the apartments, both of the participants living in the same apartment progressed through each of the phases at the same time. The criteria for implementing the intervention for the second or third set of participants required that at least one of the participants of the pair showed an effect of the motivational system and no change in behavior for the participants who were not receiving the intervention.

Procedures

Motivational System.

Points awarded for tasks. The primary investigator developed a point system to use as the motivational system. To develop the point system, the primary investigator estimated the average amount of time that each task on the checklist would take to complete in two-minute intervals. Each two-minute interval was equivalent to earning one point through the motivational system. Thus, each of the tasks on the checklist was assigned different lengths of time to complete and assigned differential point values based on the amount of time it was estimated the task would take to complete (see Appendix D for the number of points awarded for checklist tasks).

Backup reinforcer. The backup reinforcers used in the motivational system were identified after visiting with each participant a number of times and asking what type of activities he liked doing or what type of items he might like to have. The primary investigator also spoke with the staff who were familiar with the participants to discuss what activities and/or items they thought each participant might be interested in doing or having. After all of the potential backup reinforcers were identified, the primary investigator created a list to discuss with one of the site supervisors. The site supervisor went over the list of backup reinforcers to ensure that each item was appropriate and to determine how much time the average staff member could engage in the identified preferred activities on a weekly basis. Additionally, the primary investigator was able to engage in preferred activities for 30 min per participant per week for use as a backup reinforcer. Due to some of the activities being off-site, the primary investigator obtained approval from the organization and consent from all of the guardians or individuals to transport the participants to various places in the community in his own car.

The primary investigator created a formula to determine the cost of the backup

reinforcers where each dollar was equivalent to 28 points and 10 min of an activity was equivalent to 46.7 points through the point system. The organization was able to provide one dollar per day, per individual, to purchase preferred items. (Because of the delay in ordering and receiving the backup reinforcers, the primary investigator purchased the items using the one dollar per day, per participant, guideline.) Because the in-vivo observations were conducted through unannounced visits and the primary investigator was not always able to observe each apartment five days per week, the point calculations were based on a four-day week calculation. If a participant received all of the points per assigned area for four days, he could earn 140 points to purchase backup reinforcers (see Appendix E for the cost of backup reinforcers).

Preference assessment. Before implementing the motivational system, the primary investigator conducted preference assessments with each of the participants. The primary investigator presented each of the participants with a comprehensive list of the previously identified backup reinforcers, verbally described each of the items and activities, and asked if the item or activity was something the participant might be interested in having or doing. If any of the participants identified an item or activity that was not on the list, the item or activity was immediately added to the list with the associated cost. After the primary investigator went through the entire list of backup reinforcers and identified all of the items or activities the participant might be interested in earning, the primary investigator worked with the participant to rank each of those items. Each day, the primary investigator met with the participant and reviewed the preferred backup reinforcer the participant wanted and the number of points that were required for that reinforcer. Some of the more commonly identified backup reinforcers included Monster energy drinks, video games, DVDs, trips to stores in the community, and gift

cards. If one of the participants decided he wanted to work for something other than his most preferred backup reinforcer, he was immediately allowed to change what he was working for at any time (see appendix F for the preference assessment data sheet).

Crisis cleaning criteria and outside cleaning. Because the staff were instructed not to provide any prompting or assistance for cleaning to the participants throughout all phases of the study, the crisis cleaning criteria was included to address any cleanliness issues that might create a safety or health hazard. The primary investigator worked with the organization to develop specific crisis cleaning criteria prior to beginning the study. If the staff determined that a particular item met any of the crisis cleaning criteria, he or she was to immediately provide prompting and/or assistance to help the participant remedy the issue and log the incident. The crisis cleaning criteria were as follows:

- Something spilled on the floor;
- Clutter that would keep someone from getting out of the apartment in the event of a fire or clutter that would be considered a fall hazard;
- Food or drinks with mold on plates, pots, pans, cups, etc.;
- Food left out where bugs might become an issue;
- Trash overflowing to the floor/no longer able to fit trash into the trashcan.

The primary investigator contacted one of the site supervisors periodically throughout the study to get dates on which the crisis cleaning was implemented.

Additionally, beginning on January 27, 2014, a parent of one of the participants in the third apartment (Apartment #3) hired an outside cleaning agency to clean once per week. The outside cleaning agency cleaned the apartment in the afternoon, so in-vivo observations were

conducted in the morning before they arrived.

Baseline. Staff previously developed and posted a cleaning/cleanliness checklist in each apartment. Before beginning the study, the staff were instructed not to provide any prompts or assistance to any of the participants for cleaning the kitchen and living/dining room unless the crisis cleaning criteria, outlined above, was met. The primary investigator collected data in-vivo on the cleanliness of each of the apartments at least four times weekly and collected data through the remote-video monitoring system on those same observations. In this phase of the study, the staff's cleaning/cleanliness checklist was present in each of the apartments and no reinforcement was provided to the participants if their apartment met the staff's cleanliness criteria.

Observations were conducted in this phase until steady responding was achieved during in-vivo observations.

Checklists with definitions. Before beginning this phase, the primary investigator developed a more detailed cleaning/cleanliness checklist with definitions and then met with each of the participants individually to review this detailed checklist that specified how the kitchen, living room, and dining room were to be cleaned. The primary investigator verbally reviewed each part of the checklist and the definitions with each participant and asked if there were any questions. A laminated copy of the checklist with definitions was provided individually to each participant and an additional copy was placed in each of the areas the checklist covered (i.e., kitchen and living/dining room). The staff continued to provide no prompting or assistance for cleaning the participants' apartments unless the crisis cleaning criteria was met. Data were collected in-vivo on the cleanliness of each of the apartments at least four times weekly and through the remote-video monitoring system on those same observations. To assess whether

providing the participants with a checklist with detailed definitions improved the cleanliness of the apartments, the primary investigator provided no feedback or reinforcement if their apartment met the cleanliness criteria. Observations were conducted in this phase until steady responding was achieved during in-vivo observations.

Assignment of chores. This phase of the study was included to address any potential roommate conflicts that might arise from two people being required to clean a shared living space. The apartment was separated into two areas that required approximately equal amounts of time to keep clean – the kitchen and the living/dining room. Participants could earn nearly the same amount of points for each of these two areas (see Appendix D). The initial assignment of chores was decided by flipping a coin and allowing the winner of the coin toss to decide the area for which he wanted to be responsible; the other roommate was automatically assigned the remaining area. If the winner of the coin toss did not want to choose the area for which he was going to be responsible, the roommate was allowed to choose. A participant was given the opportunity to switch the area he was responsible for cleaning if the percentage of points he received for cleaning that area was above a predetermined percentage (i.e., 80% for the kitchen and 90% for the living/dining room) for three consecutive observations. After observing, it appeared as though the kitchen could require more time to clean depending on the amount of activity in the kitchen; therefore, the percentage was lower for the kitchen.

The primary investigator provided each participant with a laminated copy of his assigned area on a colored piece of paper (blue for the living/dining room and red for the kitchen), verbally described each of the parts of the checklist for the assigned area to the appropriate participant, and asked if there were any questions regarding the checklist. During this phase, no

reinforcement was provided to the participant if any parts of the checklist for his area met the cleanliness criteria. The staff did not provide any prompting or assistance for cleaning unless the apartment met the crisis cleaning criteria. In-vivo observations were conducted to collect data on the cleanliness of each of the apartments at least four times weekly, and data were also collected through the remote-video monitoring system on those same observations. Data collection continued until steady responding was achieved during in-vivo observations.

Motivational system. Before beginning the motivational system, the primary investigator provided each participant with a laminated point-tracking sheet on a colored piece of paper that corresponded with the participant's assigned area (see Appendix G for the point-tracking sheet). The primary investigator used the point-tracking sheet to show the participant how many points he earned each day and the specific parts of the checklist for which the participant did and did not receive points. Points were awarded for each part of the checklist on an all-or-nothing basis. If a specific part of the checklist met the definition of clean, the participant received all of the points for that specific part of the checklist. If a specific part of the checklist did not meet the definition of clean, the participant received zero points for that specific part of the checklist. To remind the participant how many points were needed each day to obtain the identified backup reinforcer, the primary investigator wrote the participant's identified backup reinforcer in the blank space on the bottom of the point-tracking sheet, the number of points the chosen reinforcer would cost, and the fewest number of days it would take for the participant to purchase the backup reinforcer if he earned the maximum number of points each day.

After providing each participant with the point-tracking sheet, the primary investigator

explained how the point system was going to work. All of the participants had previous experience with other token economies through the organization; thus, the primary investigator simply asked each of the participants questions regarding the present token economy to ensure each of the participants understood this token economy. The primary investigator then verbally described each part of the checklist for the assigned area to the participant and asked questions to be sure he understood the requirements. The next time the primary investigator visited the apartment, the participant began earning points for each part of his assigned area that met the checklist definition of clean.

