2023

Design of Digital Social Platform Features and User Well-Being

Jiang Hu

DESIGN OF DIGITAL SOCIAL PLATFORM FEATURES AND USER WELL-BEING

by

JIANG HU

DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy at
The University of Texas at Arlington
May, 2023

Arlington, Texas

Supervising Committee:

Dr. Jennifer Jie Zhang, Supervising Professor
Dr. Sridhar Nerur
Dr. Kay Yut Chen
Dr. David Arena

Acknowledgements

I would like to express my sincere gratitude to everyone who has contributed to the completion of this dissertation. First and foremost, I would like to express my deepest gratitude to my dissertation supervisor, Dr. Jennifer Jie Zhang for her outstanding mentorship. Without her invaluable guidance, continuous support and encouragement throughout the process, this dissertation would not have been possible. She has always been my pillars of strength, my confidant, and my role model. It is an honor to be her student, and I have learned a lot from her, not only on how to become a researcher, but also about life wisdom. No matter what happens, I know she is always the person I can talk to and get help from. It's a great pleasure to have her as my Ph.D. supervisor.

I would also like to thank my dissertation committee members, Dr. Sridhar Nerur, Dr. Kay Yut Chen, and Dr. David Arena, for their inspirational guidance and exceptional suggestions that have greatly improved the quality and rigor of my dissertation. Their expertise and insights are instrumental in shaping my research ideas and sharpening my research skills, that allow me to complete my dissertation which I am proud of.

I am also grateful to Dr. Wei He who has dedicated to guiding me in doing research, helping me to develop research skills and techniques to carry out my works, reviewing and providing thoughtful feedback of my dissertation.

Special thanks to my parents and friends for their unwavering love, tireless dedication, support, and understanding, which made my academic achievements possible. Their constant encouragement and belief in me have given me the strength and motivation to persevere through all the challenges during this journey.

Contents

LIST OF TABLES

LIST OF FIGURES

Chapter 1

Examining the Impacts of Fitness App Features on User Well-Being

ABSTRACT

Drawing on the self-regulation theory, the current paper explores the impacts of two types of fitness app feature sets (i.e., personal-oriented and social-oriented features) on users' health behavior and well-being. The results from fitness app users show that both personal-oriented features and social-oriented features of fitness apps can significantly improve exercise adherence and social engagement of users. Users' exercise proficiency level negatively moderates the relationship between social-oriented features and (a) exercise adherence and (b) social engagement. High levels of social engagement promote users' physical adherence to exercises. Exercise adherence and social engagement both enhance users' subjective well-being, but their impacts on different dimensions of well-being vary. Furthermore, regardless of specific features, sufficient use of fitness apps, in general, can significantly help users lead more positive and healthier lives by maintaining exercise adherence, reducing emotional exhaustion, and improving their satisfaction with the overall quality of life. Our findings offer important insights into the underlying mechanisms that help explain fitness app features on users' well-being, and on a practical level, provide suggestions for mobile app developers in designing better fitness app products and for exercisers in optimizing the benefits of fitness technology adoption.

Keywords: Fitness App, Personal-Oriented SRE Features, Social-Oriented SRE Features, Exercise Adherence, Social Engagement, User Well-Being.

1. INTRODUCTION

Fitness apps typically refer to third-party mobile applications with built-in GPS, social networking capabilities (e.g., users share their exercise records on Facebook or Twitter), and sensor technologies that can help users record physical and physiological data automatically and generate personalized training profiles and schedule (Oyibo et al., 2019; Yoganathan & Kajanan, 2013). Fitness apps provide various feature sets to assist individuals' physical activity (e.g., running, cycling, working out, and swimming). For example, the data management feature set allows users to collect and manage their exerciser's data, such as recording their steps, running routes, calories burned, and heart rate. Fitness apps can also support users' social activity (e.g., sharing exercise achievements and creating exercise competitions). For instance, social interaction feature sets allow users to post their fitness performance on social media or fitness online communities and compare their exercise data with others. Users may also access streaming videos or live instructions for physical exercises through the apps, free or at a lower cost than purchasing fitness services from professional trainers offline.

