Journal of Educational and Developmental Psychology; Vol. 12, No. 2; 2022
ISSN 1927-0526 E-ISSN 1927-0534
Published by Canadian Center of Science and Education

Changing the Volume of Online Lectures: Does Audio Level Affect Learning Quality?

Zhuyue Jiang[1]

[1] Ranney School, Tinton Falls, New Jersey, United States of America

Correspondence: Zhuyue Jiang, Ranney School, Tinton Falls, NJ 07724, USA. Tel: 1-848-242-0999. E-mail: 2023jiangz@myranney.org

Received: September 6, 2021 Accepted: July 3, 2022 Online Published: July 20, 2022

doi:10.5539/jedp.v12n2p77 URL: http://doi.org/10.5539/jedp.v12n2p77

Abstract

Due to the onset of the COVID-19 pandemic, students have increasingly begun to learn virtually, often watching online lectures. Some students might believe that turning up the volume on those lectures can enhance their learning efficiency, and this assumption is supported by a 2009 study (Rhodes & Castel, 2009) where students were shown to have higher judgments of learning (JOLs) for louder words compared to quiet words. I designed a within-participants experiment under two conditions to study the real effect of louder audio on learning by making the participants watch videos at different volumes, answer several questions regarding their JOLs, and complete one quiz for each video. The final data suggest that louder audio had significant influence neither on students' JOLs nor on their assessment performance. Although the online participants' assessment performance presented a similar result as that in the Rhodes and Castel study, the finding of no influence of volume on JOLs contradicts Rhodes and Castel.

Keywords: assessment performance, judgment of learning (JOL), volume

1. Introduction

From early 2020 to the present, human life changed tremendously because of the coronavirus. In order to minimize viral spread, everyone, especially students, started working and learning virtually by participating in online meetings and watching video lectures. This transition came with consequences and growing pains. Students had fewer chances to interact with classmates and teachers, and their engagement levels dropped as they were not coming to the campus. Frustrated with the non-interactive nature of online learning, some students may have turned their video lectures' volume up in the belief that low volume could damage the quality of the content. The present research is designed to study the effects of increasing the volume of teaching videos on students' judgments of learning (JOLs) and actual performance.

In a study conducted in 2009 that investigated the effect of volume on judgments of learning (Rhodes & Castel, 2009), two experiments were designed that demonstrated a metacognitive illusion for auditory information in which actual recall did not match judgments of learning, a term defined as assessments that people make about how well they have learned particular information. The first experiment showed that the participants generally had higher JOLs on the loud words than on the quiet words. The second experiment showed that the participants were more likely to choose the quiet words to restudy. Together, these experiments demonstrated that choice of volume strongly impacts JOLs and restudy choices. The study by Rhodes and Castel suggests that students might turn up their volume in order to increase their learning effectiveness.

Another study conducted in 1995 showed how turning up the volume might impact JOLs (Mazzoni & Nelson, 1995). In their Experiment 1, Mazzoni and Nelson found that JOLs were higher and more accurate after encoding by means of intentional learning than after encoding by means of incidental learning. In my experiment, turning up the volume can be interpreted as an intentional act seeking a better learning efficiency/quality, while leaving the volume at its original level can be understood as an incidental learning experience. Therefore, Mazzoni and Nelson's study suggests the possibility that intentionally turning up the volume on video lecture could result in higher and more accurate JOLs of the students.

Although students' higher JOLs produced by turning up the volume might be metacognitive illusions, the cue-utilization view in metacognition sees JOLs as based on inferences from mnemonic cues (Koriat, 2008). In this view, underlying mnemonic-based heuristics, mental shortcut based on memory are the essential elements referenced in cue-utilization, rather than reliance on intrinsic factors, such as attention and motivation (Koriat, 1997). For instance, in a study conducted in 2005, two experiments presented that the students had a general higher JOLs if they shortened the study time, and vice versa (Koriat & Ma'ayan, 2005). Based on the above, I speculate that louder volume could be identified as one of the mnemonic-based heuristics as it is an easy, shortcut way to enhance learning quality if the original volume is relatively low. Students watching louder video lectures would then have higher JOLs, believing that they are obtaining difficult knowledge in a time-efficient way.