The staff were instructed not to provide any prompting or assistance for cleaning during this phase of the study unless the apartment met the crisis cleaning criteria. In-vivo observations were conducted at least four times weekly to collect data on the cleanliness of the apartment, and data were collected through the remote-video monitoring system on those same observations. After collecting data on the cleanliness of the apartment during an in-vivo observation, the primary investigator filled out the point-tracking sheet, provided feedback to the participant regarding the parts of the checklist for his assigned area that met the definition of clean and the parts of the checklist for his assigned area that needed to be cleaned, and updated the participant regarding the number of points that were needed before the backup reinforcer could be purchased. Each participant was able to earn points every day that the researcher conducted an in-vivo observation in the apartment. After a participant received enough points to purchase his selected backup reinforcer, the primary investigator immediately provided the reinforcer to him.

There were two special circumstances that resulted in a change of procedures in the second apartment (Apartment #2) due to roommate conflicts and a lack of cleaning. First, during

intervention, Greg was responsible for cleaning the living/dining room; thus, the points he earned were contingent on the cleanliness of the living/dining room. Greg's roommate, Adam, often was unwilling to move many of his belongings from the living/dining room, and his unwillingness to do so affected the number of points that Greg could earn. To address this, on April 10, 2014, the primary investigator awarded points to Greg contingent on completion of the parts of the checklist that met the cleanliness criteria for the entire living/dining room; items belonging to Adam were excluded in determining cleanliness. Second, because Adam did not engage in any cleaning in the kitchen throughout the duration of the study, in an attempt to determine whether this was a motivational issue related to the timing of the receipt of reinforcement, the primary investigator conducted a probe on April 23, 2014. The primary investigator visited the apartment on April 22, 2014, and informed Adam that if his kitchen was completely clean during the next visit/observation, he immediately would be provided with his backup reinforcer even though he had not earned the required number of points to purchase the item.

Treatment fidelity. Treatment fidelity was recorded on the primary investigator's implementation of the motivational system. Both the primary investigator and the reliability observer independently recorded the number of points given for each part of the checklist, whether the correct amount of points were given, and whether a backup reinforcer was delivered. Independent observers scored treatment fidelity on a minimum of 21.4% (ranging from 21.4% to 29.4%) of in-vivo observations for each of the participating apartments. After comparing the reliability observer's data to the primary investigator's data, a point-by-point agreement calculation was conducted to assess the agreement on the primary investigator's behavior. The

treatment fidelity calculation was the number of agreements divided by the number of agreements plus disagreements for each observation. The primary investigator then multiplied that number by 100 to get the percentage of agreement for each observation. Treatment fidelity was 100% for all observations. The total results of these treatment fidelity evaluations are shown in Table 2.

Social validity. The primary investigator collected social validity data (Wolf, 1978) on the cleanliness of the apartment. A social validity survey was distributed to the staff of the community organization and to other professionals who work with individuals with IDD. The purpose of this survey was to assess whether persons not associated with the study rated the cleanliness of the kitchen and living/dining room as improved after the implementation of the motivational system. To collect these data, the primary investigator randomly selected videos from the tapes that were recorded during the in-vivo observations from both the baseline and motivational system conditions of each of the participating apartments. The reviewers viewed these tapes and completed a survey to assess the cleanliness of each of the apartments.

Nine reviewers (three were staff and six were professionals who worked with individuals with IDD) viewed six video clips presented in a random order. The video clips varied in length from approximately 2 to 3 min, for a total length of about 15 min of video. Each reviewer independently reviewed the tapes and answered three questions for each video clip. Questions were related to the overall cleanliness of the kitchen and living/dining room (see Appendix H for the questions that were asked of the reviewers).

Results

Figure 1 displays the percentage of checklist tasks completed for each participant. Each graph represents an individual participant, and each pair of graph represents the two participants who live in the same apartment. The x-axis represents the date the observation took place. The y-axis indicates the percentage of checklist tasks completed. The square data points indicate the data that were collected through in-vivo observation, with the open squares representing the kitchen and the closed squares representing the living/dining room. The triangle data points indicate the data that were collected through the remote-video monitoring system, with the open triangles representing the kitchen and the closed triangles representing the living/dining room. The thin dotted line indicates the days on which the crisis cleaning criteria was met and staff prompted the participants to clean their apartment or outside cleaning was provided. The upward tick marks on the x-axis indicate any time that a backup reinforcer was delivered.

For Drew, during baseline, he averaged 6.2% (ranging from 0% to 12.5%) on the parts of the kitchen checklist that met the definition of clean and 27.3% on the parts of the living/dining room checklist that met the definition of clean as measured through in-vivo direct observations. As measured by the remote monitoring system during baseline, Drew averaged 53.6% (ranging from 42.9% to 71.4%) on the kitchen checklist and 61.4% (ranging from 54.6% to 72.7%) on the living/dining room. During the checklists with definitions phase, as measured through in-vivo observations, Drew averaged 6.6% (ranging from 0% to 22.2%) on the kitchen checklist and 20.8% (ranging from 0% to 36.4%) on the living/dining room checklist. Using the remote monitoring system, Drew averaged 45.1% (ranging from 25% to 57.1%) on the kitchen checklist and 69% (ranging from 50% to 81.8%) on the living/dining room checklist during the checklists with definitions phase. With the implementation of the assignment of chores phase, Drew

averaged 24.8% (ranging from 0% to 37.5%) for the kitchen and 18.1% (ranging from 8.3% to 27.3%) for the living/dining room when measured by in-vivo observations. As a comparison, when measured by the remote monitoring system, Drew averaged 31.2% (ranging from 16.7% to 50%) on the kitchen checklist and 53.3% (ranging from 45.5% to 63.6%) for the living/dining room checklist. Finally, with the implementation of the motivational system, as measured through in-vivo observations, Drew averaged 45.8% (ranging from 11.1% to 100%) on the kitchen checklist and 78.6% (ranging from 33.3% to 100%) on the living/dining room checklist. The same observations scored through the remote video monitoring system averaged 64.3% (ranging from 16.7% to 100%) in the kitchen and 95.7% (ranging from 66.7% to 100%) in the living/dining room.

For Charles, during baseline he averaged 19.8% (ranging from 11.1% to 33.3%) on the parts of the kitchen checklist that met the definition of clean and 18.2% (ranging from 0% to 41.7%) on the parts of the living/dining room checklist that met the definition of clean when scored by in-vivo observations. When scored by the remote monitoring system during baseline, Charles averaged 50.8% (ranging from 14.3% to 75%) on the kitchen checklist and 75.9% (ranging from 50% to 90%) on the living/dining room checklist. The implementation of the new checklists resulted in Charles averaging 13.3% (ranging from 0% to 22.2%) in the kitchen and 11.1% (ranging from 0% to 25%) in the living/dining room. Charles was never responsible for the kitchen during the assignment of chores phase and averaged 19.4% (ranging from 8.3% to 33.3%) when measured by in-vivo observations and 73.6% (ranging from 50% to 91.7%) when measured by the remote video monitoring system in the living/dining room. With the implementation of the motivational system, Charles averaged 29.9% (ranging from 0% to

88.9%) in the kitchen and 64.3% (ranging from 41.7% to 83.3%) when measured by in-vivo observations. The remote video monitoring system observations averaged 57.5% (ranging from 28.6% to 100%) in the kitchen and 96% (ranging from 83.3% to 100%) in the living/dining room. Because the area Charles was responsible for cleaning never reached the mastery criteria (i.e., three consecutive observations above 80% for the kitchen and three consecutive observations above 90% for the living/dining room) required to allow him to choose which area he was responsible for cleaning, he was never provided the opportunity to choose which area he was responsible for cleaning.

During baseline, Adam averaged 20.8% (ranging from 12.3% to 25%) on the parts of the kitchen checklist that met the definition of clean and 12.5% (ranging from 8.3% to 25%) on the parts of the living/dining room checklist that met the definition of clean when measured by in-vivo observations. The same baseline observations measured through the remote video monitoring system averaged 49% (ranging from 16.7% to 71.4%) in the kitchen and 67.4% (ranging from 50% to 75%) in the living/dining room. With the introduction of the new checklist phase, Adam averaged 20.8% (ranging from 12.5% to 50%) in the kitchen and 13.5% (ranging from 0% to 27.3%) in the living/dining room through in-vivo observations. The remote video monitoring system data produced an average of 38.9% (ranging from 16.7% to 85.7%) in the kitchen and 59.7% (ranging from 33.3% to 83.3%) in the living/dining room for the new checklist phase. Adam was never responsible for the living/dining room during the assignment of chores phase; therefore, he was responsible for cleaning the kitchen where he averaged 17.2% (ranging from 12.5% to 25%) through in-vivo observations and 16.4% (ranging from 0% to 42.9%) through the remote video monitoring system. In a similar manner, Adam was never

responsible for the living/dining room throughout the motivational system. Through in-vivo observations, Adam averaged 24% (ranging from 0% to 100%) in the kitchen, and through the remote video monitoring system, he averaged 38.3% (ranging from 0% to 100%) in the kitchen throughout the motivational system. On April 23, 2014, Adam completed 100% of the tasks on the kitchen checklist and received his backup reinforcer even though he did not have the required amount of points to purchase the preferred item.

