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Exploring Smartphone App Use in Older Adults with a Chronic Respiratory Disease: The biggest Problem I have Is I Don't Understand My Phone At All

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Keywords
Smartphone · Mobile apps · Social media · Respiratory disease · Aged

Abstract

Introduction: In older people with a chronic respiratory disease, we explored (i) usual Smartphone application (App) use, (ii) the time taken to download and use an App, and (iii) changes in self-efficacy for downloading an App after a single practice session. ***Methods:*** Participants were invited to attend one or two separate assessment sessions (Part A and B). Those who attended Part A had data pertaining to their App usage over the previous week extracted from their Smartphone. Those who attended Part B were asked to download and use a pedometer App and "think out loud" during the task. Before and after the task, participants rated their self-efficacy for downloading an App using a Visual Analogue Scale (0–10). ***Results:*** Twenty-seven participants (mean ± SD 74 ± 5 years) completed Part A. Commonly used Apps related to communication (e.g., texting; median [interquartile range] 15 [9–25] min/day) and interest (e.g., news; 14 [4–50] min/day). Fifteen participants completed Part B (mean ± SD 73 ± 7 years). The median time taken to download and use the App was 24 (22–37) min. The "think out loud" data converged into four domains: (i) low self-efficacy for using and learning Apps; (ii) reliance on others for help; (iii) unpleasant emotional responses; and (iv) challenges due to changes associated with longevity. Self-efficacy increased by 4 (95% confidence interval: 3–6). ***Conclusion:*** This population used Apps mainly to facilitate social connection. It took participants almost half an hour to download and use an App, but a single practice session improved self-efficacy.

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Introduction

In 2023 in Australia, approximately 86.3% of people have a mobile (cellular) phone [1]. Data from 2019 suggest that penetration is greatest in people aged 18–49 years, where nearly 100% have a Smartphone. The proportion who have a Smartphone decreases with advancing age such that 84% people aged 75 years and over have a phone [2]. Given the

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large number of people who use mobile phones, the use of Smartphone technology such as applications (Apps) to promote chronic disease self-management would appear to be a highly pragmatic approach. To date, much of the research regarding the use of Apps to support health outcomes have targeted people younger than 50 years [3]. Indeed, our group has reported favourable outcomes for detecting exacerbations in young adults with cystic fibrosis using a Smartphone App [4]. Further, in people with type 1 diabetes mellitus (aged between 6 and 70 years old), continuous glucose monitoring (which interfaced with a Smartphone App) has been shown to reduce glycated haemoglobin [5]. Although the number of Apps targeting older adults with a chronic health condition is increasing, our clinical experience working with older adults was that their proclivity for Apps use was limited. We were especially interested in exploring issues related to Smartphone use in older adults with a chronic respiratory disease, due to the development of Apps to deliver pulmonary rehabilitation programs [6, 7]. Earlier work has suggested that limited digital literacy may preclude people with a chronic respiratory disease from engaging with such technology [8–10]. However, to the best of our knowledge, no study has attempted to objectively explore issues related to digital literacy with Smartphone Apps in this population. Therefore, we specifically recruited older adults with a chronic respiratory disease to explore; (a) usual App use and whether this differed between participants grouped according to sex, and on weekends versus weekdays, (b) the time taken, amount of support required and challenges faced when downloading an App, and (c) changes in self-efficacy for downloading an App after a single practice session. This information will be of use to clinicians who plan to use Smartphone technology to optimise health outcomes in older clinical populations.

Methods

Study Design

This was an observational study which comprised two parts with different samples (Part A and B). Participants were recruited from a private respiratory clinic in Perth, Western Australia. The study was approved by the Local Human Research Ethics Committee (Approval No. HRE 2033) and written informed consent was obtained from all participants prior to commencing data collection.

Participants

The inclusion criteria for both Parts A and B were adults aged ≥65 years who had a chronic respiratory disease, were fluent in English and owned a Smartphone. People with a documented history of a cognitive disorder were excluded. Recruitment took place between September 2020 and December 2022.

