Purpose/Rationale

After severe traumatic brain injury (TBI), some literate individuals who require augmentative and alternative communication (AAC) to support communication, use onscreen keyboards to generate text (Beukelman & Mirenda, 2013; Britton & Baarslag-Benson, 2007; Fager, Doyle, & Watson, 2014). A range of layouts are available in specialized communication software. However, limited objective information is available on the visual-cognitive processing demands of different keyboard layouts. Research Question

Is there a difference in the visual-cognitive processing demands between a QWERTY and ABC (alphabet) onscreen keyboard for individuals who have a TBI and for typical individuals?

Method

Participants

•10 individuals with TBI; Ranchos Los Amigos Level 8-10 (Hagan, 1997)
•10 typical (neurologically intact) individuals

Hardware/Software

•Tobii X2-60 eye tracker
•Tobii Studio analysis software
•Keyboard layouts-Tobii/Dynavox Compass

Procedures

•Calibrated using Tobii X2-60
•Controlled cursor with standard mouse
•Typed sentences using mouse with ABC or QWERTY (10 sentences for each onscreen keyboard layout randomized per participant)
•Data collected regarding keyboard type preference, and prior experiences using onscreen keyboards.

Analysis

•Keyboard = area of interest (AOI)
•Eye gaze metrics:
  • Fixation Count (number of fixations within an AOI)
  • Total Fixation Duration (the sum of the duration for all fixations within an AOI)
•Means/standard deviations, t-test= between group per keyboard type, paired t-tests=within group per keyboard type

Results

<table>
<thead>
<tr>
<th></th>
<th>Fixation Count</th>
<th>Total Fixation Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(average per sentence)</td>
<td>(average per sentence)</td>
</tr>
<tr>
<td>Typical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QWERTY</td>
<td>66 (SD = 14)</td>
<td>12.83 (SD = 2.29)</td>
</tr>
<tr>
<td>ABC</td>
<td>115 (SD = 26)</td>
<td>17.03 (SD = 3.80)</td>
</tr>
<tr>
<td>TBI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QWERTY</td>
<td>112 (SD = 28)</td>
<td>10.74 (SD = 2.76)</td>
</tr>
<tr>
<td>ABC</td>
<td>179 (SD = 53)</td>
<td>14.40 (SD = 4.28)</td>
</tr>
</tbody>
</table>

Discussion

•Performance matched perceptions and preferences for QWERTY over ABC layout
•Prior experiences using different technology interfaces may provide guidance for layout selection
•TBI participants- greater number of fixations and shorter duration of these fixations compared to typical; greater variability compared to typical

Acknowledgements

Project supported by the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR)- Grant # 90RE5017, RERC on AAC