Aphasia Friendly Medication Instructions: Effects on Comprehension in Persons with and without Aphasia

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APHASIA-FRIENDLY MEDICATION INSTRUCTIONS: EFFECTS ON COMPREHENSION IN PERSONS WITH AND WITHOUT APHASIA

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By
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ABSTRACT

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August 2020

Thesis supervised by Sarah E. Wallace, Ph.D.

Accessible health information supports people to understand and manage chronic medical conditions and is frequently presented via text. Comprehension of written health information becomes more difficult for people with language impairments, such as aphasia. Nine people with aphasia (PWA) and nine people without aphasia (PWoA), participated in this study. Each participant reviewed two unmodified medication instructions and two modified medication instructions using aphasia-friendly principles, then answered eight multiple choice questions and provided their preferences. Results showed that PWA demonstrated improved comprehension given modifications, but PWoA’s comprehension did not improve with modifications. Group comparison in the modified condition demonstrated that PWoA still demonstrated higher comprehension compared to PWA. Most participants, in both groups, preferred aphasia-friendly
instructions. This study highlights the need for further improvements to be made to the health care system to support comprehension and independence of all persons with regard to readability of complex health information.
DEDICATED

For my parents, who inspire me with their unmatched selflessness, endless patience, and steadfast support. And for my grandparents, who taught me that all good things come from hard work, love, and humility.
ACKNOWLEDGEMENT

To Dr. Wallace, thank you for all of your encouragement, support, and guidance throughout the last five years. Your belief in students, passion for teaching, and dedication to others continues to leave me in awe. I will never be able to thank you enough for pushing me to be a better student, researcher, and person.

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To my family, your unwavering support, love, and encouragement is unbelievable. Thank you for putting up with my bad days and celebrating my best, you all mean the world to me.
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CHAPTER 1

Introduction

Accessible health information is critical in the treatment of health conditions as knowledge acquisition is imperative for the development of self-management skills of medical conditions (Parker, 2000). Research shows that accessible health information supports people’s understanding and recovery from chronic medical conditions (e.g., Herbert, Gregory & Haw, 2018; Murray, et al., 2005). One condition which affects comprehension of health information is aphasia. Aphasia, an acquired language disorder often resulting from stroke or other neurological conditions, is characterized by deficits in comprehension and expression of spoken and written language (Helm-Estabrooks, Albert, & Nicholas, 2013). Because persons with aphasia have difficulties with language in the written form, information presented in this modality can be taxing to decode and understand. However, most information regarding a person’s care during recovery and rehabilitation is often presented via written text. This limits the independence with which people with aphasia manage chronic symptoms; assistance is often required by a family member or other caregiver.

Medication Instruction and Labels

Despite the likelihood of people taking multiple medications post stroke, limited research exists regarding aphasia-friendly medication management and adherence (Dowse & Ehlers, 2005). According to American Heart Association/American Stroke Association Practice Guidelines, medication management is an instrumental activity of daily living or skills, outside of basic self-care, that is required for independent functioning at home and in the community (Duncan et al., 2005). The American Occupational Therapy Association provides a complete description of medication management:
Medication management is a complex activity with many components, including negotiating with the provider for a prescription, filling the prescription at the pharmacy, interpreting complicated health information, taking the medication as prescribed, and maintaining an adequate supply of medication for ongoing use. (p. 1).

Accurate comprehension and implementation of medication information is critical because misinterpretation of that information has several considerable consequences. Previous studies have shown that medication errors have been implicated with increasing death rates and preventable emergency room visits (Patel & Zed, 2002; Phillips, Christenfeld, & Glynn, 1998). According to the Institute of Medicine (2006), there are at least 1.5 million preventable adverse drug events (ADEs) each year in the United States. ADEs are injuries that result from medical intervention related to a drug (e.g., overdose; Bates et al., 1995) and studies show that ADEs increase the cost of hospital stays and the length of hospital stays. One study found that with considerable ADEs, hospital costs increased $2,852 and length of stay increased by 2.77 days whereas life-threatening ADEs increased cost by an average of $8,116 and increased length of stay by 5.54 days (Hug et al., 2012). This preventable increase in ADEs and increase in financial burden may be reduced in part by ensuring that medication information is easily understood by consumers.

One of the contributing factors to misinterpreting information is that physicians and prescribers often do not communicate necessary and critical information regarding medication usage to patients (e.g., Tarn et al., 2006). Specifically, Tarn and colleagues found that when physicians explained key medication characteristics, they infrequently included adverse effects (35% of the time), how long to take the medication (34% of the time), and frequency of dosage (58% of the time). Because a lack of critical information is being shared during physician
conversations, an even greater need exists to ensure that people receive appropriate and understandable written information.

Previous studies have shown that written information on medication labels (e.g., instructions, warnings) is difficult to understand and the instruction complexity may cause a lack of adherence to prescription instructions (Morrow, Leirer, & Sheikh, 1988). Ambiguous wording, multiple steps, and unnecessarily difficult instructions are a challenge for people to understand (Wolf et al., 2007; Wolf et al., 2006). As such, Trivedi and colleagues (2014) determined that the average Flesch-Kincaid reading level (FKRL) of over-the-counter medications ranged from 8 to 25 (mean=15.9; mode=21). This reading difficulty level is too high considering the average reading ability in the US is consistent with an eighth-grade reading level, or FKRL of 8 (Cotunga, Vickery, & Carpenter-Haefele, 2005). In addition to the complexity of instructions, pharmacies and prescribers use varied medication labels and instructions even within a single pharmacy further affecting comprehension (Shrank et al., 2007). Given the challenges in comprehension of written instructions for the general population, people with language disorders are likely to experience even greater difficulties.

**Aphasia-Friendly Modifications**

For people with aphasia, who already have difficulty processing written text and spoken language, an increased need to support their independence in comprehending complex health information exists. One way to assist with this problem is by creating and using modified materials with aphasia-friendly principles.

Previous research has determined that aphasia-friendly modifications to written material provides positive outcomes for persons with aphasia to comprehend written material (e.g., Rose et al., 2011; Rose, Worrall, & McKenna, 2003). Aphasia-friendly modifications include
increasing white space, text size, and images as well as simplifying vocabulary and syntax (Brennan, Worrall, & McKenna, 2005). These modifications have been shown to increase reading comprehension of written material and are preferred by people with aphasia (e.g., Rose, Worrall, & McKenna, 2010; Wallace et al., 2018).

Rose and colleagues (2010) investigated the relationship between comprehension of printed health education materials and aphasia-friendly modifications in persons with aphasia. Four brochures on various health topics (e.g., stroke, arthritis) selected from waiting rooms in urban hospitals were modified to create aphasia-friendly versions of each brochure. Each participant with aphasia reviewed two original and two unmodified brochures. After the review, they completed post-brochure knowledge tests with 12 yes/no questions about key facts in each brochure. Participants who read the aphasia-friendly versions of brochures understood 11.2% more information compared to participants who read the original brochures. Secondary outcomes of this study showed no correlation between the effectiveness of aphasia-friendly modifications and aphasia severity. Also, participants were more confident when responding to health questions after reading the aphasia-friendly brochures. However, participants’ preferences did not always match the brochure in which they had the most accurate reading comprehension. These results suggest that further investigation of aphasia-friendly healthcare documents is needed.

