Benefits and Drawbacks of Sharing Heart Rate Data during Collaborative Exercise: A Qualitative Study

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Abstract. Co-located collaborative exercise offers many opportunities for social support. One promising form of support may be in sharing data streams with exercise partners. While prior research has examined heart rate (HR) sharing in various contexts, less is known about how these effects manifest when HR is shared in real time between co-located exercise partners. To address this gap, we conducted a study in which 24 participants (12 pairs) engaged in co-located exercise using a smartwatch app prototype that displayed both participants' real-time HR. We then interviewed the participants to explore the benefits and drawbacks of sharing HR. The participants reported that sharing HR may have benefits for motivation, mutual accountability, and social connection. On the other hand, they noted drawbacks including potential unwanted competitiveness, privacy concerns, and decreased self-esteem, particularly among less fit participants. The findings emphasize the need for privacy-preserving, customizable, and context-specific designs for collaborative exercise.

Keywords: Heart Rate · Recreational Exercise · Wearable Device · Collaborative Sport · Endurance · Social Support · Social Comparison · Colocation

1 Introduction

Regular exercise is crucial for overall health and well-being [2,29], life expectancy [40, 61], and disease prevention [17, 56, 59]. However, many people face a significant challenge in maintaining exercise practices [52, 58]. Challenges include low motivation [1, 53] and difficulty integrating exercise into daily life [4, 12]. Novel technological support for exercise holds great promise to address these challenges, and recent work has shown that innovative technology may boost engagement [53], support real-time feedback [5], and facilitate personalized and context-aware interventions [6, 21, 42].

Grounded in Social Support Theory, a promising research direction involves designing technologies that promote interpersonal motivation and accountability during exercise [19, 25]. For individuals striving to build and sustain exercise habits, especially those new to fitness, social support can play a critical role [18, 19]. Specifically, collaborative exercise[1] promotes social interaction [15], mutual encouragement [31], and a higher adherence to routines [66]. In the context of collaborative exercise, early design studies in the field of human-computer interaction suggest that sharing real-time data such as heart rate may enhance mutual awareness of effort and foster a sense of closeness [43, 65]. These studies establish a precedent for our research to provide empirical evidence on the benefits and drawbacks of real-time heart rate sharing during exercise among co-located participants.

This paper presents a qualitative investigation of the ways in which real-time shared data[2]—specifically heart rate (HR)—is perceived during co-located[3] collaborative endurance exercise. We investigate the following research questions:

RQ1: What benefits do co-located exercise partners perceive from real-time HR sharing?

RQ2: What drawbacks do they perceive from sharing HR data with a partner in real-time?

We explore these research questions through a study with 24 exercise partners who participated in our study in pairs. Participants used a smartwatch app prototype that simultaneously displayed both the participants' own HR data and that of their partner during paired running or cycling sessions, followed by semi-structured post-exercise interviews to discuss their experiences.

As biometric data becomes increasingly common in our daily routines [39,44], it is essential that the pervasive health community examines how co-located real-time data sharing impacts collaborative exercise experiences. This study offers the following contributions: 1) a nuanced understanding of how real-time HR sharing shapes co-located exercise dynamics through the dual lenses of Social Comparison and Social Support Theories, and 2) insights into the social and emotional implications of biometric interpretation during real-time, cooperative exercise among co-located exercise partners.

Findings reveal benefits pertaining to motivation, mutual accountability, and enhanced social connection, while describing drawbacks such as heightened competitiveness, privacy concerns, and the potential for decreased self-esteem. The findings inform how systems might be better designed to account for social sensitivity and sense-making, not just performance.

2 Background and Related Work

This qualitative study draws upon two primary theories in analyzing the empirical data from its interviews. First, we draw upon Social Comparison Theory [30],

[1] We acknowledge that the term "collaborative" has varied connotations worldwide. This paper uses the term "collaborative" and its derivatives to refer to *people participating together toward a common goal*, where that goal is *mutual, recreational exercise*.

[2] In this study, we define real-time sharing as the continuous, low-latency transmission of heart rate data, perceived by both users as immediate and reflective of their current level of exertion.

[3] We define "co-located" as close enough to hold a conversation in person.

which posits that individuals evaluate their own abilities, traits, and emotions by comparing themselves to others [10, 55, 60]. These comparisons can be upward or downward, a phenomenon that is particularly relevant in collaborative exercise. Both upward and downward comparisons during exercise can be beneficial, by motivating self-improvement [27] or building confidence [8], respectively. Conversely, both types of comparisons hold risks: extreme upward comparison can be demotivating [27, 51], while sustained downward comparisons can lead to complacency [8].