Procedures

Participants could choose to attend one or two assessment sessions (Part A and/or Part B) at a private clinic (Advara Sleep and Respiratory Care). The respiratory physician (S.C.) described the studies to suitable participants during their clinic visit. Those who expressed an interest in Part A were recruited by K.H. and those who expressed an interest in Part B were recruited by F.C. Thereafter, data collection for Part A was undertaken by K.H. or J.S. Data collection for Part B was performed by a PhD student (F.C.) as part of her degree. For all participants, variables were collected of age, sex, diagnosis, education level, and lung function.

Part A

Those who agreed to participate in Part A had their Smartphone reviewed by the study investigator. Specifically, screenshots were taken of the way the phone had been used for each day over the preceding week. Data were captured of the total time spent using the smartphone and the time spent using each App. These data were most commonly found under "Settings" in the "Screen Time" and "Battery Usage." Data collection took less than 30 min.

Part B

Those who agreed to participate in Part B were asked to download and use a freely available pedometer App (i.e., "Steps" App for the IOS system or "Steps Tracker" for the Android system) in front of the study investigator. The task involved completing four sequential steps; finding and downloading the App (step 1), entering demographic and anthropometric data to personalise the App (step 2), navigating the different features of the App (step 3), and collecting and interpreting data using the App (step 4). The entire session was audio-recorded, and participants were asked to "think out loud" as they completed the task. Participants were encouraged or praised by the study investigator as they moved through the steps. The encouragements provided by the study investigator to participants were general and not task specific e.g., "good job" or "well done." When a participant was unable to complete a step, they were given prompts to facilitate performance and, if necessary, the study investigator completed the step for the participant so they could continue with the task. If the participant was unable to download the App due to a technical difficulty with their phone, they were provided with an unlocked Smartphone to use for the task. Audio-recordings were reviewed by two independent study investigators (F.C. and S.W.). They recorded the time taken to download and use the App (i.e., completion of steps 1–4) and the amount of prompting and encouragement required to complete each step. Disagreements between investigators were resolved through discussion. The "think out loud" comments were transcribed verbatim and grouped into domains.

Prior to attempting the task and on task completion, participants were asked to rated their self-efficacy for downloading the App using a Visual Analog Scale (VAS; 0–10) [11]. Data collection took approximately 90 min. Additional details can be found in the online supplement (for all online suppl. material, see https://doi.org/10.1159/000539874).

Data Management and Analysis

Analyses were performed using SPSS software version 29.0 (IBM Corp., Armonk, NY, USA) and MedCalc software (MedCalc Software Ltd, Ostend, Belgium). Using the screenshots collected during Part A, with the exception of time accumulated as "home" and/or "lock screen," the time spent using each App on each day of the preceding week was entered into the database. When the phone displayed time use for an App as <1 min, we entered the usage as

1 min. Data are expressed as median and interquartile range. Differences in phone use with participants grouped according to sex, and days grouped as weekend versus weekdays were explored using a Mann-Whitney test and the Hodges-Lehmann estimator as used to derive median of the differences (MoDs) and the corresponding 95% confidence interval (CI). Changes in self-efficacy (pre- and post-VAS) were assessed by analysing the mean difference (95% CI) by the Student's *t* test. No sample size calculations were performed as this study did not aim to test a hypothesis. We continued with recruitment until no new information was evident during the assessment sessions.

Results

Flow of participants into the study is presented in Figure 1. Participant characteristics are summarized in Table 1.

Part A

For those who completed Part A, 16 (60%) participants owned an iPhone, 1 (4%) owned a Nokia, 1 (4%) owned an Oppo, 8 (30%) owned a Samsung and 1 (4%) owned a Telstra phone. Data were available across 7 days for 26 participants and 6 days for one participant. Apps were grouped into six categories (Table 2). Table 3 presents the average total daily time participants using different categories of Apps, and a comparison of App use between weekdays and weekends, and between females and males. The most commonly used Apps were in the categories of interest and communication. Compared with males, females spent more time using Apps related to communication.

Figure 2 presents the extent to which each participant used the different categories of Apps. In this figure, the App categories are represented as nodes, and the intersectionality of node use for each participant in displayed.