Through in-vivo observations, Greg had an average of 26.2% (ranging from 12.5% to 45%) on the parts of the kitchen checklist that met the definition of clean and 27.3% (ranging from 16.7% to 33.3%) on the parts of the living/dining room checklist that met the definition of clean during the baseline phase. Data collected for Greg on the same baseline observations through the remote video monitoring system averaged 40% (ranging from 16.7% to 66.7%) in the kitchen and 69.3% (ranging from 58.3% to 80%) in the living/dining room. With the implementation of the new checklist phase, Greg averaged 18.1% (ranging from 12.5% to 25%) in the kitchen and 19.3% (ranging from 8.3% to 27.3%) in the living/dining through in-vivo observations. As measured through the remote video monitoring system, Greg averaged 30% (ranging from 16.7% to 50%) in the kitchen and 62.7% (ranging from 33.3% to 72.7%) in the living/dining room. Greg was never responsible for the kitchen during the assignment of chores phase; therefore, he was responsible for cleaning the living/dining room where he averaged 17.1% (ranging from 9.1% to 27.3%) through in-vivo observations and 63.6% (ranging from 54.6% to 72.7%) through the remote video monitoring system. Greg was also never responsible for cleaning the kitchen during the motivational system. Throughout the motivational system, Greg averaged 47.7% (ranging from 27.3% to 72.7%) through in-vivo observations and 84.8%

(ranging from 63.6% to 100%) through the remote video monitoring system in the living/dining room.

During baseline, Allen averaged 29.7% (ranging from 14.3% to 57.1%) on the parts of the kitchen checklist that met the definition of clean and 48.9% (ranging from 27.3% to 75%) on the parts of the living/dining room checklist that met the definition of clean through in-vivo observations. The same baseline observations measured through the remote video monitoring system averaged 63% (ranging from 14.3% to 100%) in the kitchen and 80.8% (ranging from 72.7% to 90.9%) in the living/dining room. With the introduction of the new checklist phase, Allen averaged 20.4% (ranging from 0% to 57.1%) in the kitchen and 56.4% (ranging from 33.3% to 83.3%) in the living/dining room when measured by in-vivo observations.

Additionally, Allen averaged 42.9% (ranging from 16.7% to 83.3%) in the kitchen and 77.8% (ranging from 63.6% to 90.9%) in the living/dining room when measured by the remote video monitoring system during the new checklist phase. Allen was never responsible for the kitchen during the assignment of chores phase; he averaged 63.4% (ranging from 50% to 75%) in the living/dining room by in-vivo observations and 76.2% (ranging from 63.6% to 81.8%) in the living/dining room by the remote video monitoring system. In a similar manner, Allen was never responsible for the kitchen during the motivational system and averaged 94.9% (ranging from 66.7% to 100%) by in-vivo observations and 97.2% (ranging from 81.8% to 100%) by the remote video monitoring system in the living/dining room.

During baseline, Ryan averaged 29.7% (ranging from 14.3% to 57.1%) on the parts of the kitchen checklist that met the definition of clean and 48.9% (ranging from 27.3% to 75%) on the parts of the living/dining room checklist that met the definition of clean through in-vivo

observations. The same baseline observations measured through the remote video monitoring system averaged 63% (ranging from 14.3% to 100%) in the kitchen and 80.8% (ranging from 72.7% to 90.9%) in the living/dining room. With the introduction of the new checklist phase, Ryan averaged 20.4% (ranging from 0% to 57.1%) in the kitchen and 56.4% (ranging from 33.3% to 83.3%) in the living/dining room when measured by in-vivo observations. Additionally, Ryan averaged 42.9% (ranging from 16.7% to 83.3%) in the kitchen and 77.8% (ranging from 63.6% to 90.9%) in the living/dining room when measured by the remote video monitoring system during the new checklist phase. Ryan was never responsible for the living/dining room during the assignment of chores phase and averaged 35.8% (ranging from 12.5% to 50%) by in-vivo observations and 57.1% (ranging from 42.9% to 100%) by the remote video monitoring system in the kitchen. Finally, Ryan averaged 59.8% (ranging from 25% to 87.5%) by in-vivo observations and 73.3% (ranging from 42.9% to 100%) by the remote video monitoring system in the kitchen and was never responsible for the living/dining room during the motivational system.

Figure 2 displays the data for Greg that does not include those belongings of Adam's that he was unwilling to move. Similar to Figure 1, the x-axis represents the date the observation took place. The y-axis indicates the percentage of checklist tasks completed. The square data points indicate the data that were collected through in-vivo observations, with the open squares representing the kitchen and the closed squares representing the living/dining room. The triangle data points indicate the data that were collected through the remote-video monitoring system, with the open triangles representing the kitchen and the closed triangles representing the living/dining room. The thin dotted line indicates the days on which crisis cleaning criteria was

met and staff prompted the participants to clean their apartment or outside cleaning was provided. The upward tick marks on the x-axis indicate any time that a backup reinforcer was delivered. Through in-vivo observations, Greg had an average of 26.2% (ranging from 12.5% to 45%) on the parts of the kitchen checklist that met the definition of clean and 27.3% (ranging from 16.7% to 33.3%) on the parts of the living/dining room that met the checklist definition of clean during the baseline phase. Data collected for Greg on the same baseline observations through the remote video monitoring system averaged 40% (ranging from 16.7% to 66.7%) in the kitchen and 69.3% (ranging from 58.3% to 80%) in the living/dining room. When the new checklist phase was implemented, Greg averaged 18.1% (ranging from 12.5% to 25%) on the kitchen checklist and 19.3% (ranging from 8.3% to 27.3%) through in-vivo observations. Through the remote video monitoring system, Greg averaged 30% (ranging from 16.7% to 50%) on the kitchen checklist and 62.8% (ranging from 33.3% to 72.7%) on the living/dining room checklist during the new checklist phase. Greg was never responsible for the kitchen during the assignment of chores phase and averaged 17.1% (ranging from 9.1% to 27.3%) on the living/dining room checklist through in-vivo observations and 63.6% (ranging from 54.6% to 72.7%) on the living/dining room checklist through the remote video monitoring system. Additionally, Greg was never responsible for cleaning the kitchen during the motivational system. Using the living/dining room checklist, Greg averaged 61.2% (ranging from 27.3% to 90.9%) through in-vivo observations and 89% (ranging from 63.6% to 100%) through the remote video monitoring system.

Social Validity

Figures 3, 4, 5, and 6 display the results of the social validity surveys that were given to

the outside reviewers. On all of these figures, the x-axis represents the phase that was rated by the reviewers. The y-axis indicates the range of ratings possible on the questionnaire. The bar graph indicates the average rating across all nine reviewers, and the error bar represents the range of ratings received for the specific phase. On average, after viewing random clips of both the baseline and motivational system phases, the outside reviewers rated both the kitchen and living/dining room as cleaner during the motivational system when compared to baseline.

Discussion

Motivational System

The primary purpose of this study was to evaluate whether a motivational system for adults with IDD who lived in a semi-independent apartment community would improve the cleanliness of the common areas of their apartment independent of staff prompting and/or assistance. Overall, the results were mixed. Four of the participants showed clear and maintained improvements in the cleanliness of their assigned areas. One participant showed an initial improvement in the cleanliness of his assigned area, but the improvement did not maintain over time. Another participant showed no change in the cleanliness of his assigned area throughout the duration of the study.

Although four of the participants showed improvements in the cleanliness of the assigned areas, the other two participants (Charles and Adam) showed little improvements in the cleanliness of the areas to which they were assigned. There are two major reasons we suspect why the motivational system was not effective with all of the participants.

First, the items or activities that clients could earn on the token economy may not have

been sufficiently rewarding considering the time that was required to maintain a high level of cleanliness in the areas to which a participant was assigned. Second, participants already had access to a monthly “allowance” that they could use to purchase items or activities and parents or guardians of participants often provided items or activities to the participants. For example, Adam had unrestricted access to the internet, his Xbox, and video games, which he played online for eight to ten hours every day. Adam also was able to be with his girlfriend whenever he wanted. Unfortunately, the primary investigator was unable to restrict access to any personal items because it is an individual’s right to be able to use his or her own items as often and as much as he or she wants.

Another possible explanation as to why the motivational system did not motivate Adam to clean his assigned area may be due to countercontrol. Delprato (2002) defines countercontrol as “[i]nstead of acting in accord with controlling conditions, controlees sometimes countercontrol; that is, they oppose controlling attempts by moving out of range, attacking, or passively resisting” (p. 192). Adam, for example, told the primary investigator on numerous occasions that he was not going to clean the kitchen because he was not going to do anything that the primary investigator wanted him to do. The probe conducted on April 23, 2014, however, demonstrates that the lack of effects with Adam was likely due to a motivational issue and not an instance of countercontrol. Another instance of countercontrol may have occurred with both Charles and Adam. Neither Charles nor Adam were able to choose which area they were responsible for cleaning because they did not meet the cleanliness requirements (i.e., three consecutive observations with 90% of the checklist tasks meeting the definition of clean in the living/dining room and three consecutive observations with 80% of checklist tasks meeting the

definition of clean in the kitchen) to be provided the opportunity to choose. Because both of these participants did not have control over what area they were responsible for cleaning, they may have engaged in countercontrol, which could account for the lack of effects seen with Charles and Adam.

