

Towards Efficient Interaction for Personal Health Data Queries on Smartwatches

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1 Introduction

Our motivation is to enhance personal health data exploration on smartwatches, tapping into their potential to offer greater insights beyond current visualizations



Our work provides a characterization of personal health data queries desired for exploration on the smartwatch, to understand people's interactive needs when exploring their personal health data



- What is my average hiking distance?
- How many calories have I burned today?
- Was my sleep longer than last night?
- Compare my heart rate to my last workout
- How long have I been in this heart rate zone?



- The smartwatch is rapidly becoming a powerful personal health tracking device, allowing for the collection of a broad range of personal health data
- Yet, the smartwatch lacks direct interaction with this data beyond pre-defined glanceable visualizations and displayed metrics
- There exists a broad array of exploration which is desired by people to support personalized health outcomes
- Fundamentally, our lack of knowledge surrounding the interactive requirements for personal health data queries hinders progress in enabling exploratory capability

2 Methodology

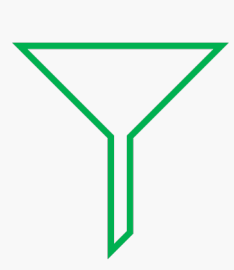
- Using a public dataset of 205 queries desired for exploration on the smartwatch [1], we characterized the queries across four natural language dimensions



