Comparing Motor and Process Ability of Persons With Suspected Dementia in Home and Clinic Settings

Louise Nygård, Birgitta Bernspång, Anne G. Fisher, Bengt Winblad

Key Words: activities of daily living evaluation • dementia • environment

Objectives. Evaluating functional level of persons with diagnosed or suspected dementia is an important part of occupational therapy. The importance of the environment is often highlighted. We investigated the ability of clients with suspected dementia to perform instrumental activities of daily living (IADLs) in the clinic versus in their homes.

Method. We used the Assessment of Motor and Process Skills (AMPS) to measure the motor and process skill ability of 19 clients with suspected dementia.

Results. Using two-tailed paired t-tests, we found no overall difference in IADL motor or process performance between the clinic and home settings. However, of the 19 clients, 6 had motor ability measures, whereas 5 had process ability measures that differed significantly between the two settings.

Conclusion. The results suggest that if we want to know how a person with suspected dementia performs in IADLs in a specific environment we should test him or her in that environment.

The contribution of occupational therapists working in diagnostic units for memory deficits usually includes an evaluation of the client's performance in activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Although society today emphasizes care for persons with diagnosed or suspected dementia (hereafter, suspected dementia) in their homes, ADL and IADL evaluations often are done in clinical settings. Moreover, although both clients and occupational therapists often assume that an unfamiliar environment obstructs task performance, it is common practice to estimate the functional ability of persons with suspected dementia on the basis of their performance in clinical settings. Therefore, for persons who are in the beginning stages of a suspected dementia and who are still acting and living in their usual environments, the knowledge of environmental influence is of utmost importance. The aim of the present study was to compare IADL ability of persons with suspected dementia in the clinic and in their homes.

Dementing diseases (e.g., senile dementia of the Alzheimer's type [SDAT], vascular dementia) can affect several important functional areas in everyday life. The diagnosis of dementia is based on symptomatology, but a memory deficit is required. Other symptoms required for this diagnosis are aphasia, apraxia, agnosia, or a change in personality that interferes with the social or occupational functioning of the person (American Psychiatric Association, 1987). The ability to independently perform ADL is gradually lost and begins with a decline in IADL (Reisberg, Ferris, de Leon, & Crook, 1982). At a relatively early stage of the disease, personal habits also can deteriorate (Levy, 1987). Despite general awareness that dementing diseases are associated with loss of functional ability, the
specific characteristics of the problems from the standpoint of ADL and IADL have not been investigated in depth. The effect of dementia on ADL and IADL performance is both complex and individual because there are a number of factors, both intrinsic and extrinsic (Rogers, 1982), influencing the person’s ability to perform daily life activities. Intrinsic factors include the cognitive limitations caused by the dementia as well as the volitional or motivational state of the person (Doble, 1988; Kielhofner, 1985; Sandman, Norberg, Adolfsson, Axelsson, & Hedly, 1986). Extrinsic factors include the physical and sociocultural context in which the activity takes place.

Among the intrinsic factors in dementia, the decline in memory and ability to recognize new information is well documented (see Backman, 1992 for review). Procedural memory, however, defined as the presence of previous experience that alters or facilitates a person’s performance in a task, is more resistant to the disease (Dick, 1992) and is important for performance of daily activities (Josephsson et al., 1995). The presence of relatively preserved procedural memory suggests the possibility of higher ability in ADLs and IADLs in a well known environment where familiarity with objects and procedures could help the person with dementia to compensate for cognitive deficits. In contrast, a decrease in ADL and IADL ability might be expected in unfamiliar clinical environments.

It is known that the environment can affect ADL and IADL performance. Josephsson et al. (1993) found that adapting the environment can affect the ability of persons with dementia to perform IADL tasks. Park, Fisher, and Velozo (1994) found that older persons living in the community demonstrated better mean IADL process skill ability in their own homes than in the clinic; however, mean IADL motor ability did not differ between settings. These studies suggest that the familiarity of the environment in which a person with suspected dementia performs ADL/IADL tasks may influence his or her level of function. Yet, despite the wide use of ADL and IADL evaluation tools with persons with suspected dementia, the effect of environmental familiarity is unknown. Although a number of studies have examined the influence of the specific setting on the functional performance in ADLs and IADLs (Park et al., 1994), none has investigated the influence of the environment on IADL performance in persons with suspected dementia.