Two additional factors may have also limited the effectiveness of the motivational system. Participants had to establish and maintain the cleanliness of the area for which they were responsible for a number of days in order to have enough points to earn an item or activity from the token store. Thus, the length of time that was required to earn an item or activity from the token system may have limited the value of these items or activities, especially because some of the participants often had the availability of items and activities immediately because of the “allowance” available to them or the parents’ or guardian’s provision of these items. Finally, because two participants shared a common living space in each of the apartments, there were times when one of the participant was responsible for cleaning an area but his roommate created and left a mess in that area. For example, one participant might be responsible for cleaning the kitchen but his roommate might cook in the kitchen and not wash the pots, pans, or dishes, and might leave cooking materials on the counter, or a participant might be responsible for cleaning up the living/dining room but his roommate may have left a large pile of dirty clothes in the middle of the living room.

In general, participants who were responsible for cleaning the kitchen appeared to be much more variable in their cleaning than those that were responsible for cleaning the living/dining room. This may be because cleaning the kitchen often required more work. The motivational system was based on the estimate of time that it would take for an individual to

complete each part of the checklist, but this did not account for some parts that remained clean for a longer period of time following an initial cleaning. Future efforts in using motivational systems probably should ensure that tasks are more equitable in terms of time to complete, the difficulty of the task, the acceptability of the tasks to be completed, and how frequently the cleaning tasks need to be completed (e.g., the kitchen needed to be cleaned several times each day whereas the living/dining room typically stayed clean for a longer period of time after it had been cleaned only once).

Remote Monitoring

A second purpose of the study was to evaluate whether a remote-video monitoring system that had cameras installed throughout the targeted rooms was able to accurately monitor the cleanliness of the apartments when compared to in-vivo observations. The results of the study show that with all of the participants, and throughout all phases of the study, the remote-video monitoring system provided an estimate of cleanliness of the apartments that was higher than what was obtained through in-vivo observations.

The discrepancy in the data between in vivo observations and the remote-video monitoring system is likely due to both the position and clarity of video cameras that were installed throughout the apartments. While the cameras were positioned to capture conditions of most of the apartment, depending on how the individuals arranged the furniture within their apartment, there were some areas that could not be seen through the cameras. Additionally, the cameras were stationary and did not provide viewers with zoom or pan capabilities. Thus, there were some areas in the kitchens and living/dining rooms that could not be seen well because the cameras were across the room and did not provide a clear picture of the cleanliness of what was

on the other side of the room. Also, the primary investigator accessed the videos through the remote monitoring system after they had been recorded through a camera, saved to a DVR (Digital Video Recorder) device, sent through the internet, and saved to another computer; each step of the process reduces the quality of the video. Cameras with greater capabilities for focusing, for zooming in on items across the room, and for panning across the entire room might be needed to record items or events that occurred in a room. As technology continues to progress and both internet speed and video quality are improved, remote monitoring systems will likely continue to play an integral role in providing support to adults with IDD. Future research should continue to assess the validity of remote monitoring telecare systems as they are used to monitor and measure various behaviors from a distance. Additionally, researchers should investigate the difference in video quality across each step of the recording process.

General Discussion

The current study has several limitations. Because cleaning behaviors could be performed at any time of the day, reinforcement was provided based on the permanent product of cleaning behaviors. Additionally, the primary investigator conducted unannounced visits because the goal was to have each of the apartments clean at all times, not just in the presence of the primary investigator. While there was an increase in the cleanliness of the apartments for four of the participants, it is possible that more immediate reinforcement following cleaning behaviors would have produced greater effects. For example, if the primary investigator had delivered points immediately after cleaning occurred, there may have been a greater increase in the cleanliness of the apartments. Also, conducting announced (scheduled) visits might have produced an increase in the cleanliness of the apartments. The purpose of this research,

however, was to develop a motivational system in which the participants kept the apartment clean at all times, not just when staff were scheduled to visit.

Points were delivered contingent on the cleanliness of each part of the checklist for each area. There were a number of occasions where a participant clearly worked on cleaning his assigned area, but a few minor items would prevent him from receiving points for certain parts of the checklist. For example, there were times where a significant number of dirty dishes (e.g., 30) were in the sink. The next time the primary investigator visited the apartment, there may have been only one or two dirty dishes in the sink. Because this is a great improvement (e.g., 30 dirty dishes to two dirty dishes), the primary investigator would definitely want to reinforce this behavior, but it still did not meet the definition of clean for this part of the checklist (e.g., sink clean). Future research might evaluate the use of a sliding scale to measure the cleanliness of each part of the checklist (e.g., awarding all of the points for a part of the checklist that met the definition of clean, awarding some points for part of the checklist that were close to meeting the definition of clean, and awarding zero points for parts of the checklist that required considerable cleaning). Additionally, future research might consider using more precise criteria, such as defining each part of the checklist in smaller increments, to award differential amounts of points for each part of the checklist (e.g., eight points for having zero dirty dishes, six points for having two or less dirty dishes, 4 points for having five or less dirty dishes, two points for having less than 10 dirty dishes, and 0 points for having 10 or more dirty dishes).

The motivational system points and backup reinforcers were delivered in a consistent manner; that is, each behavior (or checklist task) was equivalent to earning a predetermined number of points. Upon receiving the appropriate number of points to purchase the selected

backup reinforcer, the participant was immediately able to do so. A token economy implemented in this manner is based on a standard mathematical equation. The participants may have been able to determine exactly how much of a behavior (e.g., cleaning) they needed to do before they could purchase a reinforcer, which may have decreased their motivation to engage in specific behaviors based on when they believed they could earn their next backup reinforcer. Future research might examine the use of a lottery system and evaluate its effectiveness as compared to a more traditional token economy. For example, if the individual engages in a specific behavior, he or she would have his or her name put in a drawing. Drawings may occur on a daily basis and, if the participant's name were drawn, he or she would immediately be provided with his or her chosen reinforcer. Thus, more opportunities for reinforcement might occur.

The remote monitoring system in the present study was compared to in-vivo observations. Although the remote monitoring system was determined to be less accurate when compared to in-vivo observations, the remote monitoring system may be useful in the absence of staff. For example, the remote monitoring system may be useful to alert caregivers/staff when there is an issue in the home, an unwanted intruder, or simply when trying to locate an individual. Additionally, remote monitoring systems and professionals may be able to remotely prompt participants to engage in a variety of behaviors such as taking medications, wearing appropriate clothing for the weather, and preparing meals. In a similar manner, the combination of remote monitoring and direct care staff may provide the most comprehensive model of care. In the present study, the remote monitoring system could have been used to observe and award points to the participants for engaging in cleaning behaviors and in-vivo observations could have

been used to accurately assess the cleanliness of the apartments and award points based on the permanent product of cleaning behaviors. Future research should continue to determine what behaviors can be observed and measured through remote monitoring systems and examine the combined efforts of using remote monitoring systems to observe the process of a behavior and in-vivo observations to assess the outcome.

Although there were a number of issues in the effectiveness of the motivational system, four of the participants showed clear and maintained improvements in the cleanliness of their assigned areas. This study demonstrates that token economies continue to be effective with adults with IDD in a semi-independent apartment community where minimal staffing support and assistance are provided. Additionally, the total cost of the backup reinforcers purchased for all of the participants was \$125.64; therefore, the motivational system was a cost effective intervention. Furthermore, this study determined that a current remote video monitoring system installed in a community program for adults with IDD is able to monitor some behaviors, but at the current stage of technology, these monitoring systems may not provide the precise information that in-home staff provide.