Data Attributes



Aggregation Methods



Filtering Mechanisms



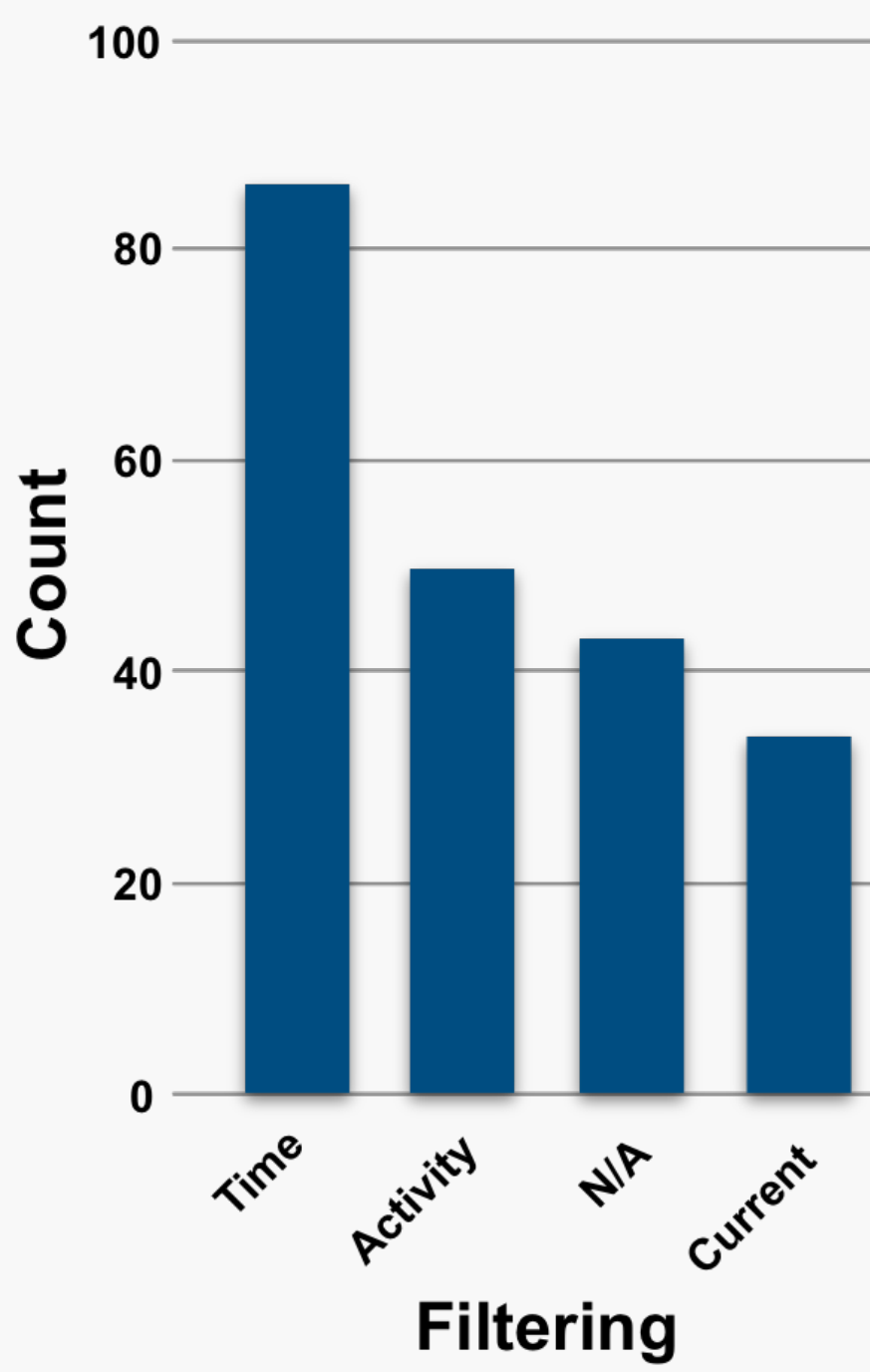
Interrogatives Used

- In the public dataset, queries were captured in-the-wild with smartwatch users who were interested in exploring their personal health data
- Eighteen participants from Canada participated in query collection. Participants were aged from 18 to 56 (M = 29.8)
- Participants had experience collecting personal health data (on average for 39.3 months) and using a smartwatch (on average for 31.3 months).
- We followed an open coding procedure, where for each query we assigned a single code for each dimension above