The second theory we draw upon is Social Support Theory [33, 64], which highlights the role of social relationships in providing various forms of support—emotional, informational, and companionship—that contribute to an individual's well-being and resilience. Social support acts as a buffer against stress [7] and is often a critical determinant of success in challenging tasks and environments such as exercise [32, 47].

In a study on sharing HR in co-located cycling, Agharazidermani et al. [3] introduced a mobile application for cyclists to view each other's HR in real time. Their preliminary study with four pairs of cyclists suggested potential in improving collaborative engagement. Similarly, Walmink et al. tested "Open Heart Helmet," which displayed HR data on a cycling helmet [62]. In that study, trailing cyclists adjusted their effort based on their partner's visible HR. These studies suggest the social affordances of sharing real-time physiological data but do not explore the nuanced emotional, motivational, and interpretive experiences of users. Our findings begin to fill that gap by surfacing participants' lived experiences and attitudes toward collaborative HR sharing.

With so little work related to real-time data sharing during co-located exercise, our study is also informed by early design studies on remote collaborative exercise. For example, remote jogging partners who shared ambient sound modulated by HR enriched their sense of connection [48]. Systems have been developed that support multiple swimmers in gamified collaboration with real-time biometric data sharing [23], and shared HR and treadmill speed in virtual environments [49].

Our work also complements recent mobile health (mHealth) studies that emphasize personalized interventions and context-sensitive system design. For example, Carlier et al. propose an ontology-driven mHealth ecosystem that tailors physical activity recommendations through intelligent decision support grounded in behavior change theory [1]. Bonneux et al. [12] propose a platform for patients to share exercise information and undertake shared decision-making with their physiotherapists during cardiac rehabilitation, finding positive feedback from the physiotherapists on the promise of that system. Shared exercise tracking has also been explored in the context of intergenerational family members for fostering social connection across age groups [41]. We note that these studies primarily involve summative exercise data shared regularly (such as after each exercise session), rather than in real time. However, with the growing prevalence of shared data in mHealth technologies, our work sheds light on the nuances of how sharing HR in particular may affect people exercising together.

Together, these works form a foundation for designing health technologies that are not only intelligent and personalized but also socially attuned. Our study adds a critical piece to this landscape by interrogating the lived experience of co-located participants using real-time shared biometric data to navigate collective physical effort.

3 Methodology

The goal of this study was to understand user perception toward shared HR data. We began with a co-located collaborative exercise session between two participants (running or cycling, participants' choice) lasting at least 30 minutes using the shared HR technology. Afterward, we interviewed each participant separately within a semi-structured interview. The full interview schedule is provided in the Appendix. In this section, we describe the recruitment process, wearable technology, collaborative exercise session, interview, and analysis techniques.

Participant Recruitment. We recruited through messages to university club sports, local clubs, word-of-mouth communication, and weekly appearances at local community running events. If a participant expressed interest, the researchers emailed or provided them with an informed consent form to review. We required participants to have the ability to run or cycle for at least 30 minutes. Ultimately, 24 participants completed all study protocols.

Participant Demographics. We report on interviews with 24 consenting participants, of which the majority (N=16) identified as runners and the remaining engaged in a variety of other sports including cycling and triathlon. Eleven participants reported exercising more than 7 hours per week, while eight exercised between 3-5 hours per week. Twenty-three of the participants self-identified as doing exercise for sport while one self-identified as a bicycle commuter. Nineteen raced or had specific performance and distance goals. Sixteen participants regularly exercised with a group and preferred group exercise, whereas eight preferred to exercise individually but occasionally joined group sessions. Seven participants self-identified as female, twelve as male, and five chose not to disclose their gender. Regarding race, sixteen participants identified as White, five as Asian, one selected

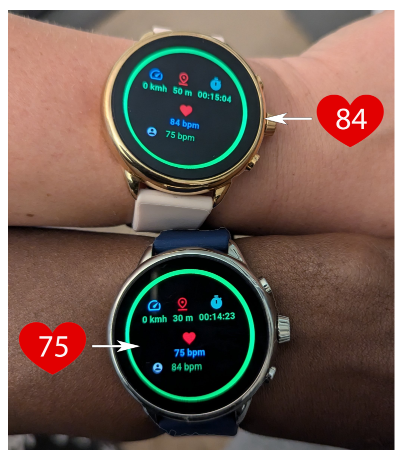

Fig. 1. Connexx loaded onto two commercially available Fossil Gen 6 watches, depicting participants' HR (top) and the partner's HR (bottom).

"Other," and five opted not to respond. Several participants selected multiple racial categories. A summary of participant demographic is provided in Table 1.