Yet another study investigated how the mere-repeated-exposure paradigm could influence people's general preferences (Zajonc, 2001). Mere-repeated-exposure means people tend to develop a preference for things merely because they are familiar with them. In this paper, Robert Bolesław Zajonc mentioned that people sometimes unconsciously prefer language that has positive connotations. As examples, we prefer to use words such as *good*, *on*, *first* over words like *bad*, *off*, *last*. Similarly, in a different study conducted by Rhodes and Castel, JOLs were influenced by font size, as larger font sizes, which connote positive meaning compared to smaller font sizes, received higher JOLs (Rhodes & Castel, 2008). As loud connotes positive and quiet connotes negative, I speculated that students might have higher JOLs and/or actual assessment performance due to their preference for "positive" feelings and effects brought by loud videos.

Higher learning efficiency/quality and JOLs are of course related to the students' familiarity with the knowledge itself. A study conducted in 1992 found that Confidence Level is based on retrieval of elements of the right answer, while Feeling of Knowing, or JOLs, is derived from recency or familiarity effects (Costermans, Lories, & Ansay, 1992). In general, greater familiarity can be achieved by better understanding of acoustic information (background sound), memory dynamics, and perceptual-motor skill of the online lecture content. First, a 2004 study concludes that recall of memory, that is the assessment performance, was enhanced with increasing acoustic familiarity of the content (Korenman & Peynircioğlu, 2004). Meanwhile, a study conducted in 1998 points out that the difference between higher and lower familiarity of the content is based on the degree to which certain memory dynamics are understood (Benjamin, Bjork, & Schwartz, 1998). Thinking along the line that louder volume produces better acoustic familiarity, I speculated that louder volume could also provide the audience a better understanding of these memory dynamics, since louder and clearer acoustic information allows stronger contrast for the subject matter of a video lecture than quieter and ambiguous acoustic information. Finally, a study conducted in 2001 conveys the idea that students' ease of access to memory and their JOLs are based on how much perceptual-motor skills were applied to study the content (Simon & Bjork, 2001). As perceptual-motor skill refers to students' ability to interact with their environment by use of their senses, the encoding of acoustic information is extremely important as indeed hearing is one of the major senses. For these reasons, it seemed plausible that louder volume would provide students with greater familiarity, and accordingly also with higher JOLs.

The students' JOLs also include an aspect of how fluently they memorized the content, referred to as encoding fluency. A study conducted in 2004 suggests that greater encoding fluency is likely to result in greater JOLs, since it plays a critical role in the formation of metacognitive judgments (Hertzog, Dunlosky, Robinson, & Kidder, 2003). This is supported by two other studies conducted in 2001 and 2004. The study conducted in 2001 highlights fluency of generation at study as a cue for JOLs (Matvey, Dunlosky, & Guttentag, 2001), while the study conducted in 2004 stresses the point that people have more favorable attitudes toward the subject if it can be more easily and fluently processed (Lee, 2004). In other words, the level of encoding fluency can be seen as how easily the knowledge comes to the students' minds. According to a study conducted in 1993, immediate prior exposure to knowledge before assessment is a determinant of encoding fluency (Kelley & Lindsay, 1993). As louder volume produces clearer content, it is a vital factor for better prior exposure to knowledge and better encoding fluency for the students. Therefore, I expect students' JOLs and assessment performance to increase with the increase in volume level of the video lecture.

Louder volume might seem a trivial component when watching online lectures, but I specifically focused on this aspect for my experiment since it was presumed to increase students' JOLs. According to a study conducted in 2008, JOLs can decisively impact learnings since they directly influence people's study choices (Metcalfe & Finn, 2008). What exactly people decide to study in the future based on a given metacognitive experience depends on the naive theory of mental processes they bring to bear, including ease or difficulty to access the information, and the outcome of students' future study choices can be highly variable. As the above articles provide evidence that louder volume positively affects students' JOLs, it seems likely that students will choose the topics they encountered at higher volume to continue to study. Hence, it is important to observe the effect of louder volume because it might directly/indirectly affect students' future study decisions.

Based on the conditions and articles listed above, I predicted that videos with louder volume would lend participants a sense of security, as they assume they can hear the content more clearly, resulting in higher judgments of learning. In addition, I expected that the volume level would not significantly affect their learning quality or the outcome of the relative quizzes.