Part B

For those who completed Part B, four (27%) participants were unable to complete the task on their own phone and needed to use an unlocked Smartphone to attempt to complete each task. The time spent downloading and practicing with the App was median (interquartile range) 24 (22–37) min. Ten (67%) participants performed the task in less than 30 min, two (13%) participants took between 30 and 40 min and three (20%) participants took more than 40 min. The time (median [25th, 75th percentile]) taken to complete steps 1, 2, 3, and 4 were 14 (4, 18) min, 4 (5, 9) min, 4 (4, 8) min, and 4 (4, 7) min, respectively. The task of "finding and downloading" the App required the most prompts and encouragement to complete. Entering demographic and anthropometric data to personalise the App and navigating the different features of the App required less support. Additional data can be found in the online supplement. Analyses of the "think out loud" data converged into the four domains presented below.

Domain 1 – Low Self-Efficacy for Using and Learning Technology

Participants expressed poor knowledge of how the phone works and being unable to find information that could help them complete the task. Common difficulties were connecting to Wi-Fi, logging onto the App store, downloading the App, and dismissing pop-up advertisements while navigating the App. They also expressed doubt that they could learn how to use it.

Participant 1, 87 years, female: "The biggest problem I have is I don't understand my phone at all."

Participant 3, 79 years, male: "Wouldn't have a clue."

Participant 4, 73 years, female: "Where would I start?"

Participant 5, 82 years, male: "All of this was on there when I got it – no education provided at time of purchase."

Participant 5, 82 years, age, male: "This icon means nothing to me. Steps what does that mean?"

Participant 12, 81 years, male: "'I'm lost now, I don't really know what comes next?"

Participant 14, 72 years, female: "When you buy the phone it is in a language that we don't understand."

Participant 14, 72 years, female: "Do you touch that do you?" (referring to the search bar).

Domain 2 – Reliance on Others for Help

Several participants described the need to ask someone for help on how to use the Smartphone. This was a strategy to overcome their lack of knowledge.

Participant 4, 73 years, female: "One of my daughters did it for me" (download other Apps on phone).

Researcher: "If you didn't have Wi-Fi what would you do?" Participant 8, age, male: "Ask my wife."

Participant 10, 76 years, male: "Now I would ask my daughter for help."

Participant 10, 76 years, male: "I want to learn about the phone, but my daughter hasn't shown me and hasn't explained it in a way that I understand."

Domain 3 – Unpleasant Emotional Responses

Participants often made comments that suggested feelings of frustration, embarrassment, and fear of breaking the Smartphone or doing harm when attempting to download the App.

Participant 1, 87 years, female: "I finish up with all the wrong things on its silly advertisements for silly films all that sort of thing."