Table 1. Participant Demographic Summary (N=24)

Category	Count
Gender	
Female	7
Male	12
Declined to Answer	5
Age (years)	
18–24	9
25–34	7
35–44	2
45+	1
Declined to Answer	5
Race / Ethnicity	
White	16
Asian	5
Other	1
Declined to Answer	5

Several participants selected multiple racial categories.

Shared Heart Rate Application. The shared HR technology, Connexx, was developed in our lab. It allows two paired smartwatches to exchange and display HR data in real time via a Bluetooth connection. A screenshot of the smartwatch interface is displayed in Figure 1.

Collaborative Exercise Session Design. All participants in the study engaged in pre-existing group exercise, where maintaining a shared exercise pace and staying together was an established norm. The goal of each session was not dictated by our study but was instead a natural part of participants' regular training routines. None of the participants had prior experience with the application, and at least one researcher was present during the exercise session to offer assistance, answer any questions, and address any concerns. While present, the researchers would maintain some distance from the participants to allow for natural usage and exchange between partners. Immediately following their collaborative exercise activity, the researchers interviewed each participant separately.

Exercise Structure: Participants engaged in either running or cycling sessions based on their preferred sport. The study period focused on their warm-up phase, which typically lasted between three and four miles for runners and a seven-mile route for cyclists, aiming for 30 minutes of exposure to our prototype HR sharing technology.

Shared Exercise Goal: While the study did not assign specific fitness goals, participants followed their group's established practices. All involved running groups adhered to a "no person left behind" approach, which made sure that all participants stayed together during the warm-up. Similarly, the cycling groups aimed to maintain a steady conversational pace even when participants had different levels of fitness.

Pairing of Participants: Some participants signed up for the study with a partner. Those who did not have a partner were randomly assigned an individually registered participant within their sport team as a partner. All randomly assigned partners knew each other ahead of time due to being in the same exercise group.

Use of Smartwatches: The smartwatches with our prototype HR sharing app were used during the collaborative warm-up phase of the group exercise. We did not collect data from subsequent phases of the group exercise for those who continued beyond the required 30 minutes.

3.1 Post-Exercise Interview

We report on 24 in-person interviews that followed a semi-structured format. The interview protocol consisted of 15 prompts, including questions about the collaborative exercise experience, participants' exercise frequency and history, and opinions of shared HR. This study was approved by the Human Subject Review Ethics Board at the University of Florida. Our specific ethical considerations include obtaining written informed consent, removing all personally identifiable information from the dataset, and deleting all interview recordings after transcription.

3.2 Analysis

We conducted a qualitative thematic analysis to examine responses from post-exercise interviews. Our approach followed Braun and Clarke's six-phase framework, employing an inductive strategy to ensure themes were grounded in participants' experiences rather than predetermined categories [14, 24]. This rigorous qualitative process began with thorough data familiarization, where each researcher independently read and annotated the interview transcripts. Through an iterative discussion process, we noted preliminary observations and began identifying meaningful segments related to the research questions using an affinity diagram. Next, we systematically coded the data and assigned labels to text excerpts that captured relevant experiences. Quotes were not restricted to a single code but were categorized across multiple relevant dimensions when applicable.

Once initial codes were established, we organized them into thematic clusters naturally aligning with benefits and drawbacks. We iteratively refined these themes over several meetings and reviewed the codes for coherence and consistency. During this process, we collapsed overlapping themes and restructured categories where necessary. We also engaged in ongoing reflexive discussions to critically examine potential biases in our interpretations.

4 Results

This section presents findings from the participant interviews. Overall, nearly all participants (N=23) expressed willingness to adopt this technology if it were available to them. This section explores both the benefits and drawbacks participants described regarding the use of shared HR data during collaborative exercise.

4.1 RQ1: What Benefits Do Participants Perceive?

Our inductive thematic clustering identified five key themes where participants perceived that shared HR data positively influenced their exercise and interactions with their partners. These themes are: *Mutual Accountability, Implicit Awareness of Others' Effort Levels, Social Connection and Communication, Motivation to Get Fitter,* and *Comfort in Shared Struggles.*

Mutual Accountability (N=9). One of the most frequently mentioned benefits was the ability to maintain mutual accountability during exercise (N=9). Participants appreciated how shared HR data allowed them to monitor their own effort levels and those of their training partners. This feedback helped participants ensure they were working within their prescribed training intensity, which supported better overall performance and consistency. Participants described a sense of shared responsibility that created a support system where they felt motivated to maintain their pace or adjust based on their partner's collective pace and state. For example, one participant highlighted how the shared HR data helped keep them together and promoted a sense of camaraderie with new runners: *"Zone Two really keeps some of our newer runners aware and keeps the older runners aware of the newer runners' ability"* (P01). Others noted that it helped them stay aligned with their exercise goals: *"The biggest benefit would be having the accountability part, but also just being able to run longer and more sustainably with it"* (P07). The ability to notice when a partner was "gassed" (i.e., working too hard) helped participants adjust their pace or offer support: *"Oh, he's gassed. Maybe I can help him out, maybe I can give him a break"* (P36). Additionally, participants described how the shared data facilitated more intentional recovery and pacing decisions within the group, such as deliberately slowing down to keep pace with a struggling partner. As one participant explained, *"[I] don't want to drop [my] group member or have that one group member not do a recovery because they want to stay with the whole group"* (P09), referring to the other member of the pair.

