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Voice Familiarity and Memory Accuracy: Advancing Earwitness Testimony through Online Experimental Evidence

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Abstract: ***This study investigates the influence of voice familiarity on memory recall and recognition accuracy within forensic contexts. Despite substantial research on eyewitness testimony, earwitness memory remains underexplored. The study adopts a quasi-experimental design to examine how familiarity with a speaker's voice affects auditory memory performance. Participants (N=30) were divided into an Experimental Group (familiar with the speaker's voice) and a Control Group (unfamiliar with the voice). Each group completed free recall, cued recall, and recognition tasks after exposure to pre-recorded audio clips. Findings reveal that voice familiarity significantly enhances free recall, cued recall, and recognition accuracy. Familiarity facilitates cognitive processing, leading to superior performance in the Experimental Group. Interestingly, confidence levels did not differ significantly between the groups. These results align with previous research emphasizing the role of familiarity in auditory memory but challenge assumptions about the confidence-accuracy relationship.***

Keywords: Earwitness testimony, voice familiarity, auditory memory, cued recall, recognition accuracy, forensic psychology

1.Introduction with Brief Literature Review

In forensic psychology, Earwitness memory is the ability to recall and recognize voices heard in forensic contexts is a crucial and so far, underexplored area. The researches in auditory memory especially in invoice familiarity are limited, while extensive research has been conducted on eyewitness memory (Smith et al., 2023). The ability to precisely identify voices is critical in forensic investigations as well as in the court where visual evidence is absent or unreliable. For instance, voice-based evidence is often integral in understanding the factors that influence earwitness memory and can enhance investigative outcomes in cybercrime scenarios, basically in bank frauds happening through fake calls.

An individual's previous exposure to a particular voice is known as Voice Familiarity which significantly influences memory recall and recognition accuracy in forensic settings. In 2022, researchers found that familiar voices of close acquaintances or romantic partners have been shown to enhance the accuracy of identity recognition even in challenging auditory environments (Kanber et al., 2022). Nonetheless, the reliability of earwitness testimony is still a concern due to factors such as voice disguise and the quality of speech samples (Sherrin, 2015). This study looks for the existing research gaps by exploring the influence of voice familiarity on auditory memory recall and recognition accuracy and its application in forensic investigations.

Voice familiarity has been found to improve both recall and recognition accuracy in forensic contexts. Familiar voices increase the higher identification accuracy, specifically in sequential lineup procedures. The influence of prior interactions is enhancing correct identifications in target-present scenarios (Lavan et al., 2018). Auditory memory is influenced by cognitive processes and familiarity with a voice. This can enhance the improved recall accuracy (Zimmermann, Moscovitch, & Alain, 2015). Familiarity affects confidence and recognition accuracy (Clark, 1997).

In 2011, Mullennix et al found that voice typicality, language familiarity, and exposure duration play significant roles in auditory memory performance. High-typical voices are more prone to confusion than other high-typical voices. This situation potentially complicates recognition tasks. Familiarity with a speaker's language enhances accuracy in target-present lineups. It is further emphasized on the role of contextual familiarity in earwitness testimony (Philippon et al., 2007). Moreover, longer voice exposure times are correlated with superior recognition performance in short - and long-term memory tasks (Cook & Wilding, 2001).

In spite of these findings, challenges in earwitness reliability persist. For example, auditory information may interfere with visual encoding; propounding the modality of the witnessed event affects memory performance (Golob & Starr, 2004). While pre-lineup confidence does not necessarily predict accuracy. Post-lineup confidence correlates with a willingness to testify reflecting the complex relationship between confidence and accuracy in voice recognition (Van der Heiden et al., 2022). Van der Heiden et al., in 2022 observed that the presence of an earwitness also influences mock jurors' decisions and the broader implications of auditory memory in judicial contexts. The present study aims to understand the effects of voice familiarity on memory accuracy in a controlled setting by adopting a quasi-experimental design.

Aim: To explore the effect of familiarity with a voice affects free recall cued recall, and recognition accuracy.

Objectives

1. To understand the effect of voice familiarity on free recall accuracy in experimental group and control group.
2. To analyze the effect of voice familiarity on cued recall accuracy.
3. To examine the differences in recognition accuracy between participants familiar and unfamiliar with the voice.
4. To explore the role of familiarity in confidence levels in memory recall and recognition.

