

## **BAB VI**

### **PENUTUP**

#### **A. Kesimpulan**

*Cybersickness* sebagai penyakit dunia *virtual* masih dirasakan oleh sebagian besar pengguna *virtual reality*. Gejala dari *cybersickness* antara lain pusing, mual, muntah, dan keringat dingin layaknya mabuk perjalanan. Berdasarkan penelitian yang telah dilakukan, kebanyakan responden yang berperan sebagai pengguna merasakan gejala *cybersickness*. Tingkat kenyamanan pengguna berbeda-beda tergantung dari pengalaman bermain pengguna selama memainkan permainan Metaverse Gamelan Demung *Virtual Reality*. Hasil penelitian juga menunjukkan efek yang dirasakan pengguna setelah memainkan permainan Metaverse Gamelan Demung *Virtual Reality* yaitu pengguna menjadi pusing. Hal ini disebabkan dari kecepatan pergeseran kamera *player* pada *controller* dalam permainan Metaverse Gamelan Demung *Virtual Reality*. Sama halnya dengan dunia nyata yang berputar terlalu cepat dapat menimbulkan gejala pusing, mual, atau keringat dingin yang disebut sebagai *motion sickness*. Persamaan dari *cybersickness* dan *motion sickness* yaitu gejala yang dialami, sedangkan perbedaan antara *cybersickness* dan *motion sickness* terletak pada penyebabnya. *Cybersickness* disebabkan oleh paparan dunia *virtual*, sedangkan *motion sickness* disebabkan dari dunia nyata.

Hasil penelitian juga menunjukkan pengguna mengalami *cybersickness* disebabkan waktu yang makin lama berada dalam dunia *virtual* maka, gejala *cybersickness* akan makin terasa. Hal lain penyebab *cybersickness* dari berbagai penelitian menyatakan *cybersickness* juga disebabkan karena ketidakcocokan antara sinyal vestibular dan visual. Ketika visual melihat pergerakan dalam dunia *virtual* maka, akan memberi sinyal pengguna sedang bergerak. Namun, vestibular tidak merasakan pergerakan dari dunia nyata sehingga, vestibular memberikan sinyal tidak bergerak. Akibat dari ketidakcocokan ini menimbulkan gejala *cybersickness* sehingga, pengguna

mengalami penyakit dunia *virtual*. Namun, *cybersickness* masih belum dapat diketahui secara pasti penyebab utamanya karena masalah *cybersickness* berhubungan langsung antara perangkat keras *virtual reality* dan fisiologi manusia. Hal yang dapat dilakukan pengembang perangkat lunak *virtual reality* adalah mengoptimalkan gejala *cybersickness* yang dapat dirasakan oleh penggunanya. Berdasarkan hasil analisis, rekomendasi pengoptimalan yang dapat diberikan kepada pengembang permainan Metaverse Gamelan Demung *Virtual Reality* yaitu mengurangi kecepatan pergeseran kamera *player* pada *controller*.

#### B. Saran

Saran yang dapat diberikan kepada pengembang permainan Metaverse Gamelan Demung *Virtual Reality* agar pengguna dapat memainkan permainan gamelan Demung dengan baik tanpa terlalu merasakan gejala *cybersickness* yaitu dilakukan pengoptimalan. Pengoptimalan yang dapat dilakukan oleh pengembang permainan adalah mengurangi kecepatan pergeseran kamera *player* pada *controller* dalam permainan Metaverse Gamelan Demung *Virtual Reality* sehingga, pengguna dapat lebih lama berada dalam dunia *virtual* dan nyaman memainkan permainan Metaverse Gamelan Demung *Virtual Reality*.