Implicit Awareness of Others' Effort Levels (N=8). Participants also valued how shared HR data created an implicit awareness of others' effort levels. This non-verbal feedback allowed individuals to make decisions about their own efforts based on their partner's exertion, without explicit communication. Implicit communication was especially useful during group activities, where some participants might not be forthcoming about their own fatigue or discomfort, but their HR data could objectively reveal it, as P20 shared: *"If the other [person's HR] is way higher than usual, then you know you have to take [the effort] back a little bit. This could be beneficial."* This implicit communication also helped synchronize group activities like running or cycling, as P1 noted: *"Some people are really good at hiding how hard a run is. To be able to tell what their HR actually is, I'd be like, okay, no, you're actually taking it too fast."* Participants described how this awareness facilitated smoother group dynamics, allowing adjustments without verbal feedback, with P28 noting: *"In a group ride, I don't* *have to verbally ask, 'Are you doing okay?' I can just look at a number and say, 'I should slow down'"*. Implicitly sharing information allowed the group to pace themselves more seamlessly, helping individuals adjust their intensity while remaining aligned with the collective goal.

Social Connection and Communication (N=5). Another benefit that emerged from the analysis was the enhancement of social connection and communication. Participants described how sharing HR data provided a deeper sense of connection, which encouraged more conversations and improved the quality of interaction during exercise. In some cases, it made participants feel more comfortable and connected to their exercise partner, which P11 highlighted: *"It might have improved the general flow of conversation between me and my partner. We would mention our HRs and then start talking about something else... It generally fosters more communication between me and my partner"*. Others found that it facilitated a bond: *"It helps with motivation and feeling a little more connected to the people you're doing exercise with"* (P32). Some described how having real-time information about their partner's effort level provided a sense of camaraderie within the team and motivated them to push through as a group when the exercise became challenging: P39 captured this sentiment, saying: *"It definitely increases the team aspect of cooperation in a group"*.

Motivation to Get Fitter (N=4). Participants reported that shared HR data served as a powerful tool for motivation to get fitter, describing how comparing heart rates helped push them to improve their work rate and fitness levels. For some, this environment encouraged a healthy challenge, as P17 explained: *"It's more [than] just a motivational tool. You want to catch up with the guys in front or have a HR as low as theirs"*. Even those who were initially discouraged by the comparisons found motivation in striving for self-improvement: *"Some people could be discouraged, but for me, it was encouraging because I saw it as my baseline and can I improve it"* (P37). Others saw it as a springboard to higher fitness levels: *"When you compare yourself to others, it pushes you to try to be better and achieve what they're achieving"* (P19).

Comfort in Shared Struggles (N=4). Participants found shared HR data provided comfort, reassuring them that their peers were experiencing similar levels of exertion. This reassurance may have helped mitigate feelings of isolation during intense exercise, as participants realized they were not alone. As P32 expressed: *"When your HR goes up, you see the other person's HR go up, and it feels like, okay, yeah, we're doing this together,"* adding: *"It's justifying how you feel."* This mutual experience of effort created a sense of solidarity and harmony between partners: *"Seeing both our HRs increase was affirming that we were both pushing through the difficulty"* (P35). Furthermore, knowing their partner was experiencing similar challenges empowered participants to persevere: *"Knowing his heart rate was higher than mine, I figured I could hang on because I could do this even though my legs were tired"* (P39).

4.2 RQ2: What Concerns or Drawbacks Do Participants Perceive?

Our inductive thematic clustering identified three key themes where participants perceived drawbacks to using real-time shared collaborative technology. These themes are: *Detracting from Focus and Individual Fitness Goals, Self-Esteem and Motivation, and Privacy.* These themes captured the challenges participants experienced related to competitiveness, privacy concerns, and the potential for shared data to distract from or compromise their exercise quality.

