

Cognitive Load and Process of Learning to Apply a New Assessment Device for Gait Analysis

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Purpose

To investigate the challenges and facilitators for novice PTs to learn how to use a wearable gait analysis device and an observational gait assessment tool to collect gait data.

Participants

SPTs were recruited from the USD class of 2025 PT program through convenient sampling. Patient participants were recruited through the Student Learning Clinic (SLC) held at USD. Three SPTs participated in the user experience survey while learning and implementing both gait analysis tools. Four patient participants provided their consent to allow participating SPTs to implement gait analysis tools on them to collect their gait data.

Methods

Part 1: Demographic surveys were completed by both SPTs and patient participants.

Part 2: SPTs participated in a drawing to determine which gait assessment tool they would be learning and implementing first.

Wearable gait analysis device- PhysiLog: A small device that fits on a subject's shoe that records motion and sends data to the Gait Up GO Mobile Application for analysis.

Observational gait analysis tool- Gait Assessment and Intervention Tool (GAIT): This is used to score subjects on position of their whole body throughout the gait cycle.

Part 2a: For the wearable gait analysis device, SPTs completed the face-to-face training module with researchers. They then recorded the time took to complete the module and filled out the NASA TLX post-training survey to examine the cognitive load of the training module. SPTs then used the device to assess gait on a SLC patient. After assessing gait, SPTs completed the NASA TLX post-assessment survey to examine the cognitive load of implementing the tool.

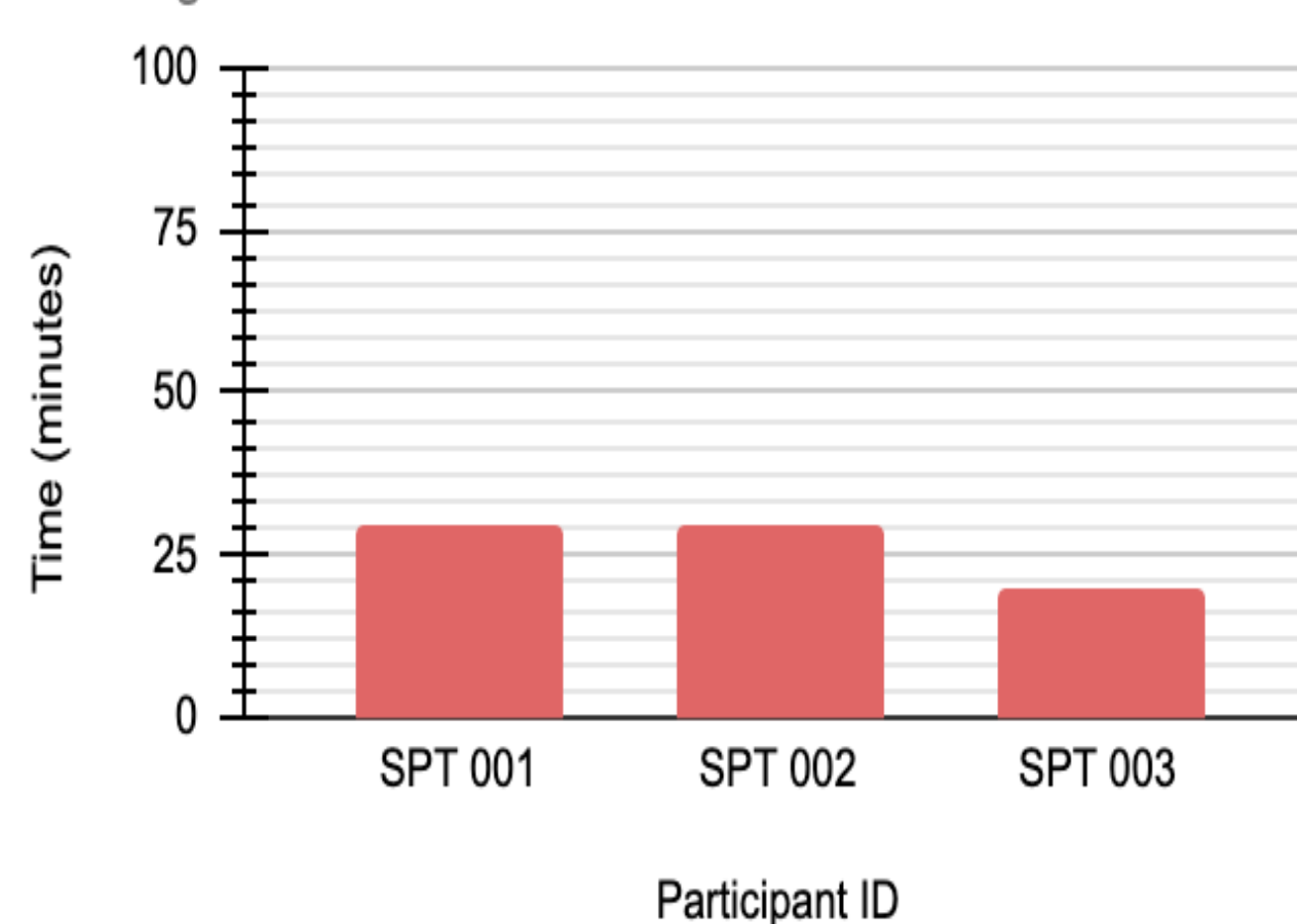
Part 2b: For GAIT, SPTs completed the online learning module consisting of a normal gait cycle video and three additional videos exhibiting abnormal gait patterns which the SPT analyzed using the GAIT. After finishing the learning module, SPTs recorded the time it took to complete the module and filled out the NASA TLX post-training survey to determine the cognitive load of learning the GAIT. They then took a video of a SLC patient's gait and analyzed it using the tool. The NASA TLX post-assessment survey was completed to examine the cognitive load of implementing the GAIT.

