

# Commentary on Polak *How short is the shortest metric subdivision?*

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**ABSTRACT:** This commentary relates to the target paper by Polak on the shortest metric subdivision by presenting measurements on West-African drum music. It provides new evidence that the perceptual lower limit of tone duration is within the range 80-100 ms. Using fairly basic measurement techniques in combination with a musical analysis of the content, the original results in this study represents a valuable addition to the literature. Considering the relevance for music listening, further research would be valuable for determining and understanding the nature of this perceptual limit.

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THE target paper by Polak is an interesting study about the lowest limit for meter perception using West-African drumming. As pointed out by Polak there are surprisingly few measurements of real performances from this musical style done in the past. Thus, this study is a welcome contribution that gives further evidence for a lower limit of time perception using a different style of music.

A major part of Polak's study is devoted to the idea that West-African drum music relies on the metric subdivision based on a shortest time unit. This part is reasonably convincing, although it is not based on direct measurements but rather provides different viewpoints supporting this idea.

The measurement methods used in the target paper are somewhat simple, mainly relying on the manual annotation of each bar. In this context it seems however adequate to use this method given the assumption and motivation that the shortest event will fall within the metric grid of some subdivision of the bar.

The author found that the shortest duration in this study (approx 85ms) is lower or comparable to what have been measured before. In our previous study on timing in jazz performances (Friberg and Sundström, 2002) we mention 100 ms as an approximate value for the lower boundary. Unfortunately, this value has been interpreted as an exact boundary in some subsequent publications. However, as discussed by Pollak, this value of 100 ms does not correspond to the lowest obtained values, as evident from the original data from our study as well as by a replication using additional data by Dittmar, Pfeleiderer, & Müller, (2015), see Figure 2 in Pollak. Given the nature of typical jazz-swing performances it is easy to motivate that the 8<sup>th</sup> notes played in jazz corresponding to the shortest commonly played notes also are part of the metrical grid.

An alternative comparison is to look at maximum tempi in jazz performances, for example. Since traditional jazz in the swing tradition is fairly formalized and one can assume that the shortest notes are the 8th notes in fast tempi, it is then possible to compare these with the data presented in the current study. Polak does this when referring to the study by Collier and Collier (1994). Assuming that the fastest tempo in Jazz is around 320 bpm we get an eight note duration of 94 ms. This is also closely in line with results in Friberg and Sundström (1997). Considering a slight swing ratio we arrive again at a shorter value that appears to be in the same range as the 80-100 ms suggested in the target paper by Polak.

The overview of previous studies together with the new contribution in the target paper by Polak, provides further evidence from different musical styles and traditions that the lower limit can be interpreted as a universal common constraint of perception. Considering its potential impact on music listening, it is surprising that it did not receive more attention within the research community so far. Thus, it would be worthwhile to explore this mechanism in different aspects further. For example, it would straightforward to run similar performance analyses on sets of excerpts from different musical styles.



It is evident that the boundary of 80-100 ms is a perceptual limitation rather than a limitation of the motoric abilities in performed music. However, the majority of the evidence in this as well as previous studies are taken from various measurements of performances. Thus, it would be important to further explore this boundary using pure perceptual experiments without any motoric component. In addition, the lower boundary on musical durations could also be investigated from a neural perspective by trying to find its neural origin (see e.g. Efron, 1973).

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### NOTES

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