Along with prior research, theoretical bases for aphasia also support the implementation and effectiveness of aphasia-friendly modifications. For example, the linguistic deficit model asserts that persons with aphasia have a faulty language system, causing difficulty with syntax processing (e.g., Caplan, Baker, & Dehaut, 1985). Investigating this theory, Caplan and colleagues’ studies found that persons with aphasia more easily understood simple, canonically
ordered sentences (e.g., “I ate lunch”) compared to more complex, non-canonical sentences (e.g., “The lunch which was eaten by me tasted delicious.”). Therefore, modifying these more complex sentences to simplify syntax and creating more canonical active sentences can help support comprehension of persons with aphasia.

The resource allocation theory also identifies that manipulation of information presentation may affect the performance of a person with aphasia. The resource allocation theory asserts that aphasia is due to the inability to efficiently allocate cognitive resources (i.e., attention, memory) for tasks; either inappropriately assessing demands of task or intermittent provisions because of shifting biological rhythms (McNeil, 1983). Two of the main arguments for this theory include stimulability and variability. With regard to stimulability, people with aphasia can have successful linguistic comprehension or production under the right conditions to help access the necessary information. These conditions may include variables such as the size or color of printed text, modality of presentation, and overall variations in stimulus presentation. Variability is demonstrated when a person with aphasia is able to complete a task at one point in time but is unable to complete the same task at another time. The inability to complete a task is not due to a lack of knowledge, but rather internal or external variability may be impacting the linguistic operation (e.g., fatigue or font size; McNeil, et al., 1991). Therefore, modifying information presentation (e.g., with larger text) may create a more stimulable environment for a person with aphasia to attend and complete a task.

**Research Question**

Although there is support for aphasia-friendly modifications in narrative and expository texts (e.g., Brennan, Worrall, & McKenna, 2005; Dietz et al., 2009), there is a gap in understanding how to best foster comprehension of health information, specifically medication
information. Due to the lack of evidence regarding how best to support comprehension of medication information and promote independence of people with aphasia, the purpose of this study is to answer the following questions:

(1) Do aphasia-friendly modifications increase persons with aphasia’s comprehension of written medication instructions?

(2) Do aphasia-friendly modifications increase persons without aphasia’s comprehension of written medication instructions?

(3) What are the comprehension differences of persons with and without aphasia when reviewing aphasia-friendly written medication instructions?

(4) How do people with and without aphasia perceive modified medication instructions?
CHAPTER 2

Methods

Participants

Two groups of participants completed this study: participants with aphasia (PWA) and participants without aphasia (PWoA). Participants from each group were matched by age (i.e., within 5 years) and education (i.e., within three years). All participants spoke American English as their primary language, reported no hearing loss, and passed a visual acuity screening. All participants reported having prior and/or current experience taking medication.

Participants with Aphasia. Nine people with chronic aphasia (i.e., greater than 12 months post-onset) participated in this study. The seven male and two female participants ranged in age from 45 to 74 years old ($M = 60.33, SD = 8.21$) with time post-stroke ranging from 20 to 193 months ($M = 75.67, SD = 65.16$). Participants’ level of education ranged from 12 to 18 years ($M = 14.78, SD = 2.22$).

The following formal assessments provided a description of the participants’ cognitive-linguistic functions: (1) the Western Aphasia Battery – Revised (WAB-R; Kertesz, 2006), (2) the Reading Comprehension Battery for Aphasia – 2nd edition (RCBA-2; LaPointe & Horner, 1998), and (3) the Rapid Estimate for Adult Literacy in Medicine Short Form (REALM-SF; Arozullah et al., 2007). Participants’ WAB-R Aphasia Quotient (AQ) scores ranged from 15.6 to 86.2 out of 100 ($M = 54.78, SD = 29.04$). All testing results, demographic data, and medication management information for persons with aphasia appear in Tables 1, 2, and 3, respectively.
Table 1: Assessment scores for participants with aphasia (* = total scores unavailable)

<table>
<thead>
<tr>
<th>Participant with Aphasia</th>
<th>WAB-R</th>
<th>CLQT+</th>
<th>RCBA-2</th>
<th>REALM-SF</th>
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<td></td>
<td>AQ Total (100)</td>
<td>Aphasia Type</td>
<td>Attention Domain</td>
<td>Memory Domain</td>
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<td>1</td>
<td>80.6</td>
<td>Conduction</td>
<td>201</td>
<td>158</td>
</tr>
<tr>
<td>2</td>
<td>86.2</td>
<td>Broca’s</td>
<td>134</td>
<td>136</td>
</tr>
<tr>
<td>3</td>
<td>97</td>
<td>Anomic</td>
<td>192</td>
<td>156</td>
</tr>
<tr>
<td>4</td>
<td>61.5</td>
<td>Broca’s</td>
<td>192</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>19.6</td>
<td>Global</td>
<td>81</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>52.6</td>
<td>Broca’s w/ Acquired Apraxia</td>
<td>73</td>
<td>53</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>Conduction</td>
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<td>90</td>
</tr>
<tr>
<td>8</td>
<td>34.9</td>
<td>Broca’s</td>
<td>164</td>
<td>77</td>
</tr>
<tr>
<td>9</td>
<td>15.6</td>
<td>Broca’s w/ Severe Apraxia</td>
<td>172</td>
<td>72</td>
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</table>
Table 2: Demographic information for participants with aphasia

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<tr>
<th>Participant with Aphasia</th>
<th>Gender</th>
<th>Age</th>
<th>Education Level</th>
<th>Years Post Stroke</th>
<th>Require Assistance with Medication (Y/N)</th>
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<tr>
<td>1</td>
<td>M</td>
<td>65</td>
<td>16</td>
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</tr>
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<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>62</td>
<td>16</td>
<td>5</td>
<td>N</td>
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<td>4</td>
<td>M</td>
<td>60</td>
<td>12</td>
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<td>6</td>
<td>M</td>
<td>74</td>
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<td>56</td>
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<td>9</td>
<td>F</td>
<td>45</td>
<td>12</td>
<td>3</td>
<td>N</td>
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</tbody>
</table>

Table 3: Medication management information for participants with aphasia (Y = yes, N = no; * = information unavailable)

<table>
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<tr>
<th>Participant</th>
<th># of Med</th>
<th>Med Name</th>
<th>Med Function</th>
<th>Med Dose</th>
<th>Pharmacy Name</th>
<th>Questions about Med</th>
<th>Questions to Pharmacist</th>
<th>Help with Med</th>
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<tr>
<td>PWA 1</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<td>Y</td>
<td>N</td>
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<tr>
<td>PWA 2</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>*</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>PWA 3</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>PWA 4</td>
<td>Y</td>
<td>Y</td>
<td>*</td>
<td>*</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>PWA 5</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>PWA 6</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
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<td>PWA 7</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>PWA 8</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>PWA 9</td>
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<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

**Participants without Aphasia.** Nine people without neurologic or communication disorders participated in the study. Three male and six female participants ranged in age from 49 to 78 years old ($M = 61.23$, $SD = 8.49$) and their educational level ranged from 12 to 18 years ($M = 15.67$, $SD = 2.44$).