## DAFTAR PUSTAKA

- [1] Y. Farmani and R. J. Teather, "Evaluating discrete viewpoint control to reduce cybersickness in virtual reality," *Virtual Real.*, vol. 24, no. 4, pp. 645–664, 2020, doi: 10.1007/s10055-020-00425-x.
- [2] J. Becker, *Traditional Music in Modern Java*. 2019.
- [3] T. Arttu, "Effect of Visual Realism on Cybersickness in Virtual Reality," pp. 1–49, 2018, [Online]. Available: <http://jultika.oulu.fi/files/nbnfioulu-201802091218.pdf>
- [4] C. Curry, R. Li, N. Peterson, and T. A. Stoffregen, "Cybersickness In Virtual Reality Head Mounted Displays Examining The Influence Of Sex Differences And Vehicle Control," *Int. J. Hum. Comput. Interact.*, 2020, doi: 10.1080/10447318.2020.1726108.
- [5] E. Chang, H. T. Kim, and B. Yoo, "Virtual Reality Sickness: A Review of Causes and Measurements," *Int. J. Hum. Comput. Interact.*, vol. 36, no. 17, pp. 1658–1682, 2020, doi: 10.1080/10447318.2020.1778351.
- [6] T. Kuosmanen, "The effect of visual detail on cybersickness: Predicting symptom severity using spatial velocity," no. April, 2019.
- [7] A. Agić, E. Murseli, L. Mandić, and L. Skorin-Kapov, "The impact of different navigation speeds on cybersickness and stress level in VR," *J. Graph. Eng. Des.*, vol. 11, no. 1, pp. 5–11, 2020, doi: 10.24867/JGED-2020-1-005.
- [8] M. Farshid, J. Paschen, T. Eriksson, and J. Kietzmann, "Go boldly!: Explore augmented reality (AR), virtual reality (VR), and mixed reality (MR) for business," *Bus. Horiz.*, vol. 61, no. 5, pp. 657–663, 2018, doi: 10.1016/j.bushor.2018.05.009.
- [9] P. Kourtesis, S. Collina, L. A. A. Doumas, and S. E. MacPherson, "Technological Competence Is a Pre-condition for Effective Implementation of Virtual Reality Head Mounted Displays in Human Neuroscience: A Technological Review and Meta-Analysis," *Front. Hum. Neurosci.*, vol. 13,

- no. October, pp. 1–17, 2019, doi: 10.3389/fnhum.2019.00342.
- [10] S. Vlahovic, M. Suznjevic, and L. Skorin-Kapov, “A survey of challenges and methods for Quality of Experience assessment of interactive VR applications,” *J. Multimodal User Interfaces*, vol. 16, no. 3, pp. 1–35, 2022, doi: 10.1007/s12193-022-00388-0.
  - [11] A. A. Laghari, H. He, K. A. Memon, R. A. Laghari, I. A. Halepoto, and A. Khan, “Quality of experience (QoE) in Cloud Gaming Architectures: A Review,” *Multiagent Grid Syst.*, vol. 15, no. 3, pp. 289–304, 2019, doi: 10.3233/mgs-190313.
  - [12] A. Mehrfard, J. Fotouhi, G. Taylor, T. Forster, N. Navab, and B. Fuerst, “A Comparative Analysis of Virtual Reality Head-Mounted Display Systems,” 2019, [Online]. Available: <http://arxiv.org/abs/1912.02913>
  - [13] D. Kamińska *et al.*, “Virtual reality and its applications in education: Survey,” *Inf.*, vol. 10, no. 10, pp. 1–20, 2019, doi: 10.3390/info10100318.
  - [14] F. E. Jamiy and R. Marsh, “Survey on Depth Perception in Head Mounted Displays: Distance Estimation in Virtual Reality, Augmented Reality, and Mixed Reality,” *IET Journals Inst. Eng. Technol.*, vol. 13, pp. 707–712, 2019, doi: 10.1049/iet-ipr.2018.5920.
  - [15] S. Weech, S. Kenny, and M. Barnett-Cowan, “Presence and cybersickness in virtual reality are negatively related: A review,” *Front. Psychol.*, vol. 10, no. FEB, pp. 1–19, 2019, doi: 10.3389/fpsyg.2019.00158.
  - [16] Z. Lai, Y. C. Hu, Y. Cui, L. Sun, and N. Dai, “Engineering High-Quality Immersive Virtual Reality on Today’s Mobile Devices,” *Assoc. Comput. Mach.*, pp. 409–421, 2017, doi: 10.1145/3117811.3117815.
  - [17] S. Matthews, A. Uribe-Quevedo, and A. Theodorou, “Rendering Optimizations for Virtual Reality Using Eye-Tracking,” *Proc. - 2020 22nd Symp. Virtual Augment. Reality, SVR 2020*, pp. 398–405, 2020, doi: 10.1109/SVR51698.2020.00066.
  - [18] K. Petri, K. Feuerstein, S. Folster, F. Bariszlovich, K. Witte, and K. Petri, “Effects of Age , Gender , Familiarity with the Content , and Exposure Time on Cybersickness in Immersive Head-mounted Display Based Virtual