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Table 1

Inter-observer Reliability Results

	Drew	Charles	Adam	Greg	Allen	Ryan
Percentage of Observations Scored	42.2%	43.4%	45.4%	42.8%	40.4%	40.4%
Percentage of Observations Scored <i>in vivo</i>	35.0%	36.0%	38.8%	38.7%	36.0%	36.0%
Percentage of Observations Scored from Remote Video Monitoring System	49.5%	50.9%	52.0%	46.9%	44.7%	44.7%
Total Agreement	94.5%	93.8%	93.9%	94.7%	94.2%	94.2%
Percentage Agreement <i>in vivo</i>	93.3%	93.0%	94.8%	95.5%	91.3%	91.3%
Percentage Agreement from Remote Video Monitoring System	95.3%	94.3%	93.3%	94.0%	96.5%	96.5%

Table 2

Treatment Fidelity Results

	Drew	Charles	Adam	Greg	Allen	Ryan
Percentage of Observations Scored	21.4%	21.4%	29.4%	29.4%	26.9%	26.9%
Percentage agreement on number of points given	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Percentage agreement on backup reinforcer delivered	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3

Percentage of Checklist Tasks Completed as Measured by In-Vivo Observations in the Social Validity Tapes for Apartment 1

	Kitchen	Living/Dining Room
Baseline	33.3%	16.7%
Motivational System	85.7%	91.7%

Table 4

Percentage of Checklist Tasks Completed as Measured by In-Vivo Observations in the Social Validity Tapes for Apartment 2

	Kitchen	Living/Dining Room
Baseline	12.5%	18.2%
Motivational System	57.1%	72.7%

Table 5

Percentage of Checklist Tasks Completed as Measured by In-Vivo Observations in the Social Validity Tapes for Apartment 3

	Kitchen	Living/Dining Room
Baseline	28.6%	27.3%
Motivational System	37.5%	100%

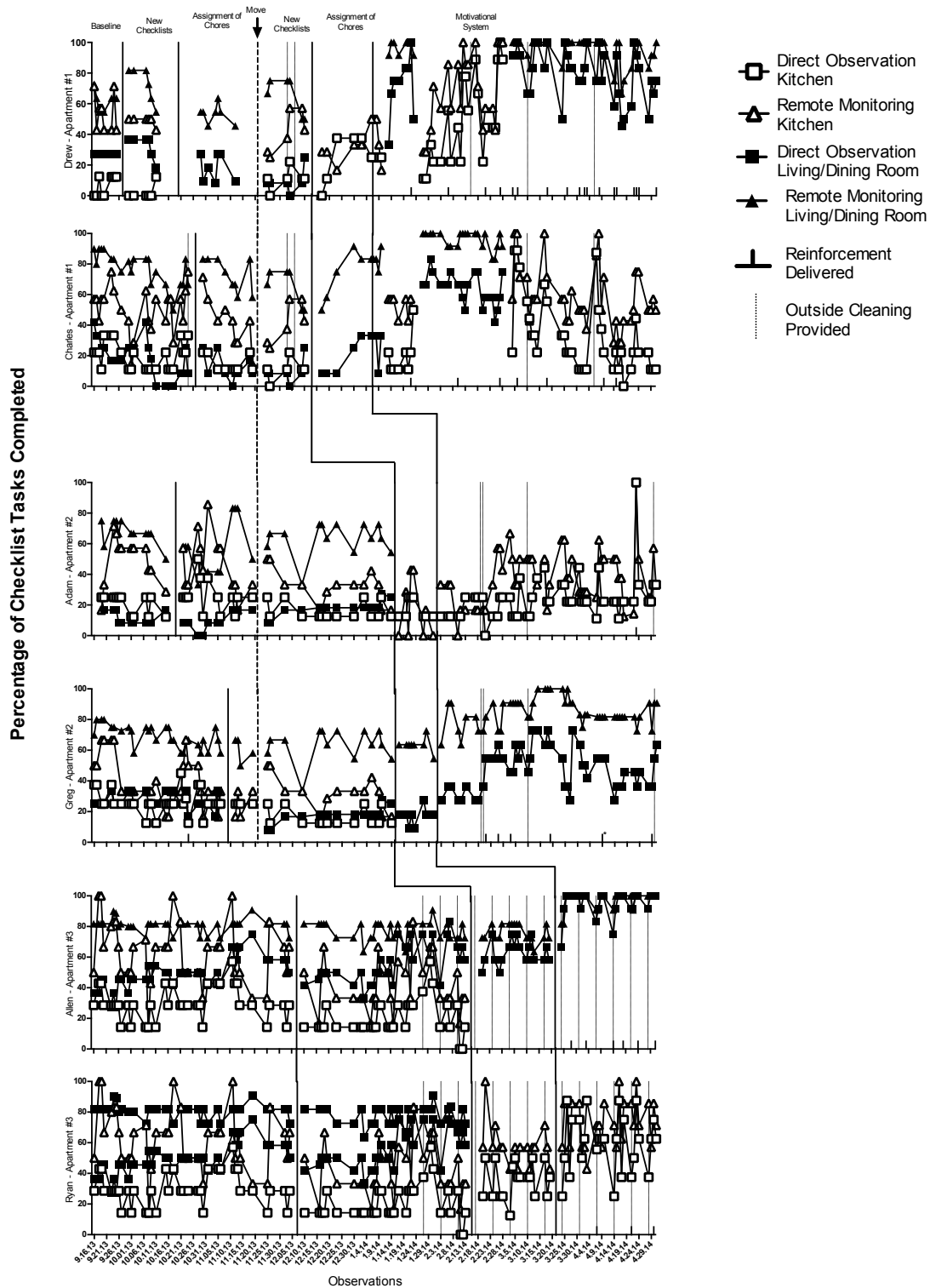


Figure 1. Results of the motivational system for each participant as measured by in-vivo direct observations and remote monitoring system observations.

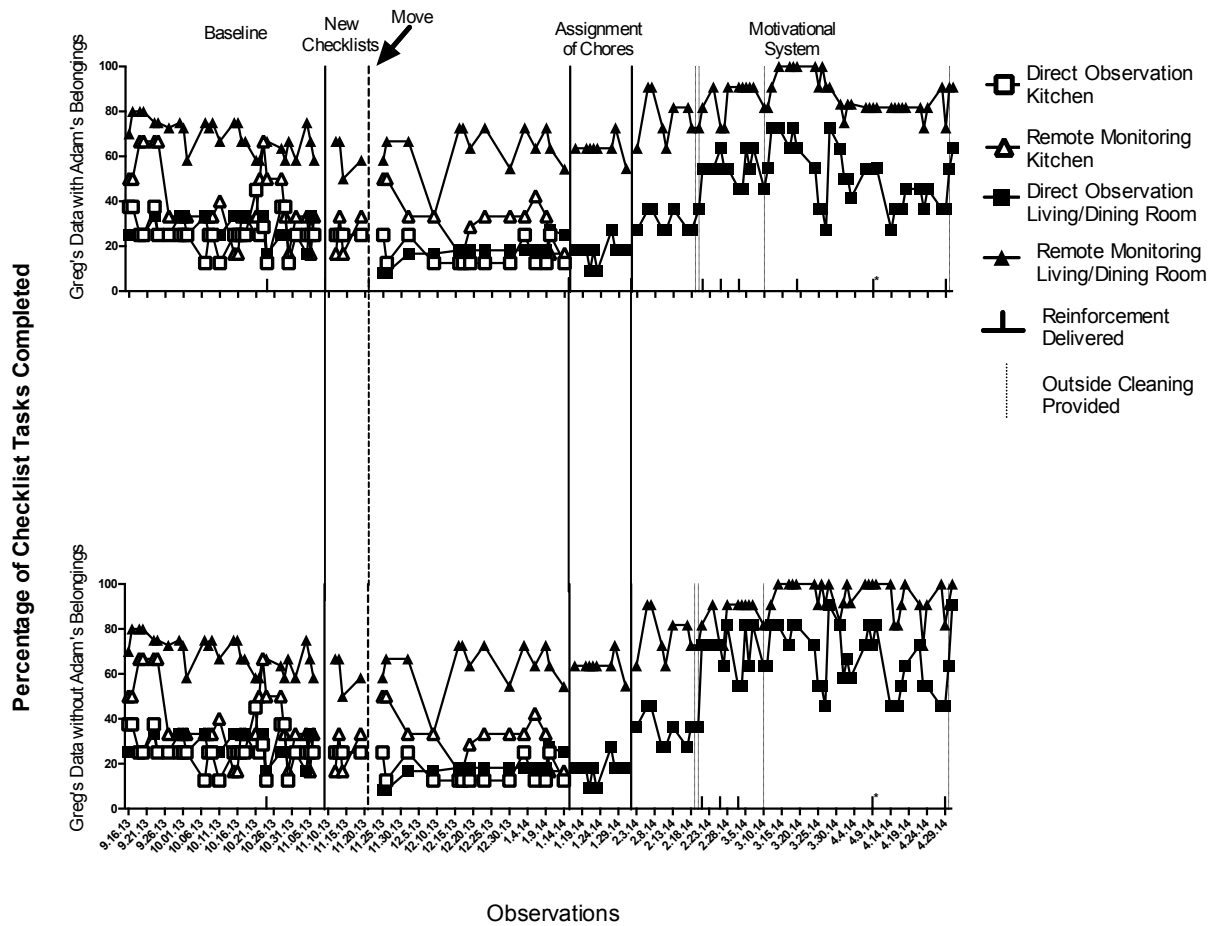


Figure 2. A comparison of Greg's data with and without Adam's belongings as measured by in-vivo direct observation and remote monitoring system observations.