An important factor limiting our knowledge of IADL performance in persons with suspected dementia is the lack of valid, reliable, and sensitive instruments for assessing ADL and IADL task performance. A common problem in assessing functional ability is the use of global ADL and IADL evaluations for assessing what a person can or cannot do, and the use of discrete skills evaluations for assessing the underlying constituents of ADL performance (e.g., memory, physical functions). Research has not demonstrated a strong enough relationship between discrete and global levels of assessment to be able to predict functional performance on the basis of discrete test scores (Fisher, 1994).

Recently, efforts have been made in occupational therapy to develop new instruments for evaluation of functional performance. Carswell, Carson, Walop, and Zgola (1992) have used qualitative methods to establish a theoretical model for assessing functional performance in persons with SDAT. Their objective was to address the need for a measure of functional ability that helps to identify effective intervention strategies (Carswell et al., 1992). Fisher (1994) developed an observational instrument for IADL performance evaluation of young and older adults called the Assessment of Motor and Process Skills (AMPS). The AMPS is unique, because it is an evaluation of the direct effect of discrete motor and process skills on global IADL performance.

The AMPS was chosen for this study for several reasons. First, IADLs are considered to be among the best indicators of functional competence (Lawton, 1987). The importance of evaluating functional performance in IADL in persons with suspected dementia is supported by the findings of Fisk and Pannill (1987), who found a higher dependency in IADLs than in ADLs among subjects with SDAT living in the community. Second, unlike global assessments, the AMPS offers a test of the interaction between discrete skills and global ability to perform IADL tasks. The AMPS also has been shown to be more sensitive to subtle IADL performance deficits than global measures of ADLs and IADLs (Dickerson & Fisher, 1993). Moreover, as discussed above, the AMPS has been shown to be a sensitive measure of the effect of home versus clinic settings on IADL performance of older adults without dementia living in the community (Park et al., 1994). These issues are all of great importance in the evaluation of clients with suspected dementia because there is a need for more sensitive instruments to capture the early signs of dementia for accurate and early diagnosis.

Another advantage of the AMPS is that it considers the intrinsic factor of motivation because the client has the opportunity to perform familiar tasks of his or her choice. This is possible because the AMPS was designed to be test free. That is, clients’ abilities can be assessed and compared even though each client performs different, yet familiar tasks (Fisher, 1993, 1994). We considered this important because our intention was to examine the subjects in different settings and provide them with the opportunity to perform tasks familiar to them and relevant to each environment. More specifically, the aim of this study was to examine and compare the effects of home and clinic environments on the IADL performance of persons with suspected dementia. We hypothesized that persons with suspected dementia would perform better in IADL in their homes than in an unfamiliar clinic setting on both the AMPS IADL motor and IADL process skills scales.
Method

Subjects

The subjects were 19 volunteers from a clinical unit for the diagnosis of memory deficits. Subject criteria for inclusion in the study were (a) motivation for a close examination of occupational performance, (b) routine performance of IADL tasks in everyday life, (c) suspected or known decline in occupational performance, and (d) no known cause of the problems in question other than clinically diagnosed or suspected dementia. The available number of clients meeting these criteria was 27. Of these, 8 clients were assessed only in the clinical setting and thus were excluded from the study (2 clients immediately left for holiday, 1 transferred to another residence after being assessed in the clinic, and 5 clients refused evaluation in their homes). For those subjects with identified dementia, clinical diagnosis was based on the Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition (DSM-III-R, American Psychiatric Association, 1987). For those subjects with the clinical diagnosis of SDAT, the criteria suggested by the National Institute of Neurological and Communicative Disorders and Stroke-Alzheimer's Disease and Related Disorders Association (McKhan et al., 1984) were used. The demographic characteristics of the final sample of 19 are shown in Table 1.

Instrumentation

The AMPS (Fisher, 1994) was used to rate each subject’s occupational performance in IADL. The AMPS is an observational assessment that permits simultaneous evaluation of motor and process skills as a person performs IADL tasks (e.g., meal preparation, home maintenance) of his or her own choice. Motor skills enable the person to cause or impart motion to the body or to objects. Motor skills are observable actions that are related to underlying postural, mobility, coordination, strength, and endurance capacities. Process skills allow for the organized performance of a series of actions en route to task completion.

Process skills are observable actions related to underlying attentional, conceptual, organizational, and adaptive capacities of the person. Because the therapist evaluates 10 motor and 20 process skill items in the context of a client’s performing daily living tasks, the AMPS gives the therapist the ability to identify specific motor and process skill deficits that directly affect performance of IADL tasks. Each item is rated on a 4-point scale, from deficit (1) to competent skill (4).