2. Method

2.1 Participants

One hundred and six online participants were recruited from the Prolific website. They were composed of seventy-two females and thirty-three males who had an average age of twenty-six years old and different educational degrees. They were randomly assigned to two groups to watch different videos based on their dates of birth (either even or odd).

2.2 Materials

Four videos were recorded for the entire experiment. The knowledge in each video was presented via cartoon animation, with a voiceover explaining the content. Each video was about five minutes long.

Each video had a different combination of volume and content. A five-minute astrobiology video lecture with loud volume and a five-minute anesthesia video lecture with quiet volume were prepared for the group of participants who had even birthdates. Meanwhile, the same astrobiology video lecture with quiet volume and the same anesthesia video lecture with loud volume were prepared for the group of participants who had odd birthdates.

An additional white noise calibration video was provided for participants to select an initial volume that they were comfortable with at the beginning.

2.3 Design and Procedure

The experiment had a within-participants design with two conditions. As stated above, the group of participants who had even birthdates watched the loud astrobiology video first and quiet anesthesia video second; the group of participants who had odd birthdates watched the quiet astrobiology video first and loud anesthesia video second,

Each participant was informed that they would watch two videos and answer questions. Then, they were asked to adjust their initial volume based on the calibration video. They were directed to pay close attention and were not allowed to adjust the volume during the rest of the experiment.

Participants were automatically separated into two groups based on their dates of birth. The participants with even birthdates watched the loud astrobiology video first; the participants with odd birthdates watched the quiet astrobiology video first. Immediately after watching the video, all participants were asked the following questions to self-assess their learning quality: (1) “How much did you like the video lecture?”, (2) “How much did you think that you learned from the video lecture?”, (3) “Do you think that you can do well on the quiz?” The participants were given a rating scale between one and five, with one being *did not like much*/*did not learn much*/*can’t do well* and five being *liked a lot*/*learned a lot*/*can definitely do well*.

The participants with even birthdates then watched the quiet anesthesia video while the participants with odd birthdates watched the loud anesthesia video. After watching the video, they answered the same set of self-assessment questions.

The participants were then asked to finish an eight-question quiz for each video, with seven multiple-choice questions and one short answer question. Quizzes were after all videos and self-assessments.

After completing the quizzes, the participants were asked the following yes/no questions to prevent inaccurate data: (1) “Did you have prior knowledge about astrobiology?”, (2) “Did you have prior knowledge about anesthesia?”, (3) “Did you adjust your volume at any time after the initial white noise video was over?”, (4) “Was it loud enough that you could hear both videos?”, (5) “Was one video louder than the other?”

Lastly, the participants were asked the following basic questions about their personal information: (1) “What is your gender?”, (2) “How old are you?”, (3) “Do you speak English fluently?”, (4) “What is your highest education attained?”, (5) “What country are you living in?”

3. Results

Based on the data from the first survey that assessed how much the participants liked the videos, means and standard deviations were collected, and ANOVAs (Analysis of Variance models) were generated. The ANOVAs used Type 3 Sums of Squares method. For the group of participants who had even birthdates, the mean and standard deviation for the loud astrobiology video were respectively 4.08 and 0.94; the mean and standard deviation for the quiet anesthesia video were respectively 4.33 and 0.72. For the group of participants who had odd birthdates, the mean and standard deviation for the quiet astrobiology video were respectively 4.09 and 0.86; the mean and standard deviation for the loud anesthesia video were respectively 4.38 and 0.72.

To examine whether participants liked videos in the loud or quiet condition better, an ANOVA comparing the loud and quiet conditions was run and revealed no statistically significant effect, $F(1, 104) = 0.05$, $p = 0.83$. I also examined across all participants whether there was a preference for the anesthesia video compared to the astrobiology video, and this ANOVA revealed a statistically significant preference for the anesthesia video $F(1, 104) = 7.39$, $p = 0.008$. As expected, an ANOVA examining between-subjects effects (Group 1 vs. Group 2) found no statistically significant effect, $F(1, 104) = 0.04$, $p = 0.844$. In summary, participants liked the anesthesia video more than the astrobiology video, but changes in volume produced no statistically significant effects.