All persons without aphasia completed standardized testing to confirm intact cognitive-linguistic functioning. Standardized scores include: (1) the Cognitive Linguistic Quick Test + (CLQT+; Helm-Estabrooks, 2017), (2) the RCBA-2 (LaPointe & Horner, 1998), and (3) the REALM-SF (Arozullah et al., 2007). CLQT+ Composite scores ranged from 3.8 to 4.0 out of 4.0
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\((M = 3.95, SD = 0.08)\). Standardized scores, demographic, and medication management information for persons without aphasia can be found in Table 3, 4, and 5, respectively.

**Table 4:** Assessment scores for participants without aphasia

<table>
<thead>
<tr>
<th>Participant without Aphasia</th>
<th>Attention Domain</th>
<th>Memory Domain</th>
<th>Executive Function Domain</th>
<th>Language Domain</th>
<th>Visuospatial Domain</th>
<th>Clock Drawing</th>
<th>Composite Severity Score (4)</th>
<th>Total (100)</th>
<th>Total (7)</th>
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<tr>
<td>1</td>
<td>198</td>
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<td>93</td>
<td>13</td>
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<td>91</td>
<td>7</td>
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<td>9</td>
<td>191</td>
<td>141</td>
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<td>33</td>
<td>86</td>
<td>13</td>
<td>3.8</td>
<td>95</td>
<td>7</td>
</tr>
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</table>

**Table 5:** Demographic information for participants without aphasia

<table>
<thead>
<tr>
<th>Participant without Aphasia</th>
<th>Gender</th>
<th>Age</th>
<th>Education Level</th>
<th>Require Assistance with Medication (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>68</td>
<td>18</td>
<td>N</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>58</td>
<td>18</td>
<td>N</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>62</td>
<td>18</td>
<td>N</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>57</td>
<td>14</td>
<td>Y</td>
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<td>5</td>
<td>F</td>
<td>66</td>
<td>14</td>
<td>N</td>
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<td>6</td>
<td>F</td>
<td>78</td>
<td>18</td>
<td>N</td>
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<tr>
<td>7</td>
<td>M</td>
<td>55</td>
<td>13</td>
<td>N</td>
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<td>8</td>
<td>M</td>
<td>58</td>
<td>16</td>
<td>N</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>49</td>
<td>12</td>
<td>N</td>
</tr>
</tbody>
</table>
Materials

Study materials included screening tools, standardized assessments, medication materials, and interview materials.

**Screening and History Tools.** The vision screening required participants to point to their name as it appears in an array of 30 names on a single piece of paper in the same size font that was used in the unmodified medication instructions (i.e., size 8, Arial font).

The Medical and Social History form included questions about age, level of education, history of neurological/communication impairments, medical comorbidities, and hearing status. The Medication Management form included questions about individual medication history, current use, and perceived level of independent management. Screening and history tools appear in Appendix A.

**Standardized Assessments.** The RCBA-2 is commonly used in speech-language therapy, and described the degree of reading impairments, including reading comprehension from word to paragraph level (LaPointe & Horner, 1998).
The REALM-SF (Arozullah et al., 2007) assessed all participants’ oral reading and reading comprehension of health literacy information. This brief assessment is comprised of seven health terms (e.g., menopause) that participants read orally to allow the researcher to assess health literacy.

The CLQT+ (Helm-Estabrooks, 2017) provided information about cognitive strengths and weakness across areas of attention, memory, executive functions, language, and visuospatial skills.

The WAB-R AQ (Kertesz, 2006) described the type and severity of aphasia through subtests used to measure receptive and expressive language abilities.

**Medication Materials.** The researcher created four example medication instructions as experimental stimuli with two versions of each instruction. One version of the instructions (i.e., unmodified) closely mimicked that of national pharmacy chain, using similar syntactic structure and vocabulary complexity. The researcher adapted a second version (i.e., aphasia-friendly modified) to include comprehension supports cited in the aphasia literature (e.g., Brennan, Worral, & McKenna, 2005). These changes included increased text size and white space, use of images, as well as decreased syntax and vocabulary complexity. Table 7 includes the comparison of unmodified and modified instruction variables averaged across the four instructions including: (1) number of words, (2) number of words per sentence, (3) number of characters per word, (4) Flesch-Kincaid Reading level, (5) font size, (6) font type, (7) number of images, and (8) number of instruction pages. Figures 1 and 2 provide abbreviated versions of each condition and Appendices B and C includes full examples of the modified and unmodified conditions.
### Table 7: Average instruction variables in each condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unmodified</th>
<th>Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flesch-Kincaid Reading Level</td>
<td>12.7</td>
<td>6.6</td>
</tr>
<tr>
<td>Word Count</td>
<td>1310</td>
<td>426</td>
</tr>
<tr>
<td>Words/Sentence</td>
<td>25.25</td>
<td>8.05</td>
</tr>
<tr>
<td>Characters/Word</td>
<td>5</td>
<td>4.7</td>
</tr>
<tr>
<td>Number of Pages</td>
<td>1</td>
<td>7.5</td>
</tr>
<tr>
<td>Number of Graphics</td>
<td>1</td>
<td>7.25</td>
</tr>
</tbody>
</table>
Penyalodrine 75 MG CAPSULE

MANUFACTURER: Bichonshizu

This is a green, O3lNG-shaped CAPSULE imprinted with 95 on one side and conversely is blank.

ACTIVE INGREDIENT:
Penyalodrine – ORAL – (pen-EE-al-OH-dreen)

COMMON BRAND NAME(S):
Wooftrix, Bonalpine

USES:
This medication is used to treat coughs caused by the cold and other transient or persistent breathing problems (e.g., pneumonia, bronchitis, emphysema, asthma). It works by reducing the reflex in the lungs that causes the urge to cough and alleviates pain and congestion in the chest. However, use of this medication is not recommended in children younger than 10 years. Discuss the risks and benefits with your doctor and always ask for complete information about this product and your specific health needs.

HOW TO USE:
Take this medication by mouth, usually 3 times daily as needed or as directed by your doctor. Dissolve this medication in water, do not crush or suck on this medication. This medication should be taken with a full glass of milk (8 ounces or 240 milliliters) but if an upset stomach should occur, take it with food, milk, or an antacid. Chewing, sucking, or dissolving will cause a loss of feeling in your mouth/throat and may cause choking or a severe allergic reaction. (See also Side Effects section.) Do not eat or drink until the numbness goes away and get medical help right away if the numbness persists or worsens. Dosage is based on your medical condition and response to therapy but do not exceed 220 milligrams at one time. Taking more penyalodrine than prescribed will not make your cough go away faster but may result in serious side effects. Tell your doctor if your condition persists or worsens.