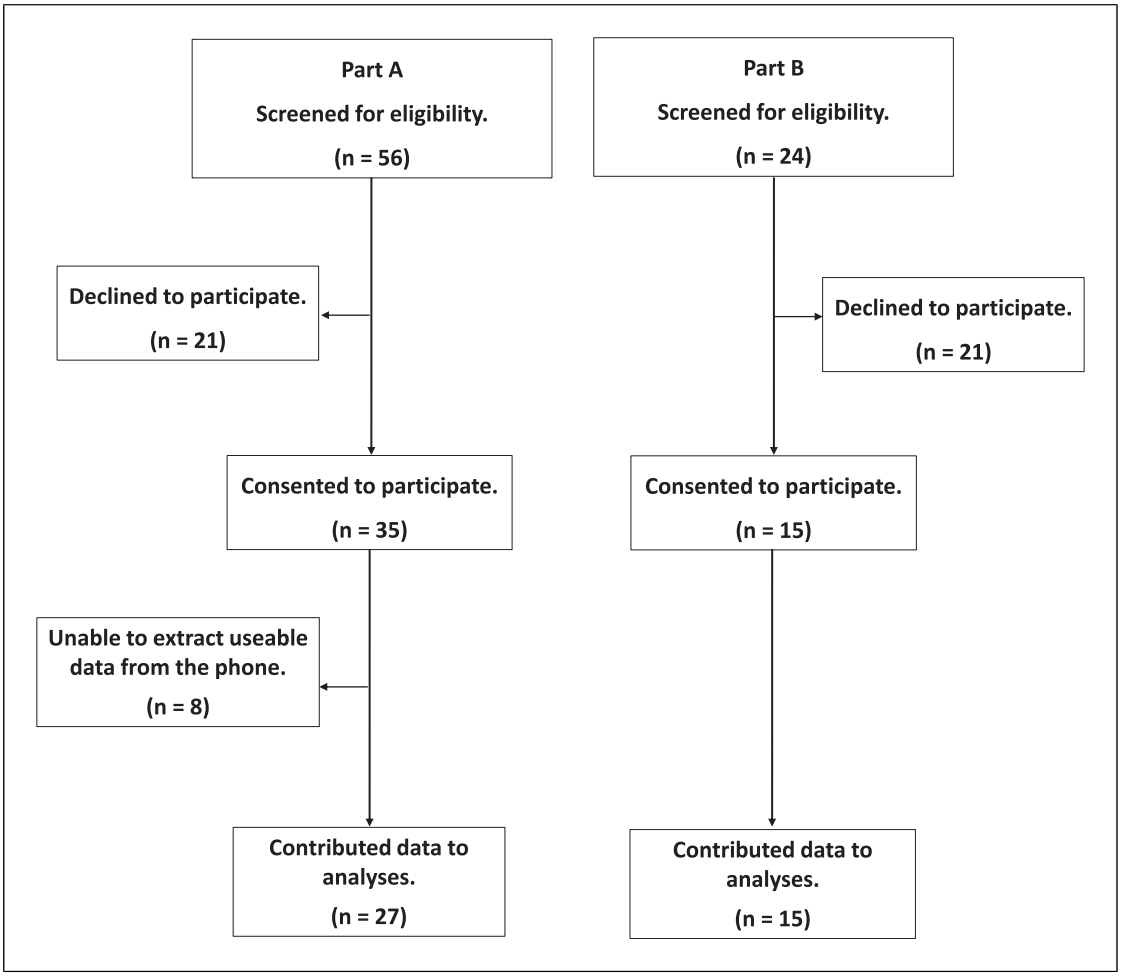


Fig. 1. Flow of participants into the study.

Participant 3, 79 years, male: "I think this will be hopeless for me."

Participant 4, 73 years, female: "When I had to work with computers, I am worried about doing something wrong and the whole bloody thing would crash."

Participant 4, 73 years, female: "I am dumber than a doornail when it comes to this."

Participant 10, 76 years, male: "You don't want people who know a lot teaching you, I would rather have an idiot teaching me."

Participant 12, 81 years, male: "I don't want to touch anything that I shouldn't."

Participant 14, 72 years, female: "I don't need any of that, that's going too far, that's ridiculous!" (talking about the Steps App).

Participant 14, 72 years, female: "Ads drive me insane that's the reason why I don't do anything on the phone."

Domain 4 – Physiological and Cognitive Changes Associated with Longevity

Several physiologic and cognitive changes associated with the ageing process were noted by the study investigator as barriers to downloading the App. Examples include a lack of focus, limited working memory, impaired fine motor skills, and poor eyesight.

Participant 10, 76 years, male: "I am not of the age that I am comfortable with symbols."

Discussion

To our knowledge, this is the first study to explore factors related to the use of Smartphone Apps in older adults with a chronic respiratory disease. The important findings of this study are: (i) although phone use was highly variable between individuals, the average person used the phone for a

Table 1. Participant characteristics

Variables	Part A (n = 27)	Part B (n = 15)
Anthropometry		
Age, years	74±5	73±7
BMI, kg/m^2	28±4	26±6
Males, n (%)	11 (41)	9 (60)
Height, m	1.66±0.08	1.65±0.09
Weight, kg	80±14	72±15
Spirometry		
FEV_1, L	1.77±0.81	1.08±0.73
FEV_1, % predicted	76±27	43±18
FVC, L	2.66±0.81	2.35±0.96
FVC, % predicted	88±18	74±18
FEV_1/FVC, %	66±19	42±15
Diagnosis, n (%)		
Asthma	8 (29)	–
Bronchiectasis	3 (11)	–
COPD	9 (33)	15 (100)
ILD	8 (26)	–
Education level, n (%)		
Uncompleted high school (≤ year 10)	11 (40)	10 (67)
Completed high school (≥ year 10)	16 (59)	5 (33)
Living status, n (%)		
Alone	9 (33)	2 (13)
With someone	18 (66)	13 (87)

Data are mean ± SD unless otherwise stated. App, application; BMI, body mass index; COPD, chronic obstructive pulmonary disease; FEV_1, forced expiratory volume in the first second; FEV_1% pred, forced expiratory volume in 1 s expressed as a percent predicted; FVC, forced vital capacity; FVC% pred, forced vital capacity expressed as a percent predicted; ILD, interstitial lung disease.