Many-facet Rasch analysis (Linacre, 1989) was used to transform ordinal raw scores to interval ability measures, taking into account the severity of the rater as well as the challenges of the tasks performed by the subject. This enabled the subject’s ability measure to be adjusted to account for the varying challenges of the tasks performed and for the effect of the rater’s severity (Fisher, 1993, 1994, in press). Because each ability measure reported by the Rasch analysis is associated with its own unique standard error of measurement, the use of Rasch analysis also facilitated our ability to compare a client’s performance at different points in time and to evaluate for significant differences in performance between settings.

The development of the AMPS and the use of a Rasch analysis has been described by Dickerson and Fisher (1993), Fisher (1993, in press), and Fisher, Liu, Velozo, and Pan (1992). These studies reported high intrarater and interrater reliability of the AMPS, as well as scale construct and concurrent validity when the AMPS is used to test well adults and adults with a variety of diagnoses. The use of many-facet Rasch analysis also enables new tasks to be calibrated into the AMPS (Dickerson & Fisher, in press, Fisher et al., 1992). As a result, the current version of the AMPS consists of more than 50 IADL tasks, culturally relevant for different parts of the world. In this study, tasks found to be culturally relevant to Sweden were used (Fisher, 1994).

Procedure

All AMPS evaluations were conducted by the principal investigator. The subjects performed two or three tasks in the inpatient geriatric diagnostic clinic setting and one or two tasks in their homes. The time between the two occasions ranged from 5 to 22 days (M = 13). The evaluation in the clinic always was administered first. Evaluations were completed at the appropriate time of day for

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subject Demographic Information</strong></td>
</tr>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Marital status</td>
</tr>
<tr>
<td>Married</td>
</tr>
<tr>
<td>Widowed/widower</td>
</tr>
<tr>
<td>Divorced</td>
</tr>
<tr>
<td>Unmarried</td>
</tr>
<tr>
<td>Living conditions</td>
</tr>
<tr>
<td>Living alone</td>
</tr>
<tr>
<td>With wife/husband</td>
</tr>
<tr>
<td>Home care help service</td>
</tr>
<tr>
<td>Receive some help</td>
</tr>
<tr>
<td>Receive no help</td>
</tr>
<tr>
<td>Diagnosis</td>
</tr>
<tr>
<td>SDAT = Senile dementia of the Alzheimer's type</td>
</tr>
<tr>
<td>Note: SDAT = Senile dementia of the Alzheimer's type</td>
</tr>
</tbody>
</table>

---

The American Journal of Occupational Therapy

691
the task (e.g., making the bed in the morning, setting a table before lunch) and in the most natural or ecologically relevant environment for the task performed (e.g., kitchen).

**Data Analysis**

To determine whether there was a significant difference in the subjects' IADL motor or process ability measures between the home and clinic settings, paired two-tailed t-tests were performed. To identify specific subjects whose performance differed significantly between the two settings, the following procedure was used: The difference between the higher of the two ability measures (home or clinic) minus its standard error (SE) was compared to the difference between the lower of the two ability measures plus its SE. The existence of an overlap shown in Figures 1 and 2, respectively. Motor ability measures were significantly higher at home for 4 subjects and in the clinic for 2 subjects (see Figure 1). Process ability measures were significantly higher at home for 4 subjects and in the clinical setting for 1 subject (see Figure 2). Thus, while no overall significant group differences were found, some subjects' performance did differ significantly between settings.

**Results**

The mean AMPS IADL motor and process abilities for home and clinic are shown in Table 2. A paired two-tailed t-test showed no significant difference in the mean group ability between the different settings for IADL motor skills or IADL process skills. Comparisons of individual AMPS IADL motor and process ability measures, ± 2 SE, are shown in Figures 1 and 2, respectively. Motor ability measures were significantly higher at home for 4 subjects and in the clinic for 2 subjects (see Figure 1). Process ability measures were significantly higher at home for 4 subjects and in the clinical setting for 1 subject (see Figure 2). Thus, while no overall significant group differences were found, some subjects' performance did differ significantly between settings.

**Table 2**

<table>
<thead>
<tr>
<th>Ability</th>
<th>M</th>
<th>SD</th>
<th>t(df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>2.30</td>
<td>.10</td>
<td>.754 (18)</td>
<td>.461</td>
</tr>
<tr>
<td>Clinic</td>
<td>2.29</td>
<td>.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>.60</td>
<td>.63</td>
<td>1.354 (18)</td>
<td>.192</td>
</tr>
<tr>
<td>Clinic</td>
<td>.47</td>
<td>.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. AMPS = Assessment of motor and process skills

**Discussion**

The findings of this study suggest that the ability to perform IADLs in the earlier stages of a dementing disease is not better overall in well known, home environments. Thus, the results of this study failed to support our hypothesis that familiarity with the environment supports IADL performance in persons with suspected dementia. Moreover, the results of this study are in contrast to those of Park et al. (1994). In that study, the IADL performance of older clients living in the community was significantly higher in process skills in the homes, whereas motor ability was stable between the two settings. None of the subjects in the Park et al. study suffered from suspected dementia.