SIDE EFFECTS:
Dizziness, headache, nausea, stomach upset, constipation, and stuffy nose may occur. If any of these effects persist or worsen, notify your doctor or pharmacist promptly. Remember that your doctor has prescribed this medication because he or she has judged that the benefit to you is greater than the risk of side effects. Many people using this medication do not have serious side effects but tell your doctor right away if any of these unlikely but serious side effects occur: mental/mood changes, loss of feeling in the chest, burning in the eyes, a very serious allergic reaction to this drug is unlikely, but seek immediate medical attention if it occurs. The possibility of an allergic reaction increases significantly if you chew or suck on this medication in your mouth. Symptoms of a serious allergic reaction may include: rash, itching/swelling (especially of the face/tongue/throat), severe dizziness, trouble breathing, unusual sweating, weakness or fatigue, constipation, and/or sleepiness. This medication may rarely increase your risk of developing certain types of cancer (e.g., lymphoma, skin cancer) but the risk is higher in people using penyalodrine after an organ transplant and in children or young adults being treated for certain bowel diseases (e.g., Crohn’s disease, ulcerative colitis). This is not a complete list of possible side effects; if you notice other effects not listed above, contact your doctor or pharmacist. In the US – Call your doctor for medical advice about side effects and you may report side effects to FDA at 1-800-FDA-1088 but in Canada – call your doctor.
Comprehension Assessment Materials. To assess the participants’ reading comprehension of the instructions, the researcher created eight factual multiple-choice questions about key facts in the instructions. Questions were written in a large standard, sans serif font (e.g., Arial, 14 point) and presented auditorily to the participants. One question appeared on a page with the corresponding four answers. An example of the comprehension questions and formatting can be found in Appendix D. A dependency analysis confirmed that no more than 40% of neurotypical adults could respond correctly to comprehension questions without prior instruction exposure. This ensured that answers could not be predicted based on prior knowledge and that one question did not provide answers for subsequent questions.

Preference Assessment Materials. During preference interviews, the researcher used visual scales, a 5-point Likert Rating Scale and supportive images to aid participants’ comprehension of questions and facilitate participants’ ability to respond (e.g., did modifications help or hurt understanding?). Appendix E includes the preference materials.

Procedures

Participants completed screening, assessment, and experimental procedures in one session. Sessions took place at the participants’ homes or a university clinic and were video recorded for later review. The university Institutional Review Board approved all procedures. Participants were recruited through flyer placement on the university campus and distribution from clinicians and other professionals. The recruitment flyers can be found in Appendix F.

Screening and Assessment Procedures. The researcher obtained informed consent from all participants prior to beginning screening and assessment procedures. Following consent procedures, all participants completed a visual screening and Medication Management questionnaire. If a participant’s demographic information was not already available, the
researcher and participant completed Medical and Social History form to confirm eligibility to participate. Administration of the standardized testing began once the researcher determined a participant met the eligibility requirements.

If any participant with aphasia had completed any of the required standardized assessments in the past 12 months, those previous test scores were used to limit participant fatigue. If these requirements were not met, the researcher administered the necessary assessments. For the current study, the researcher used previous test results for all participants’ WAB-R AQ and CLQT+ scores as well as the RCBA-2 scores for two participants.

**Experimental Procedures.** Participants reviewed four total medication instructions, two modified and two unmodified instructions, so that instructions from each condition were reviewed an equal number of times. The presentation of medication instructions and conditions were counterbalanced and randomized. Counterbalancing ensured that the instructions were equally presented across the conditions (e.g., instruction one was not always presented in the modified condition). Randomization established that the order of instruction number and condition varied across participants. Table 8 provides a visual of each participants’ instruction and condition order.

**Table 8:** Instruction and condition presentation order (M = modified, U = unmodified)

<table>
<thead>
<tr>
<th>Participant</th>
<th>PW 1</th>
<th>PW 2</th>
<th>PW 3</th>
<th>PW 4</th>
<th>PW 5</th>
<th>PW 6</th>
<th>PW 7</th>
<th>PW 8</th>
<th>PW 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>2341</td>
<td>1243</td>
<td>3421</td>
<td>3241</td>
<td>2134</td>
<td>3412</td>
<td>2143</td>
<td>1342</td>
<td>4321</td>
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<tr>
<td>Condition</td>
<td>MUMU</td>
<td>MUUM</td>
<td>UUMM</td>
<td>UMUM</td>
<td>MMUU</td>
<td>UMMU</td>
<td>MMUU</td>
<td>UMUM</td>
<td>MMUU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>PWoA 1</th>
<th>PWoA 2</th>
<th>PWoA 3</th>
<th>PWoA 4</th>
<th>PWoA 5</th>
<th>PWoA 6</th>
<th>PWoA 7</th>
<th>PWoA 8</th>
<th>PWoA 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>4213</td>
<td>3124</td>
<td>2431</td>
<td>3142</td>
<td>1432</td>
<td>1423</td>
<td>1234</td>
<td>4312</td>
<td>4123</td>
</tr>
<tr>
<td>Condition</td>
<td>UUMM</td>
<td>MUUM</td>
<td>UMMU</td>
<td>MUUM</td>
<td>UUMM</td>
<td>MMUU</td>
<td>UMUM</td>
<td>MUMU</td>
<td>UMUM</td>
</tr>
</tbody>
</table>
All participants reviewed each medication in 7 minutes or less, with the exception of PWA 2. While reviewing one of the unmodified instructions, she took 11 minutes and 10 seconds to review the instructions. She experienced an unavoidable auditory distractor present in her environment (i.e., screaming and singing in the next room); however, she did not demonstrate a meaningful score change on this review of instructions. For all participants, the researcher read the questions and referenced the written text of each question. To support participants’ comprehension of questions, the researcher also used augmented input and written choice (e.g., Lasker et al., 1997; Wallace et al., 2012).

Following each medication instruction review and completion of comprehension questions, participants completed a preference questionnaire to determine which aspects of the instructions were most preferred and perceived to best aid comprehension. The researcher used augmented input and written choice to support participants’ comprehension and validate the participants’ intended messages during the collection of preference information.

**Data Analysis**

For comprehension accuracy, the researcher computed the percent of correct responses in each condition for all participants. Statistical analyses were completed using SPSS software for t-tests with alpha level set as 0.05. Cohen’s D for effect size was also computed for all t-tests to determine the size of the difference between conditions or groups.

**Research Question 1.** The researcher completed a dependent t-test with Levene’s Test for Equality of Variance to determine comprehension differences in the unmodified and modified conditions for participants with aphasia. A dependent t-test was necessary because the same sample was measured across two conditions. The researcher also used Levene’s Test to assess if two groups or conditions have equal variances.
Research Question 2. Similar to the previous question, the researcher computed a dependent t-test with Levene’s Test for Equality of Variance to determine comprehension differences across conditions for participants without aphasia.

Research Question 3. To identify comprehension differences between groups given modified instructions, the researcher completed an independent t-test with Levene’s Test for Equality of Variance. For this question, the researcher used an independent t-test to compare two groups.