Detracting from Focus and Individual Fitness Goals (N=14). Participants frequently expressed concerns about the impact of sharing heart rate data on their focus during exercise. Adjusting their pace to match their partner's effort level sometimes led participants to compromise their personal exercise goals, ultimately affecting the quality of their exercise. P21 noted: *"I'm very used to doing these rounds individually, so I feel like, if I do group training, then I have to adjust my pace to everyone else's, and I'm not sure how good that will be for me necessarily."* P16 raised a similar concern, emphasizing how partners of different fitness levels require different recovery times: *"Well, the fastest person is going to be under that heart rate a lot quicker than the slowest person. So they're gonna have too much recovery time and maybe not get as much of the benefit out of the workout as they could if they base it more personally"*, noting that a fitter partner might recover quicker, leaving the less fit partner with insufficient recovery time, which could ultimately diminish the exercise's effectiveness. Both P35 and P18 highlighted the potential unintended shift from collaboration to competition during group exercise when HR is shared between partners. P35 said: *"For me, the heart rate made it competitive—something that shouldn't be super competitive. Like, running we're doing it together."* P18 added: *"I usually get pretty competitive about funny things, so the whole time I was staring at it to make sure I was below my partner's, and maybe the stress of that caused it to get higher at some point."* Some participants also worried that focusing too much on heart rate data could disrupt the rhythm of their activity. P36 explained: *"It may take away from... getting into the zone a little bit, and let's say if you felt really good and your heart rate was a little higher than you thought, it might throw you off"*.

Self-Esteem and Motivation (N=11). Participants raised several points about sharing their HR data with their exercise peers. One concern alluded to the social comparison inherent to shared HR data: some participants mentioned feeling self-conscious, embarrassed, or judged when their HR was higher than that of their peers. One participant noted the negative emotional impact: *"I was pushing to do this 7 min mile and my HR was through the roof. And this other guy... his HR was barely reaching 120. It makes you feel kind of crappy sometimes. You're like, 'wow! I'm just not in as good shape'"* (P12). P40, who saw shared HR as a disadvantage, especially for newcomers or those exercising with someone at a different fitness level, stated: *"People, especially new to the* *sport, could be discouraged working out with certain people because they would see . . . whatever that you're running at, and they may be putting a lot more effort towards that versus other people. And that may be discouraging for some people."* P11 also highlighted the potential for granular comparisons to cause tension between exercise partners, noting: *"You're self-conscious about your heart rate, I suppose, if you were comparing it to someone else and it was higher, you might feel a certain way, but I think some people would see it as a fun way to compare, but other people might get salty".*

Privacy (N=5). Lastly, participants raised concerns regarding privacy and the discomfort that sharing HR data could introduce, particularly in competitive settings. Some participants were apprehensive about having physiological information publicly accessible, especially if it could provide an edge to competitors. For instance, P09 highlighted that sharing HR data could expose personal circumstances, saying: "*There's plenty of people who say, 'I drank last night. I'm gonna do terrible,' but then there's some people that don't want to share that.*" Similarly, P24 noted that sharing HR data could reveal unwanted personal health details: "*It is like private information, and some people might not want that [shared], or if you are sick, and you don't want people to know.*"

Concerns also extended to data security and potential misuse. P09 worried about advertisers intercepting HR data and using it for profiling: "*If someone was able to store this, either by intercepting the Bluetooth, or they have it on their device, your data would give insights into what sports you do, what your level of fitness is, all of that could be used to profile you for advertisers*".

5 Discussion

We examined the results emerging from co-located participants' perceptions and attitudes toward shared HR data during exercise. This section interprets these results through the lens of Social Comparison Theory (5.1) and Social Support Theory (5.2), then contextualizes our findings within related work.

5.1 Perceived Benefits and Drawbacks Through the Lens of Social Comparison Theory (SCT)

SCT posits that individuals evaluate their own abilities, traits, and emotions by comparing themselves to others [30]. SCT provides valuable insights into participants' experiences and the benefits (upsides) and drawbacks (downsides) they face when sharing HR data during collaborative exercise. The emergent themes from our results reflect these dynamics and highlight the dual nature of social comparison. This section discusses these perceived benefits and drawbacks.

*Upsides of **Upward** Comparison.* Upward comparison, where participants compare themselves to someone they perceive as more capable, can serve as a powerful motivating force for some exercise enthusiasts. Our findings suggest that real-time visibility into a partner's heart rate during exercise can encourage individuals to elevate their own effort levels, particularly when the perceived performance gap is relatively small and attainable. This dynamic reinforces prior work showing that modest fitness disparities can enhance motivation without inducing discouragement [27]. In this context, HR sharing functions as a form of real-time benchmarking, enabling our participants to set performance goals and internalize their partner's exertion as a motivational reference point. Rather than promoting unhealthy competition, those modest differences in upward comparison in our study often supported goal-oriented striving, which supported progress and improvement among peers.

