SnapPI: Understanding Everyday Use of Personal Informatics Data Stickers on Ephemeral Social Media

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Sharing personal informatics data can support accountability, connectedness, and self-expression, but people often find their data too trivial to share on social media. Ephemeral social platforms like Snapchat and Story features have emerged as spaces for sharing more trivial life events, presenting an opportunity to incorporate self-tracked data into sharing. Past work suggests that including data-driven stickers on these platforms can help add additional context to what people share, but little is known about the benefits and challenges of people's everyday experiences with this concept. To understand people's everyday use of data-driven stickers, we designed and developed SnapPI, an app for flexibly incorporating data into stickers for Snapchat. We deployed SnapPI to 21 participants for two weeks, finding that participants value aligning data sharing with Snapchat's communication and stylistic norms. Perceiving Snapchat as a playful platform, participants connected data stickers with various visual components of their Snaps. Stickers were used to incorporate personal informatics data into their existing conversations, and were edited to align with different audience needs or to be expressive. We discuss recommendations for personal data sharing, suggesting supporting flexibility in presentation and aligning with the norms of existing platforms.

CCS Concepts: • **Human-centered computing** → **Social networking sites**; **Field studies**.

Additional Key Words and Phrases: Personal Informatics, Self-tracking, Social Media, Ephemerality, Stickers, Authoring, Snapchat

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1 INTRODUCTION

Many apps that track personal informatics data (e.g., fitness, music, food intake) incorporate sharing features that allow people to share data with others through in-app social features or support sharing on existing social media sites. Sharing data with others can provide benefits, including getting emotional or instrumental support [76], gaining motivation from others [77], being held accountable by others [58], or informing others with similar motivation [12]. Prior systems have supported data sharing on existing social media to help people reach friends and family to achieve these benefits, such as on Facebook [25, 30, 60, 61] as well as messaging platforms [50, 54]. Despite

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people achieving some benefits when sharing on these platforms, research has frequently suggested that people often find their accomplishments too minor or not of interest to the people on them who they communicate with on these platforms [32, 50, 61, 63]. Sharing data ephemerally, such as on Instagram Stories or Snapchat, has been suggested as a promising alternative [33, 51, 52]. Ephemeral sharing supports people in posting moments they might find too trivial for sharing persistently [7], and focus on sharing with closer connections who might be more interested in everyday events [80]. In particular, incorporating data into ephemeral conversations could potentially enable people to broach important topics like health and wellbeing [43, 63] and facilitate social norms around these topics [55]. Ephemerality can preserve similar benefits of social sharing while mitigating concerns about data being trivial or undesirable on social media that primarily support persistent sharing [33].

Systems for sharing personal informatics data persistently have primarily incorporated the data into textual summaries [23, 50, 78], images [19, 30, 44, 54] or graphs [25, 28], and badges [59]. For sharing ephemerally on social media platforms, stickers have been proposed as beneficial mediums for their ability to incorporate data by playfully and relatably providing additional context to the photos and videos people share on these platforms [33]. Evaluations of stickers through survey methods have shown potential value of the technique, such as for highlighting progress towards a goal or explaining the importance of a moment [33]. However, less is known about the circumstances in which people wish to integrate stickers, as well as the benefits they receive and challenges they face in incorporating them into their everyday use and conversations. Evaluating the use of stickers based on personal informatics data in everyday life can therefore deepen our understanding of when and how people desire to incorporate personal informatics data into their everyday conversations.

To support understanding of how people perceive and use data-driven stickers in everyday life, we designed and developed SnapPI, an app that supports embedding customizable stickers driven by personal informatics data in messages and stories on Snapchat. Motivated by previous work [31, 33, 44, 49, 52], SnapPI supports creating multiple types of stickers such as badges, embellished, and analogies, and supports sharing personal informatics data in five domains. To support self-presentation and audience interest, SnapPI allows people to extensively customize the visual appearance of the sticker and the data presented. We deployed SnapPI to 21 participants for two weeks, where they shared over 200 stickers with friends and family on Snapchat. While prior field studies have examined the everyday use of sharing personal informatics data ephemerally like perceptions of representations of biosignals [51, 52], findings from our deployment of SnapPI surface the benefits and challenges with incorporating sticker-based representations of different data domains into the everyday conversations that people already have on social media.

Participants' experiences with and use of SnapPI highlight the value of aligning stickers with the communication and stylistic norms of social platforms. Fitting with Snapchat being a playful and spontaneous platform, participants leveraged the customization options of SnapPI to align their sticker's visual appearance with the rest of their Snaps in playful ways. SnapPI stickers helped participants naturally incorporate data into relevant conversations, bringing up topics they rarely discussed like health and wellbeing and allowing them to more easily communicate their interests and feelings. SnapPI's sticker customization features helped participants align their stickers with the informational needs and personal interests of the people who they Snap with. Drawing on these findings, we discuss the benefits and challenges of supporting flexibility in presentation and approaches for integrating personal informatics data into existing platforms. We specifically contribute:

- Understanding of how sharing data through stickers aligns with the community norms of Snapchat's ephemeral sharing feature. Field study participant's use of SnapPI, a tool we created for sharing personal informatics data on Snapchat via data-driven stickers, suggests that playful inclusion of personal informatics data can help steer conversations toward deeper discussions around wellbeing and personal interests.
- Understanding of the benefits of flexibility in presentation when ephemerally sharing personal informatics data on social media platforms. We identify the importance of aligning with the content and visual norms of existing platforms, and suggest opportunities for supporting greater customization through creating data-driven stickers from everyday objects. Participants valued being able to tailor the stickers they created to the sensibilities and priorities of the different audiences they communicated with. Flexibility further enabled participants to better convey their intentions and feelings around sharing data, such as by exaggerating the data.

2 RELATED WORK

Our aim to understand people's everyday use of personal informatics data stickers on ephemeral social media platforms is motivated by past literature on sharing personal informatics data, motivations for ephemeral sharing, and different shareable representations of personal data.

2.1 Sharing Personal Informatics Data

Sharing personal informatics data, or personal information that people collect for self-knowledge and self-reflection [46], is a common practice, and is increasingly being examined in the research community [29]. Establishment of social norms such as subjective norms (belief about whether others approve or disagree with the behavior) [10] and social liberation (an increase in social opportunity to perform behaviors) [69] can help influence healthy behaviors. Evidence from past systems for sharing personal informatics data with others suggests that doing so can help establish these norms [57, 73]. To develop these norms, people share personal data to seek support from others [42, 76], celebrate accomplishments [21, 77], to be held accountable on goals [58], or maintain connections with others [25, 63]. Prior work has investigated and supported sharing data in a range of domains, including physical activity [23, 36, 57, 73, 78], heart rate [25, 50–52], and diet and food [21, 30]. Personal informatics data is frequently shared online, such as on social media or in forums [21, 32, 63, 76, 77]. In particular, research has suggested that data sharing on social platforms where people already have a history of communicating with one another can lower the burden of interaction [39, 47, 50, 54].

To support data sharing on existing social platforms, researchers have explored design strategies for sharing personal informatics data within existing social communication platforms, such as social media sites (e.g., Facebook, Twitter) [25, 30, 31, 59, 61] and direct communication apps (e.g., SMS, WhatsApp, WeChat) [47, 50, 54]. For example, past work has introduced sharing new kinds of data [25, 41, 50], new strategies for building small communities around data within social platforms [30, 54], and new approaches for structuring and presenting the data [31, 61]. By deploying these systems and evaluating participants' perspectives on them, these studies have contributed understanding of the everyday benefits and drawbacks of the sharing strategies. For example, from deploying TableChat for sharing food in families, Lukoff et al. learned that sharing food photos helped provide a light "check in", but that journaling meals eaten together was fairly redundant [54].

Although the research community has pointed to the benefits of sharing personal informatics data on existing platforms, participants frequently express concern about the suitability of the content being shared to the platform and the audience. On general-purpose social media that

support persistent sharing, sharers have often expressed concern about whether audiences are interested in the data they share [32, 63] and whether the shared data is too trivial [48, 59]. In addition, they also worry that the sharing could give audiences unintended impressions, such as of how content might be viewed in years or decades [56, 81]. Similar concerns also surface in sharing personal data on existing messaging apps [50].

2.2 Ephemeral Sharing on Social Media

Among different modes of presentation persistence of communication on social media and message apps, people view ephemeral sharing as supporting a more private and playful experience [17]. Ephemeral sharing features in social media platforms like Snapchat and Instagram are often used to share mundane and everyday life events [13, 56, 79]. Although persistent sharing could also be used for informal exchanges and everyday relationship maintenance [22, 65], people tend to view these exchanges as too trivial and random to be shared persistently [40, 79, 80]. Ephemeral sharing features tend to be used between closer social connections [13, 79] for spontaneous and playful communication, and people tend to feel less self-conscious about what they post [13, 80]. Social media platforms tend to support multiple modes of sharing persistence, such as incorporating ephemeral features into primarily persistent platforms (e.g., Instagram stories, Messenger's secret chats) or allowing for persistent sharing in platforms that primarily support ephemeral sharing (e.g., Snapchat allows people to select the persistence of content). Furthermore, people often have personal preferences around how they use the different social apps they have, and who they communicate with on each platform [64].