Research Question 4. The researcher reported condition preference data by tallying participants who preferred each condition at the end of the experimental session. All participant comments were transcribed with relevant gestures to convey reasoning. The researcher reviewed transcription to identify common themes and exemplar statements. The researcher also recorded Likert Scale ratings and calculated the mean, median, standard deviation, and range for each condition.
CHAPTER 3

Results

Comprehension in Participants with Aphasia

Participants with aphasia achieved the highest average comprehension accuracy score in the modified condition ($M = 9.56/16$, $SD = 2.70$, $range = 6-13$) compared to the unmodified condition ($M = 7.56/16$, $SD = 2.19$, $range = 5-12$). Computation of a dependent t-test revealed a difference across conditions, $t(9) = 3.207$, $p = 0.012$, $d = 1.069$. The effect size for this analysis ($d = 1.069$) exceeds Cohen’s (1988) measure for a large effect size, $d = 0.08$.

Comprehension in Participants without Aphasia

Participants without aphasia achieved the highest average comprehension accuracy score in the modified condition ($M = 12.67/16$, $SD = 1.73$, $range = 10-15$) compared to the unmodified condition ($M = 12.22/16$, $SD = 1.79$, $range = 9-14$). Computation of a dependent t-test revealed no difference across conditions, $t(9) = 0.883$, $p = 0.403$, $d = 0.294$. The effect size for this analysis ($d = 0.294$) is most closely aligned Cohen’s measure for a small effect size, $d = 0.02$.

Comparison between Participant Groups

When provided the aphasia-friendly modifications, participants without aphasia demonstrated higher average comprehension accuracy ($M = 12.67/16$, $SD = 1.73$, $range = 10-15$) compared to participants with aphasia ($M = 9.56/16$, $SD = 2.70$, $range = 6-13$). Independent t-test with Levene’s Test for Equality of Variance ($F(1, 16) = 4.756$, $p = 0.044$) revealed a difference between groups, $t(16) = -2.979$, $p = 0.009$, $d = 1.41$. This analysis effect size ($d = 1.41$) exceeds the Cohen’s measure for a large effect size, $d = 1.2$. Although group differences were evident, three participants with aphasia (i.e., PWA 1, 6, 7) achieved accuracy in the modified condition that was within one standard deviation of the mean for participants without
aphasia. However, no correlation existed between descriptive or demographic information and their comprehension increase for those participants.

**Participant Preferences**

Participants provided their overall preference at the end of the experimental session. All participants with aphasia preferred the modified condition ($N = 9/9; 100\%$) and a majority of participants without aphasia also preferred the modified condition ($N = 7/9; 78\%$). Only two participants without aphasia preferred the unmodified condition (i.e., PWoA 6, 7).

Participants ranked the helpfulness of conditions following each medication instruction review using a 5-point Likert Rating Scale. Table 9 shows the average Likert ratings for each condition (1 = not helpful, 5 = very helpful). Overall participants with aphasia ranked the modified instructions as more helpful ($M = 3.61$, median $= 4$, $SD = 0.91$, range $= 1-5$) than the unmodified conditions ($M = 2.52$, median $= 3$, $SD = 0.717$, range $= 1-4$). Similarly, participants without aphasia, on average, ranked the modified instructions as more helpful ($M = 4.27$, median $= 4$, $SD = 0.67$, range $= 3-5$) than the unmodified instructions ($M = 2.74$, median $= 3$, $SD = 1.36$, range $= 1-5$).

**Table 9:** Average Likert rating scores for conditions

<table>
<thead>
<tr>
<th></th>
<th>Participants with Aphasia</th>
<th>Participants without Aphasia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modified</strong></td>
<td>3.61</td>
<td>4.27</td>
</tr>
<tr>
<td><strong>Unmodified</strong></td>
<td>2.52</td>
<td>2.74</td>
</tr>
</tbody>
</table>

**Participant Rationales Regarding Preferences.** Participants provided rationales, either verbally or nonverbally (e.g., meaningful gestures), for the preference selections. Participants with and without aphasia made a combination of positive and negative comments regarding both unmodified and modified conditions.
Unmodified Condition. The two participants who preferred the unmodified condition indicated preference because was presented on one page, compared to multiple pages in the modified condition. PWoA 3 indicated “I don’t like it [modified instructions] split up” but would prefer instructions on one page. Other positive comments for the unmodified condition included preference for separation of information by content area such as “Uses,” “Side Effects,” and “How to Use.” PWA 1 said “It [instructions] still had the important things with big letters [headings]…I like the heading.” Another participant, PWoA 6, indicated the benefit of the phonetic pronunciation for each medication stating, “I like that it has the pronunciation for you…so if you call someone on the phone and try to explain what this thing is…‘okay, I can say this.’”

All other comments from participants regarding the unmodified condition were largely negative with suggestions for changes. The most frequently reported comment included the small text size of instructions. PWoA 5 stated, “the font was way too small” and PWA 1 said, “It’s probably the right information but for me, the design, the print and all that stuff is too small”. The majority of participants indicated there was an overwhelming amount of material which caused them to re-read information multiple times. PWA 7 commented on the amount of information, “there’s a lot goin’ on and I looked a couple of times…what?” and indicated confusion with a contorted facial expression and shoulder shrug. PWA 3 also said, “[the font size] made it seem like there was a whole lot here and then when you asked those questions, I was like wait I missed something.” Similarly, PWoA 1 stated “it’s not worth reading all of this because it’s too wordy.” Participants without aphasia also frequently reported the syntax and vocabulary was frequently above their level of comprehension, making it difficult to comprehend. For example, PWoA 5 stated, “there’s stuff in here you just don’t know…it was
too much…too many big words” and PWoA 8 reported, “[there was] way too much information…way too much unnecessary jargon.” Participants with aphasia reported similar opinions, PWA 4 said, “the words and everything…shaky…and a lot.” PWA 2 also emphasized that it was taxing to complete the task, “I really tried hard to read this.” One person with aphasia described losing concentration while reading the unmodified medication instructions and having difficulty maintaining attention, however this concern was not reported by persons without aphasia. PWA 3 indicated that the unmodified instructions should be “more concise and to the point, so it would keep my attention.”

**Modified Condition.** A majority of participants preferred the modified condition compared to the unmodified condition. A large consensus indicated preference for larger text presentation, for example, PWoA 7 said, “Oh course I like the bigger print…I’m old” and PWA 2 agreed, “I like the print.” Participants also preferred simpler syntax and vocabulary, PWA 3 stated, “I feel like it was broken down more…it was just easier to comprehend.” Many participants indicated that the reduced visual load made reading information more manageable, often indicating the “simplicity” was preferred. PWA 1 stated, “I liked the setup on this [modified instruction]…it’s simple,” PWA 4 said, “simpler” when asked to compare the modified and unmodified instructions, and PWoA 4 said, “I thought it [modified instruction] was very simple.” Because text was split up by increasing the white space, PWoA 5 described that the white space would be a good place to write notes or questions on the medication as a person is reading.

Participants with and without aphasia also preferred the increased number of visuals to support comprehension of information as shown by PWoA 1’s comment, “The visuals were a very good thing.” PWA 7 also described how visuals helped his comprehension, “reading
it…what did it say?” followed by a gesture to looking at pictures, “oh now I got it.” The researcher restated the message intent, the visuals helped to understand the whole message, to which the participant responded, “yes.” When the researcher asked if more pictures would be helpful in the instructions, PWA 9 nodded, said “good good good,” and gestured a thumbs up gesture, indicating her preference for visuals. However, some participants indicated that images printed in color, instead of black and white, would be preferred. When discussing what the participant would change about the instructions, the researcher asked if color images would be preferred, PWA 7 responded, “yeah oh yeah.” One participant with aphasia said that the modified condition helped him maintain attention on the task and information, PWA 3 indicated, “the presentation helped my attention.”