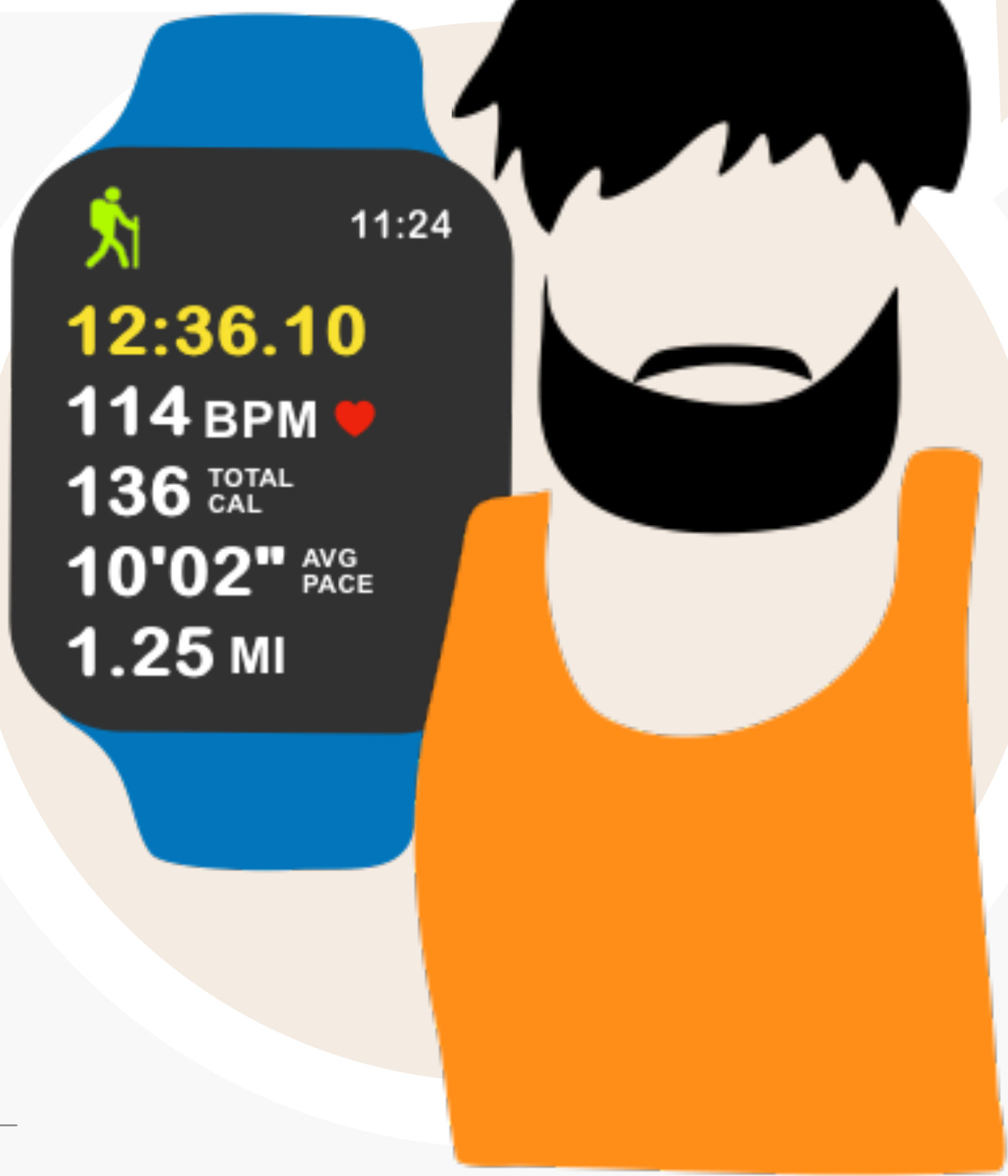
3 Findings

Filtering Mechanisms

- Time dependent filtering was most common (e.g., "What was my highest heart rate in the last hour?")
- Activity dependent filtering, a novel form of filtering, was the second most common. This enabled filtering through an instance of an activity (e.g., "Show me my heart rate chart from today's gym session?")