Consumers have been increasingly turning to mobile devices for getting necessary exercise information and supporting their fitness routines. Lack of physical activity, also called a sedentary or inactive lifestyle, worsens health and causes diseases such as high blood pressure, type 2 diabetes, coronary heart disease, certain types of cancers, and most chronic diseases (Booth et al., 2012). A recent report by the Centers for Disease Control and Prevention (CDC, 2021) shows that insufficient physical activities cost $117 billion in healthcare every year, further highlighting exercising as an essential concern for both individuals and society as a whole. In 2020, there were 87.4 million smartphone users who used fitness apps at least once per month in the United States (Statista, 2021). When the fitness industry was hit hard by the COVID-19 crisis, with thousands of gyms closing, fitness apps and streaming workout platforms such as Nike Training Club, Map My Run by Under Armour, Samsung Health, and Strava see their members sharply surging since March 2020 (Blacker, 2020; Marlik, 2020), resulting in the number of fitness app

downloads reaching 339.7 million in April 2020, a year-over-year increase of 47% (Chapple, 2020). All these facts suggest the significant role of fitness apps in the current business world and human society.

Although extant IS literature, in particular health IT research, has offered great insights into how users' behaviors and potential factors (e.g., gender, app price, and habit) may influence a user's intention to use the apps (Oyibo et al., 2019; Yuan et al., 2015), our understanding on app use outcomes is limited. First, a theory-driven investigation of fitness app features is sparse in IS and healthcare literature. Fitness apps provide users with various advanced features. However, those features are often scattered in the literature without any classification and organization based on a theoretical lens. James et al. (2019) for the first time established a theory-driven framework of fitness technology feature sets and called for more systematic research on the impact of these features on wellness outcomes. Second, there are very few empirical studies examining how app features directly influence users' behavioral and psychological aspects of health evaluation. James et al. (2019) highlighted the need to conduct more studies on the influence of fitness technologies on a wider collection of outcomes than subjective vitality, such as exercise adherence, social engagement, and other dimensions of users' well-being. Third, one of the biggest appeals of fitness communities is social communication with and receiving support from other people (Eschner, 2020); however, a clear understanding of the interrelationship between the socio-psychological effect of fitness app use (i.e., feeling socially connected) and concrete behavioral consequence (i.e., exercise adherence) is lacking. Fourth, the influence of fitness app features on users' physical and social outcomes may vary depending on whether the user is a beginner or a proficient exerciser. For example, Wu et al. (2015) found that for fitness app users who have a high level of self-confidence in doing exercise, the social comparison feature (e.g., steps ranking) shows a weaker impact on physical activity. It is thus essential to investigate the differential impact of app features on users' exercise outcomes depending on their exercise proficiency. In summary, to shed light on the value of fitness technologies, this paper aims to explore how different types of fitness app features influence users' physical activity, social activity, and well-being. Such insights can help us gain a better understanding of how fitness apps lead to improved well-being outcomes through users' behavioral modifications. Practically, the current research provides useful

suggestions for fitness technology developers to design customized technologies to meet exercisers' needs and enhance the wellness of app users.

In this study, we build on the self-regulation theory and research to categorize the fitness app features into two broad groups: personal-oriented self-regulated exercising (SRE) features and social-oriented SRE features. We then study the impacts of the features of these two groups on fitness app users' physical and social activities, which ultimately affect users' well-being such as the feeling of self-discipline, emotional exhaustion, and life satisfaction. Specifically, we explore the following three research questions:

1. *How do different types of fitness app features affect app users' well-being through users' physical and social activities, respectively?*
2. *How does exercise proficiency moderate the relationships between app features and users' physical and social activities?*
3. *What are the practical implications for app designers and app users of varying types of fitness app features?*

To address the above research question, we recruited fitness app users from the Amazon Mechanical Turk (AMT) platform and used a time-lagged survey design to test the proposed research model. We empirically evaluated the direct impacts of fitness app features on users' physical and social activity outcomes and examined how these outcomes ultimately relate to user well-being. We show that personal-oriented SRE and social-oriented SRE features of fitness apps demonstrate significant positive impacts on users' exercise adherence and social engagement, but these two physical and psychological consequences of using fitness apps impact different well-being outcomes in a nuanced manner. In addition, social-oriented SRE features show a stronger influence on exercise adherence and social engagement for novices than experienced exercisers. Moreover, regardless of specifical features, exercisers who use fitness apps more frequently, are more likely to maintain long-term exercise habits, perceive less emotional exhaustion, and be more satisfied with their overall quality of life.