Part 3: After gait assessments using both tools were completed, SPTs filled out the barriers and facilitators survey examining both tools.

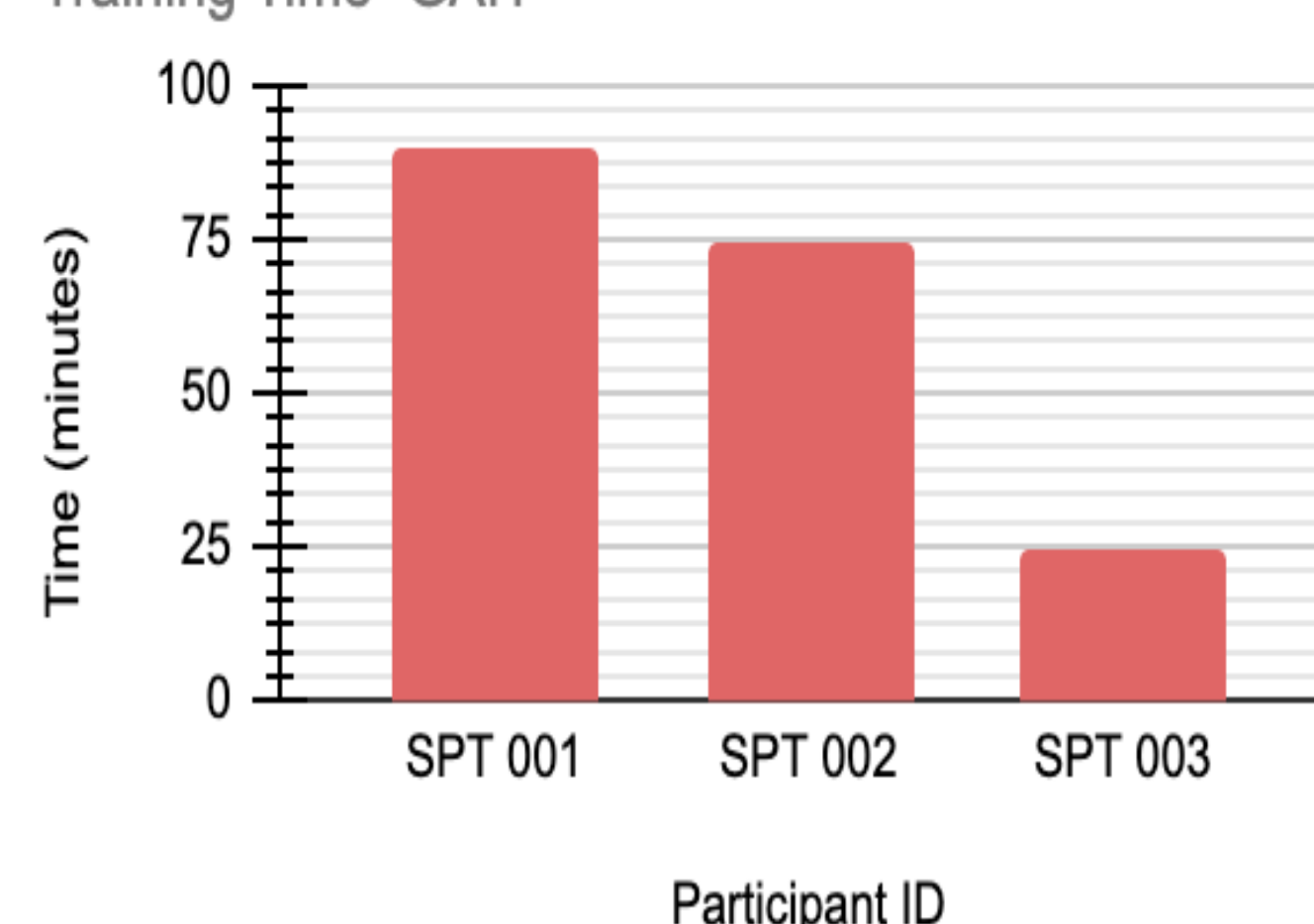
Results- Time to Complete Learning Modules