Table 2. Categories of Apps

Domains	Related Apps
Games	"Entertaining games"
Health	Apps related to government "COVID tracking," "health (from Apple)," "virtual pharmacist Phil" and "weight loss"
Interest	"Photos," "camera," "calendar," "phone settings," "music," "wallet," "weather," "App store (from Apple)," "calculator," "contacts," 'sports," 'safari navigator (from Apple)," "Google navigator," "Microsoft edge navigator" and "news"
Personal communication	"Text messages (SMS)," "phone calls," "Facetime (from Apple)," "e-mail" (outlook, Gmail and mail from Apple)
Social Media	"Facebook," "Instagram," "YouTube," "Pinterest" and "Messenger (from Facebook)"
Transport	"Maps (from Apple)," "Google maps," "Google Earth" and "Waze"

COVID, coronavirus disease.

median of 48 min each day, (ii) the most frequently used Apps related to those that facilitated personal communication (e.g., phone calls) and personal interests (e.g., news), (iii) females used Apps to facilitate personal communication more than males, (iv) people found downloading and using a freely available App challenging, taking a median of 24 min to achieve this task, and (v) after a single practice session, self-efficacy for downloading an App increased.

Table 3. Total time spent on Smartphone and comparison of total time spent on each App category according to sex and day of week

Variable	Total Smartphone use, min/day						
	total time	female	male	MoD (95% CI)	weekday	weekend	MoD (95% CI)
Games	0 [0–0]	0 [0–17]	0 [0–0]	0 (−6, 0)	0 [0 to 0]	0 [0 to 0]	0 (0, 0)
Health	0 [0–1]	0 [0–1]	0 [0 to 0]	0 (−1, 0)	0 [0–1]	0 [0 to 0]	0 (0, 0)
Interest	14 [4–50]	26 [4–55]	10 [4–19]	−10 (−41, 6)	16 [3–50]	12 [5–42]	1 (−11, 9)
Personal communication	15 [9–25]	20 [15–27]	10 [6–14]	−11 (−18, −3)[a]	15 [11–29]	13 [5–15]	−5 (−11, 0)
Social media	4 [0–35]	4 [0–64]	4 [0–35]	0 (−13, 21)	4 [0–42]	1 [0–14]	0 (−6, 1)
Transport	0 [0–1]	0 [0–1]	0 [0–3]	0 (−1, 1)	0 [0–1]	0 [0–1]	0 (0, 0)
Total phone usage	48 [23–188]	85 [27–194]	44 [22–73]	−25 (−147, 15)	53 [24–154]	36 [20–130]	−6 (−41, 19)

Data are median [IQR: 25–75%] or MoD. IQR, interquartile range; MoD, median of difference and (95% confidence interval); Total time, total time spent on within each App category considering weekdays + weekend and both sexes (female and male). [a]Difference between female and male.