Method

This study employed a non-equivalent quasi-experimental design with two groups:

- Participants familiar with the voice of the speaker (Experimental Group)
- Participants unfamiliar with the speaker's voice (Control Group)

Data were collected online using pre-recorded audio clips. The independent variable was voice familiarity. The dependent variables were:

- Free recall accuracy
- Cued recall accuracy
- Recognition accuracy

For the recognition accuracy testing, the professor's voice was manipulated using an AI tool. Consequently, the content of the voice remained the same, but the tone, pitch, and other vocal features were altered.
Participants

A convenience sample of 30 participants was recruited from the University of Kerala. The Experimental Group consisted of 15 participants familiar with the voice (a professor's voice), while the Control Group had 15 participants unfamiliar with the voice.

2.Materials

The materials used included:

- Pre-recorded audio clips of the speaker (two versions: a 40-second clip for general listening and a 49-second clip for the exposure phase).
- A cognitive load task and recall tests were administered via Google Forms.

Procedure

Participants in the Experimental Group were exposed to a familiar voice, while the Control Group was exposed to the same voice without prior familiarity. Both groups completed a cognitive load task before proceeding with free recall, cued recall, and recognition tests. All participants were then asked to assess their confidence levels in the recall and recognition responses.

Hypotheses

- H1: There is a significant difference in free recall accuracy between the Experimental and Control Groups.
- H2: There is a significant difference in cued recall performance between the Experimental and Control Groups.
- H3: There is a significant difference in recognition accuracy between the Experimental and Control Groups.
- H0: There is no difference in confidence percentage between the Experimental and Control Groups.

3.Results and Discussion

Table 1

Variable	Mean Rank Experimental	Mean Rank Control	Sum of Ranks Experimental	Sum of Ranks Control	U Value	P Value
Free Recall Accuracy	21.43	9.57	286.00	179.00	59.000	.019
Cued Recall performance	21.43	9.57	321.50	143.50	23.500	0.000
Recognition Accuracy	19.00	12.00	285.00	180.00	60.000	0.003
Confidence	16.67	14.33	250.00	215.00	95.000	0.453

Free Recall Accuracy

Table 2

Group	N	Mean Rank	Sum of Ranks
Experimental	15	19.07	286.00
Control	15	11.93	179.00

Hypothesis 1: There is a significant difference in free recall accuracy between the Experimental and Control Groups.

It is shown in Table 1 that the Mann-Whitney U test indicated a statistically significant difference in free recall accuracy between the groups (U = 59.000, p =.019), with the Experimental Group demonstrating higher accuracy than the Control Group. Hence, the null hypothesis is rejected, and H1 is accepted.

Cued Recall Performance

Table 3

Group	N	Mean Rank	Sum of Ranks
Experimental	**15**	**21.43**	**321.50**
Control	**15**	**9.57**	**143.50**

Hypothesis 2: There is a significant difference in cued recall performance between the Experimental and Control Groups.

It is shown in Table 1 that the Mann-Whitney U test results were highly significant (U = 23.500, p = 0.000) showed that cued recall accuracy of the Experimental Group better than the Control Group. Hence, the null hypothesis rejected and H2 is accepted.

Recognition Accuracy

Table 4

Group	N	Mean Rank	Sum of Ranks
Experimental	**15**	**19.00**	**285.00**
Control	**15**	**12.00**	**180.00**

Hypothesis 3: There is a significant difference in recognition accuracy between the Experimental and Control Groups.

Table 1 presents the recognition accuracy results were significantly different between groups (U = 60.000, p = 0.003), the Experimental Group outperformed the Control Group. Therefore, H3 is accepted and null hypothesis is rejected.

Confidence

Table 5

Group	N	Mean Rank	Sum of Ranks
Experimental	**15**	**16.67**	**250.00**
Control	**15**	**14.33**	**215.00**

Hypothesis 0: There is no difference in confidence percentage between the Experimental and Control Groups.

Table 1 illustrates the results were shown that there was no significant difference in confidence levels between the two groups (U = 95.000, p = 0.453). Hence null hypothesis is accepted.

4. Discussion

The findings of this study suggest that familiarity with a speaker's voice positively impacts memory recall and recognition accuracy in earwitness settings. Participants familiar with the voice were better at accurately recalling and recognizing the audio information, aligning with previous findings on cognitive processing benefits from familiarity (Pautz et al., 2023). The lack of effect on confidence indicates that while voice familiarity enhances memory accuracy, it does not influence participants' subjective confidence levels in their responses.