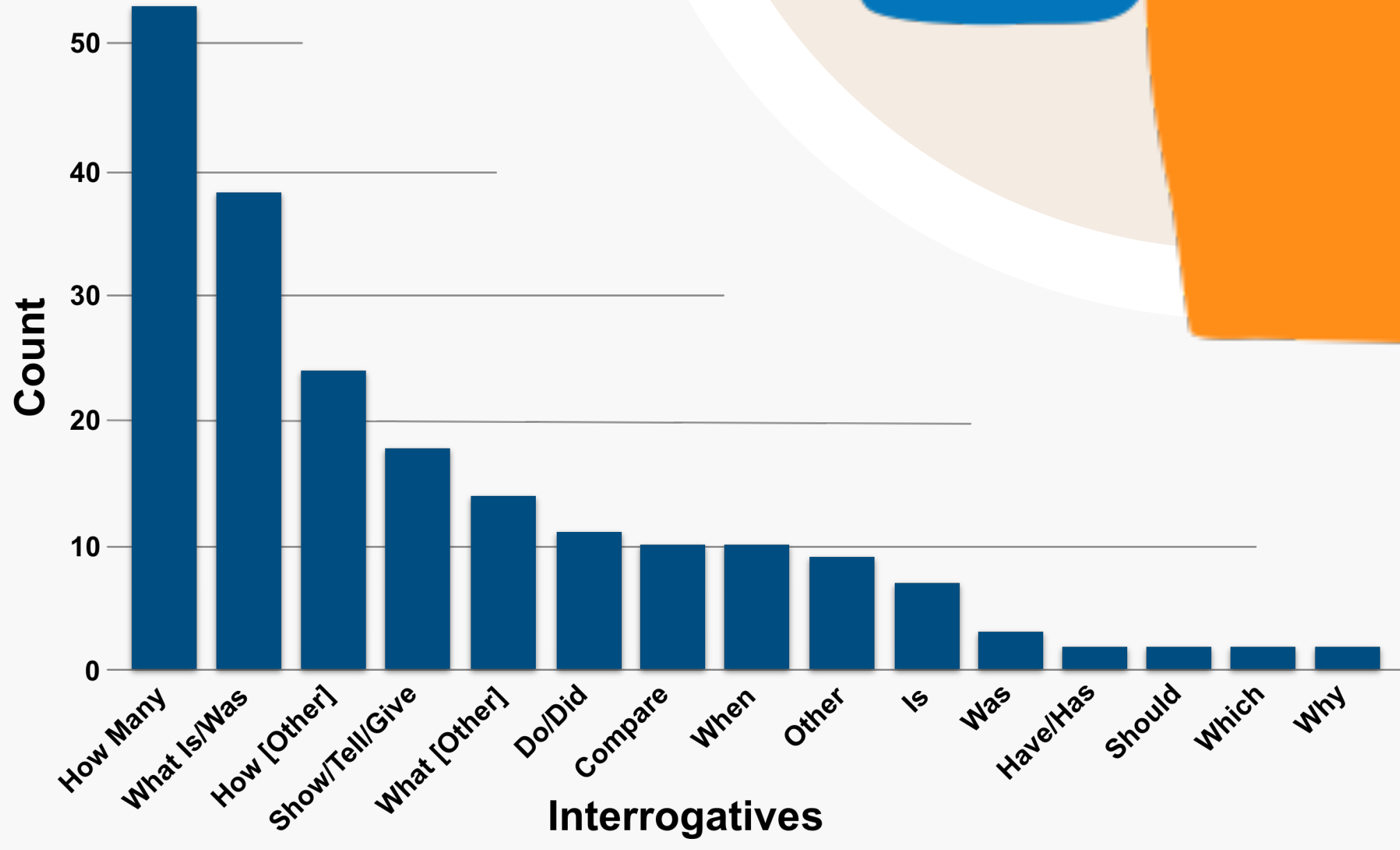


"What was my peak heart rate during my last hike?"



