

AN EXPLORATION OF THE USE OF COMPLETE SONGS AS AUDITORY PROGRESS BARS

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This paper examines the results of a study conducted to determine if Auditory Progress Bars consisting of complete songs of varying duration would allow listeners to accurately estimate the amount of time they were on telephone hold, while at the same time producing acceptable customer satisfactions scores. Previous research by the authors has shown that a subset of auditory progress bars consisting of sinusoidal wave forms in different configurations do indeed allow listeners to accurately estimate time, while other configurations did not. However, this research also showed that all of the tonal auditory progress bars had exceptionally low customer satisfaction scores. The current research demonstrates that auditory progress bars comprised of complete songs produce both accurate hold time estimates and high consumer satisfaction scores. Implications for the design of auditory progress bars and directions for further research are discussed.

INTRODUCTION

When customers attempt to contact a business using the telephone, they are frequently placed on hold. This is a result of the fact that businesses do not have unlimited resources. Clearly, the optimal consumer satisfaction strategy is to have more call center representative than callers, so a customer is never placed on hold. In reality, call centers must balance the time a customer must be on hold with their staffing requirements.

Previous research has focused altering user's perception of time so that the time on hold seems shorter than it really is (Knott, Kortum, Bushey, & Bias, 2004, North, Hargreaves, & McKendrick, 1999). However, the use of Auditory Progress Bars (APBs) takes a slightly different approach. APBs aim to present the caller with an accurate report of their place in the queue, allowing callers to make an assessment of whether or not they wish to continue to wait. APBs function like visual progress bars, providing users with an accurate picture of how far they are in the process, and how much of the process remains. This is easily accomplished in the visual domain, but is more difficult in the auditory domain.

We have previously reported results on APBs that were comprised of sinusoidal wave tones in different configurations (Kortum, Peres, Knott, & Bushey, 2005). These results showed that participant's estimates of time varied significantly depending on the characteristics of the APB, but that participants were consistent in their dislike of the stimuli. These results led us to form 2 questions: 1) what are the dimensions of the Tonal APB's that are leading to differences in perceived wait times and 2) can we obtain the high-precision estimates found for a subset of the Tonal APBs while significantly increasing users' satisfaction. The first question is the subject of continuing research in our laboratories—the second question is the subject of this paper.

One quality of 'good' APBs is that they are intuitively understood by the user to have a beginning, middle, and end. This allows users to make relatively precise estimates of the time on hold, since the stimulus communicates this information to the listener. One simple stimulus that exhibits these qualities is that of a familiar song. A single song that is even moderately familiar to a listener contains information that can be used to determine an approximate location

within the stimulus. As such, a song should function well as an APB because the listener can make an assessment of where they are in the song relative to the start and the end, and then determine where they are in the queue. As the song progresses, they are effectively moving forward in the queue. The familiar nature of the song allows the song to function as an auditory visual cue, much like being able to see the line in front of you for physical queues.

This is very different than the current on-hold systems that play music for the listener until they are at the head of the queue. In this case, the listener has no idea of how long the queue is, or at what rate they are progressing through the line.

METHOD

Participants

40 participants (31 females, 9 males) were recruited from the general psychology subject pool at Rice University for participation in the study. Average age of the participants was 19.2 years. All of the participants had self-reported normal hearing.

Stimuli and Procedure

8 different full-song APBs were generated for use in the study. Each APB consisted of an entire song, with a brief announcement at the beginning and end. 8 songs of different durations were selected from Billboard Top 40 hits over the last 30 years .

Songs ranged in duration from 62-285 seconds. Each APB had a 9-second introductory announcement that said *“Thank you for calling. All operators are currently assisting other customers. When the following song is over a service representative will be available to help you.”* Immediately following this announcement, the song was played in its entirety. At the end of the song, a 9 second

announcement was played that allowed the participant to receive information about their bill balance.

When participants arrived for the study they read and signed an informed consent and were then given a short summary of the experiment. In order to conceal the purpose of the study, participants were only told that they would be making several phone calls to a telephone call center. They were also told that the call center was extremely busy and that they might have to wait for a customer service representative to answer that phone and this was normal and to be expected.

A participant would place a call using a standard analog telephone and receive one of the stimulus APBs. At the end of each call, participants were asked to estimate the amount of time that they had been on hold. They then answered a number of questions concerning the familiarity of the song and their satisfaction with the call. After answering these questions, the participant could initiate the next call. The presentation of the songs was counter-balanced across participants to minimize order effects.