Research has suggested that ephemeral sharing features of social media platforms could be a potentially useful alternative for sharing self-tracked data, addressing the concern that the moments people use data to share are too trivial for most audiences. Ephemeral features typically allow the sharer to dynamically select audiences who receive the sharing content (e.g., who a message is shared with, who a story is visible to), which can prove helpful for filtering to close connections or audience members who might be interested in the data [13, 33]. This ubiquity of ephemeral sharing features also provides opportunities for people to share self-tracked data on platforms that they are familiar with and already communicating with others on, minimizing a need to adopt an additional platform for data sharing [34].

Prior dedicated systems for sharing data ephemerally (e.g., separate from existing social media) have found that sharing can facilitate intimacy between dyads [9, 51, 52]. For example, Significant Otter found that incorporating biosignals (e.g., heart rate) into ephemeral sharing helped enable more authentic communication and connectedness [52]. However, past systems for sharing personal informatics data ephemerally have been limited in their understanding of when, why, and how people would prefer to share their data through this medium. Studies have focused on understanding perspectives on ephemeral sharing of a small set of types of personal informatics data, particularly biosignals [51, 52]. These systems have also not integrated into existing social media, limiting who the people could share the data with and the understanding of how the sharing could be integrated into the everyday conversations people have on ephemeral platforms [34]. Further, how the data is represented has been limited in expressivity (e.g., limited options for how data can be shared) and interpretability (e.g., abstract representations of data), leading people to keep in touch, but not necessarily improve understanding of each other's experiences [51, 52].

2.3 Shareable Representations of Personal Data

Systems that enable sharing of personal data have varied in how data can be presented. Many data-sharing systems have supported sharing textual or numeric summaries. For example, Houston [23] and GoalPost [59] supported sharing a person's daily step totals in a numeric summary, while

HeartLink [25] combined a numeric summary of distance ran with other data about heart rate and pace. Systems often also generate text to be shared, such as describing a person's goal [59, 60, 78], or graphs and other visualizations [25, 28]. These summaries are often alongside images which show the content. For example, in Food4Thought [30] and TableChat [54] allowed people to share photos of the foods they ate alongside free text descriptions.

Other representations of data for sharing have been more abstract in nature. Animo [51] and Significant Otter [52] represented biosignal data in an animated avatar, allowing people to select from poses to share representations of their different states of being. Other systems have supported creating more abstract visual representations of self-tracked data like DataSelfie [44] and ColorAway [19], encoding the data visually in dimensions like the shape, color, and position of objects in an image. While these more abstract representations have supported people to flexibly decide how to present the data, the representation is primarily for themselves, and the encoding might not be easily interpreted by the people with whom they might share.

Most relevant to our work, Epstein et al. propose the idea of data-driven stickers as a potentially useful way of encoding personal informatics data for ephemeral sharing on social media platforms [33]. With ephemeral sharing, people often share content in the form of photos or videos [56, 80], frequently annotating them with text or stickers [68]. With annotations, people can express their personality [8], and provide more details to explain the context of their sharing [11, 13]. They evaluated sticker designs with different data domains and presentation techniques (e.g., badges, embellished, analogies) in speculative surveys with potential sharers and audience members, finding that data-driven stickers have the potential to make ephemeral content more informative and entertaining. Although this speculative evaluation points to the potential for data-driven stickers on ephemeral sharing on social media platforms, it does not provide understanding of the everyday circumstances where people would consider incorporating data-driven stickers, nor the barriers or challenges they encounter in embedding stickers into the community norms of an ephemeral platform. Our work therefore expands on Epstein et al.'s sticker designs by evaluating people's real-world use of and experiences with sharing stickers driven by their personal data to Snapchat.

3 SnapPI DESIGN

We designed SnapPI to support creation of data-driven stickers for ephemeral sharing on social media platforms, namely Snapchat. We designed SnapPI iteratively, envisioning approaches for authoring on paper and in digital mockups and conducting usability tests around sticker authoring before implementing our design. We opted for a structure similar to selecting other stickers for ephemeral sharing features on social media platforms, where one is selected from a list of available options. To understand the use of data-driven stickers in a real-world setting, we chose to use the stickers developed in Epstein et al.'s work [33]. These stickers were originally developed through iterative sketching and refinement, with the final versions presented in Epstein et al. [33] and used in SnapPI produced by a professional artist recruited on Fiverr [2]. Leveraging this existing set of stickers, SnapPI supports configuring aspects of the sticker's design, including the presentation style, data domain, and visual components such as colors and animations. Upon editing, the stickers could then be exported to Snapchat. Figure 1 describes the workflow of creating a SnapPI sticker. Drawing on insights from past systems for sharing personal data [28, 31, 44, 52], we designed SnapPI to support flexibility in presentation and the data shared. We developed SnapPI as a standalone app in Ionic [1] to run on iOS devices.

3.1 Data flexibility

SnapPI allows a person to customize what data they include when sharing. Rather than supporting a single tracking domain, we incorporated multiple data domains into SnapPI because people

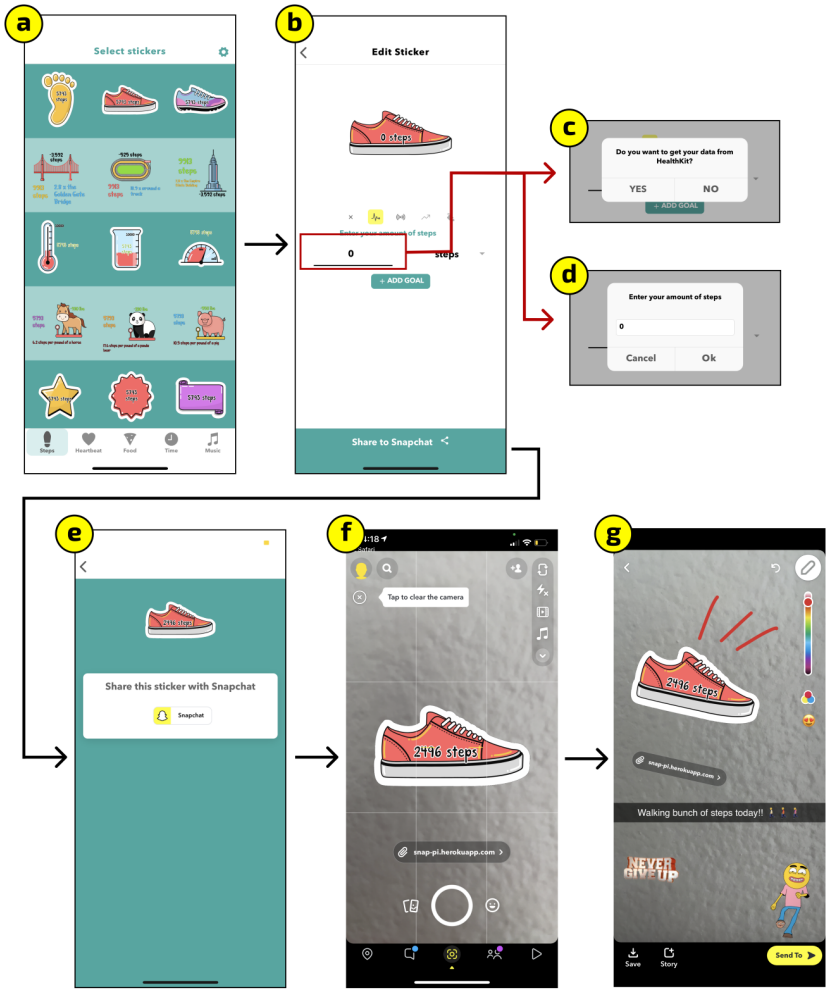

Fig. 1. The pipeline for sticker generation in SnapPI involves (a) selecting a data domain and sticker, (b) customizing a sticker's color, animation, and goal, (c) selecting data from either an existing data source (see Figure 2 (f-i) for details) or (d) through manual input, (e) rendering the sticker, (f) exporting it to Snapchat and taking a photo or video, and (g) editing the Snap with features on Snapchat. The supplemental video further demonstrates the pipeline.

frequently track across multiple domains simultaneously to support their goals [35, 72]. SnapPI incorporates stickers in all five domains examined in Epstein et al.'s work [33], which were domains that tend to be of interest commercially and in research (steps [23, 39, 59], heartbeat [25, 49], food [21, 30, 54], time [14], and music [75]), and supports customizing the exact value and unit displayed. Implementing the stickers in SnapPI required editing the raw image files (SVGs) from Epstein et al.'s to label the data fields, together with engineering work to enable dynamic updating of the data in response to a person's input.