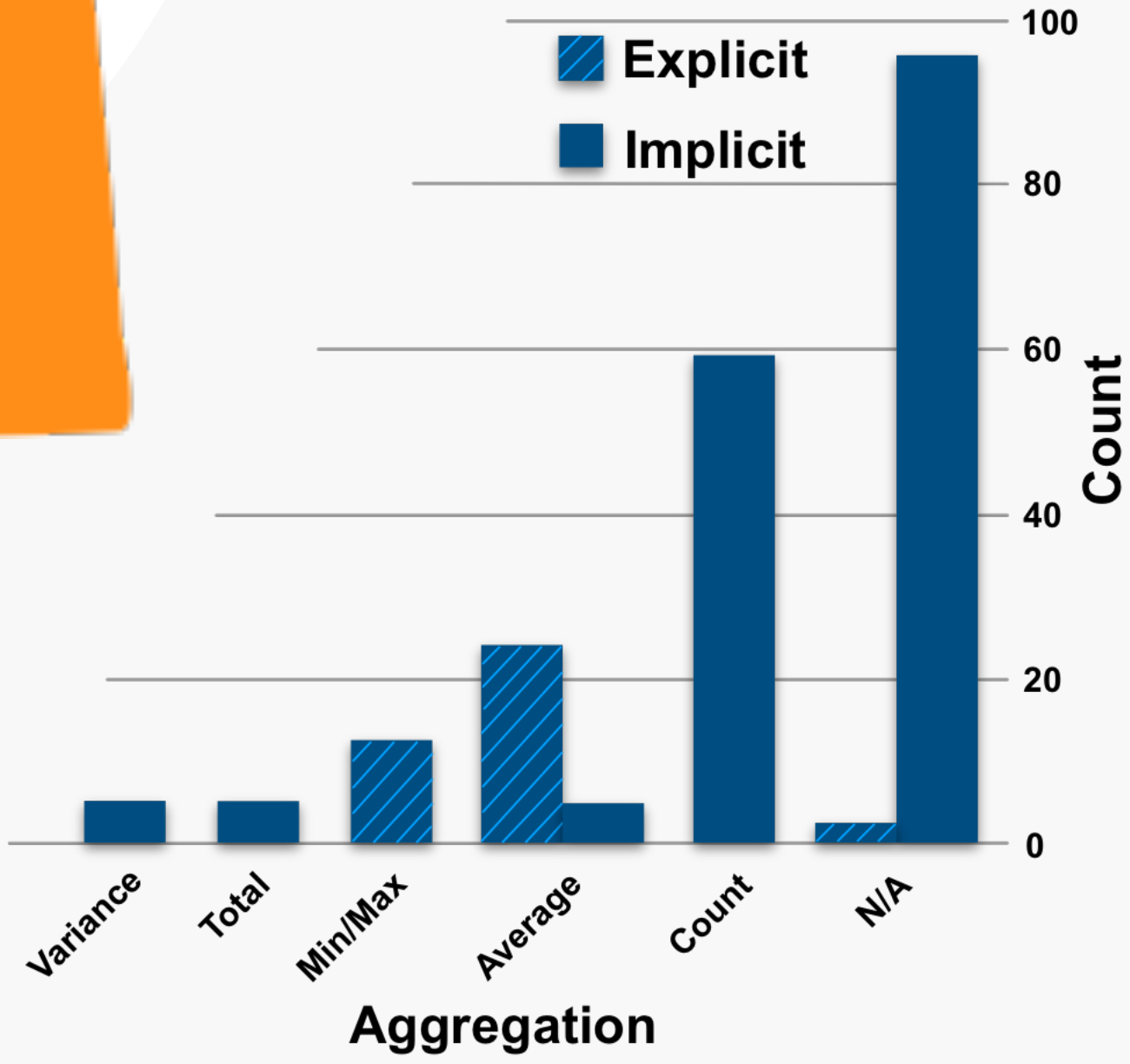
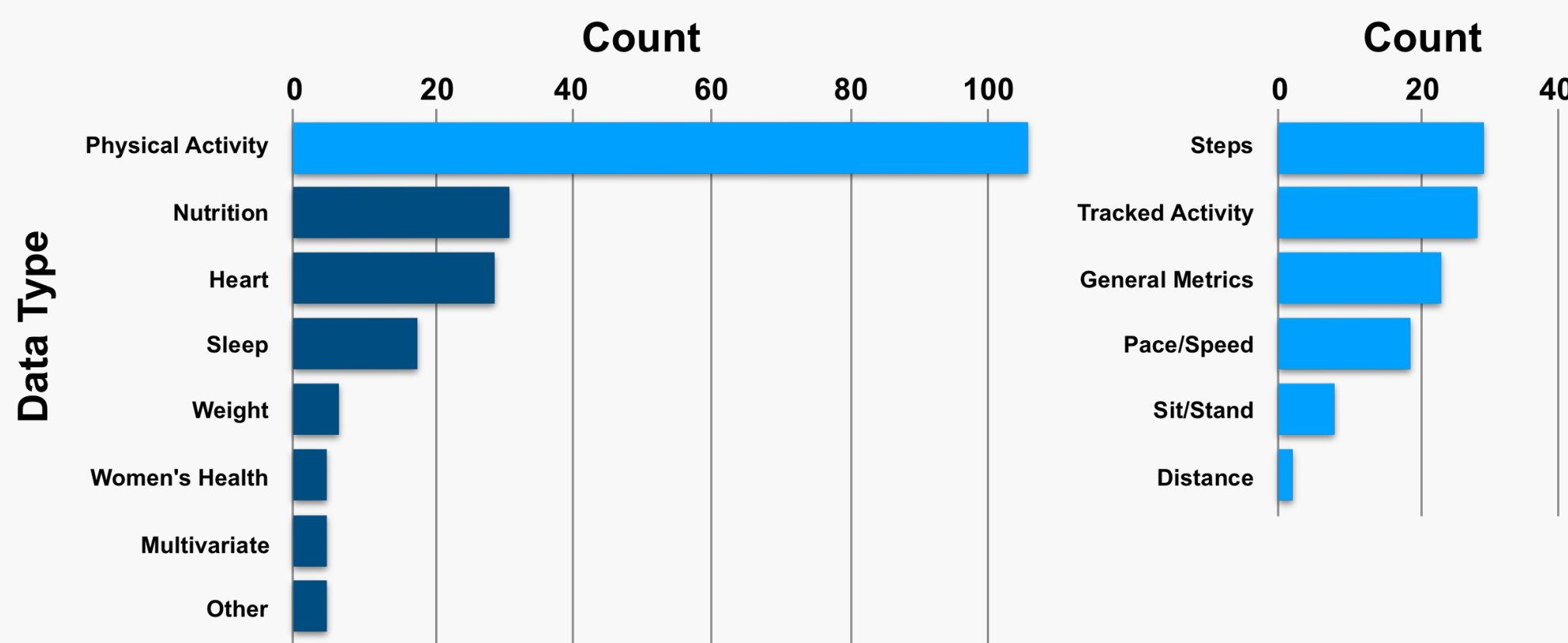
Interrogatives Used