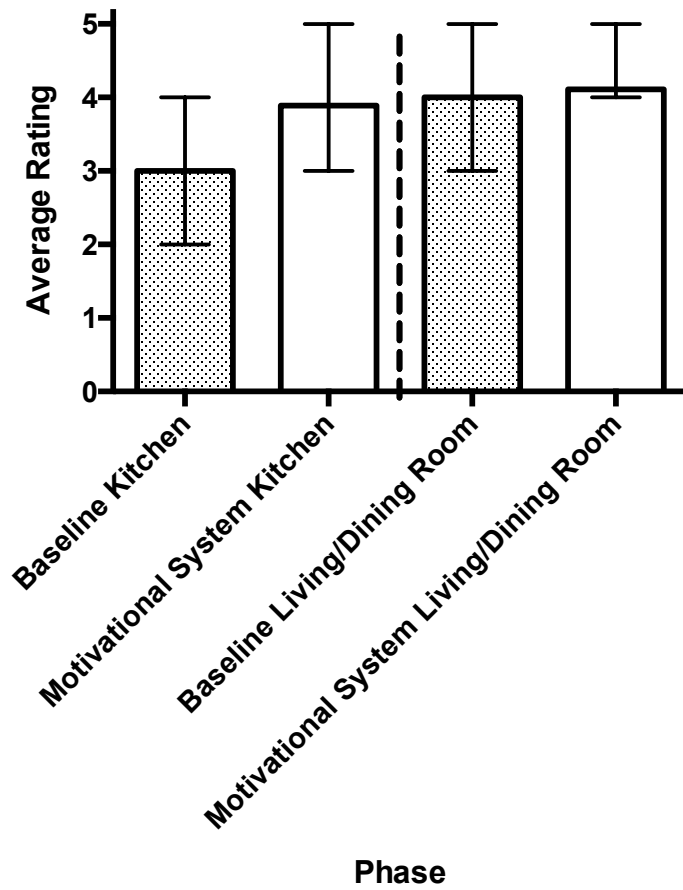


Figure 3. Social validity ratings for apartment one with error bars that represent the range of ratings from 9 reviewers.

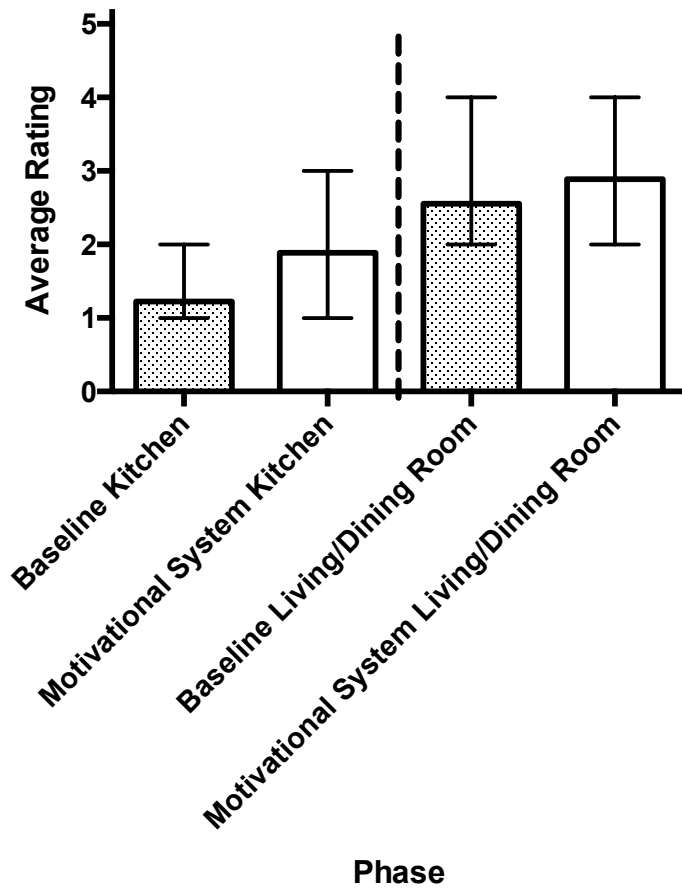


Figure 4. Social validity ratings for apartment two with error bars that represent the range of ratings from 9 reviewers.

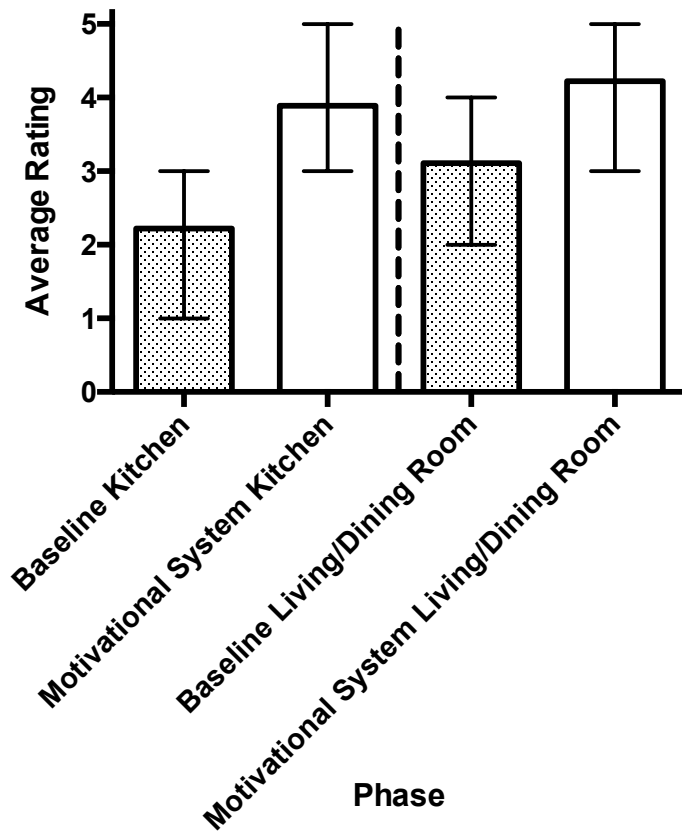


Figure 5. Social validity ratings for apartment three with error bars that represent the range of ratings from 9 reviewers.

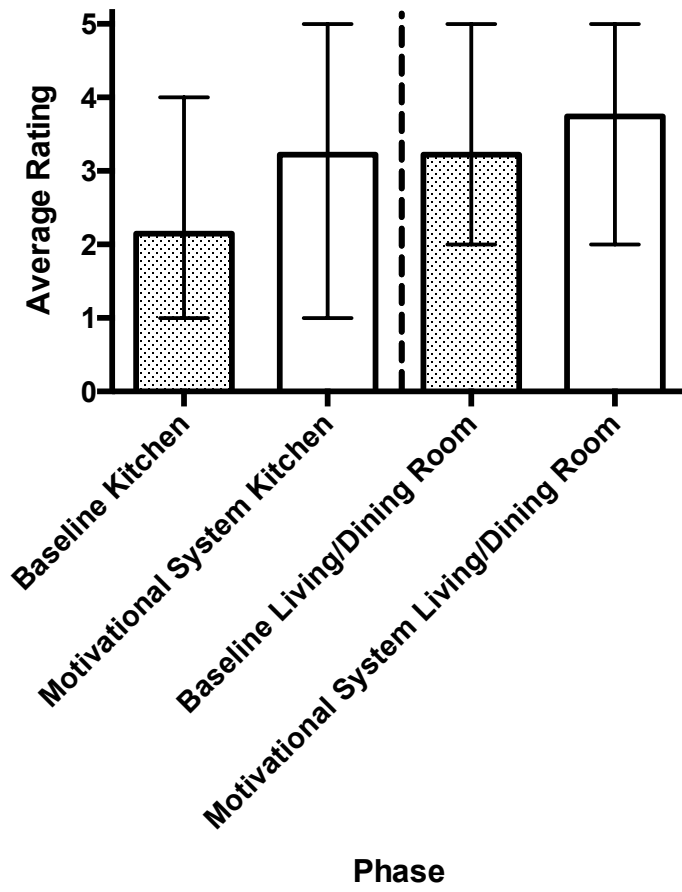


Figure 6. Social validity ratings across all of the apartments with error bars that represent the range of ratings from 9 reviewers.

Appendix A-Recruitment Packets

Your *(son/daughter/ward)* was nominated by CLO as someone who is a good candidate for participating in a research study. This particular study is designed to increase people's independence and engagement in both leisure activities and daily living tasks, which may produce a greater quality of life. Attached is a more thorough description of the study. Please read the summary of the study. If you are interested in having your *(son/daughter/ward)* participate, please sign and return a copy of the consent in the self-addressed envelope provided. There is also a copy of the consent included for you to keep. If you would like more information before you sign the consent form, please indicate this at the end of the form. We then will contact you to arrange a meeting to discuss this project.

Thank you for considering this opportunity.

Thank you for your time,

Todd A. Merritt

The Effects of Participant-Arranged Activity Schedules on Duration of Engagement and Problem Behavior

INDIVIDUAL CONSENT FORM

INTRODUCTION

The Department of Applied Behavioral Science at the University of Kansas supports the practice of protecting people who participate in research. The following information is provided for you to decide whether you wish to participate in the present study. You are not required to sign this form. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you don't want to participate in the study or if you withdraw from this study, it will not affect your relationship with or the services you receive from Community Living Opportunities or your relationship with the University of Kansas.