Prior work has highlighted the burden of copying and filtering personal informatics data from self-tracking apps to social apps [28, 39, 54]. To reduce this burden, SnapPI syncs with existing data

sources for most of the domains. For instance, steps (Figure 2e) and heartbeat (Figure 2f) are both connected to the device's health API (e.g., Apple HealthKit), which could pull data either from the phone itself or paired devices (e.g., Apple Watch, Garmin devices). Music allows people to fetch their listening history from Spotify [3] and select individual artists, albums, or songs to share the listen count of (Figure 2h). The food domain requires manual journaling in SnapPI, but a person can search for foods in the Nutritionix [4] database and add a food's nutrients to a running total (Figure 2g). Time can only be recorded manually in SnapPI, which supports flexibility in what the time shared represented (e.g., different kinds of productivity, time spent waiting for something) versus connecting to a source which offers one perspective on time (e.g., RescueTime for productivity).

SnapPI allows a person to adjust the data (step total, plays of a song) to support people in customizing exactly what data they share, as well as promoting privacy [28]. In domains where data was retrieved from an external source (steps, heartbeat, and music), a person can select the time interval that they wish to share the activity of by selecting a time range (e.g., day, week, or month) and then selecting the window of activity to share. Although SnapPI enforces minimum (0) and maximum (integer maximum) data values, a person can further edit the data totals to whatever values they desire, allowing for correcting inaccuracies or missing data or inflate totals.

To further support customizing how tracked data is presented, SnapPI supports selecting from multiple units. For steps and time, units are automatically converted (e.g., between days, hours, minutes, and seconds for time; between steps, miles, and kilometers for steps). Food and music support a few units that could be converted between based on what a person selected. For example, a person can choose to present calories or grams of protein for the foods they looked up, or number of plays or minutes played for the album they listened to. Heartbeat only supports beats per minute. We implemented custom unit strings into SnapPI to support further flexibility (e.g., "0 times", "5 bananas").

3.2 Presentation flexibility

In addition to customizing the data shared, SnapPI supports choosing among ways of presenting data. Opting for stickers for sharing data as overlays on other social media content [33], we made SnapPI to be flexible in sticker's form.

Prior work has emphasized that content variety is important when sharing personal data, as posts often appear similar to one another [31, 32]. We therefore include all stickers designed by Epstein et al. into SnapPI, spanning three presentation styles (plain, analogy, embellished), domain-relevance levels (domain-relevant, domain-agnostic), and specific instantiations [33]. SnapPI allows a person to choose among 15 different stickers for each domain, 9 of which are domain-agnostic stickers common to all domains (3 plain, 3 analogy, 3 embellished) for 39 total unique stickers.

Prior work has pointed to the value of customizing the aesthetics of self-tracking data presentation [31, 44]. SnapPI therefore further includes methods for customizing a sticker's animation, color, and target goal. SnapPI supports five colors to allow people to align with the other content they plan to share (Figure 2c). Technical limitations restrict colors to domain-agnostic stickers in badge and embellished styles, and fixed colors versus open-ended selection to ensure sticker legibility. Because prior work suggested stickers may be useful to audiences when they demonstrate progress towards a goal [33], SnapPI incorporates a target goal into all embellished stickers (Figure 2d). When a target goal is indicated, SnapPI fills up the sticker's color aligning with the proportion of the goal that the person has achieved. Animations (Figure 2b) seek to draw attention to the sticker, aligning with similar stickers on social platforms that support ephemeral sharing [13, 68, 74, 79]. All stickers can have no animation, or one of three styles: *pulse*, *shake*, or *counting up*. The pulse and shake styles animate the entire sticker in a looping animation, while the counting up style increases the number on the sticker from 0 to the value being shared, pausing on the final value

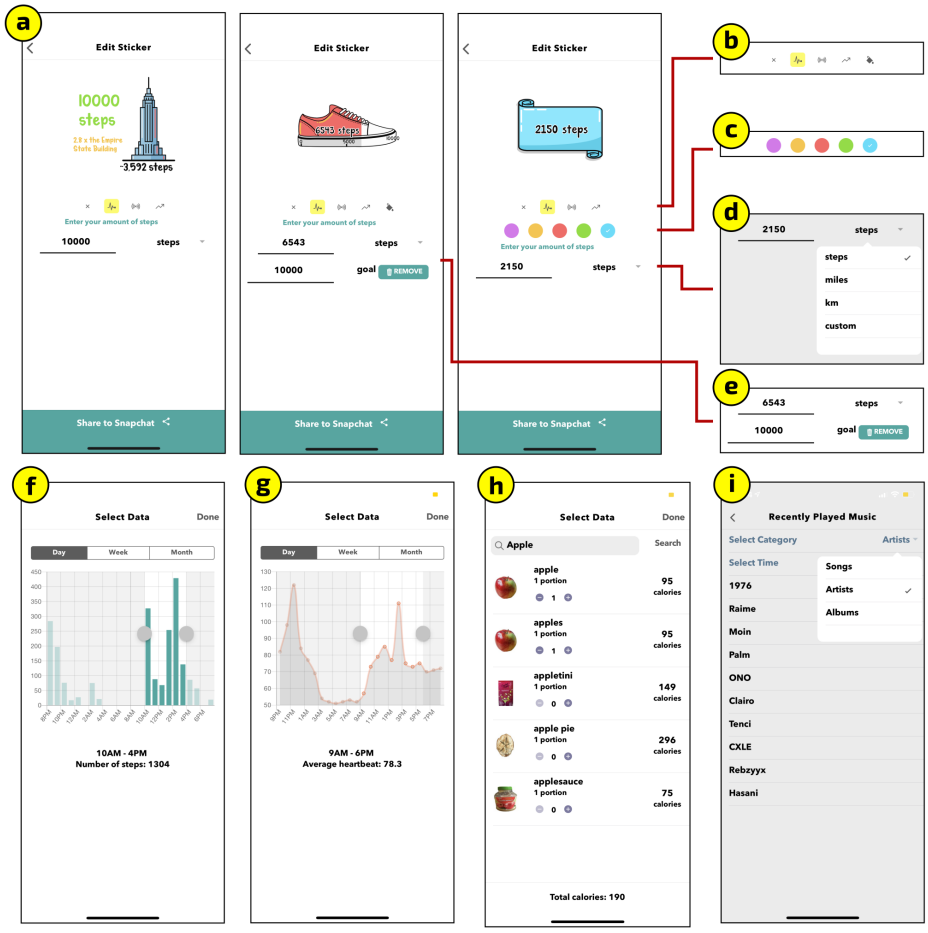

Fig. 2. SnapPI supports a range of optional customization settings for data-driven stickers. (a) Configuration settings differ from each sticker type, supporting a combination of (b) animation, (c) color, (d) unit, and (e) target goal. SnapPI also syncs with existing data sources for most domains, including (f) steps, (g) heartbeat, (h) food, and (i) music.

before looping. SnapPI includes a fourth *filling-up* animation when a sticker includes a goal, filling the sticker's color up to the selected value (e.g., about halfway for 5,235 steps out of a goal of 10,000) and pausing before looping. SnapPI included default options for all customization settings to support efficient creation: red for color, pulse for animation, and off for target goal.

We designed SnapPI as a piggyback prototype [34, 37] to support sharing on Snapchat with the platform's CreativeKit library [5]. At the time of development, Snapchat was the only widely-adopted social media app where we could find an API that allowed importing external media resources to share as overlays to ephemeral posts. Other platforms supported importing complete posts from external platforms, like sharing a screenshot to an Instagram Story. However, prior work has suggested that people more negatively perceive posts where the main content is self-tracked data [32, 33, 59], opting us to support Snapchat only. Upon finishing configuring the sticker, clicking the "Share" button sent a request containing the sticker generation specifications to a

remote Node.js server that renders the sticker. Although people usually collect and access personal tracking data and interact with social media apps locally on their devices, the sticker generation process was outsourced to the remote server to account for the limited processing power of mobile devices for the computationally expensive task of rendering animated sticker, and also to align with a Snapchat CreativeKit requirement for a publicly-available URL for each sticker. After the sticker was rendered, a person could export the sticker and customize their post for sharing in their Snapchat app using its typical features (e.g., adding other non-data stickers and filters, adding a caption, positioning the sticker over their image or video).

In our case, it is important to support the app on mobile devices because of how people usually collect and access personal tracking data and interact with social media apps. Similar to limitations of other piggyback prototypes [34], the limited processing power of mobile devices required us to work with external services to achieve computationally expensive tasks. To support the timely rendering of the animated sticker into GIFs, we had to outsource rendering to an external server and retrieve the sticker from it.

4 METHOD

To examine participants' everyday experiences of using stickers for incorporating personal informatics data on Snapchat, we conducted a two-week field deployment study of SnapPI in summer 2021.

4.1 Procedure

Our deployment of SnapPI involved collecting quantitative data from participants through usage logs alongside qualitative data from in-depth interviews after the deployment. We supplemented participants' perspectives and use of SnapPI with a survey of the audience members they shared stickers with. Our study was classified by our university's IRB as exempt, as causing no more than minimal risk to participants.