Wearable device learning modules took between 20-30 minutes to complete. Learning modules for GAIT took between 25-90 minutes to complete.

Training Time- Wearable Devices

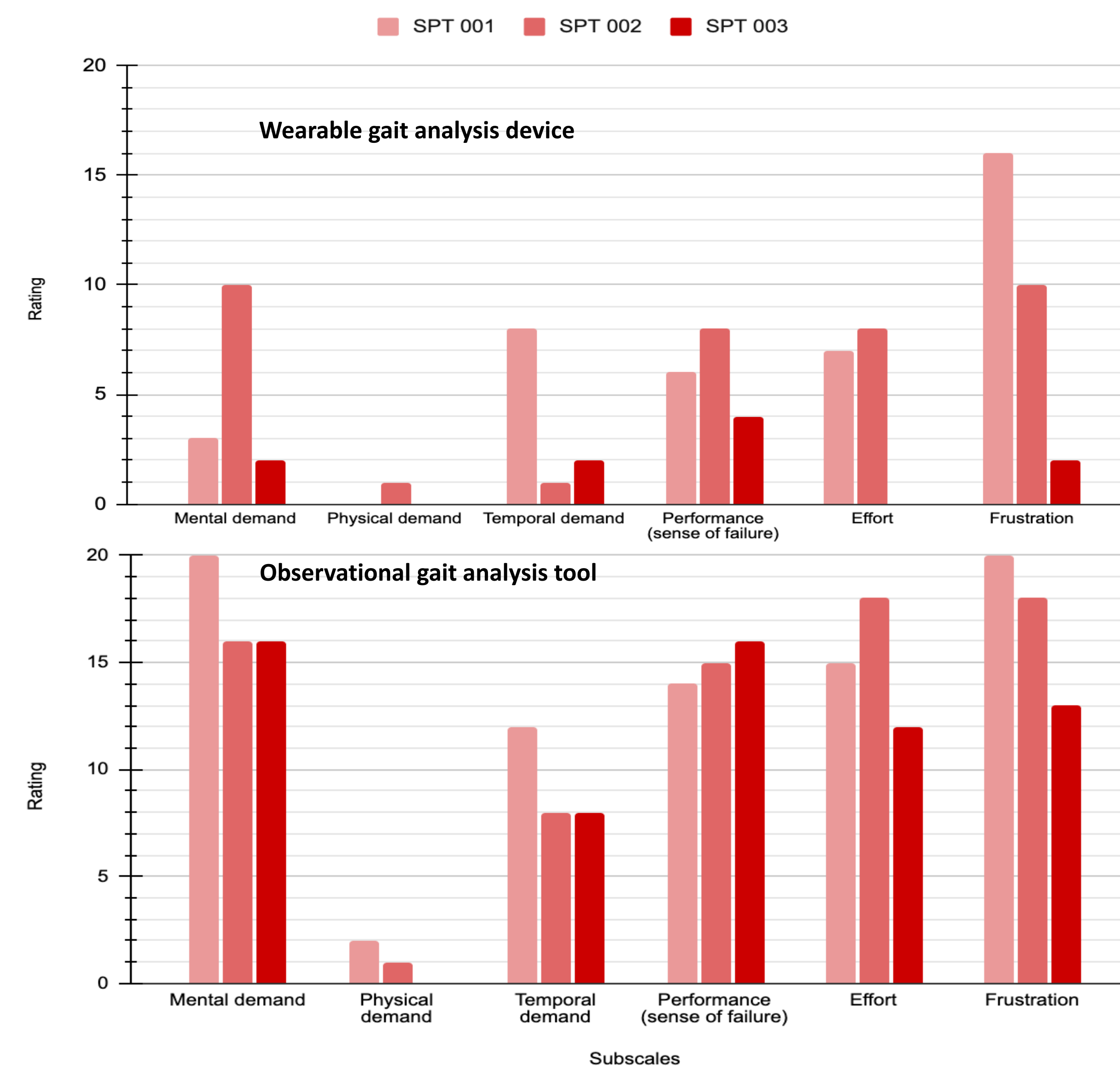


Training Time- GAIT



Results- Post-Training Survey

The graph shows the cognitive load that the SPTs felt after they completed the training for using the wearable gait analysis tool and the observational gait analysis tool. SPT001 rated her frustration high for the wearable device training due to technical difficulties encountered when using the computer for analysis.



