



Comparison of peripersonal space in front and rear spaces

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SUPPLEMENTARY INFORMATION

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Results of slow/fast condition in the speed estimation task

Here, we confirmed whether participants perceived the difference in sound speeds (slow/normal/fast). Note that the normal condition required 12 experimental trials each whereas the slow/fast condition required only 6 trials each (ANOVA was performed with the unbalanced data) because the slow/fast conditions were conducted as fillers.

Data analysis

Statistical analyses were conducted using *anovakun* (Iseki 2020) package for R. A three-way repeated-measures analysis of variance (ANOVA) was performed to determine the mean speed estimation with the speed conditions (3; slow/normal/fast), direction conditions (2; front/rear), and distance conditions (3; near/middle/far) as within-participant factors. For the ANOVA, we assessed whether the assumption of sphericity was met using Mauchly's sphericity test. We adjusted the degree of freedom using Greenhouse-Geisser's epsilon when the assumption of sphericity was violated. Multiple comparisons were conducted using Holm's correction.

Results and Discussion

An ANOVA revealed that the main effects of speed and distance, and the interaction between them were significant (speed: $F(2, 306) = 8.62, p = .006, \eta_p^2 = .324$; distance: $F(2, 306) = 22.06, p < .001, \eta_p^2 = .550$; speed \times distance: $F(2.3, 41.34) = 3.82, p = .025, \eta_p^2 = .175$), while the other combinations were not significant between distance and direction conditions (direction: $F(1, 306) = 3.36, p = .083, \eta_p^2 = .157$; speed \times direction: $F(1.31, 23.52) = 0.15, p = .771, \eta_p^2 = .008$; direction \times distance: $F(1.61, 20.73) = 0.03, p = .948, \eta_p^2 = .002$; speed \times direction \times distance: $F(4, 72) = 0.54, p = .707, \eta_p^2 = .029$). A further analysis of the interaction effect revealed that the perceived speed increased proportionally with a decrease in the physical distance of sound stimuli presentation for

all speed conditions ($F_s(1.36, 24.53) > 10.78, p_s < .001, \eta_p^2s > .375$). Multiple comparisons of the effect of speed revealed significant differences for all combinations ($p_s < .030$). In summary, the results were similar for all speed conditions (i.e., perceived speed increased with a decrease in the physical distance of auditory stimuli presentation), although the perceived speed increased as the physical speed increased.

