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Commentary on "Is there a peak in popular music preference at a certain song-specific age? A replication of Holbrook & Schindler's 1989 study"

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We appreciate the hard work invested by Hemming (this issue) in his replication of our 25-year-old study entitled "Some Exploratory Findings on the Development of Musical Tastes" (Holbrook & Schindler, 1989) – all the more because of its extensions and elaborations along lines that suggest the need for further research on this topic. Ironically, while Hemming appears to believe that his findings cast some doubt on the validity of our earlier conclusions, we view his results as remarkably supportive of our approach and findings concerning the development of tastes in music. Details follow.

Hemming has collected new data on a large sample of 25 songs and 473 respondents to produce a close replication that appears in his Figure 2. We have enlarged this diagram and have measured the loci of each data point by hand to produce exactly the same results for the nonmonotonic relationship between Musical Preference (Pref) and Song-Specific Age (129 SSAs ranging from -43 to 85) – namely, Pref = 0.09 + 0.0033*SSA – 0.0002*SSA^2 (R^2 = .45). The strength of this result – along with the general shape of the nonmonotonic relationship – strongly support our original claims concerning a preference peak for musical tastes, *but* our earlier finding that this peak occurs at an age of roughly 23.47 years (late adolescence or early adulthood) fails to jibe with the peak found in Hemming's replication – namely, as derived by calculus, 8.25 (rather than the 8.59 reported in his Figure 2).

From even the most casual examination of Hemming's Figure 2, it seems clear that the fit of the preference equation – as well as the location of its preference peak – may well reflect the influence of several outliers that appear at the extreme ends of the SSA scale. As noted by Hemming, these observations reflect very small sample sizes. For this reason – as also emphasized in our own earlier work (e.g., Holbrook & Schindler, 1996) – one should remove the unreliable observations from the data array so as to improve the stability and validity of the

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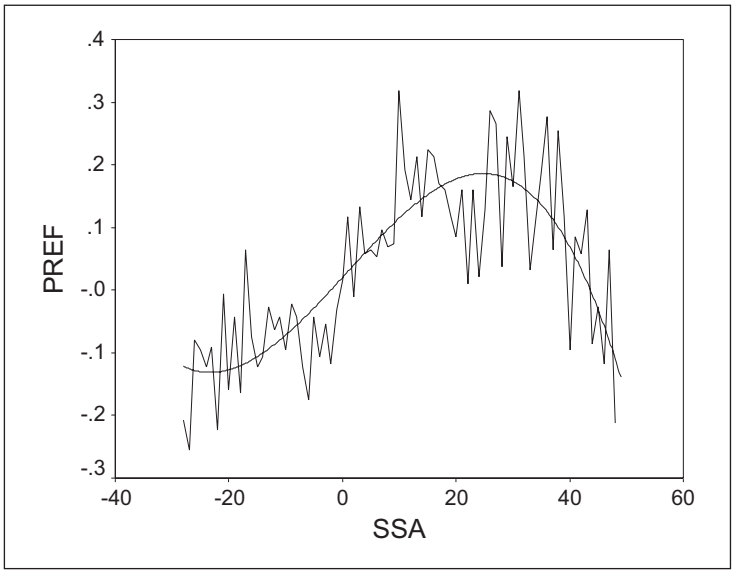

Figure 1. Cubic relationship between musical preference and song-specific age for truncated sample with 78 SSAs (jagged line = scatter plot; solid line = predicted values; Pref = 0.0204 + 0.0099*SSA + $0.00001212*SSA^2 - 0.00000573*SSA^3$; $R^2 = 0.657$; age peak at 24.72 years).

results. Toward this end, Hemming eliminates all observations based on subsamples of fewer than 50 respondents – leaving an analysis sample of only 78 SSAs (ranging from -28 to 49). With this reduced sample, Hemming obtains a relatively strong fit ($R^2 = .381$) with a far more reasonable preference peak at age 17.00 (rather than the 17.36 reported in his Figure 4). Hemming interprets this relationship as "stable" and "highly significant" support for the hypothesized critical peak in musical preferences at an age interpretable as late adolescence or early adulthood.

However, it appears that the results for the truncated sample of 78 SSAs are actually even better than Hemming believes them to be. When we repeat the same analysis, we obtain the same coefficients that Hemming reports in his Figure 4, but the strength of the statistical fit appears quite a bit stronger than he indicates ($R^2 = .525$ versus $R^2 = .381$). The age peak remains at a plausible level (16.5 years). But careful examination of Hemming's Figure 4 suggests that the distribution is skewed to one side in such a way that the fit might improve with a cubic equation. As shown in our Figure 1, such a cubic equation does indeed create a dramatic improvement in the shape and fit of the model: Pref = 0.0204 + 0.0099*SSA + $0.00001212*SSA^2 - 0.00000573*SSA^3$ ($R^2 = .657$; age peak at 24.72 years). Besides a marked increase in explained variance from the quadratic model ($R^2 = .525$) to the cubic model ($R^2 = .657$), the age peak for the cubic equation now closely approximates that reported in our earlier study (24.72 years).