*Downsides of **Upward** Comparison.* While upward comparison can be motivating, our findings reveal that it may also have the opposite effect, particularly for individuals who perceive themselves as underperforming relative to their peers. In such cases, real-time HR sharing can elicit feelings of inadequacy, frustration, or demotivation. These reactions are especially noticeable when there are significant fitness disparities within the dyad. Participants in our study often evaluated their HR against their partner's without fully accounting for contextual factors such as terrain, temperature, or fatigue, which can significantly influence HR variability [16, 26, 35]. This tendency to treat HR as a proxy for fitness, rather than effort, contributed to misinterpretations and self-doubt. These findings suggest that without contextual framing, real-time biometric sharing may amplify negative self-evaluation and erode the motivational benefits it aims to support. As such, systems that visualize HR data should prioritize interpretability and contextual awareness, rather than presenting raw numbers alone, to reduce the likelihood of harmful comparisons.

*Upsides of **Downward** Comparison.* Downward comparison, recognizing that a partner is experiencing equal or greater physical exertion, can elicit a sense of shared struggle and emotional reassurance. In our study, participants often interpreted their partner's elevated heart rate during difficult segments as a signal of mutual challenge, which helped alleviate feelings of isolation and encouraged persistence. This aligns with Social Comparison Theory's suggestion that seeing others face similar difficulties can enhance one's own coping efficacy. When HR data reflected that both individuals were exerting themselves, participants felt more connected and less alone in their effort, further reinforcing emotional solidarity. In co-located exercise contexts, this form of comparison appears to generate empathy and comfort-not competition—particularly when paired with real-time visibility and proximity. This reinforces the potential for shared physiological data to act as an implicit channel for social support, especially when contextualized by environmental conditions like terrain or weather. Systems that amplify these subtle cues may help deepen social connection and improve the emotional experience of co-located collaborative exercise.

*Downsides of **Downward** Comparison.* While downward comparison can offer reassurance, it also presents risks to motivation and group cohesion. In some cases, perceiving oneself as significantly more capable than a partner diminished the perceived value of shared HR data, leading individuals to reduce effort or disengage from the collaborative aspect of the exercise. This aligns with prior work indicating that downward comparisons may cultivate complacency or a lack of mutual growth [60, 64]. Additionally, our findings suggest that participants navigated a tension between striving for personal improvement and maintaining sensitivity to their partner's fitness level. Concerns about appearing overly competitive or critical shaped how individuals interpreted and responded to HR comparisons which highlighted the social delicacy of real-time feedback.

5.2 Social Support Theory (SST) and the Role of Shared HR in Encouraging Social Connection

SST emphasizes the importance of emotional, instrumental, informational, and companionship support. This section explores how our results reflect these emergent themes of social support.

Emotional Support and Camaraderie. In the *Comfort in Shared Struggles* theme, participants described a sense of emotional support facilitated by shared HR data, especially during challenging activities. Seeing that their partners were experiencing similar levels of exertion reassured participants and strengthened their resolve. This dynamic aligns with Agharazidermani et al. [3], who found that real-time HR sharing increased social dialogue and empathy among cycling partners. Participants in our study similarly reported that the shared data facilitated deeper social connections, reinforcing camaraderie and providing comfort in knowing that they were not alone in their struggles.

Instrumental Support and Performance Adjustments. Our theme of *Mutual Accountability* aligns with SST's concept of instrumental support. Walmink et al. [62] also observed that shared HR data allowed cyclists to align their efforts, ensuring both individuals performed within prescribed parameters. When individuals train together with a shared goal, real-time HR data helps partners synchronize their efforts and adapt to each other's needs. The findings suggest that shared HR data enables exercise partners to monitor each other's effort level during their physical activity, and offers helpful support.

Companionship and Social Connection. Participants frequently reported that shared HR data promoted social interactions and strengthened connections within the group. This aligns with findings in the literature that group exercise has a positive effect on affective valence and manages stress [34, 36, 57, 67]. Participants were less likely to give up on a tough activity when they knew others were sharing the struggle. This emotional reinforcement was highlighted in the *Social Connection and Communication* theme, as participants derived comfort and motivation from shared HR data, particularly newer trainees who may otherwise feel overwhelmed by the demands of an activity. By providing visible proof that their peers were similarly struggling, HR data may have created an inclusive group environment and maintained collective motivation through empathic conversations.

Informational Support and Group Performance. Participants used the shared HR data to adjust their own performance based on their partner's visible HR. This implicit decision-making promoted group cohesion without verbal communication, as highlighted by the *Implicit Awareness of Others' Effort Levels* theme. This real-time informational support is valuable in paired activities, where maintaining comparable intensities can be challenging, especially when partners have different fitness levels. Sharing HR data provided an avenue for participants to make those small adjustments to support one another, which nurtured empathy as participants learned to interpret the data not only as an indicator of physical exertion but as a reflection of their partners' emotional and physical state during the activity.