The use of Smartphone Apps to facilitate health outcomes has been an area of interest for almost a decade [3]. Several Apps are available to increase participation in physical activity, facilitate weight management, adherence with medication schedules, smoking cessation, mindfulness, and limit alcohol intake [3, 12]. Of the 27 people who completed Part A, 14 (52%) had engaged with a "health" App over the previous week, but for a median of less than 1 min/day. The lack of use of health Apps in our sample was especially surprising as data collection for this study occurred during the COVID-19 pandemic when contact tracing was mandatory in Western Australia and Apps were developed and promoted for this specific purpose. One interpretation of this finding was that our sample did not leave the house during these periods (i.e., they shielded at home), or when they did leave their house, they completed the contact tracing records manually (i.e., physically signed in at each site). This is consistent with our anecdotal experience that older adults are unlikely to actively engage with Apps to support their health. Nevertheless, our data highlight that older adults with a chronic respiratory disease used Apps to facilitate communication. This suggests that in clinical practice, Smartphones could be considered as a method to send reminders/prompts regarding healthcare behaviours. For example, earlier work in adults (mean age ~60 years) with coronary heart disease has shown that providing four semi-personalised text messages each week over 6 months to support to change lifestyle behaviours resulted in favourable changes in modifiable risk factors such as low-density lipoprotein cholesterol, systolic blood pressure, and body mass index [13]. In other words, understanding that older people are more likely to passively engage (i.e., read a message/prompt) than actively engage (i.e., enter data and track health outcomes) may shape the way healthcare providers use a Smartphone to optimise health outcomes.

Data collected during Part B demonstrated the challenges associated with downloading and engaging with new Apps designed to support health behaviours. Although not a specific qualitative analysis, the comments made by participants as part of the "talk out loud" technique highlighted issues pertaining to a lack of knowledge regarding the use of technology, fear of making mistakes, physical, and cognitive changes due to age and the reliance on others for support. These findings corroborate with earlier work done in people with chronic obstructive pulmonary disease (COPD) [14, 15] but also in older adults [16], and it is possible that these challenges are associated with ageing rather than being specific to older adults with a respiratory disease. Our study demonstrated that a single session during which the participant was asked and, where necessary, facilitated to download and use an App, produced a large increase in self-efficacy. As self-efficacy is a strong predictor of health behaviour [17], taking the time to do this with the person, rather than simply downloading the App for them would seem to be a worthwhile investment in the clinician's time. Availability of learning and support has been shown to be an important factor in determining if older adults value technologies [18].

Limitations

The main limitation of this study was that it was conducted in a single centre, and this sample comprised participants who chose to visit a private respiratory physician.