RESULTS

To investigate whether APBs using music had differing effects on participant's accuracy and subjective impressions from the APBs using tones, the performance and preference data from the Tonal and Music APB experiments were compared. Performance was measured using the Weber-Fechner law. Specifically, the absolute value of the participants' mis-estimation (either over or under) of the hold time was divided by the actual hold time, giving a proportion of mis-estimation. Given that these values were not normally distributed (Pearson skew = 2.3), they were transformed by taking the square-root. The transformed values were still somewhat skewed (Pearson skew =equal .76), but sufficiently close to a normal distribution for

the purposes of the inferential statistics conducted.

The previous study of the tonal APBs found that participant's time estimation improved as the length of the hold time increased (Kortum *et al.*, 2005). To determine if this effect was replicated for the music APB, a factorial ANOVA was done. Hold time (12 levels) and APB type (5 levels) were used as the independent variables and performance was the dependent variable. There were main effects for both hold time, $F(10, 279)=3.8$, $p<.001$, and APB type, $F(3, 279)=4.35$, $p=.005$, and there was no interaction between the two variables ($p=.32$). Given that the question of interest for this study was the effects of the type of APB on performance and that there was no interaction between hold time and APB type with regard to performance, hold time was used as a covariate to investigate the *a priori*

question of what impact APB has on performance.

Figure 1 shows the mean performance differences (adjusted for hold time) for the five different APB groups—4 tonal (see Kortum *et al.*, 2005 for details): Duration Decreasing (DD), Duration Increasing (DI), Pitch Decreasing (PD) and Pitching Increasing (PI) and one Music. As can be seen, performance was best (error was the lowest) for DI, PD and Music and was highest for DD and PI. The differences between the highest and lowest APBs are all significant (all p 's $< .001$). Specifically, both DD and PI are significantly higher than DI, PD, and Music. This indicates that performance for the Music APB was as good as the best performance of the tonal APBs (DI and PD).

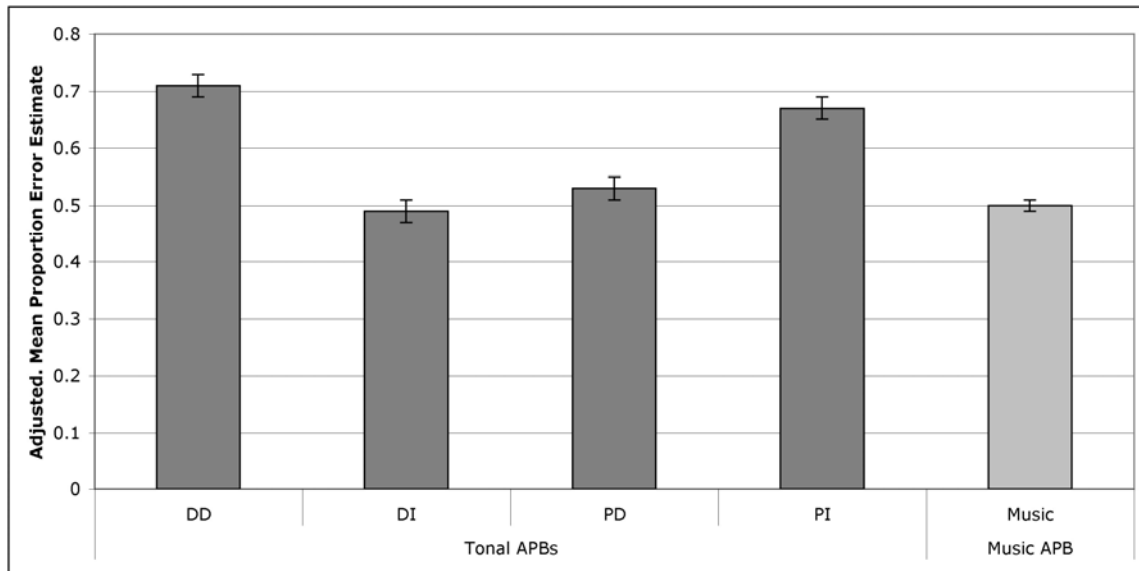


Figure 1. Mean adjusted proportion of the error estimate for the five APB types, 4 tonal APBs and one Music APB. Error bars represented the standard error of the mean.

The second question this study was designed to address was whether the participants would give the music APBs more positive subjective ratings than the tonal APBs, regardless of performance. Figure 2 shows

the mean response to the question, “*I liked the tones (music) that I heard while I was on hold*” for the five APB groups. The participants answered using a 7-point Likert-type scale with 1 representing Strongly

Disagree and 7 representing Strongly Agree (4 was Neutral).