Our study makes the following major contributions. First, drawing upon the self-regulation theory and research (Wan et al., 2012), we classify fitness app features in two sets: personal-oriented and social-

oriented and reveal the significant impact of these two app feature sets on users' exercise adherence and social engagement. Second, this research examines the underlying mechanism of fitness app features on users' well-being (i.e., the feeling of self-discipline, emotional exhaustion, and life satisfaction), which enables us to understand how and why fitness apps can lead to improved well-being outcomes through users' behavioral modifications. Our study addresses the call for a broader examination of the potential outcomes of using fitness apps over time (James et al., 2019). Third, our research provides important guidance for exercisers to use fitness technology more properly. When an app user's goal is to improve life satisfaction, he or she should focus more on the features that can enhance social engagement because more regulated exercising activities do not help with an overall evaluation of life satisfaction. Further, while social engagement stimulates exercise adherence and makes fitness app users feel good, an overly beneficial view of social engagement could be misleading and even dangerous. If a user has already been suffering from emotional exhaustion from some other aspects of his or her life, being a heavy social engager induced by the fitness app will worsen the situation.

The rest of the paper is structured as follows. First, we draw upon self-regulation theory to review the fitness app literature and classify the two groups of features. Second, we propose a research model and develop arguments leading to our hypotheses. Next, the research methodology and empirical analysis results are presented. Finally, we conclude the paper with a discussion of the findings, implications, and limitations.

2. THEORETICAL BACKGROUND

2.1. Fitness Apps and Their Features

Despite the flourishing fitness apps industry, existing reviews on fitness apps primarily originate from the healthcare and sports fields. For example, Sama et al. (2014) reported that fitness or training applications are the most popular mobile apps in the health and wellness category of the Apple App Store. They further noted that self-monitoring and progress tracking were the two most effective features for

engaging users. Through a systematic review and meta-analysis, Ringeval et al. (2020) suggest that Fitbit has the potential to improve healthy lifestyles in terms of promoting physical activity and losing weight. In an investigation of 64 different fitness apps, researchers found that self-monitoring, providing feedback on performance, and goal-setting are the most frequently used techniques attempting to promote users' physical exercise (Middelweerd et al., 2014). Similarly, another review showed that users of different age and gender groups consistently favor the apps that track physical activity and progress toward predefined goals (Coughlin et al., 2016). Table 1 summarizes the closely related studies on fitness apps and shows how the current research differs from other studies.

Table 1. Summary of Selected Prior Work on the Fitness App Features and Outcomes

Article	App features	Exercise outcome	Social outcome	Well-being	Key findings
Sama et al. (2014)	Goal setting; reinforcement tracking; self-monitoring	—	—	—	Self-monitoring is the most common user engagement method.
Zhu et al. (2017)	Social sharing; social competing	Physical activity participation	—	—	Social sharing and competing significantly influence the exercise intentions.
James et al. (2019)	Social interaction features; exercise control features; data management features	—	—	Subjective vitality	Social interaction and data management features assist well-being outcomes, but only for more self-determined and amotivated exercisers.
Whelan & Clohessy (2020)	Social features	—	—	Life burnout	The relationship between social influence and life burnout is mediated by the type of users' passion (harmonious and obsessive).
Zhang et al. (2020)	Social comparison features	Exercise participation	—	—	Within-group social comparison and the between-group competitive climate both improve group exercise participation.
Yin et al. (2021)	Self-monitoring, social support, and platform rewards	physical activity	—	—	Self-monitoring, social support, and platform rewards all positively influence users' physical activity.
Huang et al. (2022)	Social network features	Physical activity participation	—	—	High frequency of checking fitness apps and network size positively correlated with physical activity participation. Social comparison impacts physical activity participation.
Suh & Li (2022)	Social interaction features; exercise control features; data management features	—	—	Physical well-being; phycological well-being	Fitness app feature sets played different roles in enhancing physical and psychological well-being.
This study	**Personal-oriented SRE features; social-oriented SRE features**	**Exercise adherence**	**Social engagement**	**Feeling of self-discipline; emotional exhaustion; life satisfaction**	**Personal-oriented and social-oriented features significantly improve exercise adherence and social engagement. High levels of social engagement promote exercise adherence. Exercise adherence and social engagement both enhance users' subjective well-being. Gender moderates social engagement and well-being. App use frequency moderates personal-oriented features and well-being.**

