Validity of Using the Assessment of Motor and Process Skills To Estimate Overall Home Safety in Persons With Psychiatric Conditions

Martina Cooper McNulty, Anne G. Fisher

Key Words: activities of daily living • mental health occupational therapy

Objective. Occupational therapists often base estimates of home safety on their behavioral observations of a client performing functional activities during a hospitalization. To examine this practice, this study investigated the predictive validity of the Assessment of Motor and Process Skills (AMPS) to the overall home safety of persons with psychiatric conditions associated with cognitive impairments.

Method. Ability in activities of daily living (ADL) of 20 participants was evaluated with the AMPS before discharge from an inpatient psychiatric unit. Within approximately 2 weeks of their discharge, the participants’ home safety was evaluated within their home settings using the Safety Assessment of Function and the Environment for Rehabilitation. To form a basis for comparison, a second administration of the AMPS was administered concurrently with the home safety evaluation.

Results. Moderate positive relationships were found between ADL motor and ADL process ability and home safety in both the clinic and the home; however, analyses of the sensitivity, specificity, and overall predictive values revealed that home ADL process ability was the best predictor of home safety for participants who were categorized as less safe in the study.

Conclusion. Findings suggest that clinic ADL evaluations using the AMPS give a reasonable estimate of home safety for participants categorized as having more home safety risk. For participants categorized as having less home safety risk, clinic ADL evaluation using the AMPS produced significantly less accurate estimates than ADL evaluations conducted in the home. These results indicate that home safety estimates may be most accurate if they are based on home rather than clinic ADL process ability measures.

The primary objective of this study was to examine the predictive validity of clinical administration of one behavioral observation test of ADL to a person's home safety: the Assessment of Motor and Process Skills (AMPS; Fisher, 1997). A second objective was to determine whether the AMPS can predict more or less home safety risk on the basis of home safety ability measures obtained from the Rasch analysis of scores on the Safety Assessment of Function and the Environment for Rehabilitation (SAFE; Community Occupational Therapists and Associates, 1991). To compare both objectives, the AMPS also was administered in each participant's home.

**Home Safety**

According to safety educators, a person's overall safety depends on his or her attitudes, habits, knowledge, skills, and performance and the characteristics of his or her environment (Florio & Stafford, 1969). Safety is considered more than an absence of unsafe performance. Thygerson (1986) proposed that an important distinction be drawn between measuring specific safety risks and judging a person's overall safety. Safety risks are personal capacities, skills, behaviors, and environmental characteristics that increase the probability that unintentional injury or property damage will occur. Safety risks can be measured and documented. Judging a person's overall safety involves determining whether the number of safety risks found is acceptable. Occupational therapists and other health care providers often measure home safety risks and contribute in this way to the evaluation of overall home safety.

Within the field of occupational therapy, Letts, Marshall, and Cawley (1995) proposed that overall home safety be viewed as a transaction of dynamic and interacting relationships between a person's capacities and skills and the physical and social elements in his or her environment. Home safety was conceptualized to include a person's ability to access needed services and support in the community as well as his or her ability to avoid high-risk situations that can lead to adverse consequences. Allen (1992) specified that a person with adequate home safety skills is able to plan and organize meals, maintain shelter and personal health, cope with emergencies, and prevent personal injuries. Implicit within this definition is the notion that such a person also recognizes potential hazards and problem solves strategies for reducing home safety risks in spite of existing sensorimotor, cognitive, or perceptual impairments.

Safety is closely related to functional independence. Functional independence is more than the ability to perform selected daily life tasks without help. Independence relies on a person's ability to carry out effectively, efficiently, and safely a series of task performances that comprise a daily routine (Fisher, 1997). The AMPS was designed to evaluate both overall ADL ability and the quality, efficiency, and safety of the individual motor and process actions enacted in ADL performance.

ADL motor skills are the individual performance actions clients use to move objects or themselves. The quality or efficiency of the client's ADL motor skill performance can directly affect such safety factors as risk for falls. ADL process skills are observable actions that reflect sensible time and space organization and adaptation during the task performance. ADL process ability, as measured by the AMPS, reflects the quality, efficiency, and safety of individual actions hypothesized to be more related to problem solving and judgment than to underlying physical capacities. Hence, independent and safe performance of ADL will likely have a stronger relationship to a client's ADL process ability than to his or her ADL motor ability.