4.1.1 Recruitment. We recruited participants through two channels: (a) Advertisements on Snapchat geofiltered to the U.S., and (b) Reddit posts to university-centric subreddits where the research team is affiliated. All participants completed a screening survey, where we filtered to participants who were at least 18 years old and lived in the U.S. We further required participants to be frequent users of Snapchat (sending at least two Snaps per day), self-describe as regularly using stickers in their Snaps, and also regularly collect two or more types of personal informatics data. To help ensure participants would use SnapPI socially, we asked participants during recruitment to identify at least one connection with whom they were interested in sending Snaps.

4.1.2 Onboarding Session. Each participant completed a 30-minute onboarding session with a research team member over a video call. During the session, we instructed the participant to install SnapPI on their personal phones and granted SnapPI permission to access their Spotify account and Apple Health data on their devices, if they planned to use stickers from those domains. We then gave participants a brief overview of all the features of SnapPI, including all available options for stickers and customization features. After instruction, we asked participants to send a test snap to the research team with SnapPI.

4.1.3 Deployment Study. We asked participants to use SnapPI however they wished for two weeks, with a rough aim to share at least one Snap containing a SnapPI sticker each day through direct Snaps or to their Stories. We expected many or most participants would share less often, as participants would likely experience days when they did not wish to share any personal data or Snaps altogether. To understand how the participants created and embedded SnapPI stickers in

their Snaps, we created a Snapchat account for the research team and asked the participants to add it as their Snapchat friend. Whenever participants sent a Snap containing a SnapPI sticker to their friends, we asked them to send a copy to the research account as well, if they were comfortable doing so. The research team members then recorded these Snaps by taking screenshots of them. If the participant did not send any Snaps to our account for more than two days, we sent them a message on Snapchat to check in, as well as an email. During the two-week trial, we also kept in contact with participants through Snapchat and email to resolve bugs and issues they encountered.

4.1.4 Exit Session. We conducted a 60-minute exit interview with each participant over a video call to understand their experiences with SnapPI. The interview included questions about their general perception of SnapPI, their experience of incorporating data from different data domains, how they selected and configured different types of stickers, and how their sharing was received by their friends on Snapchat. To help recall their experience of using SnapPI, we also aggregated the Snaps with SnapPI stickers they sent to the research account and discussed them during the interview. After the interview, we showed participants how to uninstall SnapPI and remove the permissions it granted. Participants were then compensated with $80 in cash or a gift card.

4.1.5 Audience Survey. At the end of the exit session, we asked participants for contact information of the connections they shared SnapPI stickers with who they thought might be willing to participate in a survey about their experience receiving stickers. We sent these audience members a 10-minute survey to understand their perception of SnapPI stickers and their experiences receiving and conversing around them. The survey included demographic questions and open-ended questions on how they felt their connection's SnapPI stickers helped support common social interaction goals around data sharing including providing support [36, 63, 76], accountability [32, 39, 59], information [12, 21], and self-expression [31, 75]. We compensated audience members $10 cash for their time.

4.2 Participants

Overall, we recruited 24 participants, 21 of whom used SnapPI for two weeks (12 from Reddit, nine from Snapchat ads). Of the three participants who did not complete the study, one faced technical difficulties that prevented them from using SnapPI and two became unresponsive after the onboarding session. Our participants skewed young, with 15 participants being between 18 and 22 and all being under 30. 10 participants were male, 10 female, and 1 non-binary. Participants lived in 11 different states in the U.S. 9 participants wore smartwatches or wearable activity trackers, 7 of which sensed heart rate. All had access to Apple Health for recording step data from the phone, and 17 connected SnapPI to their Spotify accounts. Participants gave us the contact information of 32 social contacts with whom they shared SnapPI stickers (min 0, max 3). Fifteen audience members responded and completed the survey, of which we discarded one response from an underage sibling. Of the 14 responses, 10 were friends or colleagues of the participant, 3 were partners, girlfriends, or significant others, and 1 was a sibling.

Table 1 describes participant and audience demographics. In the remainder of the paper, we quote participants with PXX. We quote the audience members they shared with AXX, corresponding to the participant number, appending a letter if multiple audience members completed the survey (e.g., A1a).

4.3 Analysis

We analyzed the interview results and the Snaps collected through reflexive thematic analysis, as outlined by Braun and Clarke [15, 16]. We developed themes primarily inductively, following a semantic approach by primarily examining the explicit meaning behind what participants described

Table 1. Participant's self-described demographics, relationships, and overall use of SnapPI. Our study participants were young, aligning with the typical demographics of Snapchat. Most participants used SnapPI every day or two. *P10 sent additional snaps with SnapPI, but forgot to send them to the research team before they disappeared.

Participant ID	Audience members surveyed	# of SnapPI Stickers Sent
P1 (M, 21)	A1a (Partner, F, 22) A1b (Friend, M, 22)	12
P2 (M, 21)	A2a (Friend, F, 22) A2b (Friend, M, 24)	8
P3 (F, 22)	A3 (Friend, M, 22)	14
P4 (M, 21)	-	5
P5 (M, 25)	-	9
P6 (M, 22)	A6 (Friend, M, 21)	17
P7 (F, 22)	A7a (Best friend, F, 22) A7b (Friend/acquaintance, M, 22)	17
P8 (F, 18)	-	18
P9 (M, 27)	-	10
P10 (M, 27)	-	1*
P11 (F, 27)	A11 (Sister, F, 23)	6
P12 (F, 20)	-	12
P13 (F, 20)	-	6
P14 (F, 18)	A14a (Significant other, F, 19) A14b (Friend, F, 19)	4
P15 (F, 20)	-	11
P16 (F, 19)	-	7
P17 (NB, 18)	A17 (Girlfriend, NB, 19)	7
P18 (M, 20)	A18 (Friend, M, 20)	37
P19 (F, 20)	-	11
P20 (M, 26)	A20 (Colleague, F, 23)	12
P21 (M, 29)	-	8

and interviews and what Snaps they took. A critical realist approach was also employed for analysis, as we focus on participants' understanding of their experience in light of the broader social contexts in which they used SnapPI. Our approach roughly followed Braun and Clarke's six phases of familiarization, coding, generating initial themes, reviewing themes, naming themes, and writing up. The research team first discussed participant perspectives from a few early interview transcripts. The first author then open-coded all interview transcripts and Snaps collected and wrote analytic memos, constructing codes around participants' experiences incorporating stickers into their everyday Snapchat use. The research team then reviewed the codes and memos in weekly meetings, eventually developing a final codebook for the interviews with nine codes, which we used to re-code the interviews. Example codes include "Explaining the importance of the moment", where participants used SnapPI stickers to explain what made the moment they shared noteworthy, and "Reaching interested audiences" where participants described using SnapPI stickers to reach audiences who they thought would appreciate the content such as strong ties or connections with similar interests. While we developed the final codebook for interviews, we identified a subset of three codes from the codebook that were highly relevant to the visual aspects of the Snaps people

sent. We decided to re-code all Snaps we received using the three codes: Snaps which used captions to explain moments, Snaps which connected stickers to the Snap's background image or video in playful ways, and Snaps where data appeared fabricated. Then, the first author re-coded all interview transcripts and Snaps according to the final codebook. Informed by the coded data, the research team formed primary themes around SnapPI's role in supporting creative self-expression and sharing everyday accomplishments. During the writing process, we further refined the themes around our main research goal of understanding how people perceive and use data-driven stickers in everyday communication.

In addition to our qualitative analysis, we gathered quantitative information about participants' use of SnapPI from the usage logs and Snaps sent to us. We counted the number of stickers participants sent in total, the data domains and unique stickers they shared, and the customization options (color, animation, unit) they used in each sticker.

4.4 Limitations

We intentionally recruited younger participants to align with the demographics of Snapchat, which is most widely used by people under 30 [6]. However, older people, as well as minors, may perceive SnapPI differently, such as having greater hesitation about including data into Snaps or desiring more playfulness in stickers. Better understanding of how these age groups create and use data-driven stickers can further knowledge about their use for sharing ephemerally on social media platforms.

Because SnapPI exported stickers to be shared on Snapchat, we had limited ability to observe what participants shared, with whom they shared, and whether there was any further discussion. When participants exported the sticker from SnapPI to Snapchat, we could no longer observe how they incorporated the sticker, who they shared it with, whether they shared it at all, or whether or how audience members reacted. Although we asked participants to send us the Snaps where they used SnapPI stickers, 3 participants mentioned occasionally choosing not to send us their Snaps to protect their privacy (P7) or forgetting to send us their Snaps (P5, P10, with P10 regularly forgetting). We addressed these limitations through our interviews, asking participants probing questions to better understand how they used SnapPI even in the moments they did not share with us. Interviews and surveys of audience members also provided insights into how people responded to Snaps with SnapPI stickers and communicated around the shared data.