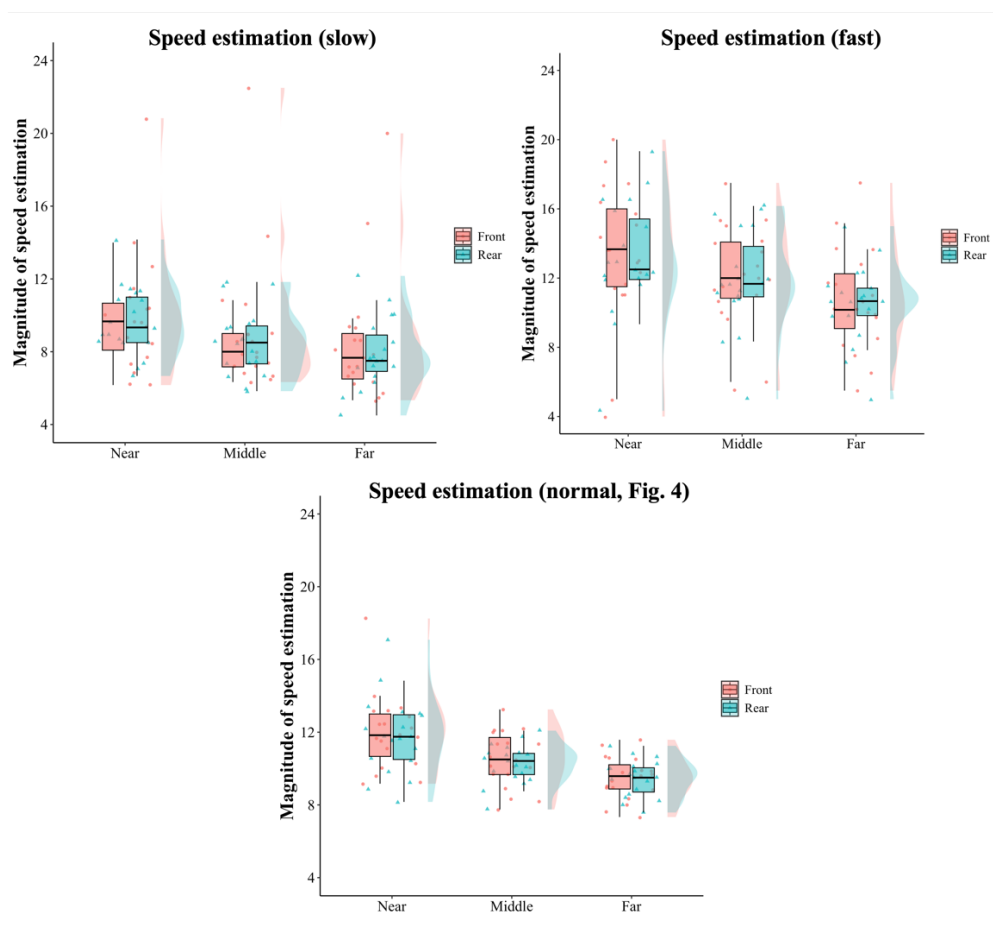


Fig. S1 Raincloud plots including individual data points, boxplots, and density functions for estimated sound speed at each distance in each direction condition. Larger values indicate that the participants perceived a faster speed of sound stimulus. The 95% confidence interval is indicated by the ends of the vertical error bar. Plots were generated using *ggplot2* package for R.

Results of raw RT analysis

Here, we confirmed whether there were difference in the RTs before computing the facilitation effect (i.e., probe RT – baseline RT). If there was a difference in Baseline reaction times (trials in which only the tactile stimulus was delivered) between the front and rear conditions, this would suggest that RTs might be faster in the rear in general, with or without the facilitation effect induced by the probe.

Data analysis

Statistical analyses were conducted using R software (version 4.1.2) and JASP (version 0.16). As with the main study, we included only trials where the RTs were within ± 3 standard deviations from the mean for each of the probe distance and baseline conditions. This outlier exclusion procedure for the RT was applied once per condition per participant after the data were log-transformed.

For the baseline RTs, the Shapiro-Wilk test was used to test for normality. The results accepted the normality of the data. Then, a paired t test was performed between direction conditions.

For the RTs in the audio-tactile condition, the Shapiro-Wilk test rejected the normality of the data using the *ARTool* (Elkin et al. 2021; Wobbrock et al. 2011) package for R. Then, we performed an aligned rank transform for the data, and then performed a two-way repeated measures ANOVA with the direction and distance as within-subject factors.

Results and Discussion

Figure S2 shows the mean RTs for each condition. For the baseline RTs, there was no significant difference ($t(18) = 0.07, p = .943, d = .074$). For the RTs in the audio-tactile

condition, ANOVA revealed significant main effects for direction ($F(1, 90) = 6.39, p = .013, \eta_p^2 = .066$) and distance ($F(2, 90) = 5.06, p = .008, \eta_p^2 = .101$), but none for interaction ($F(2, 90) = 0.04, p = .952, \eta_p^2 = .001$). Multiple comparisons of the effect of distance revealed a significant difference between near and far conditions (near vs. middle: $p = .080$, near vs. far: $p = .007$, middle vs. far: $p = .302$). These results imply that the difference in RTs between the front and rear in the PPS task is caused by the task irrelevant approaching probe.

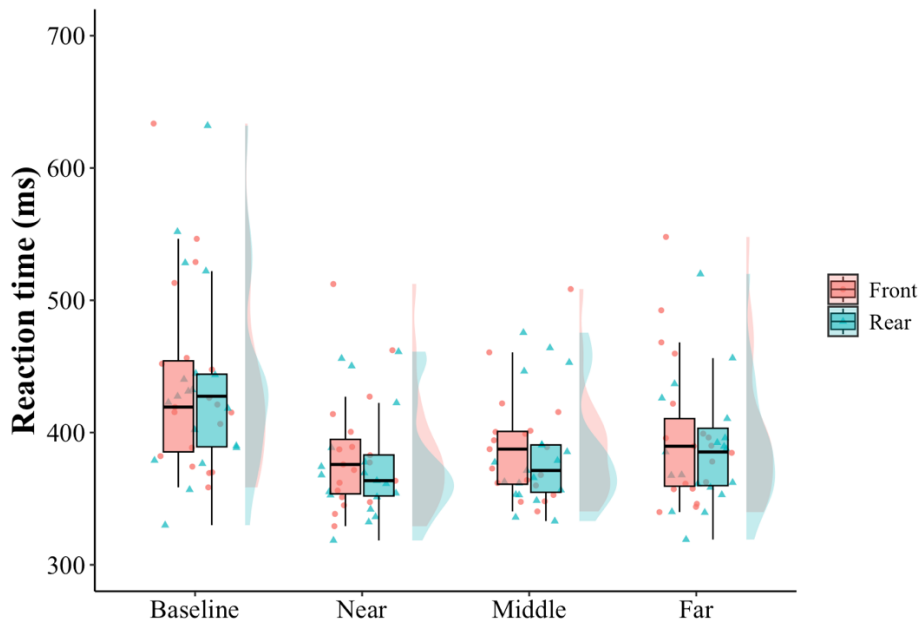


Fig. S2 Raincloud plots including individual data points, boxplots, and density functions for reaction times (RTs) at each distance (and baseline) in each direction condition. The 95% confidence interval is indicated by the ends of the vertical error bar. Plots were generated using *ggplot2* package for R.

Supplementary References

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