Temporal Discrimination Task Analysis

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This report presents an analysis of a task from research on time perception, involving a single participant and using a hand effector. The task is based on the following article: Pourmohammadi A and Sanayei M (2023), Context-specific and context-invariant computations of interval timing, Front.Neurosci. 17:1249502. doi: 10.3389/fnins.2023.1249502. All analyses and visualizations are generated to explore the temporal reproduction task's outcomes and highlight any context-dependent differences between sensory and motor timing.

1. Psychometric Curves and Gaussian Fits for ts1 Variations

Figure 1 illustrates the psychometric curves and Gaussian fits for different values of ts1, the initial time interval presented to participants. The x-axis (ts2) represents the second time interval, while the y-axis shows the proportion of "Right" responses, which reflects the likelihood of selecting ts2 as the longer duration compared to ts1. Each data point indicates the proportion of "Right" responses for a specific ts1 and ts2 pair, and the colored curves represent the Gaussian cumulative density functions fitted to each ts1 condition. For instance, for ts1=400 ms, the Point of Subjective Equality (PSE) is 438.90 ms with a standard deviation (SD) of 274.68 ms. These values vary across conditions, revealing differences in participants' temporal discrimination at different time intervals.

The analysis of the psychometric curves and Gaussian fits in Figure 1 shows that both the PSE and SD tend to increase as ts1 increases. This rise in PSE suggests that, for longer ts1 intervals, participants require an even longer ts2 interval to perceive it as longer, indicating a temporal scaling effect. The increasing SD values with higher ts1 further indicate greater uncertainty in temporal perception for longer durations. Thus, Figure 1 not only highlights a linear relationship between ts1 and PSE but also reflects a trend of increased temporal uncertainty (SD) as ts1 grows.

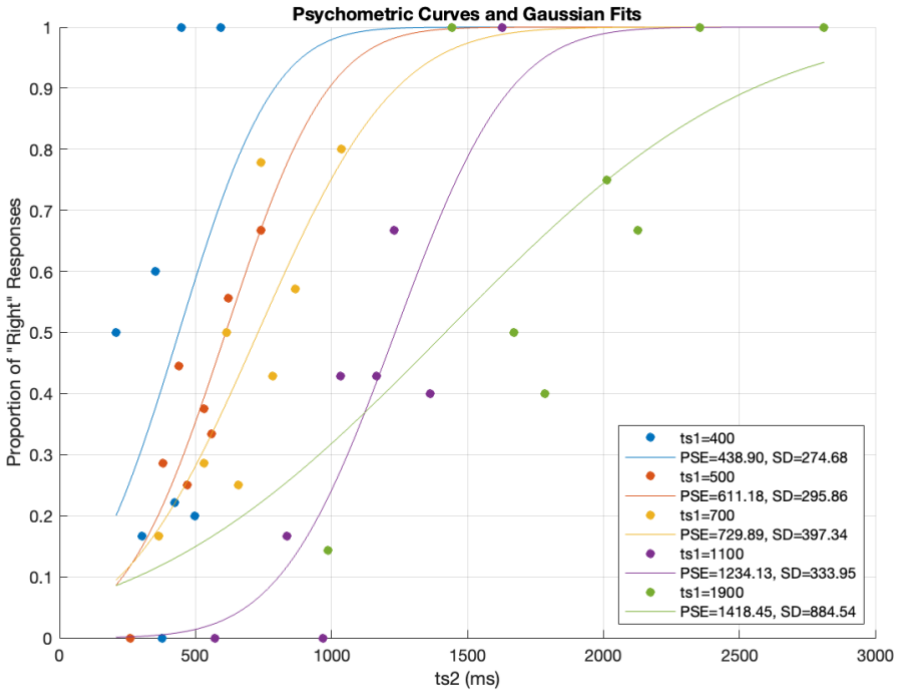

Figure 1: Psychometric curves and Gaussian fits illustrating the effect of varying ts1 on the proportion of correct responses as a function of ts2 (ms).

2. Relationship Between ts1 and Point of Subjective Equality (PSE)

Figure 2 presents the relationship between Interval Duration (ts1) and the Point of Subjective Equality (PSE), demonstrating how participants' temporal perception shifts with varying initial intervals. The x-axis represents ts1, the first interval presented, while the y-axis shows the corresponding PSE values. Each data point indicates the PSE for a specific ts1, and the linear regression line provides an overall fit for the data. This linear trend suggests a consistent increase in PSE with increasing ts1, indicating that participants require proportionally longer ts2 intervals to perceive them as equal to longer ts1 intervals.

The positive slope of the linear fit in Figure 2 supports the notion of a scaling effect in temporal perception, where the perception of equal intervals shifts with the duration of ts1. This trend suggests that participants adjust their judgment of time based on the initial interval, with longer ts1 values leading to correspondingly higher PSE values. The analysis illustrated in Figure 2 highlights a systematic relationship between ts1 and perceived temporal equality, shedding light on participants' adaptive mechanisms in temporal discrimination tasks.

