Validating Modifications to the Sensory Gating ERP Paradigm

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**Purpose**
- To validate the sensory gating ERP paradigm with the following modifications:
  - Have the participants watch a silent movie vs. stars at a fixed asterisk
  - Increase the auditory stimulus intensity
  - Employ more trials of paired-clicks
- To examine if there is a gender effect in the sensory gating ERP paradigm

**Introduction**
The traditional auditory sensory gating paradigm has been extensively studied in individuals with schizophrenia (e.g., Nagamoto et al., 1989; Olincy et al., 2002). However, studies sometimes fail to demonstrate group differences in sensory gating due to the large within-group variance (e.g., Kemmer, et al., 2002; Olincy, et al., 2002). In order to demonstrate significant group differences in sensory gating between persons with and without disorders, designing a valid and reliable sensory gating ERP paradigm that minimizes the within-group variance is important. For instance, Kisley et al. (2004) and Marshall et al. (2004) have used a modified gating paradigm (i.e., watching a silent movie) in studies involving schizophrenia patients and healthy children, respectively. Nevertheless, children displayed a large within-group variance (i.e., Marshall et al., 2004), but less variance was found in adults (i.e., Kisley et al., 2004). This inconsistent finding between adults and children may be due to the maturational effect, attention, numbers of trials, and stimulus intensity. While et al. (2006) demonstrated that the stimulus intensity plays a key role in sensory gating. While et al. (2005) also found that adult females display less gating and more variance than males during stress. The purpose of this study is to validate the modified gating paradigm compared to the traditional gating paradigm using two different stimulus intensities. Gender differences in gating performance were examined.

**Method**

**Participants**
- Thirty-one healthy adult volunteers with no known disorders (16 females & 15 males) between 20 and 38 years of age ($M = 3.69$).
- Findings for Sensory Gating – P50
  - P50 T/C Ratio: The partial Pearson correlation with the following modifications:
    - Thirty-one healthy adult volunteers with no known disorders (16 females & 15 males) between 20 and 38 years of age ($M = 3.69$).
  - Correlations between Two Paradigms
  - Findings for Sensory Gating – N100
    - N100 T/C Ratio: The intensity x gender paradigm - see Figure 1.

**Procedures**
- Participants were randomly assigned into either high intensity or low intensity group.
- Each participant engaged in both traditional and modified sensory gating ERP paradigms in a counterbalanced order.
- Traditional Sensory Gating ERP Paradigm
  - Participants stared at a fixed asterisk on the computer screen while listening to clicks
  - Figures
    - N100 Amplitude: $r = .774$, $p < .0005$ - see Figure 1.
    - P50 T/C Ratio = .61 (.34)

**Modified Sensory Gating ERP Paradigm**
- Participants watched a silent video while listening to clicks
- Participants were seated in a relaxed position with eyes opened
- Figures
  - N100 Amplitude: $r = .774$, $p < .0005$ - see Figure 1.

**Findings for Sensory Gating – P50**
- P50 T/C Ratio: The planned comparisons from the intensity x Paradigm x Click ANOVA revealed significant differences between the amplitude of Conditioning click and that of Test click for each level of the intensity and paradigm - see Figure 1.
- P50 T/C Ratio: The intensity x gender x Paradigm ANOVA revealed:
  - Intensity ($F_{1,27} = 4.70, p = .039$)
  - Gender ($F_{1,27} = 1.05, p = .315$)
  - Paradigm ($F_{1,27} = 1.4, p = .714$)

**Findings for Sensory Gating – N100**
- N100 Amplitude: $r = .774$, $p < .0005$ - see Figure 1.
- N100 T/C Ratio: The intensity x gender x Paradigm ANOVA revealed:
  - Intensity ($F_{1,27} = 4.36, p = .046$)
  - Gender ($F_{1,27} = .86, p = .362$)
  - Paradigm ($F_{1,27} = 1.66, p = .208$)

**Gender Differences**
- P50 T/C Ratio: Although the ANOVA did not show the gender effect, the planned comparisons indicated:
  - High intensity in the traditional paradigm: Females ($M = .72, SD = .44$) vs. Males ($M = .50, SD = .16$) – $t = 2.369, p < .025$
  - Low intensity in the traditional paradigm: Females ($M = 1.02, SD = .43$) vs. Males ($M = .83, SD = .46$) – $t = 1.863, p < .05$

**Conclusions**
The modified paradigm is as valid and reliable as, and perhaps better than the traditional paradigm for studying sensory gating in adults based on these findings:
- Participants displayed stronger gating and less variance for the high intensity compared to low intensity clicks.
- The mean T/C ratio differences between paradigms were minimal but the variance was 46% lower in the modified paradigm (high intensity while watching a movie) as compared to the traditional paradigm.
- Females displayed less gating than males in the traditional paradigm but not in the modified paradigm.

**References**