Evidence of the presence of retained procedural memory in persons with suspected dementia had led us to hypothesize that functional performance in familiar contexts would be facilitated. The absence of differences in the IADL motor and process ability between the two settings suggests that procedural memory is not specific to environment, but rather to actions and tasks routinely performed. A possible interpretation of the present results is that retained procedural memory is inadequate to compensate for declining functions in IADL performance in clients with suspected dementia. On the other hand, the results could also be interpreted as showing relatively retained ability to compensate for problems caused by dementia, even in unfamiliar environments.

This latter explanation seems unlikely. Of the two AMPS scales, IADL motor and IADL process, we thought that the IADL process scale would be the one more sensitive to the effects of environmental familiarity and retained procedural memory. Park et al. (1994) found that only mean IADL process skills of older adults living in the community, without evidence of suspected dementia, were significantly better in familiar home settings. Because AMPS IADL process skills are more closely related to the ability to compensate for motor or cognitive deficits than are AMPS IADL motor skills (Fisher, 1994), the results of Park et al.'s study suggest that older persons with relatively intact cognitive abilities are better overall at compensating for underlying deficits in familiar home environments. If our sample had retained the ability to compensate, then we would have expected, like Park et al., to find higher overall IADL process skill ability in the home.

That this sample demonstrated limited ability to compensate for the effect of their cognitive deficits on IADL ability is illuminated by comparing their mean AMPS ability measures to those of persons who continue to be able to live independently in the community. To provide a frame of reference for the interpretation of AMPS IADL motor and process ability measures, Fisher (1994) has reported the means and standard deviations for (a) independent, well older adults living in the community; and
(b) a sample of persons, both well and with a variety of conditions (e.g., neurologic, musculoskeletal, cognitive) who continue to be able to live independently in the community (see Table 3).

Persons with ability measures below 2.0 on the AMPS IADL motor scale are likely to have motor limitations that affect IADL motor ability; persons with ability measures below 1.0 on the AMPS IADL process scale are likely to have process skills deficits that affect IADL process ability. The AMPS IADL process skills scale is better able to discriminate between persons who are able to live independently in the community and those who would require assistance than is the AMPS IADL motor scale. Of persons with IADL process ability measures below 1.0, 93% require assistance to live in the community. In contrast, 16% of persons below 2.0 on the AMPS motor scale can continue to live independently despite their motor limitations (Fisher, 1994).

When the mean AMPS IADL motor and process ability measures of our sample are compared to these reference groups, the mean IADL motor ability of our sample indicates that they had, overall, adequate motor skills to support independent living. In contrast, their mean AMPS IADL process skill ability measures in both the home and the clinic were below the 1.0 cutoff indicative of high risk of needing assistance to live in the community. Like our
Comparison of subjects' clinic and home process ability measures. The findings suggest that persons with suspected dementia may be less able to benefit from familiar environments that are persons without cognitive impairments. The extent to which our findings generalize to persons with specific cognitive impairments needs to be investigated.

Table 3
Mean AMPS IADL Ability Measures for Independent, Community-Living Older Persons Without Disabilities and Combined Group of Independent-Living Persons With and Without Disabilities

<table>
<thead>
<tr>
<th>Variables</th>
<th>Older Well Persons</th>
<th>Combined Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>72.47</td>
<td>50.70</td>
</tr>
<tr>
<td>SD</td>
<td>5.25</td>
<td>18.60</td>
</tr>
<tr>
<td>Range</td>
<td>65 to 90</td>
<td>16 to 93</td>
</tr>
<tr>
<td>AMPS motor ability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3.01</td>
<td>2.99</td>
</tr>
<tr>
<td>SD</td>
<td>.61</td>
<td>1.25</td>
</tr>
<tr>
<td>Range</td>
<td>1.76 to 4.42</td>
<td>10 to 7.43</td>
</tr>
<tr>
<td>AMPS process ability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>1.65</td>
<td>1.94</td>
</tr>
<tr>
<td>SD</td>
<td>.52</td>
<td>.89</td>
</tr>
<tr>
<td>Range</td>
<td>41 to 4.42</td>
<td>-50 to 5.70</td>
</tr>
</tbody>
</table>

Note: AMPS = Assessment of motor and process skills, IADL = instrumental activities of daily living.
always was better in the home. When considered together, these results suggest that when the environment does have an effect, environmental familiarity is more likely to support IADL task performance. However, the finding that only some subjects benefited from evaluation in a familiar environment underscores the need to evaluate individual clients within settings that are relevant to their everyday lives.