A few participants encountered technical issues which made them unable to send SnapPI stickers as they would like to, including where stickers did not attach to Snaps and integration issues with some of the data sources. These issues may have caused some participants to not be able to send out SnapPI stickers immediately at the time they desired, or may have resulted in participants engaging with SnapPI less than they intended to. One participant (P4) re-sent Snaps with the same sticker to ensure they were received. Participants' feedback during interviews suggested that these issues were not widespread, and that most participants could regularly create and share SnapPI stickers.

As our goal was to study people's experience incorporating data-driven stickers in their everyday life through SnapPI, we leveraged the original five domains studied in the work of Epstein et al. [33]. Although incorporating multiple data domains allows our findings to generalize beyond a single kind of data, care needs to be taken when considering data-driven sticker's utility in emotionally-laden tracking domains, such as mental health. In the domains we included in SnapPI, the stickers could be easily appropriated to promote unhealthy goals, such as calorie intake being used to promote under-eating. Scaling these techniques requires incorporating lessons from past work on mitigating harmful behaviors in tracking apps [26] and on social media [18, 66, 67]. Thoughtful

consideration of what quantified metrics to be included and how to include them in future systems incorporating the same features could help mitigate these potential concerns.

Finally, we acknowledge the limitation of the two-week study duration on understanding participants' everyday integration of personal informatics data into ephemeral sharing on social media platforms. We expect participants' use of SnapPI was somewhat influenced by its novelty, and participants likely sent more Snaps containing data-driven stickers during the study than they would on their own. By recruiting participants who were frequent Snapchat users and regularly collected personal informatics data, we feel we somewhat mitigated the influence of a novelty effect, as participants frequently used Snapchat to communicate about and share their data already. Although the study duration was effective for understanding participants' and their audience member's perceptions of incorporating data into existing social media platforms, a future longer-term study can help understand the frequency and circumstances under which people incorporate data-driven stickers.

5 RESULTS

We now describe how participants used and perceived the data-driven stickers created in SnapPI and their experiences incorporating those stickers into their everyday Snapchat use. Across the two-week study, the 21 participants forwarded the research team a total of 230 Snaps with SnapPI stickers (Average=10.95, SD=7.33). Participants sent Snaps containing SnapPI stickers fairly evenly throughout the study, with no fewer than 10 and no more than 18 participants sending a Snap each day of their two-week enrollment. Participation was slightly higher during the first two days of the study (16 and 18 participants sent Snaps, respectively), and stabilized shortly after. Participants made frequent use of the customization features in SnapPI's authoring process. Sixteen participants sent stickers from three or more different data domains during the study, using an average of 8.47 unique sticker designs. (Table 2)

Overall, we found participants used stickers to share their data in ways which aligned with Snapchat's norms as a platform and a community. As a social platform that primarily supports ephemeral sharing, Snapchat facilitates playful sharing with its lighthearted design and visual components. Because sharing on the platform tends to be spontaneous and mundane, participants used stickers within their posts to share details about their everyday wellbeing, habits, and interests that they would have struggled to incorporate in other ways. Participants leveraged the flexibility in how data could be presented through stickers to personalize what they shared to the interests and experiences of the people who they shared with. In the following sections, we describe how our participants integrated sharing data stickers into their everyday use of Snapchat.

5.1 Playfully Using Stickers to Share Data

Overall, participants felt the visual appeal of SnapPI stickers made it easier to share their tracked data and start conversations about it. P12 described that the playfulness of stickers made it easier for her to talk with others: "*I felt like [SnapPI stickers] did add more expression or kind of more playfulness to my conversations, because personally, I don't really use stickers. But when I started using these stickers, [...] it made it a little more fun to talk, or to be able to like, say what's going on.*" Participants frequently mentioned that using stickers to share their data would be more fun than sharing that information through other means. For example, P16 particularly appreciated the cuteness of being able to share her music listening habits with others: "*I think it's more fun when you can show just how much you have been listening to them. [...] I don't know, it's really silly. But I think it's way more fun than just telling people like that. Especially with the graphics. It's cute. Makes [sharing] more fun.*"

Table 2. Participants made frequent use of SnapPI's configuration settings, with most sending stickers across multiple domains and often using customization settings.

Customization category	Descriptive statistics (per participant)
Data domains used	Average: 3.43, SD: 1.33 Min 1, Max 5 Most used: Steps (21 participants) Least used: Heartbeat (12 participants)
Unique stickers used	Average: 8.47, SD: 4.46 Min 1, Max 21
Stickers with customized animation	Average: 2.43, SD: 4.31 Min 0, Max 20
Stickers with customized color	Average: 0.71, SD: 1.01 Min 0, Max 4

When using data stickers, participants embraced the playful nature of Snapchat by connecting the data they shared with the other visual elements of the Snaps they sent. For example, through customizing the shapes and colors of their data stickers, participants connected them with objects in the background of their Snaps (Figure 3a) or other stickers they included (Figure 3b). For example, P11 used a bowl sticker with food data to interact with the food she ate to make what she shared more attractive (Figure 3c): "*If I cook, like one thing that I liked to do was, I like to use the little bowl [sticker]. [...] And like, I would hold up like food over the sticker of the bowl, because I thought that looked cute. So like, I think for those instances, it did help convey some form of meaning.*" P20, who shared mostly health-related SnapPI stickers in their Snaps, usually shared stickers with "*just a picture of a floor or a mirror, just a blank sort of background*". After his friends asked him about his repetitive background, he "*tried to make it a little more fun*" by taking a photo of their shelf, adjusting the size of the sticker to put it in the cupboard (Figure 3d): "*so I was putting it into the cupboard, my goal is in the shelf*". In placing the sticker on Snapchat to look as though it were shelf in the physical world, P20 tried to convey to his audience that his goal of trying to be physically active was something that he might encounter regularly as he goes about his daily life.

Participants who had experience with sharing in dedicated activity tracking platforms like MyFitnessPal and Apple Health felt that incorporating data stickers into Snapchat was more inherently sociable and less serious than sharing on these platforms. For example, P20 highlighted the value of the interpretability of SnapPI stickers compared to sharing on other platforms: "*So I feel like the major difference between SnapPI and MyFitnessPal is that SnapPI will be more sort of aesthetically pleasing. It's easier to absorb information from figures and numbers and with animations, and it's more sort of interactive, which is why I find it easier to use to sort of share what I was doing in terms of calories and steps. [...] And Snapchat it's sort of, I'm sending them Snaps anyway, so it's very streamlined being able to send them all at once.*" P1 felt that having the SnapPI stickers integrated in Snaps felt less "*braggy*", as it looked less intrusive than if they shared a screenshot from another app on Snapchat: "*If I want to [share my steps] without the SnapPI sticker, then I would need to go to the health app see how much I walked, and then actually manually put it in Snapchat and say how much I walked, for example. And it sorta feels like it's more, like, braggadocious that way, because like when you put in the sticker, it's like fun, and it's just like, it doesn't get taken too seriously, it doesn't seem like as much as a flex.*" P5 suggested that sharing stickers helped them further communicate activities to others that would be difficult to otherwise: "*I viewed it [sending SnapPI stickers] as another tool to creatively express to my audience. How do I say this? admittedly, if I didn't have SnapPI,*

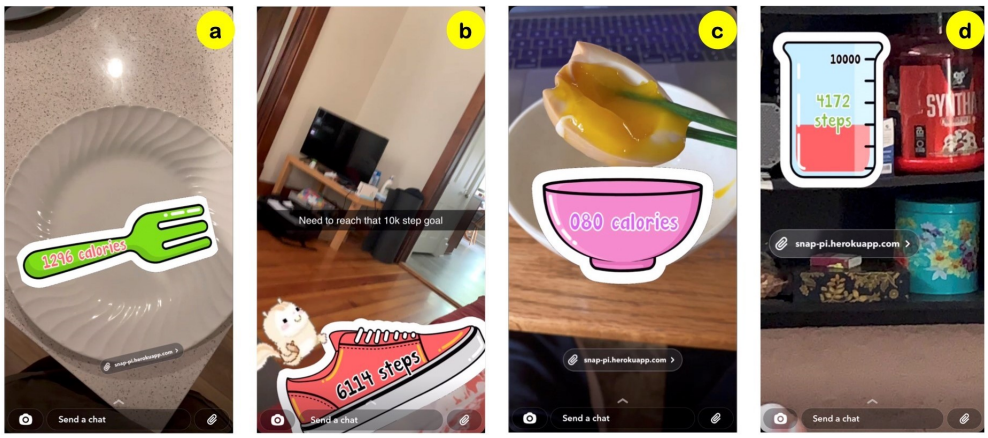

Fig. 3. Some participants playfully connected SnapPI stickers with other visual elements in their Snaps. (a) P3 aligned a fork sticker with the plate in their photo. (b) P7 used a sneaker-shaped steps sticker with a gif of a squirrel to create an effect of the character walking. (c) P11 used a bowl sticker with food data to interact with their dumpling. (d) P20 placed the beaker-shaped sticker on the shelf of his background photo.