Results- SPT Perceived Facilitators and Barriers

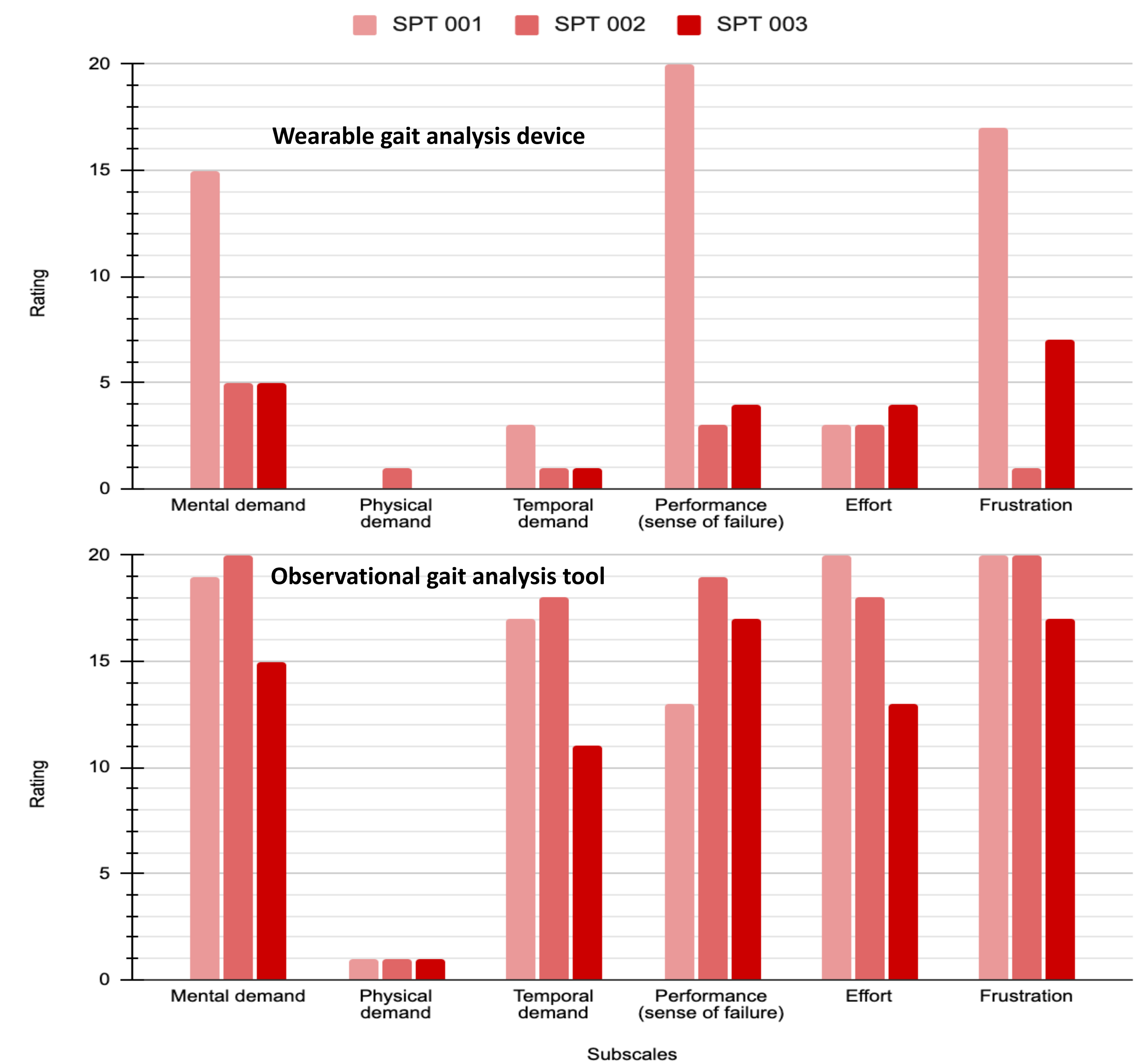
The preferred tool of choice was the wearable device due to ease of use, but SPTs also stated that there were many directions to follow, and there were technology issues. When asked what support was needed for each tool, SPTs mentioned they would need more practice and time using the tool.

Discussion

The GAIT training modules on average took 2.5 times longer to complete than those for the wearable device and required higher mental and temporal demand, leading to greater sense of failure and frustration. Challenges observed by the participants for the GAIT were lack of confidence in scoring and time commitment for learning. For the wearable sensors, challenges were technological difficulties, lack of familiarity, and numerous directions. Lack of time is the primary barrier for PTs (not just students) to engage in learning activities. Clinicians want time to practice with supervision, collaborate, and be mentored when learning new tools. Mentoring is impactful to change PT's behavior and motivate participation in learning. Limitations include the number of participants and time, leading to low generalizability of the study. These limitations were a result of busy schedules of the STPs involved, timeline of the research, and necessity to meet multiple times with patient participants. Future research should include a more diverse patient population and experienced clinicians.

Results- Post-Implementation Survey

The graph shows the cognitive load that the SPTs felt after they implemented the wearable gait analysis tool and the observational gait analysis tool to collect gait data on patient participants.



Subscale questions:

Mental Demand: How mentally demanding was the task? Scaled from very low to very high.

Physical Demand: How physically demanding was the task? Scaled from very low to very high.

Temporal Demand: How hurried or rushed was the pace of the task? Scaled from very low to very high.

Performance: How successful were you in accomplishing what you were asked to do? Scaled from perfect to failure.

Effort: How hard did you have to work to accomplish your level of performance? Scaled from very low to very high.

Frustration: How insecure, discouraged, irritated, stressed, and annoyed were you? Scaled from very low to very high.

Conclusion

The SPTs were able to learn and implement both assessment tools. Based on the results, we concluded both tools could be implemented, but the GAIT required a higher cognitive load for training and implementation.

Clinical Relevance

Wearable devices could be useful as a tool for a quick screen of gait. If deviations are present, a thorough visual analysis from the GAIT would be helpful to provide patient-specific interventions. Face-to-face learning can also improve PT learning.

Scan this QR code for references