Our review highlights two major distinctions from the literature. First, prior studies predominantly emphasize the role of social features on users' exercise participation, while neglecting how personal features (e.g., goal setting, notification, and recording) regulate users' fitness behavior to achieve exercise goals. For example, Whelan and Clohessy (2020) found that for users with different exercise passions (i.e., harmonious and obsessive), social features of fitness apps can influence well-being differently. A notable exception is a study by James et al. (2019) that divides group fitness technology features into three sets: social interaction features, exercise control features, and data management features. The social interaction group consists of features that enable the exerciser to have social interactions with other users, such as data sharing, encouragement, competition, comparison, and coaching. The exercise control group includes features such as rewards, reminders, and goal management, all aiming at exercise control. The third group of features collects and manages users' exercise data, including data collection, data analysis, progress updates, and information searching. Following this categorization, Suh and Li (2022) investigated the impacts of those app feature sets on older adults' physical and psychological well-being. Both studies provide a good starting point for investigating the influence of fitness app features on a wide collection of health outcomes. Second, past literature consistently focuses on examining the impact of fitness app features on physical activity while overlooking the benefit of fitness app features on users' social activity and well-being. Prior research has widely recognized that sufficient social activity and stable social relationships can satisfy humans' basic psychological needs and are important indicators of physical and mental health (Berkman et al., 2000). Well-being integrates mental health and physical health resulting in more holistic approaches to preventing disease and promoting health. Findings from experimental, ambulatory, and longitudinal studies show that higher levels of well-being are closely linked with both short-term and long-term health benefits, such as buffering stress, decreasing the risk of disease and illness, promoting immune functioning, and increased longevity (Howell et al., 2007; Pressman & Cohen, 2005). The ultimate goal of employing fitness technologies is to improve users' well-being and health outcomes (James et al., 2019). Therefore, to optimize the benefit of fitness technology designs for exercisers, it is

necessary to gain a deeper understanding of how different types of app features impact users' physical and social activities and well-being. Our study extends the literature by exploring how personal features and social features jointly affect users' exercise outcomes, social outcomes, and well-being.

2.2 A Self-Regulation Perspective of Exercising

Exercise is a physical activity that is planned, structured, repetitive, and purposive, with the objective to improve or maintain one or more components of physical fitness and overall health and wellness (Caspersen et al., 1985; Hopkins et al., 2012). This conceptualization makes self-regulation theory (SRT), which focuses on human motivation and action (Bandura, 1991), an inherently relevant theory for examining exercising. Self-regulation refers to a set of principles and practices by which people monitor their behavior and consciously adjust those behaviors in pursuit of personal goals (Bandura, 1991). Individuals with well-developed self-regulation are better at evaluating their capabilities, monitoring their work progress, and making efforts strategically over time to achieve desired outcomes (Karoly, 1993). Literature also suggests that self-regulation is an adaptive capacity fostering health promotive behaviors and psychological well-being (Kuhl et al., 2006). Therefore, SRT is a suitable theoretical lens for our investigation of fitness app features and their impacts on users' well-being.

Self-monitoring and social support are prominent in SRT (Bandura, 2001). Prior research applied the self-regulation perspective to conceptually identify a pair of e-learning strategies, namely, personal versus social self-regulated learning (Wan et al., 2012). Specifically, personal self-regulated strategies refer to practices of managing personally directed activities such as goal setting and planning, whereas social self-regulated strategies are social-oriented, like seeking assistance from others and social comparison (Wan et al., 2012). Following this line of research, we build upon and extend the self-regulation perspective to regard fitness app use as a process of self-regulated exercising (SRE) and name two distinct categories of app features: *personal-oriented SRE features* and *social-oriented SRE features*. Personal-oriented SRE features include the features of fitness apps that are used to manage personally directed exercising, while

social-oriented SRE features would comprise the app features that support social interactions, sharing, and comparison among the app users.