5.3 Our Findings Within Existing Literature on Social Comparison and Social Support

Existing research has shown that sharing biometric data such as HR can both motivate and demotivate users depending on context. For example, Epstein et al. [28] and Liu et al. [45] found that leaderboard-style comparisons and shared HR data could increase engagement but also induce anxiety when users felt they were underperforming. Our study expands on these insights by examining real-time HR sharing in face-to-face settings, where comparisons are immediate and users cannot selectively disengage. This amplifies both positive and negative effects: more aerobically fit participants reported feeling reassured and encouraged by their partner's higher HRs, while less fit participants expressed concern about being perceived as weaker, leading to discomfort or demotivation.

This finding aligns with research by Chen et al. [20] who found that users' health and fitness levels shape whether they benefit more from competitive or supportive features. In our study, some participants found upward comparison motivating and appreciated the perceived challenge, while others preferred encouragement and support, particularly when the fitness gap felt large. These findings further highlight the importance of adaptive system design to tailor visualizations to users' needs and physical capabilities.

Cultural norms also play a role in shaping comparison behavior. Cheng et al. [22] emphasized that frequency and comfort with comparison vary across cultures, and White et al. [63] warned that frequent social comparison can lead to guilt or defensiveness. Similarly, some of our participants misinterpreted HR data as a direct measure of fitness rather than effort, which led to negative self-evaluation. These responses suggest that systems may benefit from contextual cues or embedded education to reduce misinterpretation of HR data.

Our study revealed strong evidence of social support, particularly emotional and instrumental [9]. Participants often adjusted their pace to match their partner's HR zone or offered verbal encouragement when they sensed their partner was struggling. This finding points to the interesting role of power dynamics within exercise-related social situations, something the current study did not examine in detail. For example, work on shared exercise data between patients and physiotherapists [12] where a power differential is clearly present, showed that the physiotherapists (who hold more power) were favorable toward the new technology. Future work to examine the experiences of users who hold less power will be important in a variety of contexts.

5.4 Implications for Interfaces that Display Shared HR Data

Our study's findings highlight several design considerations for collaborative technologies, particularly those that display shared HR data.

Design for Norms Within Training Groups. Given the dual nature of social comparison—as both a motivator and a potential source of discouragement—individuals adopting this tool within collaborative training sessions should have conversations to set expectations for how technology should be used. Under the lens of contextual integrity [37], our prototype facilitates the sharing of HR data from one participant to another with transmission between users being reciprocal. Future iterations of this technology should incorporate features that support these distinctions and be marketed in a way that facilitates setting appropriate boundaries before use.

Our findings, along with those from Benthall and Cummings [11] and Kumar et al. [37], challenge current trends in workout groups such as Orange Theory[4], Pulse Monitor[5], and F45[6], where participants' live HR is displayed publicly. Participants in our study indicated that such broadcasting may not suit everyone, particularly those who experience anxiety or discomfort due to public comparisons or who value privacy. Design features that accommodate different levels of data visibility could offer a more inclusive experience to align sharing practices with individual preferences and group norms.

Balancing Competition and Collaboration. While HR data sharing can motivate users, it may inadvertently lead to unintended competition, especially among people of varying fitness levels. Features that contextualize HR data—such as displaying it as a percentage of maximum effort rather than absolute beats per minute—could help mitigate misinterpretation and preserve motivation without triggering unhealthy comparisons. Showing relative effort based on individual physiology may particularly benefit people who are new to participating in sports and cultivate motivation through transparency. Additionally, incorporating contextual sensitivity for different settings (e.g., group rides versus solo training) and skill levels can support varied needs for a more productive experience.

[4] https://www.orangetheory.com/en-us/workout
[5] https://www.pulsemonitor.net/
[6] https://f45training.com/what-is-f45/

Privacy Controls. The *Impact of Shared HR on Privacy and Competitive Edge* theme highlights privacy as a significant consideration for designing shared HR systems. To address these privacy concerns, system design must move beyond simple binary options of opting in or out. While offering users the ability to dynamically pause or stop sharing can be a useful tool, especially in high-pressure environments, this alone is insufficient. Instead, privacy should be understood through the lens of contextual integrity [11, 37], which reframes privacy not as secrecy, but as the appropriate flow of information within a given social context. In shared HR systems, this means enabling users to define not just *if* they share, but *how* and *with whom*, based on situational needs. By appropriating the agency to users to shape the terms under which their HR data is shared, systems can better respect the boundaries of acceptable information exchange within different training scenarios.