- Question words can provide insight into the aggregation desired, indicate a question versus a command, and hint at appropriate output
- The interrogative can be used as an implicit form of aggregation (e.g., "How many (→ count) steps did I take in the past seven hours?" versus "What was my peak heart rate during my workout?")



Data Attributes

- Attribute references to data were either explicit (80%) or implicit (20%)
- Explicit queries were data-driven (e.g., "What is my current heart rate?")
- Implicit queries showcased broader interest (e.g., "Compare my running stats from the same time last year.")



Aggregation Methods

- Large majority of aggregations are done implicitly (e.g., "How long does it take after a walk to get back to resting heart rate?" → Average) rather than explicitly (e.g., "What is my average walking pace per kilometer?" → Average)
- Queries coded N/A signify a current value desired (e.g., "What is my current step count?")

4 Discussion



- At a minimum, all queries contained an interrogative and data attribute (e.g., "What is my resting heart rate?")
- Implicit exploration and activity dependent filtering are important. These can be easier for people when using a smartwatch where visual exploration is limited, and focus may be on a primary in-situ task

How can we create efficient smartwatch interactions for personal health data exploration that encompass the findings in this work?

- Multi-modal interaction can allow explicit dimensions to be explored through direct manipulation (i.e., touch) while often implicit dimensions can utilize broader interactive capability (i.e., speech)



Across the two known datasets [1, 2], <1000 personal data queries have been collected. Future work must continue to collect queries for analysis to better the exploratory capability afforded to people

5 Conclusions

- Key findings:
 - We identified several dimensions related to lay-person personal health data queries, including the requested data attributes, aggregation methods, filtering mechanisms, and interrogatives used
 - Both implicit and explicit aggregation should be supported through interrogatives
 - Activity dependent filtering can support exploration on the smartwatch beyond explicit time dependent filtering
- In summary, this late breaking work adds to smartwatch interaction and personal informatics research, emphasizing input requirements for exploring health data on the smartwatch

By leveraging these insights, researchers and designers can create smartwatch applications that further meet peoples' health data interaction needs, aiming for improved well-being

6 References

- Bradley Rey, Bongshin Lee, Eun Kyoung Choe, and Pourang Irani. Investigating In-Situ Personal Health Data Queries on Smartwatches. IMWUT 2023
- Reza Rawassizadeh, Chelsea Dobbins, Manouchehr Nourizadeh, Zahra Ghamchili, and Michael Pazzani. A natural language query interface for searching personal information on smartwatches. PerCom Workshops 2017



View Analyzed Dataset



View LBW



Contact Me

Thank you for your interest, feedback, and discussion with respect to our late breaking work! We are excited about the potential for increasing exploration on the smartwatch and look forward to future work within the research community! ©