PURPOSE OF THE STUDY

This project is designed to help you complete daily living activities and reduce problem behavior. The project is also designed to determine whether you engage in more activities if you arrange your activities or if I do.

PROCEDURES

The research staff will work with Community Living Opportunities (CLO) staff to do this project. The researchers are Todd Merritt, a graduate student in the PhD program in Applied Behavioral Science at the University of Kansas and Dr. James Sherman and Dr. Jan Sheldon, professors in the Department of Applied Behavioral Science at the University of Kansas.

If you give consent to take part in the research, this is what will happen:

1. We (research staff members) will ask for your age and relevant medical/psychological information. We understand that this information is private, and we will not give it to any other people in a form that reveals who you are.
2. We will also visit your home to observe you participate in everyday activities. We will also try to find out what types of things you like and get to know you better.
3. We will also interview CLO staff members who work closely with you to try to help find out what type of activities and items you might enjoy.
4. We will give you opportunities to engage in these activities and we will record how long you

engage in them.

5. You will be taught to follow a schedule in which you will complete daily living activities according to a schedule developed specifically for you. I will teach you to engage in daily activities and follow a schedule, and I will provide reinforcement to you when you engage in these activities. Once you are able to engage in the activities independently, we will determine whether the order of activities works better if you arrange the order of activities or if the order is arranged by me.
6. All sessions will take place in your home at CLO. Sessions will be conducted 3 to 4 times per week during the times convenient for you and may last up to 2 hours.
7. It is necessary for us to videotape some of the teaching sessions. The purpose of this is to be able to record information about what you do. The videotapes will be kept secure and private. We also would like to show some of the videotapes to other people and have them decide how appropriate the teaching methods are and what they think about the outcomes of the teaching. If you allow us to show these videotapes to other people, please check the box and sign your name at the end of the form. All of the videotapes will be destroyed within 5 years following the publication of the study in a professional journal.
8. It is necessary for us to observe you using the CLO HomeLink videotapes. The main purpose of using the Homelink videos is to observe if you successfully engage in the tasks or activities when we are not with you in the home.
9. We anticipate that it will take between 6 and 12 months to complete this project. When the project is completed, we will give you a written report.

RISKS

There are no risks anticipated for participating in the study.

BENEFITS

If successful, this study may result in you completing more daily living activities and having a higher quality of life with fewer problem behaviors. This is an experimental procedure, however, so there may not be any direct benefits to you.

PAYMENT TO PARTICIPANTS

There will be no monetary compensation for your participation in the study.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. Instead, the researcher(s) will

use a number or a fake name rather than your real name. Your identifiable information will not be shared unless (a) it is required by law or university policy, or (b) you give written permission.

INSTITUTIONAL DISCLAIMER STATEMENT

In the event of injury, the Kansas Tort Claims Act provides for compensation if it can be demonstrated that the injury was caused by the negligent or wrongful act or omission of a state employee acting within the scope of his/her employment.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form, and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may choose to not participate in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about you, in writing, at any time, by sending your written request to:

Todd Merritt

4001 Dole Human Development Center

1000 Sunnyside Avenue

Lawrence, Kansas 66045

If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

PARTICIPANT CERTIFICATION:

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429, write to the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385

Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to take part in this study as a research participant. By my signature, I affirm that I have received a copy of this Consent and Authorization form.

_____	_____
Type/Print Participant's Name	Date

Participant's Signature	

(This consent form will be read to the participant, and the consent process will be videotaped.)

Researcher Contact Information

Todd A. Merritt	James A. Sherman, PhD
Principal Investigator	Faculty Supervisor
Department of Applied Behavioral Science	Department of Applied Behavioral Science
4001 Dole Human Development Center	4001 Dole Human Development Center
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Jan B. Sheldon, PhD, JD

Faculty Supervisor
Department of Applied Behavioral Science
4013 Dole Human Development Center
University of Kansas
Lawrence, KS 66045
785 864-4840

I give consent for the researchers to show videotapes of me for presentations at conferences and to other people. I understand that my face will be visible but all identifying information (e.g., names, where I live) and very specific information about me will be removed from the videotape prior to showing.

Type/Print Participant's Name

Date

Participant's Signature

Appendix B-Written Checklist Used to Evaluate the Cleanliness of the Apartments

Kitchen	Meets criteria?			
Dishes, containers, and cookware stored appropriately?	Yes	No	NA	CBSTC
Counter and stove tops free of personal items and cleaning supplies?	Yes	No	NA	CBSTC
Counter and stove tops clean?	Yes	No	NA	CBSTC
Sink clean?	Yes	No	NA	CBSTC
Hand soap and paper towels (or napkins or hand towel) available?	Yes	No	NA	CBSTC
No overflow of trash in trash can?	Yes	No	NA	CBSTC
Floor free of extra items?	Yes	No	NA	CBSTC
Floor tile clean?	Yes	No	NA	CBSTC
Floor rugs clean?	Yes	No	NA	CBSTC

Living Room and Dining Room	Meets criteria?			
No overflow of trash in trash can?	Yes	No	NA	CBSTC
Room free of dishes?	Yes	No	NA	CBSTC
Room free of beverages excluding single-serving, re-sealable containers?	Yes	No	NA	CBSTC
Room free of food?	Yes	No	NA	CBSTC
Furniture free of extra items?	Yes	No	NA	CBSTC
Floor free of extra items?	Yes	No	NA	CBSTC
Floor carpet clean?	Yes	No	NA	CBSTC
Floor rugs clean?	Yes	No	NA	CBSTC
Surfaces free of clutter?	Yes	No	NA	CBSTC
Surfaces clean?	Yes	No	NA	CBSTC
Floor tile clean?	Yes	No	NA	CBSTC
Dining room table clean?	Yes	No	NA	CBSTC
Dining room table free of personal items and cleaning supplies?	Yes	No	NA	CBSTC

1.16.14 Data Sheet

Comments: _____

Number of points given?	_____
Correct amount of points given?	Yes No NA
Backup reinforcer delivered?	Yes No NA

Key: NA = Not Applicable CBSTC = Cannot Be Seen Through Camera

Appendix C-Apartment Checklist with Definitions

Kitchen Checklist

- **Dishes, containers, and cookware stored appropriately** – There are no dishes, containers, or cookware in the sink or on the table, counter, or stove tops.
- **Counter and stove tops free of personal items and cleaning supplies** – Unless in use, the counter and stove tops are free of all personal items and cleaning supplies.
- **Counter and stove tops clean** – Unless in use, the counter and stove tops have no visible trash, food particles, dust, dirt, or spilled residue.
- **Sink clean** – Unless in use, the sink has no dishes, visible trash, stains, food particles, spilled residue, or dirt.
- **Hand soap and paper towels (or clean hand towel or napkins) are available**
- **No overflow of trash in trash can** – There is no trash above the brim of the trash can.
- **Floor free of extra items** – Unless in use, the floor is free of all items, excluding furniture, appliances, storage containers, and trash cans.
- **Floor tile clean** – The floor tile has no visible trash, food particles, dust balls, spilled residue, or dirt.
- **Floor rugs clean** – The rugs have no visible trash, food particles, dust balls, spilled residue, or dirt.

Living Room and Dining Room Checklist

- **No overflow of trash in trash can** – There is no trash above the brim of the trash can.
- **Room free of dishes** – There are no dishes, Tupperware, or eating utensils in the living room.
- **Room free of beverages excluding single-serving, re-sealable containers** – There are no beverage containers (e.g., gallon of milk, juice containers, cups, etc.) excluding single-serving, re-sealable containers (e.g., bottle of water, travel mug, etc.) in the living room.
- **Room free of food** – There is no food in the living room.
- **Furniture (e.g., couch, chair, etc.) free of extra items (e.g., magazines, video games, boxes, bags)** – Unless in use, the furniture is free of all items, excluding blankets, pillows, and remotes.
- **Floor free of extra items (e.g., magazines, video games, boxes, blankets, pillows)** – Unless in use, the floor is free of all items excluding furniture, trash cans, and storage containers.
- **Floor carpet clean** – The floor carpet has no visible trash, food particles, dust balls, spilled residue, or dirt.
- **Floor rugs clean** – The rugs have no visible trash, food particles, dust balls, spilled residue, or dirt.