I probably wouldn't have communicated. Some of the things, like, wouldn't have been in my lexicon, I guess you could say this to say, 'Oh, I ate this many calories on this.' But since I was given the option, I found it fun to do." Being able to share stickers with data helped P5 communicate about health in a creative way, starting conversations that they otherwise would not have had.

5.2 Moving Everyday Conversations to Important Topics

Through sharing stickers with data with SnapPI, participants incorporated data sharing into the everyday, lightweight conversations that platforms like Snapchat facilitate, leading to different conversations from what they typically had on the platform. P8 pointed to occasions where being able to share data through SnapPI stickers helped her start a casual conversation about her activity: "*Hmm, I think in general, I use stickers pretty often. So with these stickers, they start a point of conversation, I think, with some friends. Cuz I mean, [...], if I went on a walk, and I use this sticker, my friend would ask me, [...] stuff like, 'Where did you take the walk?' Or like, Oh, good, that you took the walk', and something like that. But yeah, it's a point of conversation to talk about. [...] I think I guess, people looking at the number, or some of my friends feel, 'oh, that's high', or something like that. Yeah, looking at the number, they would say stuff.*" P8's experience highlights a contrast between SnapPI stickers' ability to prompt discussion and other stickers she regularly used when sharing.

Participants also reported sharing being beneficial for holding themselves accountable to and receiving support on their fitness or diet goals. For example, P10 described that sharing data stickers helped hold him accountable to his wellness goals: "*I liked that aspect [using SnapPI to incorporate the data and share on Snapchat] of it, because it also helped keep me accountable, especially with food and steps and everything. So I did enjoy that. [...] With Snap[chat], it's kind of more just like throughout your day as you go and then like sharing with friends.*"

Participants often mentioned how being able to share data stickers enabled them to convey aspects of their interests or identities that they wanted to share with their Snapchat friends, but did not have the mechanisms to do so. P9 frequently used SnapPI to share music, appreciating SnapPI's ability to highlight how much she liked a song, which she had struggled to convey in the past: "*you know, I would put on there on my story, sometimes, like, how many times I've listened to a song because,*

you know, if you like a song, you'll listen to it over and over again. And you know, when, before SnapPI, it would just be a random screenshot or something, you know, I wouldn't necessarily put captions so people couldn't tell how much I liked the song. Or you know, the times [you listened to it]." P6 further described how using SnapPI stickers allowed him to briefly add context to what he shared in simpler ways than other mechanisms on the platform: "*honestly, I like the time spent [stickers], because usually, like, I like to send snapshots of like if I'm working on something or doing something. And so it's nice to show the amount of time I've spent on that because otherwise, I wouldn't really use a sticker for that. So it's cool to incorporate a sticker that, you know, shows all the information in like one package, rather than doing like a caption and something else.* "

In addition to supporting conveying aspects of their interests, participants found stickers an entertaining way to facilitate conversations around their personal data. P8 similarly felt that sharing a sticker that he walked was more fun than text, lowering the burden to integrate data: "*[...] rather than just typing 'Oh, I walked x amount of miles today', using the sticker is a fun way to show it. And also, it's just cool that it drags it from the health app, makes the process easier instead of going to the health app and seeing how many steps you have and putting it on Snap or something.*" While participants acknowledged that integrating personal data into everyday Snapchat conversations may have been technically feasible, SnapPI made doing so naturally integrated with how they already communicated. Through using SnapPI, participants were also able to record aspects of their habits, such as keeping track of the play count of a song or the time they spent on a chore, and shared them with others as social proof. These usages align with the documentary [72] and curiosity [35] tracking goals that were mentioned in previous works.

Participants valued how stickers allowed them to incorporate relevant data into conversations with people who they knew would care about the topic. For example, P12 described sharing health data through SnapPI stickers with her friend who was also interested in fitness, using the sticker to provide evidence and freeing her up to talk to her friend about other topics instead: "*[we're] both doing, like, fitness goals [...] I was able to like let them know, like, I'm being active, I can show you through [SnapPI], you know, steps. [...] I already always [share with them] when I did exercises, I would just say I'm working out or I just did a long walk. [By] using the stickers, I [am able to] add more to it, [...] like adjusting how I say things to accommodate to sending that sticker.*"

Participants frequently adjusted what data they shared via stickers to the interests of specific recipients. P11 and P13 both frequently shared stickers with different data domains with different friends based on their interests, bonding with them over the discussed topics. P13 contrasted who she would share music stickers with versus heart rate stickers: "*[I] usually just [share SnapPI stickers] with close friends, or like people that I have bonded with music, like friends that you know, specifically I may bond with someone over working out, and they get the heart rate Snaps. Or if I bond with someone over music, then they get the music Snaps, you know. And in the middle there [are] people who get both.*" P11 agreed, highlighting that she would share different stickers with her friends from family members due to their different interests, and wanting to bond over different kinds of data: "*like step count, I'll share that with, like, family members, but food I would share with friends. So like, I would kind of keep the two separate, if that makes sense. [...] The reason I'm more likely to share step counter stuff with, like, family is because we're more likely to do the competition stuff. [...] I think a lot of my friends, like I have some that are really into cooking. And I like making a lot of homemade stuff. [...] I sent those [food] pictures because like, it's something that we've bonded over, like cooking was kind of one way that we were really able to get along and get to know each other when we were younger.*"

Participants frequently used data stickers from SnapPI to give close ties updates on their everyday life and keep their online conversations going. For instance, P12 described SnapPI stickers as a way to sustain conversations as he did other activities, like studying: "*I remember I would use it to like, cuz all my friends [and I] had online classes [together] over the summer. So I'll usually be like, 'Your*

studying time starts now' or like, 'I'm putting you on a timer'. Things like that, or, 'This is how long it took me to do something'. That's what I remember [I] used it for." Some participants mentioned using SnapPI stickers to maintain their *Snapstreaks*, or Snapping with a particular social connection for consecutive days. P18 frequently sent time stickers to keep his Snapstreak going with his most frequent contact, using the sticker to keep track of how far he was through his workday: "*[I used SnapPI stickers for streaks] just with people I keep streaks with, like, just a few close friends. [...] I send the timestamp points on a regular basis. [...] it was kind of like telling him that I hate the work, or like, I don't know, I don't hate the work. I hate working.*"

5.3 Leveraging Flexibility To Customize for Different Audiences

The flexibility in choice and format of stickers that SnapPI provided allowed participants to be expressive and effectively communicate their thoughts and feelings to others on Snapchat. For instance, although participants often shared self-tracking data retrieved from other sources like HealthKit and Spotify, many often used the ability to edit or manually input data to be creative with the data they shared. Rather than solely trying to be accurate with what they shared, a few participants fabricated the data with an unusually high or low number to be expressive. For example, P1 inflated his heart rate in a sticker to indicate that he was hungry (Figure 4a). P12 once exaggerated her heart rate to emphasize her anxiety about taking an exam (Figure 4b): "*I over-exaggerated the amount of heartbeats I was having just to be funny. And yeah, it kind of gave that little illusion like, 'Oh, really?' 'You're being dramatic?' 'Your heartbeats are not like, 800 [beats per minute].' I was like, 'exams, that's how most people would do.'* " P2 had a similar experience in doing so, and further explained an occasion he used the fabricated data to create a narrative: "*heartbeat, I think I also shared a lot, because I don't like wearing Apple Watch on, I just sort of create[d] my own data, which I think was also sort of just humorous. I wasn't trying to like, actually demonstrate that I'm like a pro athlete. And time spent doing things is another good one, I think, especially if you're doing like a monotonous thing for hours. I think that's a funny way to share how much time you spend doing things.*"

As part of fabricating data, some participants chose to create stickers with unrealistically high or low numbers. P2 similarly used a steps sticker with 113,518 steps (Figure 4c) to indicate how busy the day was and how tired he felt. P5 often exaggerated the values to express how he felt about the data he was sharing, such as feeling that he was wasting time or not being healthy (Figure 4d): "*I hope this is okay. I, I sort of abused, I abused it a little bit in the sense that I didn't, I wasn't always being honest, I was being a little comedic, sometimes with my Snaps, which I think is valuable. [...] so I would put like, you know, something egregious, like, five hours in the bathroom or something right? Or like, three hours? You know, scrolling Facebook, [...] I tried to type in like, as many calories as I could, because I was feeling really fat is a big deal. But yeah, well. So I tried to you know, max out the calories on the thing. It was like, you know, 200 burgers or something like that. I thought that was funny.*" In one sticker, P5 (Figure 4d) used a time sticker with 0 seconds to joke about the amount of "*time spent with my life on track*". While these exaggerations were often intended to be funny to sharing audiences, they also helped participants better express their feelings.

