

Research Questions

- Does the menstrual cycle phase affect the perceived attractiveness and trustworthiness of women's voices?
- If so, are blind individuals more sensitive to cycle-dependent changes in women's voices than normally sighted individuals?

Introduction

- Many studies suggest that women's voices sound more attractive during the fertile phase of their menstrual cycle^{1,2,3}
- Blind individuals have been found to possess superior voice processing capabilities due to neuronal plasticity⁴
- Here we tested whether blind individuals are more sensitive than sighted individuals and whether speech content plays a role

Method

- The voice of 20 female speakers ($M = 22.7$ years, $SD = 2.3$; non-smokers, regular menstrual cycle, no hormonal contraception, no pregnancy, no breastfeeding) was recorded when speaking different sentences around ovulation and in the luteal phase
- Three sentences were of neutral content and three sentences suggested an affiliation context in which you want get to know someone
- Ovulation was determined by means of LH ovulation tests and the cycle phases were confirmed by means of hormone analysis from saliva⁵



- For each speaker, voice recordings of both cycle phases were paired
- 60 sighted raters (30 women, $M = 27.3$ years, $SD = 11.6$) were asked to choose the voice sample of each pair that sounded more trustworthy (Block 1) or more attractive (Block 2) in a two-alternative forced choice paradigm
- 23 blind raters (visual acuity less than 0.1; 15 women, $M = 53.0$ years, $SD = 15.0$) were given the same task



- All participants reported to have no hearing problems
- In addition to the perceptual ratings, voice recordings were analysed acoustically using Praat software⁶

References

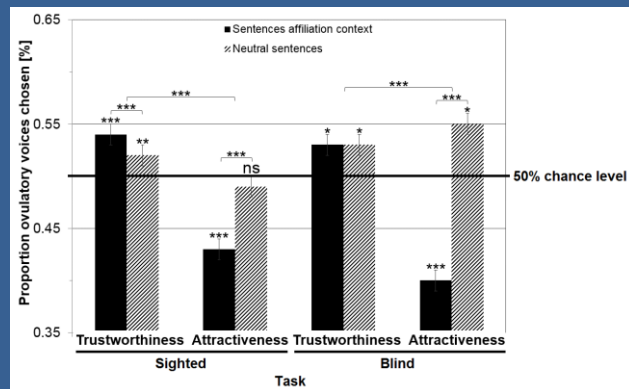
1. Bryant, G. A., & Haselton, M. G. (2009). Vocal cues of ovulation in human females. *Biology Letters*, 5(1), 12-15. doi: 10.1098/rsbl.2008.0507
2. Pipitone, R. N., & Gallup, G. G., Jr. (2008). Women's voice attractiveness varies across the menstrual cycle. *Evolution and Human Behavior*, 29(4), 268-274. doi: 10.1016/j.evolhumbehav.2008.02.001
3. Fischer, J., Semple, S., Fickenscher, G., Juergens, R., Kruse, E., Heistermann, M., & Amir, O. (2011). Do women's voices provide cues of the likelihood of ovulation? The importance of sampling regime. *PLoS ONE*, 6(9), e24490. doi: 10.1371/journal.pone.0024490
4. Föcker, J., Best, A., Hölig, C., & Röder, B. (2012). The superiority in voice processing of the blind arises from neural plasticity at sensory processing stages. *Neuropsychologia*, 50(8), 2056-2067. doi: 10.1016/j.neuropsychologia.2012.05.006
5. Lobmaier, J. S., Probst, F., Perrett, D. I., & Heinrichs, M. (2015). Menstrual cycle phase affects discrimination of infant cuteness. *Hormones and Behavior*, 70, 1-6.
6. Boersma, P., & Weenink, D. (2014). Praat: doing phonetics by computer [Computer program]. Version 6.0.29, retrieved 24 May 2017 from <http://www.praat.org/>
7. Maner, J. K., & Miller, S. L. (2014). Hormones and social monitoring: Menstrual cycle shifts in progesterone underlie women's sensitivity to social information. *Evolution & Human Behavior*, 35. doi: 10.1016/j.evolhumbehav.2013.09.001

Conclusions

- Sighted and blind individuals do not differ in sensitivity to subtle changes in women's voices
- We found that women's voices sound more trustworthy around ovulation and more attractive in the luteal phase

Results

- A 2 (task) × 2 (sentence content) ANOVA with "vision" and "rater's sex" as between-subjects factors revealed a significant effect of "task" ($F(1,79) = 26.980, p < .001, \eta_p^2 = .26$), an effect of "sentence content" ($F(1,79) = 16.277, p < .001, \eta_p^2 = .17$), a significant "sentence content × vision" interaction ($F(1,79) = 4.763, p = .032, \eta_p^2 = .06$), and a "task × sentence content" interaction ($F(1,79) = 25.946, p < .001, \eta_p^2 = .25$)
- The factors "vision" ($p = .57$) and "rater's sex" ($p = .56$) were not significant
- "Task": In the trustworthiness rating, ovulatory voices were preferred as sounding **more trustworthy** ($M = .53, SE = .006$); in the attractiveness rating, voices in the luteal phase were preferred as sounding **more attractive** ($M = .47, SE = .01$)
- "Sentence content": In sentences with affiliation context, voices in the luteal phase were preferred ($M = .48, SE = .008$); in neutral sentences, ovulatory voices were preferred ($M = .52, SE = .008$)
- "Sentence content × vision" interaction: Blind individuals more often chose luteal phase voices in sentences with affiliation context ($M = .47, SD = .05, t(22) = -3.215, p = .004, r = .57$) and ovulatory voices in sentences with neutral content ($M = .54, SD = .06, t(22) = 2.977, p = .007, r = .54$); in sighted individuals there was no such effect (both p 's > .15)
- "Task × sentence content" interaction: In the trustworthiness rating, **ovulatory voices were perceived as being more trustworthy** irrespective of sentence content (affiliation sentences $M = .54, SD = .07, t(82) = 5.477, p < .001, r = .52$; neutral sentences $M = .52, SD = .07, t(82) = 3.373, p = .001, r = .35$); in the attractiveness rating, voices in the **luteal phase** were perceived as being **more attractive**, but only in sentences with affiliation context (affiliation sentences $M = .42, SD = .11, t(82) = -6.557, p < .001, r = .59$; neutral sentences $p = .52$)



- Phonetic analysis revealed no cycle-dependent differences

Discussion

- Women might express increased affiliation motivation⁷ during the luteal phase in their voices, but only in sentences with social content
- Speech content is relevant when assessing the attractiveness of women's voices
- Raters seem to be more sensitive than phonetic software
- Limitations: Different sample sizes, age differences, sex ratio not well-balanced in blind sample