

**Title:** What Happens if a Note Occurs When You Don't Expect It?

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## **Intro**

Many sounds in our environment have some sort of rhythmic structure or regular pattern. According to Dynamic Attending Theory (DAT) we attend to these sounds through a process where attention oscillates up and down in time with the beat. Regularly timed sounds in the environment entrain the oscillation of attentional energy so that the peak of the attentional wave coincides with the onset of the stimulus. Once entrainment occurs, the brain makes predictions of when the next stimulus onset will occur can take place, this is called an expectancy. An event that confirms these expectancies is easier for the brain to process than one that violates them. So if an event occurs at an expected time (preserving the rhythmic pattern), listeners should respond to it more accurately than if it occurs at an unexpected time.

However, pitch judgement tasks have revealed inconsistent results regarding the impact of temporal expectancies on task performance. Some research shows that when a temporal expectancy is fulfilled, listeners are better at telling if the first pitch of a sequence is higher or lower than the first (ignoring the notes in between). Conversely, other research has shown no impact whatsoever of temporal expectancies on pitch classification in the same task. Due to these contradictory findings further research into the discrepancy of findings is needed, as well as further research into the suitability of the pitch comparison task to illustrate DAT.

Other research has shown the impact of the predictability of a tone's onset to influence expectancies. The more a tone occurs at a certain point in time in a sequence the higher the predictive validity of that tone occurring at that point in the future. It may be that expectancies in the pitch comparison task are influenced by the likelihood of the comparison tone occurring either early, on-time or late in relation to the timing of the preceding sequence.

## **Aim**

The current study aims to further investigate the suitability of the pitch comparison task as an example of DAT. To do this different groups were allocated differing likelihoods of a certain temporal shift occurring. It was predicted that an expectancy would be formed for the temporal shift with the highest likelihood of presentation. It was also anticipated that this expectancy would emerge as participants progressed through the experiment.

## **Method**

115 Participants from the Murdoch research portal were recruited for the study. The pitch comparison task in the present study presented a sequence of 10 tones to participants. The first tone in the sequence was a standard tone, which was then followed by a context sequence of eight tones and finally a comparison tone. The tones in the context sequence were random in terms of their pitch so melodic patterns were present. The participants were required to indicate if the last (comparison) tone was higher or lower than the first (standard tone). All tones were regularly timed with 600ms between each tone, however, the onset of the last tone was either presented early, on-time, or late.

Participants were split into seven different groups with each group having one temporal shift with a higher likelihood of presentation. Out of the 240 trials each group had one temporal shift that accounted for 60% of the trials and the remaining 40% was split up equally between the two remaining temporal shifts.

A general questionnaire asked participants to provide information about their age, gender, handedness, first language, musical experience, and what type of music they mostly listen to.

**Results**

The results showed no evidence of the inverted 'U' shaped expectancy profile synonymous with DAT, thus no effect of temporal expectancies on the pitch comparison task were found. Participants were no more accurate for on-time trials than they were for early or late. Additionally, no performance increase was seen across the experiment for the trials that had the highest likelihood of occurring. Musical experience was not shown to impact the prevalence of any expectancy profiles nor did performance increase with musical experience.

**Conclusion**

The present study supports recent research which has failed to support the influence of expectancies on pitch classification tasks. These results and past research bring question to the suitability of the pitch comparison task as an illustration of DAT.