2.3. Two Categories of Fitness App Features

According to the SRT, both exercise control and data management features are personal-oriented whereas social interaction features are social-oriented. Therefore, we discuss the two categories of fitness app features in detail below.

Personal-oriented SRE features are self-directed, including goal setting, recordability, notification, and information searching. Goal setting allows users to set their personalized exercise goals (i.e., relaxation, weight loss, or muscle building). Users have varied body indexes and unique needs and expectations. Fitness apps facilitate users' exercising by providing customized services for setting their own fitness goals and timeline, recommending which exercising activity to practice and what supplement intake users may consider, and so on. Recordability, a fundamental feature of fitness apps, refers to the feature of recording the history of fitness activities of users. Fitness apps can generate and present recorded exercise data (e.g., the calorie burned) for users to review. Notifications or reminders, help prompt users to take exercises regularly. Finally, fitness apps typically enable users to search for exercise information in the form of texts, demonstration figures, or videos. The information searching feature helps users to gain knowledge on exercising as well as lessen the risk of injuries because of inappropriate postures.

Social-oriented SRE features, on the other hand, include any features of a fitness app that support a user's social interactions with others, such as coaching, social comparison, and networkability. With coaching, users will be able to interact with fitness experts and get customized solutions for their specific health and fitness concerns via online consultation. In addition, many apps have virtual coaches that can talk with the users, provide personalized service and answer questions, making users feel like a professional trainer is working out with them (Cavallo et al., 2014; Laranjo et al., 2015). The social comparison feature offers a way for users to compare their exercise performance with others. Through leaderboards, people

could easily browse others' physical activity performance and check their own rank in their social network (Zhang et al., 2020; Zhu et al., 2017). Networkability enables users to share fitness information and personal activity history with others through the apps, which may not be for comparison purposes. Fitness apps often allow information exporting to social media platforms like Facebook or support the creation of user communities within the app (Zhu et al., 2017).

2.4. Impacts of Fitness App Features

2.4.1. Exercise Adherence

Given that the goal of fitness app use is to promote users' exercise participation at sufficient levels of intensity, frequency, and duration to accrue positive health benefits, exercise adherence is a crucial outcome variable on which we focus in this study. Adherence is a stable and persistent behavior performed regularly to achieve desired future outcomes (Carey et al., 2004; Robison & Rogers, 1994). The benefits of exercise can be sustained only if physical activity is regularly maintained (Robison & Rogers, 1994). In prior literature, adherence has been defined differently across studies, for example, attendance, accumulation of points, lack of dropout, and participation rate (Robison & Rogers, 1994). Incorporating the exercise literature and self-regulation research (Carey et al., 2004; Robison & Rogers, 1994), we define exercise adherence as a regulated behavior performed on a regular basis to fulfill predetermined exercise goals. Exercise adherence is related to, but conceptually distinct from habit. Habit captures the extent to which people perform behaviors automatically (Limayem et al., 2007), which is executed with little or no conscious attention and only minimal mental effort (Verplanken & Orbell, 2003). By contrast, adherence is an intentional, goal-directed behavior requiring self-control and self-regulation (Carey et al., 2004; Robison & Rogers, 1994).

Much of the fitness and physical exercise research has tended to understand how different mechanisms can help people establish sustained exercise routines (McAuley et al., 1994; Mitchell et al., 2013; Oman & McAuley, 1993; Ryan et al., 1997; Teixeira et al., 2012; Williams, 2008). However, prior

literature does not show consistent and confirmative effects of fitness app features on users' physical activities. For example, a 12-month experiment engaging US veterans shows that adding personalized coaching could not improve the level of physical activity compared to using a fitness app alone; rather, both with- and without-coaching groups had the majority of participants who failed to sustain exercise adherence (Damschroder et al., 2020). Other studies, however, suggest that advice from a personal coach would facilitate users' physical behavior (Brunstein et al., 2012; Connelly et al., 2013).

2.4.2. Social Engagement

Engagement has long been the interest of system design and application development because it positively relates to users' performance and their future intention to use (Bateman et al., 2011; Kuem et al., 2020; Ray et al., 2014). Fitness apps such as Fitbit, Nike Run Club, and PumpUp usually have their own online communities for users to communicate. Like in other online communities, engagement not only is critical to the initial app adoption but also influences app continuance usage significantly (Zhang et al., 2020; Zhu et al., 2017). Therefore, engagement is one of the essential impacts of fitness app feature design.

