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Seipp, Karsten

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Introduction

Touchscreen smartphones can be operated in portrait (P) and landscape (L) orientation. Previous research [1, 2, 4, 7] suggests that a landscape layout is quicker to perceive but it remains unclear if it actually performs better than a portrait one and which areas are the best for positioning an element.

We investigate whether a touchscreen smartphone is faster to operate in P or L and where to put a button in each layout for best findability and operability.

How?

In line with various sources on optimum button size [3, 5], we laid out a series of 3, 5, and 8 buttons in both orientations on an HTC Sensation XE. Each button was 53 x 53 pixels in size, had a grey background and black type to minimize the effect of visual salience.

First round (R1):

• 44 users to tap a target consisting of a three-letter-word, target name shown on task screen
• In portrait and landscape
• In a layout consisting of 3, 5 or 8 buttons

Second round (R2):

• same as R1, but colour names shown using method similar to Stroop effect [6] to require brief consideration of target before selection
• task screen vanishes automatically after one second in portrait and landscape
• in a layout consisting of 3, 5 or 8 buttons

Results

R1: The ANOVA showed no statistically significant difference between P and L or the target positions, only a main effect for button amount, which is expected. F(2,86) = 91.04, p<.001. Bonferroni: alpha : 0.05/3 = 0.017

R2: The ANOVA showed three effects and one interaction:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Orientation</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(2,86)=25.205, p&lt;.001</td>
<td>F(1,43)=36.42, p&lt;.001</td>
<td>F(2,86)=12.53, p&lt;.001</td>
</tr>
</tbody>
</table>

Breakdown:

- 3 buttons (Median: 1170.00) is faster than 5 buttons (Median: 1302.88), Z = 4.28, p < .001
- and 5 buttons is faster than 8 buttons (Median: 1389.50), Z = 4.81, p < .001
- End is faster than Start (Median: 1483.30); Z = 5.59, p < .001

Bonferroni: alpha : 0.05/2 = 0.025

Interaction

- 3 Buttons
  - Start is faster than End (Median: 1378.25), Z = 5.59, p < .001
- 5 Buttons
  - Middle is faster than Start (Median: 1408.25), Z = 7.62, p = .006; although not statistically significant
- 8 Buttons
  - Middle is faster than End (Median: 1285.38); Z = 4.34, p<.001

Bonferroni: alpha : 0.05/3 = 0.017

Tips for Designers

When designing time-critical applications, favour landscape orientation over portrait. In addition, the user’s visual focus set by a dialogue has a higher impact on interaction time than the proximity of the finger to an element. Therefore, put a button you would like the user to perceive first in the same place as your preferred option. In portrait orientation, place these to the bottom and the top respectively.

References