Supporting Varied Athlete Data Preferences. Participants represented a range of athletic experience levels and expressed different preferences regarding data visibility and its impact on motivation and self-esteem. This highlights the importance of tailoring support across the continuum of athletic experience. Systems should enable users to choose the level of data detail they share. A flexible design approach can create a more supportive training environment that accommodates diverse backgrounds and promotes long-term engagement.

6 Limitations and Future Work

This work has several notable limitations, each presenting an opportunity for future research. First, our 24 participants were primarily runners, cyclists, and triathletes who compete in local races. While these sports and participants' inclination towards training for competition make them well-suited for this study's objectives, they do not represent the broader, diverse population engaged in various other physical activities. Future work should explore the extent to which these findings apply to other types of sports and physical activities.

Second, this study focused exclusively on outdoor activities, which have been shown to offer distinct psychological benefits compared to indoor activities [13, 38, 54]. It remains unknown whether the same phenomena observed in outdoor contexts would apply to indoor settings. Future research should investigate how these findings translate to indoor exercise environments and non-endurance group activities to determine whether different social dynamics and patterns of comparison yield similar effects.

Third, while HR data is widely available through consumer fitness devices, the level of comprehension among users varies. Our study participants likely had a higher baseline understanding of HR metrics compared to the general population. However, HR interpretation can still be complex, particularly for individuals unfamiliar with concepts such as HR zones, exertion thresholds, or subjective cardiovascular response to exercise. Our study did not collect data on participants' understanding of the HR data, and we view deeper investigation into this topic as a promising direction for future work.

Lastly, the presence of researchers during the sessions, coupled with the novelty of the technology, likely introduced the Hawthorne effect [46, 50]—a change in behavior due to awareness of being observed—potentially preventing sessions from fully reflecting natural conditions. However, participants were still willing to point out downsides of using the technology, which suggests a level of comfort in sharing both positive and negative aspects of their experience. Future studies should include longitudinal designs and some sessions without researcher presence.

7 Conclusion

This work investigated the benefits and drawbacks of co-located exercise partners sharing live HR data. Overall, real-time shared HR technology shows promise for improving group exercise experiences, with nearly all participants (N=23) expressing a willingness to adopt it. We found that shared real-time co-located HR data offered benefits such as mutual accountability, motivation, and enhanced social connection. However, these benefits were influenced by perceived fitness levels; participants who felt less fit compared to their peers sometimes experienced self-consciousness or discouragement. This highlights the importance of intentional pairing to promote positive outcomes. Conversely, shared HR data supported smoother coordination and empathy, enhancing group cohesion, particularly in group runs or rides. Ultimately, designing shared HR systems that prioritize user control and customization can enhance motivation while managing privacy and competition concerns. Future research should continue to explore the broader impacts of real-time collaborative co-located exercise and refine its application in diverse group exercise contexts.

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Appendix

Interview Questions

1. What is your primary sport?
   (a) How long have you been training for X sport?
   (b) How many hours do you train a week? [Approximately, what is your 5k pace?]
   (c) Do you do this sport competitively or recreationally?
   (d) Do you train with a group?
      i. How do you train with this group?
      ii. Why do you train with this group?
   (e) What are your goals for [sport name]?
      i. Do you share these goals with your training group?
      ii. Do you communicate your progress with your training group?
         A. (if yes) How do you do that?
2. Do you use any technology to help you achieve your athletic goals?
   (a) Some examples are smart watches, power meters, or bike computers
   (b) If so, what kind/type?
   (c) How do you use this technology?
3. Have you ever trained with heart rate before?
   (a) How do you use HR?
   (b) When you're training, if you're using HR, would you mind if your group members see your HR?
      i. If [insert their answer], why/why not?
4. If you were training with a dedicated training partner, would you want them or let them know your HR information in real-time?
   (a) Why or why not?
   (b) About a coach, do you think shared HR would be valuable to a coach?
   (c) In a team environment, do you see an opportunity where shared HR would be valuable? Would you feel comfortable letting a coach know about that information?
5. In what ways do you think sharing your heart rate could impact your overall experience during group activities?
6. Can you recall any specific moments during the practice session where the shared heart rate data influenced your motivation or behavior with your partner?
7. If you continued to use this technology, how do you think it would impact how you interact with your workout partners?
8. What kind of insight do you think knowing someone's heart rate during exercise can provide?
9. Can you think of any downsides to sharing heart rate in the way you did today? If so, what are those downsides?
10. What are the main benefits of using collaborative technology such as the watches you tried on?
11. Would you like to see this technology for other metrics than HR?
12. You got a chance to try this technology for X sport but could you see this application being helpful in any other sports?
    (a) What about team sports?
    (b) OR What about other individual sports?
13. Would you use this technology if it was available?
14. Anything you'd like to share that we did not talk about?
15. Could you describe your relationship with the individual you did this study with today?