

Title: "Spearcons Enhance Performance and Preference for Auditory Menus on a Mobile  
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## **EXTENDED ABSTRACT**

Increasing the usability and accessibility of menus on small electronic devices is essential due to their decreasing sizes and increasing proliferation. Advanced auditory menus are being studied as an enhancement to the visual-only menus currently on most of these devices, especially when the user is unable to look at the device (e.g., it is in a pocket) or unable to see it (e.g., due to a vision impairment). It remains to be determined how to design an optimal auditory menu, but various enhancements have been proposed to improve the basic (and often unsatisfactory) text-to-speech (TTS) menus often deployed.

One auditory menu challenge is learning the mapping of sounds (especially if not speech sounds) to menu items. Faster learning will allow the user to begin taking advantage of the functionality of the phone. Palladino and Walker (2007) showed that listeners learn to associate menu items to special sounds called *spearcons* faster than to other types of sounds, such as earcons. In addition, earcons were significantly more *frustrating* to learn.

Another basic challenge is navigational efficiency, which includes knowing one's position in the menu, and being able to navigate quickly to another item. Walker, Nance, and Lindsay (2006) and Palladino and Walker (2008) found that even in the absence of explicit hierarchical cues, desktop menu interfaces enhanced with spearcons significantly outperformed menus with auditory icons, earcons, and text-to-speech (TTS) alone in time-to-target efficiency.

It remains to be determined, however, how enhanced auditory interfaces perform in actual mobile tasks, both in terms of deployment on actual mobile devices, and in terms of use while in motion (e.g., walking). It is also important to begin to assess user opinions and preferences, since usability depends not only on performance (e.g., time to target), but also subjective impressions.

## **Current Study**

The present study extends previous studies in order to: (1) verify that spearcons improve performance on auditory-enhanced menus; (2) explore the generalizability of spearcons to mobile handsets; and (3) explore subjective perceptions of the spearcon.

## **Method**

*[Note: Data are still being collected (we will collect 100 participants in total). Data from 20 participants are showing exactly what we predicted, so we report on the preliminary results in this Abstract, but will report on the total data set for the full camera-ready paper.]*

Twenty undergraduates with normal or corrected-to-normal hearing and vision participated for partial credit in psychology courses. There were four participants in each of five conditions, in a between-subjects design.

The task was to interact with a one-dimensional menu on a mobile phone, use the cursor keys to navigate to a particular item, and select it. The menu was exactly the same list of 50 names used by Palladino and Walker (2008). There were five interface conditions: visual menu only; visual menu plus TTS; visual menu plus TTS and spearcons; TTS only (no visuals); TTS and spearcons (no visuals). We recorded accuracy and time-to-target. There were 25 trials in a block and 10 blocks of trials.

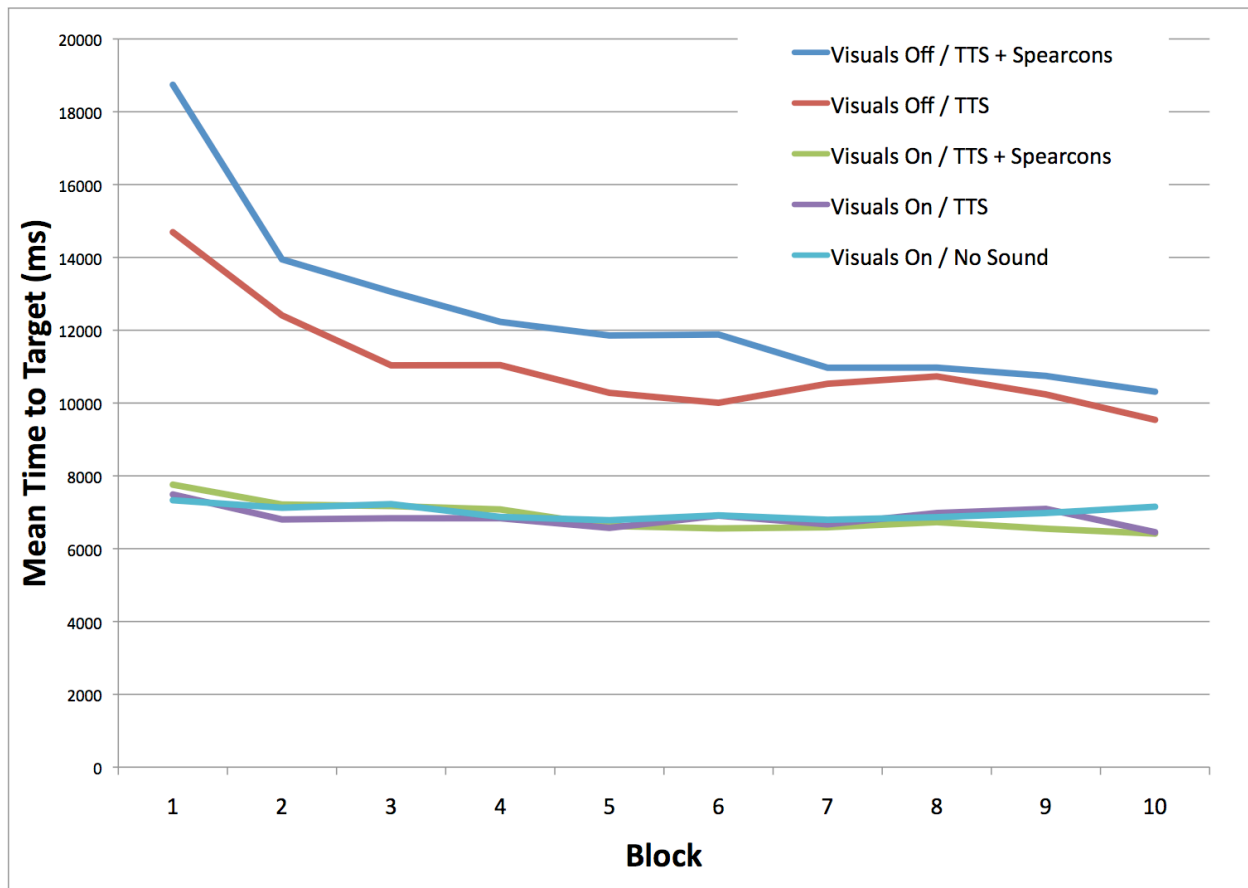
Participants completed demographics and questions assessing their subjective perception of the auditory menus. A free-response field solicited other comments on their experience, and on any strategies they may have used to complete the task.

## **Results**

The results are presented in Figure 1. There are two main findings. First, performance was slower in conditions with no visuals. This is expected, since the visuals enable look-ahead and faster scanning, with no delay due to listening to the audio. In the audio-only conditions, menus with spearcons and TTS started slower, but as participants learned that they could navigate based on the spearcons alone, that condition caught up with the TTS-only condition. In the conditions with visuals enabled, the TTS condition and the TTS and spearcons condition both led to numerically faster performance, though these differences are not statistically reliable. This indicates that the multimodal interface has at least as fast, and possibly slightly faster performance as the visuals-only. These results completely replicate previous results that were obtained on a desktop platform.

In addition, the subjective results support the use of spearcons. Participants in the visuals-on conditions were ambivalent about spearcons and TTS, whereas in the audio-only condition the general view was that the auditory menu enhancements were beneficial, and even “fun”.

Overall, these results support the use of spearcons in mobile device auditory menus. Follow-on work now underway is looking at performance and preference for these interfaces while the user is actually walking a path while making menu selections. We expect that in those cases the auditory menus will show dramatically greater performance, and preference, as compared to visuals-only, and as compared to the stationary data collection used in the present study.



## References

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