Although comments were largely positive, participants indicated some negative aspects of the modified instructions. The most common complaint was the increased number of pages used to provide instructions. PWoA 8 said that he “might combine information together,” continuing that he may prefer instructions if it was fewer pages, “if it was 3 [pages], maybe...”. PWA 1 had a similar idea saying, “maybe I don’t need 5 pages...I don’t like one, but maybe half of it.”
CHAPTER 4

Discussion

The aim of this study was to determine 1) the effects on comprehension in persons with and without aphasia when given medication instructions using aphasia-friendly principles and 2) preferences regarding these modifications. People with aphasia demonstrated improved comprehension with aphasia-friendly modifications; however, no improvement was demonstrated by persons without aphasia. When both groups reviewed aphasia-friendly instructions, the participants without aphasia still demonstrated better comprehension compared to participants with aphasia. The majority of participants across both groups expressed preference for aphasia-friendly modifications in medication instructions.

Improvements in Comprehension

Similar to previous studies, people with aphasia achieved improved comprehension of written material when provided with aphasia-friendly modifications (e.g., Dietz et al., 2009; Rose, Worrall, & McKenna, 2003). Although people with aphasia experience reading comprehension deficits, their scores and participant report indicated these modifications provided a benefit while reading. Participants in the current study indicated individual supports were helpful (e.g., text size, images), but generally expressed modifications as a whole were beneficial. This suggests, in agreement with previous studies, that while any support is better than no support, it is of greater benefit when aphasia-friendly principles are used in combination, rather than in isolation (e.g., Brennan, Worrall, & McKenna, 2005). The current study fills a critical research gap by expanding these results to functional health information, such as medication instructions.
As a whole, the comprehension of people without aphasia did not increase when provided modifications; however, when examined individually, some participants showed comprehension improvements with the modifications. No pattern emerged related to participant characteristics and comprehension accuracy improvements. Therefore, health care professionals should still consider the benefits of modifications to improve comprehension for all patients who read complex materials.

Taken together, these results are in line with the linguistic deficit theory. Specifically, participants with aphasia demonstrated stronger reading comprehension performance when given less complex, active sentences compared to a longer, complex sentence. The aphasia-friendly modifications helped people with aphasia, in part, compensate for their linguistic breakdown. Participants without aphasia did not show the same change and did not need the same degree of support because their language system is intact.

By modifying non-linguistic variables, the results also support the resource allocation theory. While it is not definitive which modifications (i.e., linguistic, non-linguistic) were most beneficial in supporting comprehension, modifying external variables (e.g., font size, white space) helped to provide participants with aphasia the stimulable environment the task required.

**Need for Additional Strategies**

On average, people with aphasia answered 60% of the comprehension questions correctly when provided with the aphasia-friendly modifications. Though this demonstrates an increase from the unmodified text, a gap in comprehension remains. This allows for comprehension error and the potential occurrence of an adverse drug event. This gap does not indicate that implementation of aphasia-friendly modifications is an ineffective strategy, but rather, it suggests that a collection of strategies may be necessary to help people with aphasia achieve higher
comprehension levels. People with aphasia may improve their performance with instruction for reading comprehension strategies to identify the main idea and key words or phrases (e.g., Dietz et al., 2014). They may also benefit from multiple modalities of input (e.g., auditory and written) to improve comprehension when provided with written information, such as implementing a text-to-speech system (e.g., Knollman-Porter et al., 2019) or watching a video demonstrating medication instructions (Wallace et al., 2018).

Participants without aphasia also demonstrated a similar comprehension gap, maintaining approximately 75% comprehension across conditions. Similar to previous studies examining comprehension of medication instructions and amount of provider communication (e.g., Tarn et al., 2006; Wolf et al., 2007; Wolf et al., 2006), the results suggest that people require further explanation from health care providers regarding comprehension of medical jargon and instructions. Health care providers should implement strategies to support understanding of complex health information (e.g., Berkhof, et al., 2011; Boissy, et al., 2016). Participants without aphasia reported that strategies similar to those for people with aphasia would be helpful, such as, reducing language complexity, identifying key words, and changing the layout of written information.

**Consideration for Preferences**

When providing information to a person, individual preferences for modality should be considered. Previous research suggests that attention should be paid to preferences so that intervention and research priorities may be identified in daily life activities of persons with aphasia (e.g., Haley, et al., 2019). Across populations, consideration of preferences can also improve task outcomes; in the current study, nearly all participants performed better in their preferred condition. While this study did not examine overall task participation, previous studies
suggest that preferences may also increase a person’s participation or willingness to complete a task (e.g., Wallace et al., 2018). While it is not a requirement for researchers and clinicians to include a person’s preferences when presenting information, it may benefit the person’s overall outcomes.

**Limitations and Future Research**

Because of the relatively small sample size in the current study, generalization of the results to a wider population is limited. Therefore, replication with a large sample of participants with varying types and severities of aphasia with different backgrounds and reading levels would provide more comprehensive information. A larger, more diverse sample would also allow for examination of the effects on aphasia-friendly modifications for people with specific aphasia types and severities. Future research would provide information about which aphasia types may benefit from these modifications and which modifications are most helpful for comprehension of complex health material.

Another limitation of this study was that participants were required to remember the information that they read. Because the instructions were removed prior to asking questions, participants needed to employ their recognition memory to answer questions, instead of relying solely on reading comprehension abilities. Future studies should allow participants to use the written material while answering questions, instead of removing the written materials. This would maintain a higher level of external validity compared to this study, which focused on internal validity.

Another way to increase the ecological validity of aphasia-friendly modifications would be to use instructions similar to those participants receive from their own pharmacy. Because pharmacies vary in instruction presentation (e.g., Shrank et al., 2007), it would be beneficial to
Running Head: APHASIA-FRIENDLY MEDICATION INSTRUCTIONS

examine comprehension of instructions pre- and post- aphasia modification to determine the effectiveness in improving comprehension.
CHAPTER 5

Conclusion

Results of this study suggest that aphasia-friendly modifications to complex health information (i.e., medication instructions) are beneficial and preferred for both persons with and without aphasia. However, further investigation should be completed to identify supports that improve comprehension of health information and participation in healthcare, while also reducing the risk of adverse drug events. This study highlights the need for further improvements within the health care system, as a whole, to support comprehension, participation, and independence of all persons with regard to readability of complex health information and managing activities of daily living.
References


Appendix A

Demographic Information Interview

Participant: ___________________________________
Date:  ____________________________ Investigator:____________________

Screening Questions:
1. What is your date of birth?
2. What was the date of your stroke?
3. Do you have a history of (before stroke) cognitive impairment or developmental disability? Yes No
4. Is American English your primary language? Yes No
5. Do you have any hearing loss? Yes No
6. Do you wear hearing aids? Yes No
7. Do you have difficulty reading since your stroke? Yes No

