Frequency of each BPM type in Sec. IV C

We analyzed whether BPMs occurred more frequently in IDS. Considering that BPMs are used to convey the pragmatic intentions of the speaker, and the conversation between mothers and their infants is more likely to be interactive, such that the need to communicate pragmatic intentions tends to occur more frequently, it is reasonable to predict that BPMs will occur more frequently in IDS than in ADS. We tested this prediction by analyzing the frequency of BPMs in two ways. First, the frequency of BPMs relative to the total number of APs in each register was compared between ADS and IDS. Means are shown in the figure below.
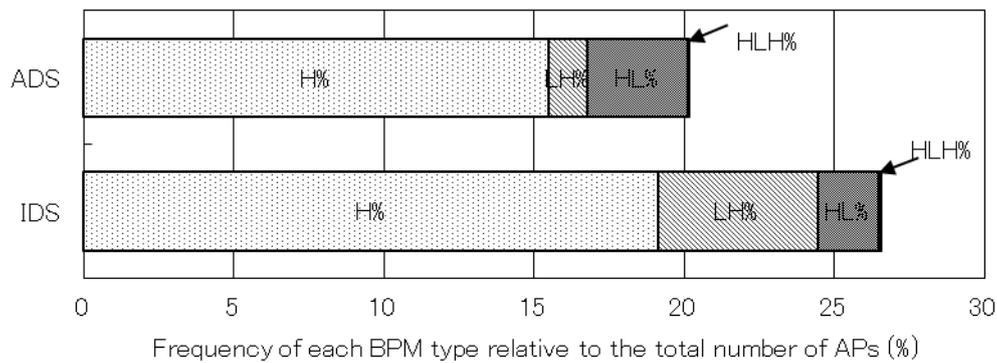

FIG 1. Frequency of each BPM type relative to the total number of APs.

Results were submitted to repeated measure 2 x 3 Analyses of Variances (ANOVAs), with the frequency of each BPM relative to the total number of APs as the dependent variable. Register (ADS and IDS) and BPM types (H%, LH%, and HL%) are both within-subjects factors. The data for HLH% was not included in the analysis, due to an extremely low occurrence of this BPM type (less than 0.1% of total BPMs in both registers). The results revealed a significant main effect of Register [$F(1, 20) = 71.79^{***}$], a significant main effect of BPM type [$F(2, 40) = 77.58^{***}$], and a significant interaction [$F(2, 40) = 48.10^{***}$]. Since we found significant interactions, the effect of Register was tested separately for each BPM type. H% and LH% BPMs occurred significantly more frequently in IDS, whereas HL% occurred more frequently in ADS. As predicted, the results revealed that BPMs occurred more frequently in IDS than ADS overall. At the same time, it was not the case that all types of BPMs occurred more frequently in IDS.

Secondly, to examine the relative frequency of BPM types within each register, we calculated the frequency of each BPM type occurrence as a proportion of total number of BPMs in each register. The results are depicted in the figure below. We conducted paired *t*-tests for each BPM type separately. The results showed that H% and HL% occurred significantly more frequently in ADS [for H% $t(20)$ = -2.550*; for HL% $t(20)$= -9.379***], whereas LH% occurred more frequently in IDS [$t(20)$ = 11.959***]. H% was the most frequently used BPM in both registers, and it occurred more often in IDS in terms of raw frequency. In terms of the proportion of total BPMs, however, it was chosen more frequently in ADS than IDS.
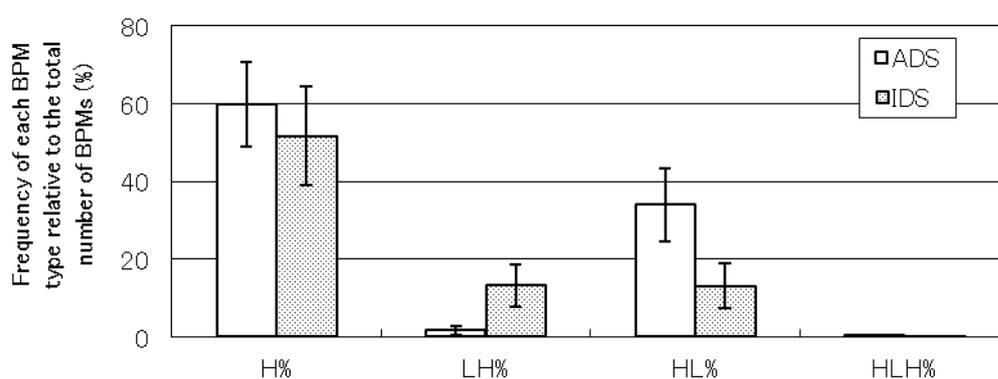

FIG 2. Frequency of each BPM type relative to the total number of BPMs. Error bars represent standard deviation.

Importantly, LH% occurred considerably more frequently in IDS. As discussed in Sec. II, one of the main functions of LH% is question-marking (Venditti, 2005). Fernald and Morikawa (1993) have reported that Japanese mothers do not use questions as frequently as American mothers do. On the other hand, the proportion of LH% BPMs in the present study is comparable to the proportion of questions produced with prosodic cues by the two American mothers in Soderstrom et al. (2008). It seems that Japanese and American mothers employ question-marking prosody at a comparable rate. Since attracting infants' attention is one important characteristics of IDS (Ferguson, 1977; Newport et al., 1977), the frequent use of LH% may serve to facilitate interaction between the mother and the infant.

References

Ferguson, C. A. (1977). "Baby talk as a simplified register," in *Talking to Children: Language Input and Acquisition* , edited by C. E. Snow and C. A. Ferguson

(Cambridge University Press, London), pp. 209-235.

Fernald, A., and Morikawa, H. (1993). "Common themes and cultural variations in Japanese and American mothers' speech to infants," Child Development **64**, 637-656.

Newport, E., Gleitman, H. and Gleitman, L. (1977) "Mother, I'd rather do it myself: some effects and non-effects of maternal speech style," in *Talking to Children: Language Input and Acquisition* , edited by C. E. Snow and C. A. Ferguson (Cambridge University Press, London), pp. 109-150.

Soderstrom, M. (2007). "Beyond babytalk: Re-evaluating the nature and content of speech input to preverbal infants," *Developmental Review* **27**, 501-532.

Venditti, J., Maekawa, K., and Beckman, M.E. (2008). "Prominence marking in the Japanese intonation system," in *Handbook of Japanese Linguistics*, edited by S. Miyagawa, and M. Saito (Oxford University Press: New York), 456-512.

Note: This is a supplemental material to the following paper. Please refer to it when referring to the information contained in this Supplemental Material.

Igarashi, Y., Nishikawa, K., Tanaka, K., & Mazuka, R. (2013).Phonological theory informs the analysis of intonational exaggeration in Japanese infant-directed speech. The Journal of Acoustical Society of America, 134(2), 1283-1294.