I next looked at JOLs for the two groups of participants via the second survey question asking how much they thought they learned from the video lectures. For the group of participants with even birthdates, the mean and standard deviation for the loud astrobiology video were respectively 3.65 and 0.89; the mean and standard deviation for the quiet anesthesia video were respectively 3.90 and 0.90. For the group of participants with odd birthdates, the mean and standard deviation for the quiet astrobiology video were respectively 3.74 and 0.83; the mean and standard deviation for the loud anesthesia video were respectively 4.05 and 0.89.

An ANOVA for these JOLs that compared the loud and quiet conditions revealed no statistically significant effect, $F(1, 104) = 0.11$, $p = 0.745$. Participants generally thought they learned more in the anesthesia video compared to the astrobiology video, with the ANOVA revealing a statistically significant effect, $F(1, 104) = 9.18$, $p = 0.003$. Once again, an ANOVA examining between-subjects effects found no statistically significant effect, $F(1, 104) = 0.77$, $p = 0.383$. In summary, participants reported higher JOLs for the anesthesia video than for the astrobiology video, while my initial hypothesis was contradicted as changes in volume produced no statistically effect on JOLs.

Regarding the third survey question asking how well the participants thought they could do on the quizzes, another measure for JOLs, I observed similar mean ratings across the test group for all conditions. For the group of participants with even birthdates, the mean and standard deviation for the loud astrobiology video were respectively 3.48 and 0.85; the mean and standard deviation for the quiet anesthesia video were respectively 3.23 and 0.88. For the group of participants with odd birthdates, the mean and standard deviation for the quiet astrobiology video were respectively 3.59 and 0.94; the mean and standard deviation for the loud anesthesia video were respectively 3.48 and 0.84.

An ANOVA that compared the loud and quiet conditions revealed no statistically significant effect, $F(1, 104) = 0.66$, $p = 0.417$. When examining across all participants whether they thought they could do better on the anesthesia quiz compared to the astrobiology quiz, the ANOVA also revealed no statistically significant effect, $F(1,104) = 3.86$, $p = 0.052$. However, this is on the verge of statistical significance, which is $p=0.05$. Finally, I again looked at between-subjects effects, for which the ANOVA found no statistically significant effect, $F(1, 104) = 1.52$, $p = 0.220$. In summary, volume had no statistically significant effect on participants' self-predictions of quiz performance.

For the ultimate scores of both quizzes, I observed similar means and standard deviations for all conditions. For the group of participants with even birthdates, the mean and standard deviation for the loud astrobiology video were respectively 4.71 and 1.46; the mean and standard deviation for the quiet anesthesia video were respectively 4.79 and 1.52. For the group of participants with odd birthdates, the mean and standard deviation for the quiet astrobiology video were respectively 4.76 and 1.64; the mean and standard deviation for the loud anesthesia video were respectively 4.90 and 1.41.

Regarding the post-video lecture quiz performance, an ANOVA that compared the loud and quiet conditions revealed no statistically significant effect, $F(1, 104) = 0.03$, $p = 0.857$. Across the entire test population, participants scored similarly on the anesthesia quiz compared to the astrobiology quiz, with the ANOVA also revealing no statistically significant effect, $F(1, 104) = 0.53$, $p = 0.467$. Once again, between-subjects effects ANOVA analysis found no statistically significant effect, $F(1, 104) = 0.09$, $p = 0.759$. In summary, neither changes in volume nor the topic of the video lecture produced any statistically significant effect on students' quiz performance.

There were 58 participants who could tell the difference between the volumes of the video lectures, and the remaining 48 participants thought the volumes of both video lectures were the same. These data indicate that over half of the participants realized that one video is louder than another. However, this fact still did not influence their preference on either video lecture or confidence on either quiz, meaning that the volume does not have a significant effect on the participants' judgments of learning.

4. General Discussion

At the outset, I predicted that volume is an extremely important factor that would quite noticeably influence the participants' assessment performance and assessment performance and JOLs are different and somewhat independent, as I conjectured that higher volume would bring them a more secure sense, resulting in them believing they can do better on the quizzes. However, as shown in the present results, volume did not significantly influence how much the participants liked the video, their judgments of learning or real assessment performance.