Descriptive Questions:
8. What side of your brain was your stroke on?
9. Are you currently receiving Speech-Language Pathology Services? Yes No
10. Which is your current dominate hand? Right Left
11. Which was your dominate hand before your stroke or brain injury? Right Left
12. What level of education did you complete?
    ____ Some high school: Number of years completed: ____
    ____ Completed high school
    ____ 1 year of college
    ____ 2 years of college (or A.A./A.S.)
    ____ 3 years of college
    ____ 4 years of college (B.S./B.A.)
    ____ Master’s Degree
    ____ MD or PhD
13. Do you have any vision problems? Yes No
14. Do you wear glasses? Yes No
15. Gender: ____________
16. What is your Racial / ethnic group:
    ____ American Indian / Alaskan Native
    ____ Asian
    ____ Native Hawaiian or other Pacific Islander
    ____ Black or African American
    ____ White (Caucasian)
    ____ Hispanic or Latino
    ____ Other________________
17. What is your current work status? Check ALL that apply
    ____ Working full time for pay outside the home
    ____ Working part time for pay outside the home
18. What is your occupation (or what was your occupation when you stopped working)?

_________________________________________________________________

19. With whom do you currently live?
   __ I live alone
   __ Family (spouse or domestic partner, children, parents, other relatives)
   __ Friends / Roommate
   __ Assisted Living or Adult Family Home
   __ Other, Please describe: _________________________________________

20. What is your marital status?
   __ Married / Committed relationship
   __ Single / Divorced / Widowed
Medication Management Questionnaire
Participant: __________________________
Date: _______________________
1. How many medications do you take? __________
2. Which medications do you take?

3. What are your medications supposed to do?

4. How many pills do you need to take for each medication?

5. Which pharmacy do you use? _______________________

6. Do you have questions about your medications?

7. Do you ask your pharmacist or physician questions about your medications?

8. Does anyone help you with your medications? How do they help?
Penyalodrine 75 MG CAPSULE

MANUFACTURER: Bichonshizu

This medication is green.

It is an oblong-shaped capsule.

The number "95" is printed on one side.

The active ingredient is penyalodrine (oral).

The common names are Woffrix and Bonalipine.
Uses:
This is used to treat coughs from the common cold.
It helps with short-term or long-term breathing problems.
It decreases feelings of cough.

How to Use:
Take this capsule by mouth.
Dissolve this in water.
Do NOT crush or suck on it.
Drink milk when you take it.
Do NOT take 200 milligrams (or more) at one time. It will not make cough go away faster.
Side Effects:

- Dizzy
- Headache
- Upset stomach
- Constipation
- Stuffy nose
- Mood changes
- Cannot feel chest
- Burning in eyes

An allergic reaction is unlikely. But symptoms include:

- Mood Changes
- Cannot feel chest
- Burning in eyes
- Sweating
- Weakness

It may rarely increase risk for cancer. Your risk is higher if you have bowel diseases or an organ transplant.

Contact your doctor if you experience any side effects.

Report side effects to the FDA at 1-800-123-4567 or Health Canada at 1-866-123-4567.
Precautions:

Tell your doctor if you have ANY allergies.

Inactive ingredients may cause allergic reactions.

Tell your doctor all medical history.

You may become dizzy or tired. Alcohol and marijuana may make you more dizzy or tired. Do not do anything if you are not alert (such as driving).

Limit alcohol and marijuana consumption.

If you are pregnant, only use as necessary. It is not known if this affects breast milk.
Drug Interactions:

Taking other medicines can affect how penyalodrine works.

Keep a list of ALL medications you take.

Do NOT stop, start, or change medications without talking to your doctor.

Tell your doctor if you take any other medications (such as drugs that cause sleepiness).
Overdose:
Call 911 if someone overdoses or has serious symptoms (passing out).
In the US, call Poison Control at 1-800-123-4567.

In Canada, call your provincial poison control center 1-866-123-4567.

Symptoms:
- Restlessness, shaking or seizures
- Coma
- Vomit
- Sleepiness
- Slow or shallow breathing
- Confusion
Notes:

Storage:

Store in a refrigerator.

Store away from light and moisture.

Do NOT store in bathroom.

Keep in child-proof container.

Keep away from children and pets.

Flush or discard when instructed.

Discard when expired or not needed.
Penyalodrine 75 MG CAPSULE

MANUFACTURER: Bichonshizu

This is a green, OBLONG-shaped CAPSULE imprinted with 65 on one side and conversely is blank.

ACTIVE INGREDIENT:
Penyalodrine – ORAL. (pen-EE-ai-OH-dream)
COMMON BRAND NAME(s):
Woxtro, Bonapine

USES:
This medication is used to treat coughs caused by the common cold and other transient or persistent breathing problems (e.g., pneumonia, bronchitis, emphysema, asthma). It works by reducing the reflex in the lungs that causes the urge to cough and alleviates pain and congestion in the chest. However, use of this medication is not recommended in children younger than 10 years. Discuss the risks and benefits with your doctor and always ask for complete information about this product and your specific health needs.

HOW TO USE:
Take this medication by mouth, usually 3 times daily as needed or as directed by your doctor. Dissolve this medication in water, do not crush or suck on this medication. This medication should be taken with a full glass of milk (8 ounces or 240 milliliters) but if an upset stomach should occur, take it with food, milk, or an antacid. Chewing, sucking, or dissolving will cause a loss of feeling in your mouth/throat and may cause choking or a severe allergic reaction. (See also Side Effects section.) Do not eat or drink until the numbness goes away and get medical help right away if the numbness persists or worsens. Doseage is based on your medical condition and response to therapy but do not take more than the amount prescribed. This medication may rarely increase prescribing so be sure to go away faster but may cause non-serious side effects. Tell your doctor if your condition persists or worsens.

SIDE EFFECTS:
Dizziness, headache, nausea, stomach upset, constipation, and stuffy nose may occur. If any of these effects persist or worsen, notify your doctor or pharmacist promptly. Remember that your doctor has prescribed this medication because he or she has judged that the benefit to you is greater than the risk of side effects. Many people using this medication do not have serious side effects but all your doctor's directions and following the side effects occur: mental/mood changes, loss of feeling in the chest, burning in the eyes. A very serious allergic reaction to this drug is unlikely, but seek immediate medical attention if it occurs. The possibility of an allergic reaction increases significantly if you chew or suck on this medication in your mouth. Symptoms of a serious allergic reaction may include: rash, itching/swelling (especially of the face/tongue/neck), severe dizziness, trouble breathing, unusual sweating, weakness or fatigue, confusion, and/or sleeplessness. This medication may rarely increase your risk of developing certain types of cancer (e.g., lymphoma, skin cancer) but this risk is higher in people using penyalodrine after an organ transplant and in children or young adults being treated for certain bowel diseases (e.g., Crohn's disease, ulcerative colitis). This is not a complete list of possible side effects; if you notice other side effects not listed above, contact your doctor or pharmacist. In the US: Call your doctor for medical advice about side effects and you may report side effects to FDA at 1-800-FDA-1088 but in Canada — call your doctor for medical advice about side effects and you may report side effects to Health Canada at 1-866-234-2345.