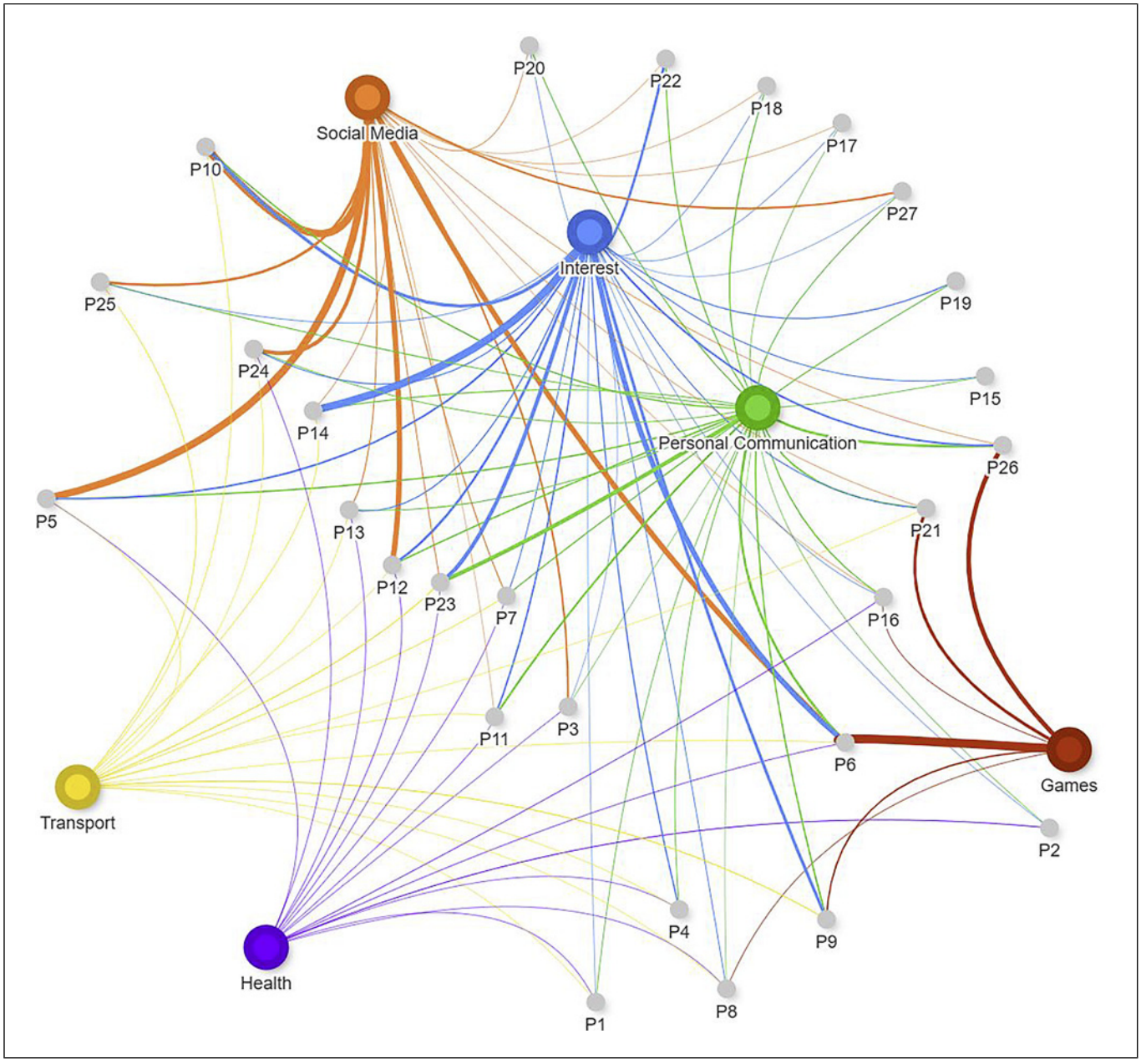


Fig. 2. Relative contribution that each participant made to overall time use recorded for each category of App. Line thickness represents the contribution of each participant to total time use for each category. For example, the thick burgundy line between P6 and Games indicates that the time spent in games was greatest for participant 6 than the others.

For this reason, these data may not be reflective of those from a lower socioeconomic status. This study did not reassess self-efficacy at a later time point so we are unable to comment on whether or not this improvement was maintained. It is also likely that the social restrictions imposed to contain the COVID-19 virus influenced our data.

Clinical Implications and Further Directions

Older adults with chronic respiratory disease engaged with Smartphones Apps for an average of median of 48 min/day. There was inconsistent and, at best, brief use of "health" Apps with use predominantly reserved for social connection and personal communication. This

suggests that clinicians may have more success if they ask older people to use their Smartphone in a passive way (i.e., to review reminder text or prompts) rather than expecting active engagement (i.e., expecting people to enter or track data using an App). Downloading and using an App was challenging, taking a median of 24 min to achieve. However, it seems that this might be a useful investment in time, as a single practice session produced large improvements in self-efficacy for this task. Future studies are needed to determine how many practice or training sessions older people with chronic respiratory disease need in order to both achieve and maintain competence to use an App that has been designed to improve health outcomes.

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Statement of Ethics

This study protocol was reviewed and approved by the Ramsay Health Care Human Research Ethics Committee (HREC) (committee Approval No. HRE 2033) and Curtin University HREC (HRE2021-0519). Written informed consent was obtained from each participant prior to data collection.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Fiona Coll: conceptualisation, data curation, formal analyses, investigation, methodology, project administration, supervision, writing the original draft, and writing – review and editing. Isis Grigoletto: formal analyses, methodology, visualisation, writing – original draft, and writing – review and editing. Vinicius Cavalheri: conceptualisation, formal analyses, methodology, supervision, writing – original draft, and writing – review and editing. Jaimie-Lee Smith: data curation, investigation, and writing – review and editing. Scott Claxton: conceptualisation, data curation, and writing – review and editing. Sheldon Wulff: data curation, investigation, and writing – review and editing. Kylie Hill: conceptualisation, data curation, formal analyses, funding acquisition, investigation, project administration, methodology, supervision, visualisation, writing the original draft, and writing – review and editing.

Data Availability Statement

The data that support the findings of this study are not publicly available as they contain information that could compromise the privacy of research participants. Data may be made available from the corresponding author (K.H.; K.Hill@curtin.edu.au) upon reasonable request.

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