Appendix D-Points Awarded for Checklist Tasks

Kitchen	Point Values
Dishes, containers, and cookware stored appropriately?	8 points
Counter and stove tops free of personal items and cleaning supplies?	5 points
Counter and stove tops clean?	5 points
Sink clean?	5 points
Hand soap and paper towels (or napkins or hand towel) available?	1 point
No overflow of trash in trash can?	3 points
Floor free of extra items?	2 points
Floor tile clean?	4 points
Floor rugs clean?	3 points
36 points total	

Living Room and Dining Room	Point Values
No overflow of trash in trash can?	3 points
Room free of dishes?	1 point
Room free of beverages excluding single-serving, re-sealable containers?	1 point
Room free of food?	1 point
Furniture free of extra items?	2 points
Floor free of extra items?	2 points
Floor carpet clean?	5 points
Floor rugs clean?	3 points
Surfaces free of clutter?	3 points
Surfaces clean?	3 points
Floor tile clean?	4 points
Kitchen table clean?	3 points
Kitchen table free of personal items and cleaning supplies?	3 points

Point Values

Comments: _____ 34 points total

Key: NA = Not Applicable CBTSC = Cannot Be Seen Through Camera

Appendix E-Cost of Backup Reinforcers

Reinforcer Menu

Item or Activity	Points Cost
Todd attends an exercise class with you (1 hour + \$3 pending cost)	370
Go to a poetry slam with Todd (1 hour + \$3 admission)	370
Go bowling with Todd (1 hour + cost of bowling)	320
Get a coffee with Todd (\$5 + 30 minutes)	280
Go out for a treat (sonic slush, froyo, etc.) (\$5 treat + 30 minutes)	280
New cookbook (\$10 value)	280
New CD (\$10 value)	280
Used video game (\$10 value)	280
One movie ticket to Hollywood Theaters	280
Watch a movie with Todd (1 hour)	280
Watch TV with Todd (1 hour)	280
Watch a sporting even on TV with Todd (1 hour)	280
Play video games with Todd (1 hour)	280
Play a sport with Todd (volleyball, soccer, etc.) (1 hour)	280
Go to a park with Todd (1 hour)	280
Walk on Mass St. with Todd (1 hour)	280
Go hiking at a park with Todd (1 hour)	280
Go to a rec center to play sports/games (1 hour)	280
Visit Spencer Art Museum (1 hour)	280
Visit Natural History Musem (1 hour)	280
Visit the library (1 hour)	280
Play a sport with Todd (volleyball, soccer, etc.) (45 minutes)	210
Go to a park with Todd (45 minutes)	210
Walk on Mass St. with Todd (45 minutes)	210
Go hiking at a park with Todd (45 minutes)	210
Go to a rec center to play sports/games (45 minutes)	210
Visit Spencer Art Museum (45 minutes)	210
Visit Natural History Musem (45 minutes)	210
Visit the library (45 minutes)	210
Watch a movie with Todd (45 minutes)	210
Watch a TV show with Todd (45 minutes)	210
Watch a sporting even on TV with Todd (45 minutes)	210
Play video games with Todd (45 minutes)	210

Play a sport with Todd (volleyball, soccer, etc.) (45 minutes)	210
Go to a park with Todd (45 minutes)	210
Walk on Mass St. with Todd (45 minutes)	210
Go hiking at a park with Todd (45 minutes)	210
Go to a rec center to play sports/games (45 minutes)	210
Visit Spencer Art Museum (45 minutes)	210
Visit Natural History Museum (45 minutes)	210
Visit the library (45 minutes)	210
Watch a movie with Todd (45 minutes)	210
Watch a TV show with Todd (45 minutes)	210
Watch a sporting even on TV with Todd (45 minutes)	210
Play video games with Todd (45 minutes)	210

Gift card (iTunes, Hastings, Kindle, etc.) (\$5 value)	140
Microsoft points (\$5 value)	140
New comic book or magazine (\$5 value)	140
New book (\$5 value)	140
New pack of Yu-gi-oh cards (\$5 value)	140
New pack of Magic cards (\$5 value)	140
Minutes on cell phone (\$5 value)	140
Watch a sporting event on TV with Todd (30 minutes)	140
Cook with Todd (30 minutes)	140
Watch TV with Todd (30 minutes)	140
Watch a move with Todd (30 minutes)	140
Play a board/card game with Todd (30 minutes)	140
Play a sport with Todd (volleyball, soccer, etc.) (30 minutes)	140
Play video games with Todd (30 minutes)	140
Go to a park with Todd (30 minutes)	140
Walk on Mass St. with Todd (30 minutes)	140
Go hiking at a park with Todd (30 minutes)	140
Go to a rec center to play sports/games (30 minutes)	140
Play Yu-gi-oh with Todd (30 minutes)	140
Play Magic with Todd (30 minutes)	140
Visit the library (30 minutes)	140
Go for a walk with Todd (30 minutes)	140

Play Yu-gi-oh with Todd (15 minutes)	70
Play Magic with Todd (15 minutes)	70
Play video games with Todd (15 minutes)	70
Play a sport with Todd (volleyball, soccer, etc.) (15 minutes)	70
Watch a sporting event on TV with Todd (15 minutes)	70

Watch TV with Todd (15 minutes)	70
Go for a walk with Todd (15 minutes)	70
Play a board/card game with Todd (15 minutes)	70

Other ideas:

Appendix F-Preference Assessment Data Sheet

		Rank
1	Todd attends an exercise class with you	
2	Go to a poetry slam with Todd	
3	Go bowling with Todd	
4	Get a coffee with Todd	
5	Go out for a treat (sonic slush, froyo, etc.)	
6	New cookbook	
7	New CD	
8	Used video game	
9	One movie ticket to Hollywood Theaters	
10	Watch a movie with Todd	
11	Watch TV with Todd	
12	Watch a sporting event on TV with Todd	
13	Play video games with Todd	
14	Play a sport with Todd (volleyball, soccer, etc.)	
15	Go to a park with Todd	
16	Walk on Mass St. with Todd	
17	Go hiking at a park with Todd	
18	Go to a rec center to play sports/games	
19	Visit Spencer Art Museum	
20	Visit Natural History Museum	
21	Visit the library	
22	Gift card (iTunes, Hastings, Kindle, etc.)	
23	Microsoft points	
24	New comic book or magazine	
25	New book	
26	New pack of Yu-gi-oh cards	
27	New pack of Magic cards	
28	Minutes on cell phone	
29	Cook with Todd	
30	Play a board/card game with Todd	
31	Play Yu-gi-oh with Todd	
32	Play Magic with Todd	
33	Go for a walk with Todd	
34	Go for a walk on campus with Todd	
35	New pack of Pokemon cards	
36	Soda/energy drink	

Appendix G-Point-Tracking Sheet

Kitchen	Points received?
Dishes, containers, and cookware stored appropriately?	
Counter and stove tops free of personal items and cleaning supplies?	
Counter and stove tops clean?	
Sink clean?	
Hand soap and paper towels (or napkins or hand towel) available?	
No overflow of trash in trash can?	
Floor free of extra items?	
Floor tile clean?	
Floor rugs clean?	
Daily total:	

Kitchen	Point Values
Dishes, containers, and cookware stored appropriately?	8 points
Counter and stove tops free of personal items and cleaning supplies?	5 points
Counter and stove tops clean?	5 points
Sink clean?	5 points
Hand soap and paper towels (or napkins or hand towel) available?	1 point
No overflow of trash in trash can?	3 points
Floor free of extra items?	2 points
Floor tile clean?	4 points
Floor rugs clean?	3 points

_____ **weekly total =** _____

Living Room and Dining Room

Points received?

No overflow of trash in trash can?				
Room free of dishes?				
Room free of beverages excluding single-serving, re-sealable containers?				
Room free of food?				
Furniture free of extra items?				
Floor free of extra items?				
Floor carpet clean?				
Floor rugs clean?				
Surfaces free of clutter?				
Surfaces clean?				
Floor tile clean?				
Kitchen/dining room table clean?				
Kitchen/dining room table free of personal items and cleaning supplies?				

Daily total:

--	--	--	--

weekly total =

Living Room and Dining Room

Point Values

No overflow of trash in trash can?	3 points
Room free of dishes?	1 point
Room free of beverages excluding single-serving, re-sealable containers?	1 point
Room free of food?	1 point
Furniture free of extra items?	2 points
Floor free of extra items?	2 points
Floor carpet clean?	5 points
Floor rugs clean?	3 points
Surfaces free of clutter?	3 points
Surfaces clean?	3 points
Floor tile clean?	4 points
Kitchen/dining room table clean?	3 points
Kitchen/dining room table free of personal items and cleaning supplies?	3 points

Appendix H-Social Validity Questionnaire

Video 1

1. The overall cleanliness of the kitchen was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

2. The overall cleanliness of the living and dining room was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

3. The overall cleanliness of the entire apartment was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

Video 2

1. The overall cleanliness of the kitchen was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

2. The overall cleanliness of the living and dining room was:

1	2	3	4	5
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Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable
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3. The overall cleanliness of the entire apartment was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

Video 3

1. The overall cleanliness of the kitchen was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

2. The overall cleanliness of the living and dining room was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

3. The overall cleanliness of the entire apartment was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

Video 4

1. The overall cleanliness of the kitchen was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

2. The overall cleanliness of the living and dining room was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

3. The overall cleanliness of the entire apartment was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

Video 5

1. The overall cleanliness of the kitchen was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

2. The overall cleanliness of the living and dining room was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

3. The overall cleanliness of the entire apartment was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

Video 6

1. The overall cleanliness of the kitchen was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

2. The overall cleanliness of the living and dining room was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable

3. The overall cleanliness of the entire apartment was:

1	2	3	4	5
Very unacceptable	Unacceptable	Neutral	Acceptable	Very Acceptable