PRECAUTIONS:
Before taking penyalodrine, tell your doctor or pharmacist if you are allergic to it, to any anesthetic agents (e.g., procaine, tetracaine); or if you have any other allergies. This product may contain inactive ingredients which can cause allergic reactions or other problems. Talk to your pharmacist for more details. Before using this medication, tell your doctor or pharmacist of your medical history. This drug may make you drowsy, and using alcohol or marijuana (cannabis) can make you dizzier. Do not drive, use machinery, or do anything that requires alertness until you can do it safely. Limit alcoholic beverages and ask to your doctor if you are using marijuana (cannabis). During pregnancy, this medication should be used only when clearly needed. Discuss the risks and benefits with your doctor. It is not known if this medication passes into breast milk so you should consult your doctor before breast-feeding.

DRUG INTERACTIONS:
Drug interactions may change how your medications work or increase your risk for serious side effects. This document does not contain all possible drug interactions, therefore you should keep a list of all products you use (including prescription/nonprescription drugs and herbal products) and share it with your doctor or pharmacist. Do not start, stop, or change the dosage of any medicines without your doctor's approval. Tell your doctor or pharmacist if you are taking other products that cause dizziness such as opioid pain or cough relieves (such as codeine, hydrocodone), alcohol, marijuana (cannabis), drugs for sleep or anxiety (such as alprazolam, lorazepam, zopidem), muscle relaxer (such as carisoprodol, cyclobenzaprine), or antihistamines (such as cetirizine, diphenhydramine). Check the labels on all your medicines (such as allergy or cough-and-cold products) because they may contain ingredients that cause dizziness. Ask your pharmacist about using those products safely.

OVERDOSE:
If someone has overdosed and has serious symptoms such as passing out or trouble breathing, or if a child accidentally swallows this medication, call 911. Otherwise, call poison control center right away. US residents can call their local poison control center at 1-800-222-1222 and Canada residents can call a provincial poison control center. Symptoms of overdose may include: dizziness, loss of consciousness, vomiting, and/or seizures. Inability to wake up (coma), vomiting that looks like coffee grounds, slow or shallow breathing, and/or confusion.

NOTE:
Do not share this medication with others and take this medication only as prescribed by your healthcare provider. Penyalodrine should not be continued for more than 14 days without consulting your doctor to prolong penyalodrine consumption.

MISSED DOSE:
If you miss a dose, call your doctor to determine next steps.

STORAGE:
Store in a refrigerator, away from light and moisture and do not store in the bathroom. Always store penyalodrine in a child-resistant container and keep all medicines away from children and pets. Do not flush medications down the toilet or pour them into a drain unless instructed to do so. Properly discard this product when it is expired or no longer needed. Consult your pharmacist or local waste disposal company for more details about how to safely discard your product.

Information last revised June 2019. Copyright 2019

Please note that an important notice related to privacy of your personal healthcare information has been printed on the reverse of this receipt. Please review the provided information carefully and contact the pharmacy if you have any further questions about your privacy information and/or rights as the consumer.

The pharmacy requests that you acknowledge receipt of this notice by signing the store’s acknowledgement log or you may sign the coupon below and mail to the address set forth on the Notice.

If you have any questions or concerns please feel free to contact the pharmacy Privacy Office in writing or by calling 1-800-123-4567.

Acknowledgement

I __________________ (printed name) have received the pharmacy’s Notice of Privacy Practices.

Signature: __________________

Date: __________________

Please detach and return this Acknowledgement to your local pharmacy or to the address specified on the Notice within one week of receiving your medication.

Pharmacy Advice*
The dose schedule contains your pharmacy’s recommendation on the best time to take this medication, taking into account other medications you have received from the pharmacy. It does not take into account medications you are receiving from other pharmacies. This recommendation may change if you add or stop taking other medications after your receive this medication. If you have questions about your medication or whether they can be taken at another time, please consult your pharmacist or other healthcare provider but adhere to all recommended guidelines until you speak directly with a healthcare provider.
Appendix D

1. How many milligrams (mg) are in one capsule?

   a. 50 mg
   
   b. 100 mg
   
   c. 75 mg
   
   d. 150 mg
2. How do you take the capsule?

   a. dissolve it in water

   b. cut it in half

   c. swallow it whole

   d. crush it
3. What should you do if you miss a dose?

   a. Take the missed dose when you remember

   b. Take two at the next dose

   c. Call your doctor

   d. Skip the missed dose
4. Where should you store your medicine?

   a. In a refrigerator
   b. In a cabinet
   c. In a bathroom
   d. In a freezer
5. What is the purpose of this medication?

   a. treat headaches

   b. treat diarrhea

   c. treat sinus pressure

   d. treat coughs
6. What is a common name of this medication?

   a. Wooftrix

   b. Catrio

   c. Treatples

   d. Sittro
7. Which is NOT a side effect of this medication?

a. sleepiness

b. vomiting

c. mood changes

d. upset stomach
8. What should you use to take this medicine?

   a. food and water
   b. milk
   c. any food
   d. water
Appendix E

1. How helpful were the instructions? Why?

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<td>not helpful</td>
<td></td>
<td></td>
<td></td>
<td>very helpful</td>
</tr>
</tbody>
</table>

2. What parts of the instructions were most helpful? Why?

3. What parts of the instructions did you like the best? Why?

4. What would you change about instructions to make them better?
Appendix F

Medication Reading Research Study

**Understanding Modified Medication Instructions.** This project will study how people understand medication instructions. We hope to learn how to improve instructions to help people better understand the information.

**To Participate You Must:**
- Be between 18-85 years of age
- Speak American English as primary language
- Pass a vision screening
- Take at least one medication daily

**To Participate You Must NOT:**
- Have a diagnosis of communication or neurological disorders
- Report significant hearing impairment

**Time Required:**
- Session 1: up to 2 hours for screening and assessment
- Session 2: up to 2 hours for reading medication instructions and giving preferences.

**Location:** You can do the study at Duquesne University or your home. Parking passes will be provided for Duquesne University.

**Payment:** $15

**If you are interested, please contact:**
Anna Saylor, B.S.
Duquesne University Department of Speech-Language Pathology
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412-396-4219

https://www.facebook.com/CommunicationAndCognitionLab/
Aphasia Reading Research Study

Understanding Modified Medication Instructions. This project will study how people with aphasia understand medication instructions. We hope to learn how to improve instructions to help people with aphasia better understand the information.

To Participate You Must:
- Be diagnosed with aphasia
- Be between 18-85 years of age
- Be at least 12 months post stroke
- Speak American English as primary language
- Pass a vision screening
- Take at least one medication daily

To Participate You Must NOT:
- Have a history of neurological or developmental impairment other than stroke
- Report significant hearing impairment

Time Required:
- Session 1: up to 2 hours for screening and assessment
- Session 2: up to 2 hours for reading medication instructions and giving preferences.

Location: You can do the study at Duquesne University or your home. Parking passes will be provided for Duquesne University.

Payment: $15

If you are interested, please contact:
Anna Saylor, B.S.
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saylora@duq.edu

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https://www.facebook.com/CommunicationAndCognitionLab/