Prior research on online communities suggests that engagement is a kind of psychological state that brings personally meaningful benefits and prosocial behavior (Mirzaei & Esmaeilzadeh, 2021). We follow the holistic approach in the literature (Ray et al., 2014) to define social engagement in this study as the psychological state in which fitness app users perceive their interactions with other users (i.e., other members of the fitness app community) are socially important and personally meaningful. Users are cognitively and emotionally energized by their social interactions with others in the same community. The psychological state of a user's engagement keeps reinforcing meaningful and valuable social roles, which in turn provides a sense of value, belonging, and attachment to the community (Zhang et al., 2011).

Numerous studies have examined the antecedents and consequences of user engagement in various community contexts. For example, multi-dimensional customer experience, including social support received from a brand community, the extent to which a user's personal connection is bonded with other

users, and the sense of total involvement positively impact user engagement with online brand communities (Zhang et al., 2017). In the healthcare context, seeking informational and emotional support is found to be a strong driving force of engagement in online health communities (Kordzadeh & Warren, 2017; Mirzaei & Esmaeilzadeh, 2021). Moreover, online fitness community engagement can significantly increase members' participation in physical exercise and healthy food choices (Dessart & Duclou, 2019). Generally, a lot of empirical evidence shows that engagement is a significant predictor of brand loyalty, health outcomes, prosocial behaviors in online communities (e.g., knowledge contribution), use and continued use, and positive word-of-mouth (Di Gangi & Wasko, 2016; Milton et al., 2012; Ray et al., 2014; Zhang et al., 2017).

2.4.3. User Subjective Well-Being

The ultimate objective of fitness apps is to assist users to establish a healthy lifestyle and improve the well-being of app users. Regular physical activity may benefit people across different age groups by improving their well-being and quality of life (Mandolesi et al., 2018). Subjective well-being is important to both the physical and phycological health of individuals because it increases life expectancy, decreases the risk of disease, illness, and injury, and is associated with positive health behaviors (Mandolesi et al., 2018). Subjective well-being has therefore a profound ultimate consequence to study in this context.

Subjective well-being generally refers to how and why people experience their lives in positive ways (Diener, 2009). Specifically, it includes three distinguishable components: an individual's general cognitive evaluation of life satisfaction and the positive as well as negative emotions they experience (Diener et al., 1999; Diener, 2009). The cognitive element describes an individual's global life satisfaction (i.e., life as a whole) and satisfaction in a specific domain (e.g., work, family, finances, etc.) (Diener et al., 1999). The affective element refers to one's emotional experience and feelings, which can be either positive or negative. Positive or pleasant affect can be joy, happiness, pride, the feeling of self-discipline, etc. Negative or unpleasant affect includes emotional exhaustion, depression, stress, sadness, etc.

In this study, we focus on three outcome variables capturing the effectiveness of long-term physical exercise and social engagement: the feeling of self-discipline, emotional exhaustion, and life satisfaction. As discussed earlier, subjective well-being consists of three distinguishable components: an individual's evaluation of life satisfaction and the positive as well as negative emotions they experienced. Our three outcome variables can successfully capture the three different dimensions of the characteristics of well-being, which help us gain an improved understanding of the impacts of physical exercise and social engagement on an individual's different aspects of psychological evaluation. In addition, feeling of self-discipline, emotional exhaustion, and life satisfaction are important indicators of individuals' exercise outcomes in the psychology, sports, and health management literature (Dyrbye et al. 2017; Proctor et al. 2009; Tian et al. 2018). In line with this literature and given the context of this study, feeling of self-discipline, emotional exhaustion, and life satisfaction can serve as important metrics for the assessment of exercisers' long-term physical exercise and social engagement consequences.