In Figure 2, it is clear that the mean levels of preference do differ for the different APBs ($F(4,297)=51.14, p<.001$) and the results of a Tukey's pairwise comparison confirms that the Music APB has a significantly higher mean rating than the four tonal APBs (all p 's $< .001$) and that the duration APBs

(DD and DI) have higher mean ratings than the pitch APBs (PD and PI). Thus, the participants in the Music group had a significantly more positive subjective rating for the Music APBs.

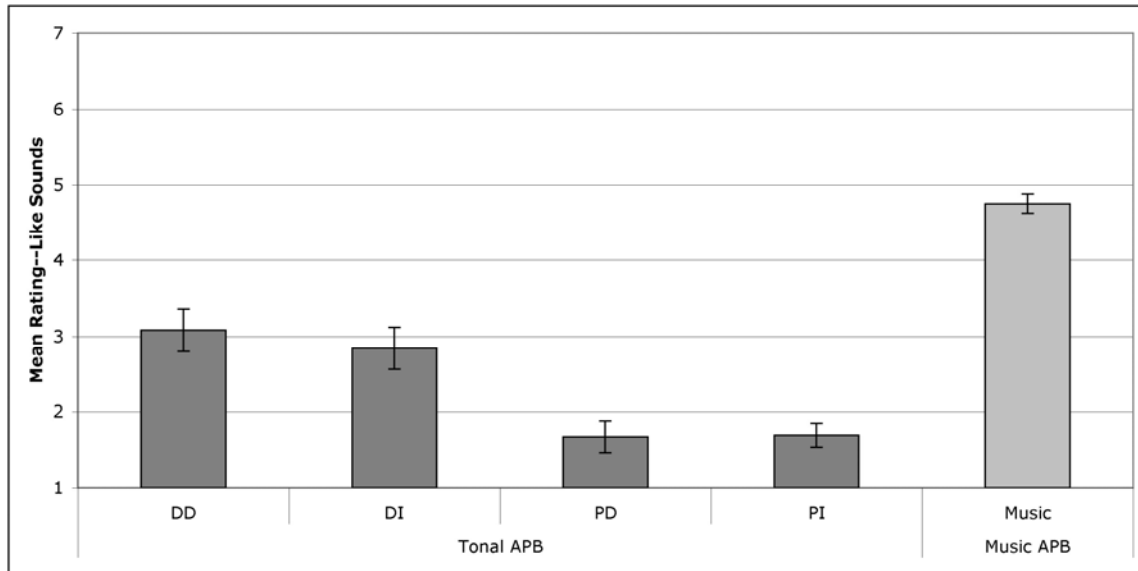


Figure 2. Mean responses to the statement “*I liked the tones (music) that I heard while I was on hold.*” Responses based on a 7-point Likert-type scale with 1 – Strongly Disagree and 7 – Strongly Agree. Error bars represented the standard error of the mean.

DISCUSSION

These results show that it is indeed possible to create auditory progress bars that have the desired characteristics of both high precision in time estimation and high likeability by the users. This is an important finding, since high precision in estimation alone is insufficient for consumer facing applications: customers must also be happy with both the stimulus and the overall experience.

The key question that arises from these results revolves around trying to establish what the Music APBs and the 2 high

precision Tone APB's have in common. There are 2 possibilities that need to be explored to understand this question. The first is that the Music APBs and the high-precision Tonal APBs share a common auditory dimension that listeners use to make accurate assessments of the duration of the hold time. The other possibility is that instead of these APBs having a particular dimension that facilitates accurate time estimates, they lack a dimension found in the 2 low-precision APBs that somehow inhibits or interferes with the accurate estimation of time. In either case, discovery of this dimension would allow high-precision stimuli to be constructed in a more

systemic fashion. Unfortunately, as alluded to by Kellaris and Kent (1992) the dimensions that are driving the accuracy of time estimation may also be the dimensions that makes users dislike the stimulus.

Further research needs to be conducted to uncover the auditory dimensions that are driving these performance and preference differences. We have wondered if the high-precision APBs contain a 'musical-element' that makes them more song-like. Thus, in future research we plan to make a series of APBs that have the same temporal patterns as the Tonal APBs, but that are constructed using recognized musical elements, like chords. This will help us identify if the temporal patterns or the musical qualities are the principle components behind the performance aspects of the stimuli

Our current research has shown that using music, i.e., whole songs, as auditory progress bars can allow callers to make very accurate estimates of the time that they are on hold. These stimuli have significantly higher customer satisfaction rating than Tonal APBs, suggesting that it is possible to construct APBs that meet the requirement for high performance and high consumer satisfaction at the same time.

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