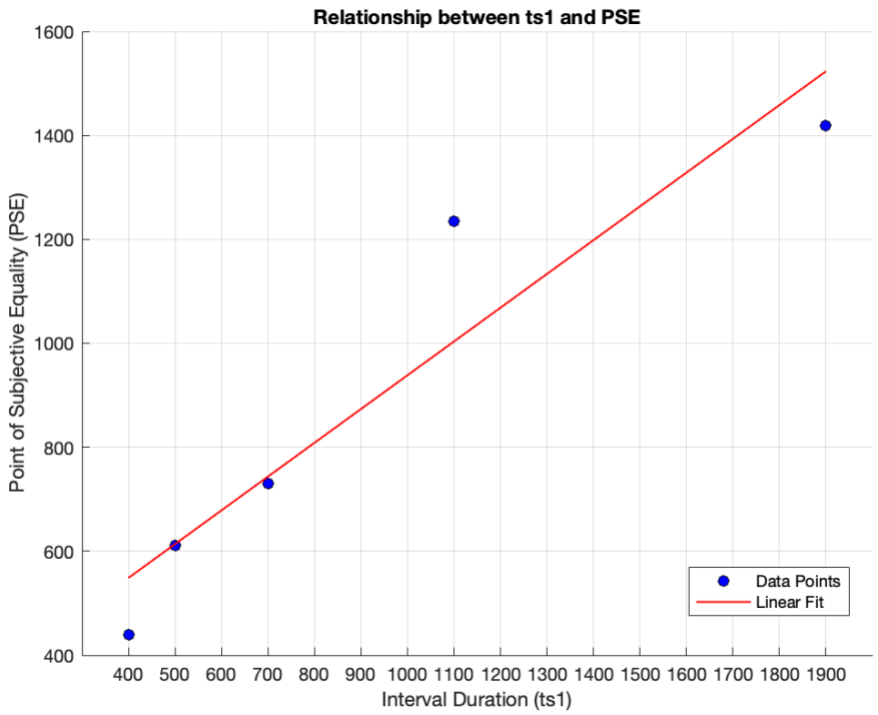

Figure 2: Linear relationship between ts1 (interval duration) and PSE (Point of Subjective Equality), highlighting the proportional increase of PSE with longer ts1 values.

3. Analyzing the Variation of Mean Bias Across Interval Durations

Based on the provided plot (Figure 3), the analysis demonstrates how mean bias varies across different interval durations (ts1). The mean bias reflects the difference between the target interval and the participant's response, with values close to zero indicating accurate temporal judgments. In this case, we observe noticeable fluctuations in mean bias across the intervals, including a positive peak suggesting overestimation and a negative dip indicating underestimation at specific durations. These variations suggest a non-linear relationship between interval duration and bias, which could stem from perceptual inaccuracies or cognitive strategies such as the regression toward the mean effect, where participants' judgments shift toward average interval values.

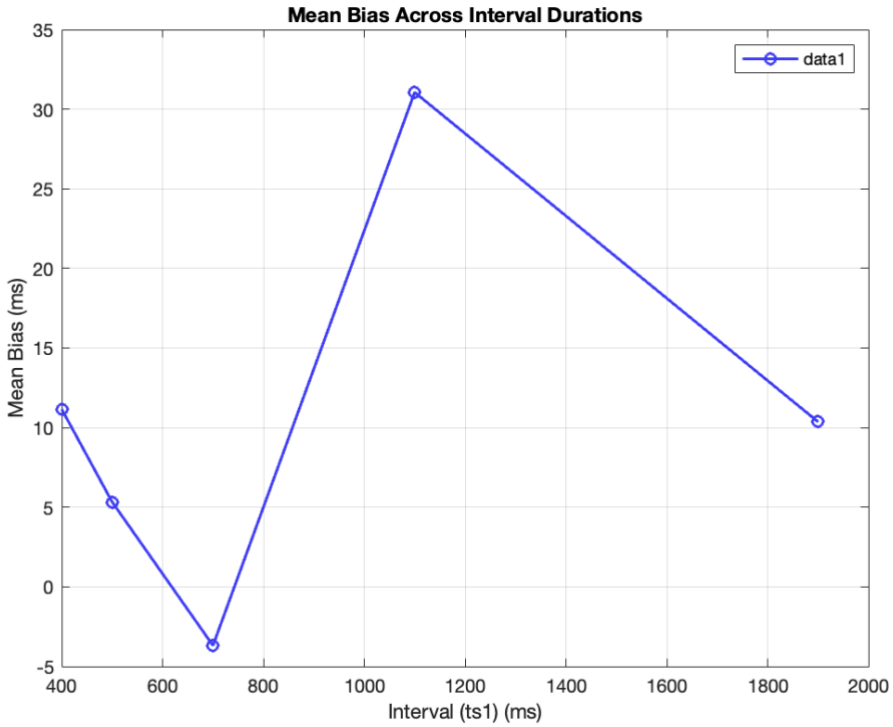

Figure 3: Mean bias as a function of interval duration. Positive values indicate overestimation, while negative values reflect underestimation, revealing variability in temporal judgments.