Self-discipline is not an automatic psychological process but requires conscious efforts. It is defined as "the ability to suppress prepotent responses in the service of a higher goal" (Duckworth & Seligman, 2006). The essential components of self-discipline include concentration, control of impulses, self-motivation, and the ability to overcome stress (Rogus, 1985). Prior research shows that self-discipline is associated with various positive behavioral changes, such as overcoming eating disorders, addictions, smoking, and other negative habits (Duckworth & Seligman, 2006; Tian et al., 2018). The feeling of self-discipline can make individuals feel more confident and less anxious because they feel in control of how they act and on the path to achieving their goals.

Emotional exhaustion is a well-documented construct in psychology and organizational behavior research. It is defined as a chronic state of emotional and physical depletion (Cropanzano et al., 2003; Lewig & Dollard, 2003; Wright & Cropanzano, 1998). Prior studies show that social support from coworkers and understanding from supervisors can significantly reduce employees' emotional exhaustion because others'

support can provide an employee with tangible aids to assist in resolving problems (Halbesleben, 2006; Halbesleben & Bowler, 2007).

Life satisfaction is a cognitive judgmental process dependent upon a comparison of one's circumstances with what is thought to be an appropriate standard (Sirgy, 2002). Global life satisfaction and domain satisfaction are two different components of subjective well-being, though they are often correlated substantially (Diener et al., 1999). Global life satisfaction is not simply the arithmetic average of life satisfaction in various domains. Instead, it reflects individuals' satisfaction with personally important domains of life and their interpretation of the overall life (Diener et al., 2009). To capture the general perception of individuals' evaluation of their quality of life, we adopt the global concept of life satisfaction in the present study.

3. RESEARCH MODEL AND HYPOTHESES

3.1. Personal- and Social-Oriented SRE Features and Exercise Adherence

Although the benefits of regular exercise on human health are well-documented (Peddle et al., 2008), a major issue encountered in the practice is how to promote adherence to regular exercise (Ryan et al., 1997). Self-regulatory skills such as developing plans to achieve fitness goals, monitoring exercise progress, and adjusting one's behavior in line with personal goals are important predictors of exercise adherence (Martin Ginis & Bray, 2010). Therefore, people who have a higher level of self-regulatory skills are more likely to achieve greater exercise adherence than those with a lower level of self-regulatory skills.

Fitness apps are designed to enhance users' self-regulatory skills. Personal-oriented SRE features support setting fitness goals, recording and reviewing workouts, and searching for exercise information, all of which aim to help users proactively manage and direct their exercise activities. Specifically, self-monitoring features in Fitbit, Strava, and Garmin are consistently found to be associated with increased physical activity (Oyibo et al., 2019; Petersen et al., 2020). Setting personal goals and exercise pace and self-evaluating performance turns out to be effective in improving one's knowledge acquisition and skill

development (Wan et al., 2012). In line with this research, fitness app research also shows that users who set goals in fitness apps indeed record more physical activities (Zhou et al., 2016). Thus, we hypothesize:

H1: *Personal-oriented SRE features positively impact fitness app users' exercise adherence.*

Social-oriented SRE features cater to users' need to discuss with others, whether professional trainers or more experienced exercisers. The underlying assumption of the social comparison feature is that users would become more physically active in order to outperform others (Jia et al., 2017; Wu et al., 2015). Furthermore, sharing exercise data and communicating with friends and acquaintances would receive encouragement, moral support, and feedback (Cavallo et al., 2014; Laranjo et al., 2015), which are positively related to physical activities (Petersen et al., 2020). Healthcare literature has already provided rich evidence supporting the positive relationship between social support and self-regulated behaviors (for instance, smoking cessation and abstinence) (Cobb et al., 2010). A supportive community can help its users remain highly motivated and encourage them to be more committed to the shared goals (Ray et al., 2014). Prior research also suggests that social support or social sharing of exercise experiences can help users maintain or increase regulated exercising behaviors (Duncan & McAuley, 1993; Molloy et al., 2010; Zhang et al., 2020). Therefore, we propose:

H2: *Social-oriented SRE features positively impact fitness app users' exercise adherence.*

3.2. Personal- and Social-Oriented SRE Features and Social Engagement

Personal-oriented SRE features allow users to monitor and record their exercise data. Individuals using self-monitoring features have plenty of personal exercise data and summary statistics, which is the fundamental resource for subsequent sharing in the fitness community. People who have more exercise records to share are more likely to socially interact with other community members, receiving feedback and endorsement for their achieved goals from others (Stragier et al., 2018). Their sharing would foster a sense of relatedness, belonging, and meaningfulness (Petersen et al., 2020; Stragier et al., 2018). Moreover, personal-oriented SRE features enable users to have more control over their exercise process (James et al.,