The ADL process scale also tests a client's ability to self-correct during ADL performance. The process skill items under the AMPS domain of adaptation are scored on the basis of the client's ability to notice and respond appropriately to relevant environmental cues, accommodate his or her task performance, adjust the environment when problems are encountered, and benefit from prior errors and feedback to prevent problems from recurring. Some inefficiency with one or two of the adaptation process skills is not necessarily an indicator of decreased independence or a potential for safety problems. However, if a client demonstrates enough decreased efficiency or safety with any of the ADL process actions, or the scoring reflects task breakdown or a need for therapist intervention, it is reasonable to assume that the client would be at risk for safety problems or would need assistance in the future.

Another reason why we hypothesized a closer relationship between ADL process ability performance and home safety is that a past study revealed a significant correlation between participants scoring below 1.0 logit on the AMPS ADL process ability scale and the need for assistance to live in the community (Fisher, 1997). No such correlation was revealed for the ADL motor ability scale. A partial explanation for this finding may be that many persons with significant ADL motor restrictions are able to live independently because they have the requisite ADL process skills needed to compensate for their sensorimotor limitations during ADL performance.

To examine the predictive validity of the AMPS to overall home safety in persons with cognitive disability, a criterion tool for measuring home safety was needed. Occupational therapists commonly use nonstandardized checklists for home safety that focus on the environmental characteristics of a client's home related to fall prevention. Fall prevention has been a major focus of home safety literature because of the close relationship established between falls in elderly persons and decreased independence and mortality (Watzke & Smith, 1994). The Westmead Home Safety Assessment (Clemson, Roland, &
The expanded view of home safety was evident in two standardized assessments for clients with psychiatric conditions: the Kohlman Evaluation of Living Skills (KELS; Thomson, 1992) and the Milwaukee Evaluation of Living Skills (MEDLS; Leonardielli, 1988). Both assessments were designed to screen or evaluate ADL functioning, including specific components that address home safety and community safety awareness. However, the validity of the KELS and MEDLS safety assessments have not been studied to determine whether clinical performance correlates with actual home safety. Additionally, the safety items in these tests comprise only a small part of the overall evaluations. Arguably, these safety tests involving interview and simulation are too contrived to predict how a client will perform in his or her home environment. The KELS and MEDLS test safety outside of purposeful tasks and the client's environment, which is contrary to earlier stated definitions of home safety related to occupational therapy.

The only standardized test that defines home safety in broader terms than fall prevention and fully takes into account the relationship between persons and their environments is the SAFER (Community Occupational Therapists and Associates, 1991). Occupational therapists use the SAFER to assess the client's environment in terms of different types and levels of social supports and built objects and the transactive relationship with the client's functional abilities (Letts et al., 1994). The occupational therapist plays an important role in identifying and facilitating the adaptations necessary to “match” a client's capabilities for optimal safe functioning in his or her home and community environments (Letts & Marshall, 1995).

For this study, safety was defined in two ways. First, safety was defined as the client's ability to perform tasks free from unsafe practices that can lead to personal injury or damage to the environment. For example, a client who picks up a knife unsafely while preparing a salad illustrates potential risk for causing an injury. Second, safety was defined as a client's ability to perform tasks free from the complications or task breakdown that suggests potential inability to meet basic needs related to food, clothing, shelter, and personal health (Allen, 1992). Although the client's actions in and of themselves do not constitute a direct safety risk, the absence of problem recognition and solving would suggest that the client is unable to complete or problem solve successfully tasks necessary to maintain health and safety alone at home. An example of this second notion is a client with dementia who turns on the coffee maker and does not notice after several minutes that it is unplugged. Together, these two definitions capture the comprehensive nature of an occupational therapist's evaluation of home safety: what clients do that creates direct safety risk and what they omit doing that suggests future difficulties with identifying and managing home safety risks.

To investigate the predictive validity of the AMPS to overall home safety of persons with psychiatric conditions associated with cognitive impairments, we anticipated a moderate relationship (i.e., .50–.70 [Hinkle, Wiersma, & Jurs, 1988]) between hospital ADL ability as measured by the AMPS and home safety as measured by the SAFER. This level of correlation was anticipated because researchers have found moderate relationships between the AMPS and other related tests such as the Functional Independence Measure (Guide for the Uniform Data System for Medical Rehabilitation, 1997), Older Americans Resources and Services (Fillenbaum, 1988), and the Barthel Index (Mahoney & Barthel, 1965) (Fisher, 1997). We anticipated a stronger ability to estimate home safety with the ADL process ability measures than with the ADL motor ability measures because the criteria for inclusion for the study focused primarily on the presence of cognitive impairments and because ADL process ability is more closely associated with self-correction and adaptive behaviors that could potentially compensate for ADL motor ability problems.