As the COVID-19 world situation continuously fluctuates and influences human life, virtual learning has become a phenomenal solution for which students could pursue their education under this hard circumstance. The results of my experiment suggest the ineffectiveness of audio adjustment on enhancing learning efficiency. To the end of assisting students' study efficiency, further research on various online study methods and their effectiveness should be conducted.

5. Acknowledgements

This research was supported by a $450 grant from Liujun Jiang. Nate Kornell, Michael Graves, and Dinghua Liu also provided invaluable support.

References

Benjamin, A. S., Bjork, R. A., & Schwartz, B. L. (1998). The mismeasure of memory: When retrieval fluency is misleading as a metamnemonic index. *Journal of Experimental Psychology: General, 127*(1), 55-68. https://doi.org/10.1037/0096-3445.127.1.55

Costermans, J., Lories, G., & Ansay, C. (1992). Confidence level and feeling of knowing in question answering: The weight of inferential processes. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18*(1), 142-150. https://doi.org/10.1037/0278-7393.18.1.142

Hertzog, C., Dunlosky, J., Robinson, A. E., & Kidder, D. P. (2003). Encoding fluency is a cue used for judgments about learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 29*(1), 22-34. https://doi.org/10.1037/0278-7393.29.1.22

Kelley, C. M., & Lindsay, D. S. (1993). Remembering mistaken for knowing: Ease of retrieval as a basis for confidence in answers to general knowledge questions. *Journal of Memory and Language*, *32*(1), 1-24. https://doi.org/10.1006/jmla.1993.1001

Korenman, L. M., & Peynircioğlu, Z. F. (2004). The role of familiarity in episodic memory and metamemory for music. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 30*(4), 917-922. https://doi.org/10.1037/0278-7393.30.4.917

Koriat, A. (2008). Easy comes, easy goes? The link between learning and remembering and its exploitation in metacognition. *Memory & Cognition, 36*, 416-428. https://doi.org/10.3758/MC.36.2.416

Koriat, A. (1997). Monitoring one's own knowledge during study: A cue-utilization approach to judgments of learning. *Journal of Experimental Psychology: General, 126*(4), 349-370. https://doi.org/10.1037/0096-3445.126.4.349

Koriat, A., & Ma'ayan, H. (2005). The effects of encoding fluency and retrieval fluency on judgments of learning. *Journal of Memory and Language*, *52*(4), 478-492. https://doi.org/10.1016/j.jml.2005.01.001

Lee, A. Y. (2004). The prevalence of metacognitive routes to judgment. *Journal of Consumer Psychology*, *14*(4), 349-355. https://doi.org/10.1207/s15327663jcp1404_3

Matvey, G., Dunlosky, J., & Guttentag, R. (2001). Fluency of retrieval at study affects judgments of learning (JOLs): An analytic or nonanalytic basis for JOLs? *Memory & Cognition* 29, 222-233. https://doi.org/10.3758/BF03194916

Mazzoni, G., & Nelson, T. O. (1995). Judgments of learning are affected by the kind of encoding in ways that cannot be attributed to the level of recall. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*(5), 1263-1274. https://doi.org/10.1037/0278-7393.21.5.1263

Metcalfe, J., & Finn, B. (2008). Evidence that judgments of learning are causally related to study choice. *Psychonomic Bulletin & Review, 15*, 174-179. https://doi.org/10.3758/PBR.15.1.174

Rhodes, M. G., & Castel, A. D. (2008). Memory predictions are influenced by perceptual information: Evidence for metacognitive illusions. *Journal of Experimental Psychology: General, 137*(4), 615-625.

https://doi.org/10.1037/a0013684

Rhodes, M. G., & Castel, A. D. (2009). Metacognitive illusions for auditory information: Effects on monitoring and control. *Psychonomic Bulletin & Review*, *16*(3), 550-554. https://doi.org/10.3758/PBR.16.3.550

Simon, D. A., & Bjork, R. A. (2001). Metacognition in motor learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 27*(4), 907-912. https://doi.org/10.1037/0278-7393.27.4.907

Zajonc, R. B. (2001). Mere exposure: A gateway to the subliminal. *Current Directions in Psychological Science*, *10*(6), 224-228. https://doi.org/10.1111/1467-8721.00154