Another concern that might be expressed is that evaluations in this study were implemented in the same sequential order, that is, the clients were first assessed in the clinic and then in the home. This was due to pragmatic circumstances, as the initial contact with all clients was established in the diagnostic unit in the clinic. Although this is a potential limitation of this study, available evidence does not indicate this to be a significant factor. In their study, Park et al. (1994) found no significant order effect between home and clinical settings for AMPS evaluations. The time between the two evaluations (5 to 22 days) in the clinic and in the homes also was considered unlikely to affect the results. When our subjects showed significant differences in performance between settings, they most frequently were better during the second evaluation in the home. If persons with suspected dementia were expected to change over time, the most likely change would have been a decline in performance.

Using the AMPS to examine subjects with suspected dementia involved many advantages. The symptoms caused by declining cognition are known to affect the subjects' awareness and estimation of functional ability in everyday life (McGlynn & Kaszniak, 1991). This emphasizes the need for observational assessments of functional performance in ADLs and IADLs, because clients with dementia tend to overestimate their functional ability (McGlynn & Kaszniak, 1991). The AMPS, which takes into account the subject's habits and routine tasks performed in real-life contexts, offers a detailed understanding of the underlying motor and process skill items affecting ADL and IADL performance. It also enables the therapist to contribute valuable information about the client's functional capacity to the diagnostic team. In the development of methods for early diagnosis of dementia, the AMPS seems to be a promising instrument. It is already being used by Oakley, Fisher, and Sunderland (1993) to identify motor and process skill item profiles of SDAT. This research could lead to developing new methods of therapy for persons with dementia.

Clinical Implications

The implication of this study is heightened awareness of the environment in assessing motor and process IADL ability for persons with memory deficit, including suspected dementia. If we want to know how a person with suspected dementia performs in IADL in a specific environment, we should test him or her in that environment.

This assertion is consistent with the conclusion of Park et al. (1994). Studying the effect of the environment on ADL and IADL ability in persons with suspected dementia is necessary in order to examine in depth and elaborate on the relationship between different aspects of environment (e.g., physical, social) and functional performance in real-life contexts.

According to the American Occupational Therapy Association (1986), the goal of occupational therapy for persons with dementia is to (a) maintain, restore, or improve functional capacity; (b) promote participation in activities that optimize physical and mental health; and (c) ease caregiving activities. Occupational therapists who work on diagnostic teams for memory deficits and who wish to facilitate these goals need to deepen their knowledge of the environment's effect on the ability to perform ADL and IADL in persons with suspected dementia.

Acknowledgments

We thank the subjects for participating in this study and Gunilla Rudander for statistical consultation.

This study was supported in part by a grant from the Swedish Council for Social Research (C 90:0177:2). It was also supported by scholarships from the Swedish Association of Occupational Therapists (FSA) and the Solstickan Foundation and by the Department of Occupational Therapy, Solberga Hospital, Stockholm.

References


---

**Brain Atlas & Functional Systems**

Josephine C. Moore, PhD, OTR, FAOTA

Enhance your knowledge of the central nervous system with Brain Atlas & Functional Systems, an illustrated workbook and reference guide. Designed for neuroscience and psychosocial undergraduate and graduate OT students, as well as for OTs who practice in these specialized areas, this workbook may be used as a classroom text or self-guided review. As a "coloring atlas," its advantage over other atlases is its simplicity. Only important views or cross sections of the brain are illustrated—and only major functional areas that are diagnostically important are labeled.

Use colored pencils or pens to color the structures that belong to each functional system in order to understand their relation to each other. Appendices supplement the atlas by emphasizing the relationships of structures and by providing additional information about the functional systems of the central nervous system, including potential dysfunctions. 54 pages, 1993.

Order #1981
$19.00 AOTA member $24.00 nonmember

Send Your Order To: AOTA Products • 1383 Piccard Dr. P.O. Box 1725 • Rockville, MD 20849-1725 or call 1-800-SAY-AOTA (AOTA members), 1-800-377-8555 (TDD), or (301) 948-9626 (nonmembers).

Yes! I want to order Brain Atlas & Functional Systems.
Order #1981.

<table>
<thead>
<tr>
<th>Name</th>
<th>Member #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>State</td>
</tr>
</tbody>
</table>

\[ \]
\[ \]
\[ \]
\[ \]
\[ \]
\[ \]
\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]

\[ \]
\[ \]