As a basis for comparison of both study objectives, as stated previously, the AMPS was administered in the home setting concurrently with the SAFER. This study examined the following questions:

1. How strongly do ability measures derived from clinic administration of the AMPS estimate the overall home safety of participants as measured by the research version of the SAFER compared with ability measures derived from home administration of the AMPS?
2. How effectively do ability measures derived from clinic administration of the AMPS predict which participants are more or less safe compared with ability measures derived from a home administration of the AMPS?

Method

Participants

After receiving institutional approval for this study, the first author recruited volunteers from an acute psychiatric unit of a 300-bed medical center where she was employed. Thirty of the 45 persons eligible to participate gave consent. It was not clear why some chose not to participate; however, one potential reason may have been the sensitive nature of home safety and that participation in the study may have been perceived as a potential threat to future autonomy. Twenty of the original 30 consenting participants completed the study protocol. The reasons for attrition included relocation to homes more than 50 miles away from the hospital, an inability to locate the participants...
after discharge, and participants changing their minds about participating for personal reasons.

All participants were men who ranged in age from 31 to 85 years of age (M = 58 years, SD = 16.05). All were given an axis I diagnosis (American Psychiatric Association, 1994). Six were diagnosed with schizoaffective disorder, 5 with bipolar affective disorder, 4 with major depression, 2 with dementia, 2 with schizophrenia, and 1 with dissociative disorder).

The participants were asked to take part in this study if the treatment team considered them to have some type of cognitive deficits ranging from barely detectable to severe. Cognitive deficits were defined as difficulties with following directions, remembering, concentrating, learning new skills, being aware of details in the environment, initiating and sequencing tasks, tracking time and schedules, thinking abstractly, problem solving, or anticipating and planning for primary and secondary consequences of actions. Evidence of cognitive deficits for this study were (a) referral for an occupational therapy evaluation because of cognitive deficits or (b) the assignment to an activity-based group program on the unit designed for clients with cognitive deficits. A clinical judgment of stabilization of acute psychiatric symptoms also was required for inclusion in this study. Stability of acute symptoms was judged on the basis of two factors: (a) evidence of the team discussing the client’s discharge and (b) an observable reduction in acute symptoms, indicating that the client’s cognitive functioning was stable. Clients who met these criteria but lived more than 50 miles from the hospital or needed supervision because of reported suicidal ideation were excluded.

**Instruments**

**AMPS.** During administration of the AMPS, a therapist offers a client a choice of 5 or 6 tasks from the 76 task options available in the AMPS manual that are based on the client’s abilities and expressed interests. The client selects 2 or 3 tasks he or she would like to do. Before beginning the observation, the therapist fully orients the client to an unfamiliar environment by discussing and ensuring that the client knows where available tools and materials are located. If feasible, the client is encouraged to put tools and materials into locations similar to his or her home environment (Fisher, 1999).

The AMPS scoring criteria consider a client’s unsafe performance, need for assistance, or task breakdown. For example, an AMPS rater gives a score of 4 for competent skill performance (i.e., no problems are observed). A score of 3 is given for acceptable performance, although the therapist has some question or doubt about the client’s effectiveness while carrying out a particular skill item. A rater assigns a score of 2 when the skill performance is ineffective. A score of 2 indicates that the client does not need assistance, but at times, a score of 2 may reflect a potential safety risk. For example, if a client makes tea and toast instead of the agreed-on task of coffee and toast, the rater gives a score of 2 on the process skill item Heeds because this reflects a failure to complete the prespecified goal of the task. The rater assigns a score of 2 on the process skill item Handles if the client holds a knife in a manner that is potentially unsafe but does not result in an immediate safety risk.

The lowest score of 1 indicates a need for a therapist to intervene because of a risk for damage, injury, or task breakdown. This need may arise because of an imminent safety risk posed by an unsafe practice or because of the client’s inability to complete a goal-directed action of the task performance. For example, a rater would assign a score of 1 on the process skill item Handles after intervening to prevent the client from injuring himself or herself. Similarly, if the client’s ability to complete a task is so impaired that task breakdown occurs, or if the therapist needs to intervene by providing physical or verbal assistance, the rater would assign a score of 1 on the process skill item Heeds.