These findings have substantial implications for forensic psychology. Incorporating voice familiarity into earwitness identification protocols could potentially improve the reliability of auditory memory in legal settings, such as court testimonies. However, confidence measures should be interpreted with caution, as they may not reliably reflect recall accuracy.

5.Conclusion and Limitations

In conclusion, voice familiarity enhances earwitness recall and recognition accuracy, suggesting that familiar voices may be processed more effectively in memory. The study's limitations include a small sample size, reliance on non-parametric tests, and potential confounding variables not accounted for in the experimental design. Future studies should aim to replicate these findings with larger, more diverse samples and explore additional auditory stimuli to confirm the generalizability of the results.

References

[1] Bull, R., & Clifford, B. R. (1984). Earwitness voice recognition accuracy. Expert Evidence, 1 (1), 1–14.
[2] Clark, S. (1997). A familiarity-based account of confidence–accuracy inversions in recognition memory. Journal of Experimental Psychology: Learning, Memory, and Cognition, 23 (1), 232–238. https://doi.org/10.1037/0278-7393.23.1.232
[3] Cook, S., & Wilding, J. (2001). Earwitness testimony: Effects of exposure and familiarity on voice recognition accuracy. Psychology, Crime & Law, 7 (2), 123–132. https://doi.org/10.1080/10683160108401791
[4] Cook, S., & Wilding, J. (2001). Earwitness testimony: Effects of exposure and attention on the face overshadowing effect. British Journal of Psychology, 92 (4), 617–629. https://doi.org/10.1348/000712601162374
[5] Golob, E. J., & Starr, A. (2004). Visual encoding differentially affects auditory event-related potentials during working memory retrieval. Psychophysiology, 41 (2), 186–192. https://doi.org/10.1111/j.1469-8986.2004.00154. x
[6] Kanber, E., Lavan, N., & McGettigan, C. (2022). Highly accurate and robust identity perception from personally familiar voices. Journal of Experimental Psychology: General, 151 (4), 897–911. https://doi.org/10.1037/xge0001112
[7] Lavan, N., Burton, A. M., Scott, S. K., & McGettigan, C. (2018). Flexible voices: Identity perception from

variable vocal signals. Trends in Cognitive Sciences, 23 (5), 399–410.
[8] Mullennix, J. W., Ross, A., Smith, C., Kuykendall, K., Conard, J., & Barb, S. (2011). Typicality effects on memory for voice: Implications for earwitness testimony. Applied Cognitive Psychology, 25 (1), 29–34. https://doi.org/10.1002/acp.1635
[9] Pautz, N., McDougall, K., Mueller-Johnson, K., Nolan, F., Paver, A., & Smith, H. M. J. (2023). Identifying unfamiliar voices: Examining the system variables of sample duration and parade size. Quarterly Journal of Experimental Psychology, 76 (12), 2804–2822. https://doi.org/10.1177/17470218231155738
[10] Philippon, A., Cherryman, J., Bull, R., & Vrij, A. (2007). Earwitness identification performance: The effect of language, target, deliberate strategies, and indirect measures. Applied Cognitive Psychology, 21 (5), 539–550. https://doi.org/10.1002/acp.1296
[11] Sherrin, C. (2015). Earwitness evidence: The reliability of voice identifications. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2628313
[12] Smith, A. M., Ayala, N. T., & Ying, R. C. (2023). The rule-out procedure: A signal-detection-informed approach to the collection of eyewitness identification evidence. Psychology, Public Policy, and Law, 29 (1), 19–31. https://doi.org/10.1037/law0000373
[13] Stevenage, S. V., Edey, R., Keay, R., Morrison, R., & Robertson, D. J. (2024). Familiarity is key: Exploring the effect of familiarity on the face-voice correlation. Brain Sciences, 14 (2), 112. https://doi.org/10.3390/brainsci14020112
[14] Van der Heiden, R. M. A., Kenemans, J. L., Donker, S. F., & Janssen, C. P. (2022). The effect of cognitive load on auditory susceptibility during automated driving. Human Factors, 64 (7), 1195–1209. https://doi.org/10.1177/0018720821998850
[15] Yarmey, A. D. (1994). Earwitness evidence: Memory for a perpetrator's voice. In D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), Adult eyewitness testimony: Current trends and developments (pp.101–124). Cambridge University Press. https://doi.org/10.1017/CBO9780511759192.006
[16] Zimmermann, J., Moscovitch, M., & Alain, C. (2015). Attending to auditory memory. Brain Research, 1640, 298–307. https://doi.org/10.1016/j.brainres.2015.11.032