However, the selection of N = 50 as the cut-off point for subsample sizes reflects such a clearly arbitrary decision that we cannot help but wonder what result would have appeared had Hemming chosen other plausible cut-off criteria. Therefore, after a close examination of Hemming's Figure 3, we investigated the outcome of eliminating *very* small sample sizes in general and those for SSA = -43, -42, -41, -40 and SSA = 75, 77, 79, 81, 83, 84, 85 in particular (leaving an analysis sample of 118 SSAs). As shown in our Figure 2, a scatter plot of

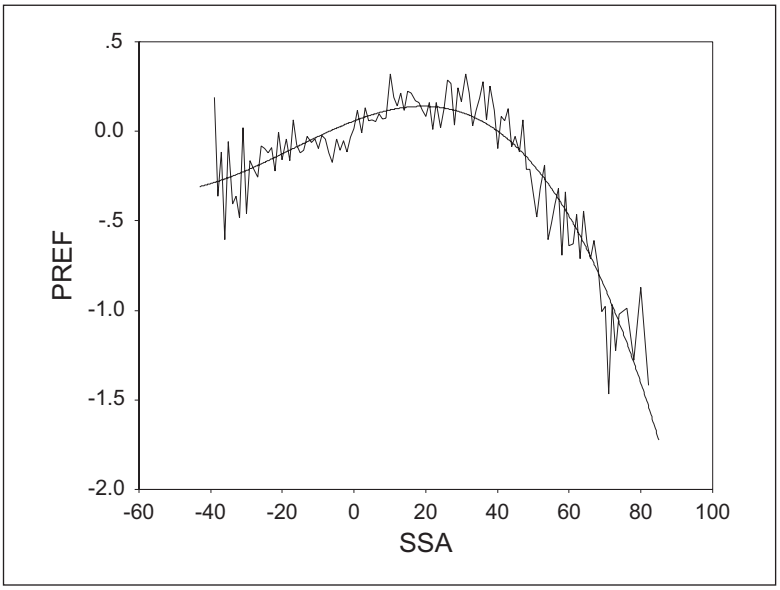

Figure 2. Cubic relationship between musical preference and song-specific age for pruned sample with 118 SSAs (jagged line = scatter plot; solid line = predicted values; Pref = 0.058 + 0.007611*SSA – 0.000127*SSA^2 – 0.00000246*SSA^3; R^2 = .858; age peak at 19.23 years).

these data points for the pruned sample of 118 SSAs reveals a clearly cubic relationship, strongly skewed to one side, as represented by the following preference equation: Pref = 0.058 + 0.007611*SAA – 0.000127*SSA^2 – 0.00000246*SSA^3 (R^2 = .858; age peak at 19.23 years). Here, by virtue of a more data-friendly sampling strategy, the statistical fit gains considerably in strength (from R^2 = .657 to R^2 = .858) while the location of the age peak continues to make reassuring sense as occurring during late adolescence or early adulthood (19.23 years of age).

In short, Hemming's own data strongly support our earlier formulation – especially when we analyze them in a sympathetic manner. We do not intend to argue here that one cut-off or one way of pruning the sample or one functional form is right or wrong; we merely wish to demonstrate that the supportiveness of the results obtained with these sorts of data hinge on the willingness of the investigator to let them tell their story to the best of their ability.

All of which brings us to a bewildering aspect of Hemming's analysis. In his Figure 6 (plus Table 2), Hemming presents a bar chart (plus relevant t-tests) that appear to show a clear preference peak at an SSA of about 19 to 22 years. This, of course, exactly corresponds to what we would expect (as does the SSA-related trend from high positive to low negative correlations shown in his Figure 7). However, Hemming interprets his Figure 6 by emphasizing that the differences between neighboring bars do not reach statistical significance (Table 2) – failing to notice that no reason exists under the sun why such statistically significant differences *should* appear. Ideally, we would find a very smooth curve, with neighboring SSAs very close in their preference levels. The relevant peak refers to the overall shape of the curve from beginning to end and not to contrasts between near neighbors. Thus, if Hemming's Table 2 and Figure 6 offer anything meaningful, it would simply be a confirmation of the smoothness of the inverted-U function found both in our research and his.

Finally, Hemming presents an important point – namely, that the sort of nonmonotonic relationships discussed here can be approximated by two linear relationships that intersect in the vicinity of the preference peak – a truism that we ourselves exploited via the estimation of piece-wise linear models in the aforementioned study (Holbrook & Schindler, 1996). However, without justification, Hemming suggests that this ability to approximate a curve with two lines somehow indicates the presence of "an artifact" – a criticism that appears quite unfounded, all the more because the two scatter plots he presents both appear strongly curvilinear to the naked eye. The visible inverted-U's in these data are impressive considering that, in the younger age group, it was impossible to have an SSA greater than 37 and that, in the older age group, it was impossible to have an SSA less than 14 (assuming that the reported ages were as of 2012).

To emphasize this point, Hemming might want to consider what would happen if he broke the age range into three groups of 43 respondents each. Quite plausibly, he might find a positive linear relationship at low ages, a nonmonotonic curve at middle ages, and a negative relationship at high ages. If so, such a finding would strongly support our hypothesized preference peak in late adolescence or early adulthood.

In sum, amidst strong support for our original findings plus a number of potentially confusing distractions, Hemming offers one extremely important point – namely, that small sample sizes at the SSA extremes can play havoc with the empirical results in a study of musical preferences related to song-specific ages. However, the optimal way to address this problem lies *not* in throwing away large portions of the data but *rather* in collecting big enough numbers of observations from people at the SSA extremes. We hope that the work by Hemming will inspire such refinements in the future.

As noted by Hemming, after our initial contribution (Holbrook & Schindler, 1989), we have explored the generality of this phenomenon by showing early-experience effects in preferences for films, movie stars, fashion designs, and the aesthetic aspects of automobiles (e.g., Schindler & Holbrook, 2003). Recently, similar early-experience effects have been found for perfume preferences (Lambert-Pandraud & Laurent, 2010). This work on generality is strengthened by Hemming's replication of our findings for music. In our view, the close similarity of Hemming's results to our own – over large distances of time, place, and culture – are remarkable and add considerable weight to the idea that this phenomenon constitutes a reliable principle in the development of musical tastes.

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