The AMPS scoring software converts the raw data from these ratings into equal-interval additive ADL motor and ADL process ability measures that can be analyzed with traditional statistics (Fisher, 1997, 1999). This software is a specialized application of the many-faceted Rasch analysis (MFR) model for the AMPS (Linacre, 1987–1994). The software adjusts the final ADL ability measures to account for four factors (facets) simultaneously: skill item difficulty, severity of the rater, difficulty of the task, and the ability of the person. The end-product of the analysis is that the client’s ADL ability measures are placed on linear continua of ADL motor ability and ADL process ability. The high end of each continuum represents more ADL ability, and the low end indicates less ADL ability.


**SAFER.** Occupational therapists use this standardized assessment to assess 97 safety items within 14 categories (Community Occupational Therapists and Associates,
The SAFER was designed to allow an occupational therapist to delete items that he or she judges not useful for a particular client’s situation. For our study, an expert panel of five experienced occupational therapists (including the authors) judged 29 of 97 SAFER items to be most related to cognitive-behavioral abilities. The panel omitted items that it deemed were most pertinent to the evaluation of safety for persons with primary or major physical impairments. A reduction in the number of SAFER items used for this study was considered necessary because of time constraints involved with administering both the AMPS and the SAFER. An example of 1 of the 29 items in the SAFER research version was titled handling money/safekeeping (Community Occupational Therapists and Associates, 1991). This item was viewed as more pertinent to assessing home safety problems in persons with cognitive-behavioral deficits than other SAFER items that were excluded (e.g., stairs/ramps, positioning in bed or wheelchair) (Community Occupational Therapists and Associates, 1991). Standard scoring of the SAFER was used with the following modification: If assistance was needed and provided by a caregiver or another person, the participant was scored as having a problem with that particular item. We coded the SAFER data so that higher SAFER ability measures indicated more home safety ability (lower safety risk).

Previous psychometric testing of the SAFER has been rudimentary (Letts & Marshall, 1995; Letts, Scott, Burttney, Marshall, & McKean, 1998). To perform traditional inferential statistics with the SAFER data, we needed a mechanism to transform the SAFER’s ordinal data into equal-interval data. Because we hypothesized that the 29 items used in the research version for this study represented one unidimensional scale of home safety ability, we applied MFR analysis (Linacre, 1987–1994, 1993) to raw scores from the SAFER to determine a linear safety measure for each participant.

More specifically, we used MFR analyses to test aspects of validity and reliability of the shorter research version using a larger data set of 131 participants who had participated in SAFER evaluations with trained and experienced SAFER evaluators. This important step ensured that the 29 home safety items used in the research version were a valid sample. The participants in the larger data set were community-dwelling adults and older persons with memory, neurological, and psychiatric disorders. Our results supported the following: (a) scale validity (unidimensionality) as indicated by fit of the 29 items to the MFR model, (b) rater reliability as indicated by 37 of 38 raters demonstrating acceptable goodness-of-fit to the model, and (c) person response validity of all 102 participants. Our criteria for acceptable goodness-of-fit were $\text{MnSq} \leq 1.4$ and $z \leq 2$.

**Procedure**

After receiving approval from human research review boards, the first author secured informed consent before the study. The AMPS observation was conducted in the hospital setting within 1 day to 15 days ($M = 4$ days, $SD = 3$) before the participants’ discharge from the hospital. The participants’ hospital lengths of stay ranged from 2 days to 34 days ($M = 15.4$ days, $SD = 8.2$). The SAFER and second AMPS observation occurred in the home within 5 days to 29 days after discharge ($M = 11$ days, $SD = 6.1$). This time frame was judged sufficient to enable each participant to stabilize in the home setting in order to get a more accurate estimate of community-based performance. The first author, a trained and calibrated AMPS rater, administered the AMPS and SAFER.

**Results**

Pearson product-moment correlations were used to determine the strength of the predictive validity of the hospital and home ADL motor and ADL process ability measures to participants’ overall home safety ability measures. Multiple regression analyses were used to determine the strength of the predictive validity of home safety and the combined ADL motor and ADL process ability measures from hospital and from home.