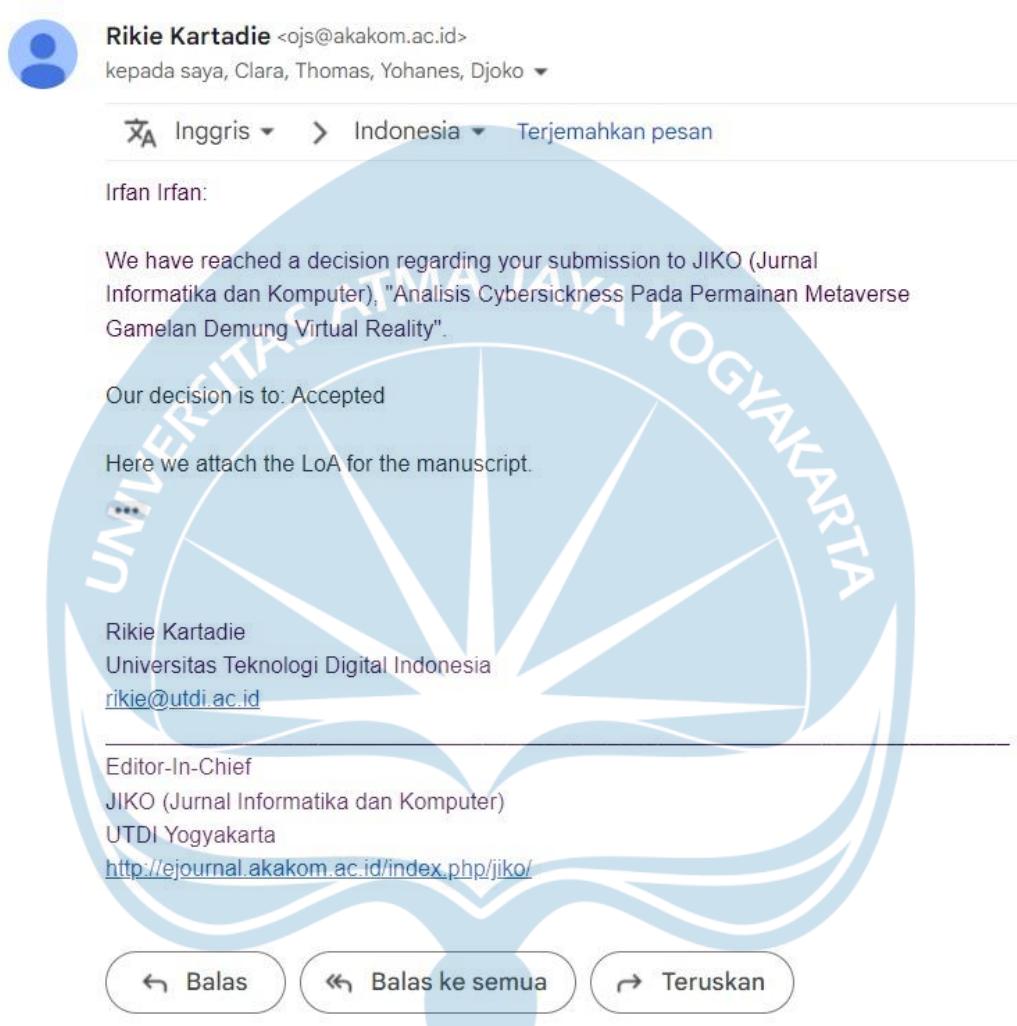
- Reality,” vol. 12, no. 2, pp. 107–121, 2020, doi: 10.5099/aj200200107.
- [19] M. Recenti *et al.*, “Toward Predicting Motion Sickness Using Virtual Reality and a Moving Platform Assessing Brain, Muscles, and Heart Signals,” *Front. Bioeng. Biotechnol.*, vol. 9, no. April, pp. 1–13, 2021, doi: 10.3389/fbioe.2021.635661.
- [20] U. A. Chattha, U. I. Janjua, F. Anwar, T. M. Madni, M. F. Cheema, and S. I. Janjua, “Motion Sickness in Virtual Reality: An Empirical Evaluation,” *IEEE Access*, vol. 8, pp. 130486–130499, 2020, doi: 10.1109/ACCESS.2020.3007076.
- [21] C. Y. Liao, S. K. Tai, R. C. Chen, and H. Hendry, “Using EEG and Deep Learning to Predict Motion Sickness under Wearing a Virtual Reality Device,” *IEEE Access*, vol. 8, pp. 126784–126796, 2020, doi: 10.1109/ACCESS.2020.3008165.
- [22] R. Lou, “Geometric deformation for reducing optic flow and cybersickness dose value in VR,” pp. 1–2, 2022.
- [23] A. M. Gavgani, F. R. Walker, D. M. Hodgson, and E. Nalivaiko, “A comparative study of cybersickness during exposure to virtual reality and ‘classic’ motion sickness: Are they different?,” *J. Appl. Physiol.*, vol. 125, no. 6, pp. 1670–1680, 2018, doi: 10.1152/japplphysiol.00338.2018.
- [24] D. Saredakis, A. Szpak, B. Birckhead, H. A. D. Keage, A. Rizzo, and T. Loetscher, “Factors associated with virtual reality sickness in head-mounted displays: A systematic review and meta-analysis,” *Front. Hum. Neurosci.*, vol. 14, no. March, 2020, doi: 10.3389/fnhum.2020.00096.
- [25] G. Albaum and R. A. Peterson, “Conducting Close-Ended Survey Research: Theory, Practice, and Insights,” *Int. J. Mark. Res.*, pp. 3–23, 2019.
- [26] H. Schuman and S. Presser, “Questions and Answers in Attitude Surveys: Experiments on Question Form, Wording, and Context,” *SAGE Publ.*, 2017.
- [27] V. Baburajan, J. D. A. E Silva, and F. C. Pereira, “Open-Ended Versus Closed-Ended Responses: A Comparison Study Using Topic Modeling and Factor Analysis,” *IEEE Trans. Intell. Transp. Syst.*, vol. 22, no. 4, pp. 2123–2132, 2021, doi: 10.1109/TITS.2020.3040904.