Beyond fabricating data, participants frequently customized stickers to cater to the needs of the different audiences they have on Snapchat. For instance, P9 described using analogy stickers with friends who might know less about the domain: "*people who are not aware of steps might not know 10000 steps is a lot. Having the '3 times the golden gate bridge' helps those people understand the number of how many steps I walked*". Similarly, sharing data about goals would often be considered as out of context or hard to follow, but through SnapPI, participants found embellished stickers useful for sharing their progress. P20 found that SnapPI supported him in discussing his step goals: "*before when it was just the steps, there wasn't really much of a conversation to be had, because no one*

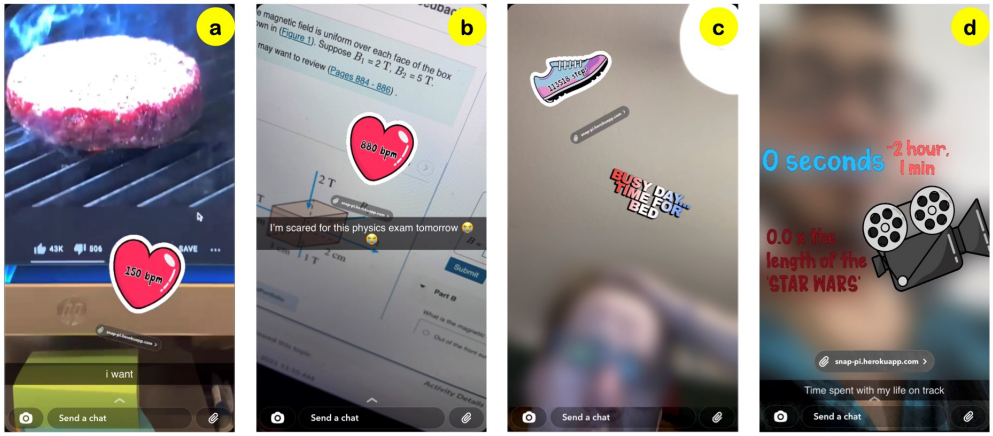

Fig. 4. To express how they felt, participants occasionally fabricated or exaggerated the data by entering unusually high or low numbers. (a) P1 indicated his hunger by sharing a sticker with a high heart rate over a video of a meat patty. (b) P12 exaggerated her heart rate to emphasize her anxiety about taking an exam. (c) P2 used a sticker with 113,518 steps to indicate how busy the day was and how tired he felt. (d) P5 exaggerated how he felt aspects of his life were going using a time sticker.

sort of remembers what your goal is for steps or for calories and things like that. When you have a meter [sticker] or like a thermometer [sticker], things like that, it sort of shows them what and how much you need to hit. So then someone else, a lot of times this has happened, where people have told me: 'Oh, you have a really long way to go!' just because they could see what my goal was." A20 appreciated the meter sticker that P20 sent: "*I really liked the progress meter because it gave me a good visual sense as to what was done and what was left to do.*"

Participants selected from color or animation options for stickers based on what they thought would be most engaging or interesting to their audiences. P10 described, "*when you change the color, I felt like it pops more and probably fit with some of my stories a little more.*" P9 felt the *pulse* animation would draw the attention of the friend who he shared with: "*So it's cool to you know, if it's just you get a random picture for your friend, you know, you may miss some of that information, but [the sticker] kind of grabs your attention if it's wiggling around or jumping up and down and stuff.*" P2 felt the *counting up* animation was useful for adding suspense to the data: "*as the viewer, you have to engage with it. You know what it says that you actually had like, watch it. Where like, some just like, say '10,000', but this one comes up so you never know where it's gonna end. Which I think is fun.*" A2b liked the sticker he sent to him, saying "*The personalization is an excellent addition*", and made him "*curious to see such personal data incorporated into my friends' Snaps*". P13 described putting more care into sharing stickers to her Story given the broader audience, finding color important to her Story's visual appeal: "*if I bother putting one of these stickers on my story with like my heart rate data, I would probably be more like nitpicky about, like which color I'm gonna choose which kind of sticker I'm gonna choose. Because like when you put something like out to everyone whose friends who you're friends with on Snapchat, you want to look a little bit nicer.*"

Although having customization options helped participants create Snaps they thought would be engaging, some participants prioritized spending less time customizing their stickers. For example, P16 cared mostly about emphasizing the data they shared, saying that they "*[weren't] really picky about the colors... the content matters more than what it looks like. Like, I still like how it's cute. But I'm not gonna like overthink it [...] I'm just not that sort of a Snap taker*". P1 similarly valued efficiency,

and typically kept the default color and animation options for SnapPI stickers: "*I think for me, it's just easier to just send it to Snapchat as it was by default. [...] it's just convenient, it's just easier for me, because usually I try to send my snaps quickly. So yeah, I prioritize speed. [...] by default is completely sufficient.*"

Compared to past work where people have expressed concern that data sharing can appear trivial and repetitive [31, 32, 50, 59, 63], participants leveraged and appreciated the ability to differentiate the data they shared with SnapPI's varied stickers and customization options. For example, P3 switched between different data domains to share each time they shared on Snapchat: "*I found a way to like, incorporate it [the SnapPI sticker] in like whatever I did throughout that day. If it was a bit too, like, repetitive at the same thing, I would try to use a different sticker for a different activity that day. Like I keep doing a lot of steps sticker. I was like, 'okay, maybe I'll just do this [time] one instead today or like the heartbeat one', maybe you know, I'll just change them.*" P20 focused heavily on sharing fitness tracking data through SnapPI, but found that being able to switch between different sticker types and colors was helpful for achieving variety in sharing: "*even though we had numbers, and even though we [had] a meter [sticker], if you[r audience] see every day [you have] 2500 [as a goal], [or you] go to that 600 score again, that also gets boring. So if you convert that and say, 'oh, I'm trying to get to a quarter the weight of a cow or a horse'. And then you switch it up in the middle, that made [it] more captivating, I think, than just sending the same numbers every day.*"

Although participants leveraged the flexibility from SnapPI to differentiate the data they shared, some participants desired even more customization options, aligning with what current platforms provide. For example, P7 compared SnapPI with the animated gif board they usually used, pointing to a desire for a larger set of stickers: "*I think would be more useful for SnapPI [if it had] different types of stickers. The stickers, they were cute, right? But it just didn't feel like it was customizable enough for me... Like, can you change the color of the heart?... Like, the shape of it, right? Or can you use stickers from outside sources, instead of just those from SnapPI? ... I wish I could do that, And then put like the number of calories on there...*" Around a single domain like calories, P7 also envisioned having enough options to allow her to select one she thought would look nice in her Snap, or potentially even create her own sticker. P11 further envisioned being able to control how the sticker animated to mirror his activity: "*[If] I walk 10,000 steps, [...] I don't want it to just be like a weak little kick, like I want it to like actually move to show what I did, or something like that was kind of my thought process. [...] I think what would be cool is if you could choose how it moves, so to speak. So, if you were to able, if you're able to draw like a path and have the shoe follow the path that you draw, that would be neat.*"

6 DISCUSSION

Participants' experiences with sharing data-driven stickers through SnapPI point to the value of aligning the data sharing with the communication and stylistic norms of platforms. Snapchat's perception as a social platform with fun and playful interactions led participants to utilize SnapPI to customize stickers in ways which playfully incorporated their personal informatics data, connecting it to various visual components of their Snaps. Participants also used stickers to incorporate personal informatics data into their everyday conversations, using stickers to casually steer conversations towards topics they cared about or to sustain longer conversations. The flexibility in data stickers that SnapPI enabled helped participants align with different audience needs, such as providing additional context or selecting interpretable stickers, as well as expressing their own feelings through faking the data.

In discussing participant's experiences with sharing data stickers through the ephemeral sharing feature on social platforms, we point to the challenge and benefits of sharing personal informatics data on existing social platforms, the value of customization and flexibility in doing so, and future

opportunities for sharing personal informatics data using ephemeral sharing features on social media.

6.1 Integrating Personal Informatics Data into Existing Social Platforms

Overall, participants felt SnapPI's strategies for integrating personal informatics data into Snapchat felt like a natural extension of the platform, appreciating the ability of the data to start conversations and provide proof. In field studies of prior systems which supported sharing self-tracked data on existing social platforms and studies of commercial systems, participants have frequently expressed concern that the data they were sharing was too trivial or would not be understood by their audiences [31, 32, 50, 59, 63]. Participants' perspectives on SnapPI, as well as the perspectives of the people they shared with, generally stood in contrast to these experiences. These experiences provide supporting evidence that ephemeral sharing is particularly effective for sharing personal informatics data [33], and extend findings from prior systems to show that sharing of personal informatics data beyond biosignals ephemerally can help people connect with others [51, 52]. In particular, participants' experiences with SnapPI highlight that ephemeral data sticker sharing on existing social platforms can help integrate data into people's everyday and casual conversations.