We found moderate positive relationships between safety ability as measured by the SAFER and clinic ADL motor and ADL process ability measures. Similar moderate relationships were found when comparing safety ability and home ADL motor and ADL process abilities. The relationships increased when both ADL motor and ADL process ability measures were entered into multiple regression analyses compared with either ADL motor or ADL process ability measures (see Table 1).

To evaluate the ability of the ADL motor and ADL process ability measures to predict participants who are more or less safe, we evaluated the sensitivity, specificity, and overall predictive ability of both measures. Because the ADL motor and ADL process ability measures are continuous variables, we used the classification tables generated by discriminant analysis procedures. As do traditional contingency tables, these classification tables report the number of participants classified as true positive, false positive, true negative, and false negative. We implemented the discriminant analyses in hierarchical order on the basis of our hypothesis that ADL process ability measures would be the stronger predictors of home safety. Therefore, we entered ADL process ability measures first and ADL motor ability measures second. Because clinic ADL motor ability measures, when considered by themselves, did not significantly predict who was more or less safe, we did not evaluate home and clinic ADL motor ability measures.
The sensitivity, specificity, and overall predictive value analyses, however, indicated a clinically meaningful difference in the ability of the AMPS clinic and home ADL process ability measures to predict clients who are more or less safe. Because occupational therapists are most concerned with clients with more rather than less safety risk, these results indicate that home safety estimates may be most accurate if they are based on home rather than clinic ADL process ability measures. Although the strength of the relationship increased when both ADL motor and ADL process ability measures were considered, specificity and overall predictive value were highest when home ADL process ability measures were considered alone. If an occupational therapist wants to know about a client’s overall home safety, the results of this study suggest that assessment results from the ADL process scale obtained in the home setting would be the most trustworthy predictor.

**Limitations and Directions for Future Research**

Because of the small sample size and design constraints of this study, the results only can be generalized with caution. An additional limitation of this study was the potential threat of bias because a single occupational therapist rated and scored all of the assessments of ADL ability and home safety. Rater fit to the MFR model was one assurance of rater reliability; nevertheless, future research of the validity of clinic and home assessment of home safety and ADL ability should include more than one rater. Designing the study so that raters are blind to as many test variables as possible would help to alleviate potential bias.

To verify the findings of this study, research is needed to investigate clinic and home ADL and safety assessments with a larger population with different diagnostic profiles. With larger samples, researchers can examine the relationship between home safety and ADL motor and ADL process skills more in-depth. This advanced understanding of home safety and ADL ability could provide a strong foundation for meeting the critical need for efficacy studies of home safety interventions for clients with different skills, capacities, environmental supports, and cultural backgrounds.

**Acknowledgments**

We thank Lori Letts, OT(C), MS, and Community Occupational Therapists and Associates for their assistance and willingness to collaborate in our use of the SAFER tool. We thank Claudia Brown, MS, OTR, Thomas Hansen, MD, Jean Bagdoff, MS, RN, and John Dryden, MD, for their assistance and support for this investigation. We also thank the participants who made this study possible.

This study was completed in partial fulfillment of the first author’s requirements for a master of science degree in occupational therapy at Colorado State University. This study was supported, in part, by a grant from the National Institutes of Health, National Institute on Aging, 1R01AG12345.

**References**


---

**Table 1**

<table>
<thead>
<tr>
<th>AMPS Scale</th>
<th>r</th>
<th>R</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>.58</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>.67</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Motor and process</td>
<td>.73</td>
<td>≤ .002</td>
<td></td>
</tr>
<tr>
<td><strong>Home</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>.63</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>.60</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>Motor and process</td>
<td>.75</td>
<td>≤ .001</td>
<td></td>
</tr>
</tbody>
</table>

*Note. SAFER = Safety Assessment of Function and the Environment for Rehabilitation; AMPS = Assessment of Motor and Process Skills.*

---

**Table 2**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Overall Predictive Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic ADL process ability</td>
<td>78</td>
<td>55</td>
<td>65</td>
</tr>
<tr>
<td>Home ADL process ability</td>
<td>78</td>
<td>82</td>
<td>80</td>
</tr>
<tr>
<td>Clinic process and motor ability</td>
<td>78</td>
<td>64</td>
<td>70</td>
</tr>
<tr>
<td>Home process and motor ability</td>
<td>78</td>
<td>73</td>
<td>75</td>
</tr>
</tbody>
</table>

*Note. n = 20; ADL = activities of daily living.*