- [28] Y. Cho and S. Lee, “Investigating the Impact of Survey Design on Responses to Close-Ended Questions,” *Int. J. Soc. Res. Methodol.*, pp. 431–447, 2019.
- [29] Y. Cho and H. Lee, “Understanding Factors Influencing Response Quality in Close-Ended Online Surveys,” *Int. J. Soc. Res. Methodol.*, pp. 221–235, 2021.
- [30] R. Judson and W. Barfield, “The Impact of Gender on the Susceptibility to Simulator Sickness in Virtual Environment,” *J. virtual Real. Broadcast.*, 2018.
- [31] D. Y. Kim and Y. J. Kim, “Effects of Auditory Cues on Cybersickness in A Virtual Reality Environment,” *Appl. Ergon.*, 2020.
- [32] H. Benko and A. D. Wilson, “Factors Affecting Virtual Reality Sickness and Methods to Reduce its Occurrence: A Systematic Review and Meta Analysis,” *ACM Trans. Comput. Interact.*, pp. 1–47, 2021.
- [33] D. Delen and E. Eryarsoy, “Sample Size Determination. In Data Science for Business and Decision Making,” *Chapman and Hall/CRC*, pp. 175–189, 2018.
- [34] M. Rodriguez and L. Garcia, “Assessing the Margin of Error in Market Research Surveys,” *J. Mark. Res.*, pp. 25–40, 2020.
- [35] J. G. Bachman and R. K. Schutt, “The Practice of Research in Criminology and Criminal Justice,” *SAGE Publ.*, 2020.
- [36] M. Nahas, “Convenience Sampling,” *J. Egypt. Public Health Assoc.*, pp. 1–6, 2018, doi: 10.1186/s42506-018-0007-9.
- [37] S. Mackenzie, M. A. Vankosky, and B. A. Warick, “Convenience Sampling in Fisheries Research: Issues, Challenges, and Recommendations,” *Rev. Fish Biol. Fish.*, pp. 427–444, 2020.
- [38] S. Alkire, J. M. Roche, and A. Vaz, “Global multidimensional poverty index 2019 : illuminating inequalities,” *J. Econ. Inequal.*, pp. 209–235, 2019.
- [39] E. Johnson and M. Brown, “Measuring Anxiety Levels using a Dichotomous Scale: A Comparative Study,” *J. Psychol. Behav. Sci.*, 2021.
- [40] A. J. Berinsky, G. A. Huber, and G. S. Lenz, “Evaluating online labor markets for experimental research: Amazon.com’s mechanical turk,” *Polit.*

- Anal.*, vol. 20, no. 3, pp. 351–368, 2017, doi: 10.1093/pan/mpr057.
- [41] F. J. Fowler, “Survey Research Methods,” *CASAGE Publ.*, 2018.
- [42] R. F. DeVellis, “Scale Development: Theory and Applications,” *SAGE Publ.*, 2017.



## LAMPIRAN



Gambar *Letter of acceptance journal*