People often use personal informatics systems in support of action, such as developing healthy practices [35, 46]. Participants' use of SnapPI suggests that supporting data sharing ephemerally can potentially help facilitate action by establishing a social norm around the practices. People often struggle to broach these topics with their friends and family members on social media [43]. But SnapPI's use of play and sharing within everyday typical banter on ephemeral social media suggests some value of stickers in ameliorating those concerns. Participants' experience with SnapPI aligns with other interventions which casually introduced health and wellbeing measures into everyday conversation [57, 73], suggesting that future systems aiming to promote sharing health and wellbeing data could embrace casualness as a core design principle. Stickers can also help support documentary or curiosity tracking goals [35, 72], supporting people in recording aspects of their habits for providing social proof, rather than behavior change.

When designing to support sharing personal data on social platforms, our work points to the importance of aligning with the norms of the conversation content and the visual styles of the platform. Participants tended to incorporate data into relatively mundane life events, such as studying for exams, going to the gym, listening to music, and eating at restaurants. While these are the same sorts of content that people already shared on Snapchat [13, 56, 79], SnapPI stickers allowed participants to steer these conversations towards topics they cared about or express interests or emotions they struggled to express otherwise. This offers some evidence of the benefit of sharing self-tracked data as annotations rather than data being the primary content shared, which supports suggestions from prior work [31, 33, 52]. In addition to aligning the kind of data being shared to the norms of the platform, participants' experiences with and use of SnapPI emphasize the importance of aligning with the more visual design components of the platform, such as using different colors and animation to cater to different audiences as a "fun" way of incorporating data. For example, we expect the stickers that people could author with SnapPI might be too playful for certain platforms, and might require adjusting the visual style.

Supporting customization for aligning self-tracking data to augment the kinds of content people share on other and multiple existing social platforms can be a promising direction for future work. In particular, contextualizing self-tracked data to the different sharing features within a particular social platform or ecosystem is an important consideration. For instance, sharing logs of mood and emotion to augment the sharing of personal and emotional content could be tailored differently to ephemeral versus persistent messages. For ephemeral sharing, to support more playful communication, data could be presented with lively animation and potentially data fabrication to

exaggerate the sender's feeling. While for persistent sharing, the maintained record may make it important to stick to accurate records (where possible) and increase data granularity to add context. Further, the sharing timing (continuous or sporadic) could also be adjusted to align with the personal informatics data shared through different persistence forms [17], as people generally prefer control over sharing form [41]. For instance, stickers that support continuous sharing, such as keeping an updated log of songs people are listening to or accumulating the time people have been spending on a chore, could potentially provide contextual information for Snapchat users that use private snaps to communicate synchronously.

Further, from people's everyday use of stickers, we saw evidence of people customizing different types of personal data to incorporate in their conversations with different connections. This indicates the need to support sharing different types of personal data in different conversations. Prior work has additionally pointed to other desired goals when sharing personal informatics data, such as shared sensemaking [62, 70]. Designing social platforms specifically towards these sharing goals, and investigating how to support authoring data for sharing to those platforms, would increase the opportunity for people to collectively derive value from personal informatics data. To support the customization of personal informatics data shared on multiple social platforms one used, it is crucial to account for people's personal conception of communication places and who they prefer to communicate with on those platforms [64]. Having the flexibility to customize could allow people to communicate with the same contact with different presentation persistence. For instance, a person could use persistent sharing features for sharing detailed account of progress when sharing with a close contact who cares about progress and might help with collaborative sensemaking, while also using ephemeral sharing for providing timely updates. Supporting sharing of tracked data across multiple communication platforms can also help alleviate expression breakdowns [38], but effectively supporting each app's individual visual style and norms alongside effective data presentation would require further study.

While participants' experiences with SnapPI suggest the value of customization, it should be considered whether incorporating data and presentation flexibility would benefit or detract from the experience. Some participants using SnapPI optimized for sending Snaps quickly, and were generally ambivalent about how stickers appeared visually and did not filter or adjust their data beyond what was imported by sensors or services. The desire for efficiency in ephemeral sharing somewhat contrasts with past work on sharing tracked data with persistent sharing features, which has largely emphasized that the ability to customize presentation is crucial to supporting people's self-presentation needs and drawing audience interest [24, 81]. However, as ephemeral sharing tends to be more casual and emphasizes on everyday moments, our work suggests that some people may favor speed over self-presentation, echoing previous works suggesting diminished emphasis on self-presentation when sharing ephemerally [56, 80]. Therefore, designers of ephemeral data sharing systems could consider how to support efficiency alongside flexibility. For example, providing defaults that can be customized, such as a random set of customization choices could account for the need for flexibility while maximizing efficiency when desired.

6.2 The Value of Customization and Flexibility in Presenting Personal Informatics Data

The ethos of personal informatics has often focused on objectivity, using self-tracked data to more deeply understand a person's experiences and behaviors [20]. This ethos has largely impacted the self-tracking content people share, though some research has explored masking or altering shared content [28]. Although SnapPI supported importing "objective" data from external sources (e.g., HealthKit, Spotify, Nutritionix), participants frequently deviated from these sources when sharing their data. Some reasons were logistical, like not having access to the data source (e.g., an Apple

Watch for heart rate monitoring). But participants often intentionally exaggerated or fabricated their data to better convey *how they felt* rather than *what they did*, posting higher-than-typical numbers to convey that they were tired, hungry, stressed, or off-track. Supporting this flexibility in SnapPI allowed participants to subjectively appropriate their quantified data [27]. Continuing to support this kind of flexibility in authoring tools may help people use data to connect and commiserate with their friends and family, moving beyond traditional sharing goals like accountability or celebrating goal achievement.

SnapPI's ability to share multiple data domains allowed participants to vary their sharing, mitigating repetitiveness and tailoring to the interests of the different people they communicated with. Prior work has suggested that repeated sharing of data in a single domain might have made conversations focus primarily on a person's goals, such as around wellbeing [60]. Although this can support some sharing goals like accountability, the singular focus has often made the content feel inappropriate for the broader platform [32, 59, 63]. Even within wellbeing, people frequently monitor data towards multiple related wellbeing goals simultaneously [72]. Supporting sharing across these domains can allow people to select the most appropriate domain for the moment they want to share. SnapPI's support for domains typically not associated with wellbeing further supported participants in having conversations about wellbeing when they desired to, and electing to have other data-driven conversations at other times. In addition to supporting data domains typically associated with health and wellbeing, our work highlights the utility of sharing less-explored data domains such as music and time for self-expression of interests (e.g., artists they liked), or proof of struggles (e.g., time spent on challenging work or study). Participants' experiences with SnapPI therefore suggest the utility of sharing personal informatics data towards strengthening social relationships, even when data may not be related to physical health.

6.3 Future Opportunities for Sharing Personal Informatics Data Through Ephemeral Sharing Features

Participant perspectives on and experiences with SnapPI point to a few ways in which supporting sharing of data-driven stickers through ephemeral features could be improved. Participants used a variety of SnapPI stickers in their Snaps for variety and to better connect with the images and other stickers they were sharing. Participants frequently wished SnapPI included even more stickers. In general, the experience of sharing stickers with data could be improved by following the design patterns of conventional stickers for social media, by designing stickers with more variety, and making them taggable and searchable. Nevertheless, although people are used to having many customization options to pick from in apps that support frequent and ephemeral sharing, such as scrolling through stickers or lenses in Snapchat [71], the effort and cost of supporting data sharing can be overwhelming. In particular, participants' use of SnapPI points to the value of creating stickers which interact well with the objects and surroundings people often incorporate into their social media posts, such as household objects, objects outside, and parts of their body.

To support this goal, future work can examine how to lower the threshold to creating stickers with editable annotations. Conventional stickers for social media typically consist of a standalone image or animation, making new stickers relatively easy to import into a platform after creation. Conversely, we found migrating Epstein et al.'s stickers [33] for use in SnapPI required complex masking and placing careful constraints on the text and data shared. For example, dynamically supporting goal progress for embellished stickers (Figure 2a) required additional masking of the original stickers and customizing the endpoints. Verifying that stickers would not create awkward text wraps which extended beyond the sticker boundaries when units or values got large and ensuring text would still be legible if shrunk required substantial development investment for each sticker which was added. Drawing on information visualization techniques for generating

customizable representations can help lower the integration burden, and perhaps even enable people to annotate pre-existing stickers with data [44, 45, 53].

7 CONCLUSION

Through understanding participants' experiences with SnapPI, we highlight the importance of aligning how personal data is shared with the communication and stylistic norms of platforms. Enabling participants to playfully connect their data to align with Snapchat's fun and playful customs allowed participants to better express their feelings and connect with their audiences. Integrating stickers into the ephemeral sharing feature on existing social media helped steer conversations towards topics our participants and their contacts cared about and helped sustain their conversations. Flexibility in the presentation of data stickers also enabled participants to align what they shared with the informational needs and interests of their sharing audience. We point to the benefit of future systems for sharing data on existing platforms to align with platforms' norms around content and visuals, and to support flexibility that allows people to appropriate their data to meet their conversational goals.

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