2019), which helps a user to build confidence in his or her exercise ability and performance. Indeed, highly efficacious members are more likely to find the opportunity to contribute their own knowledge to others and be highly engaged in social communities (Ray et al., 2014). Therefore, we hypothesize:

H3: *Personal-oriented SRE features positively impact fitness app users' social engagement.*

Social-oriented SRE features are designed to create opportunities for app users to connect with like-minded exercisers for getting assistance, social comparison, and networking purposes. These features, by nature, can strengthen users' interactions with other community members and contribute to a higher degree of social bond with the community (Stragier et al., 2018). Prior research has provided empirical support for the social benefits derived from the use of fitness apps' social-oriented SRE features, for example, receiving emotional support (such as encouragement and empathy) and informational support (like advice or suggestions) from other users (Petersen et al. 2020). These social benefits can enlarge users' sense of group and enhance users' community attachment (Petersen et al., 2020; Zhang et al., 2020). Thus, we propose:

H4: *Social-oriented SRE features positively impact fitness app users' social engagement.*

3.3. Social Engagement Affecting Exercise Adherence

The lack of encouragement, support, or companionship from other people is a major barrier that prevents fitness app users to continue their physical exercises (Wilcox et al., 2006). Social engagement overcomes this barrier by providing emotional support, information support, and companionship support to exercisers from the fitness community. On one hand, users post their exercise workouts and get "likes" from others in fitness online communities, which brings a sense of gratification and achievement. These positive emotions, encouragement, and caring from peer users in the community are all emotional support (Zellars & Perrewé, 2001) that motivates fitness app users to continue their physical exercise. Informational support, on the other hand, is the provision of advice, guidance, suggestions, or useful information to someone in need (Halbesleben, 2006). Finally, companionship support is the type of support that gives someone a sense of community or social belonging (Wills, 1991). Social engagement in the fitness

communities means continually reinforcing meaningful and valuable social roles a user has established, which can provide recognition and affirmation support to an individual for regulated exercising. Taking together three types of support from social engagement, we expect that social engagement can promote a user's exercise adherence. A recent study on fitness app users has found empirical support for the positive effect of social comparison on users' exercise participation at the group level (Zhang et al., 2020).

H5: *Social engagement is positively related to exercise adherence.*

3.4. The Moderating Effect of Exercise Proficiency

Following our earlier argument that social support obtained from social-oriented SRE features increase users' regulated exercising behavior (in Hypothesis 2) and perceived social engagement (in Hypothesis 4), we now turn to the contingent role of exercise proficiency. Exercise proficiency refers to the degree of a user's proficiency in exercising. The impact of app features on users' physical and psychological outcomes may vary depending on whether the user is a beginner or a proficient exerciser (Lewis et al., 2020). Through a study of Nike+ Running users, Wu et al. (2015) find that for fitness app users who have a high level of self-confidence in doing exercise, social comparison has a weaker impact on physical activity. For a novice user who has little workout experience or exercising knowledge, social-oriented SRE features such as coaching and networking could be an important source of information and guidance helping them to develop basic exercising skills. Exercise beginners are more likely to be perplexed and even give up, thus they need more informational support and emotional encouragement to help them start and maintain exercise activities than proficient exercisers. Similarly, exercise beginners would benefit more from the social comparison and networking features in establishing a sense of belonging and relatedness than their counterparts who are experienced in exercising.

However, even experienced exercisers would like to use fitness apps to record their personal workouts and generate progress statistics to ensure they accomplish their exercise goals. These exercising records generated from the personal-oriented SRE features are equally important for veteran exercisers as

well as novices for sharing their achievements with the online community. Therefore, the role of personal-oriented SRE features on exercise adherence and social engagement is less likely to depend on the user's proficiency in exercising. Hence, we hypothesize:

H6a: *Exercise proficiency negatively influences the relationship between social-oriented SRE features and users' exercise adherence, such that for exercise beginners, social-oriented SRE features have a stronger positive impact on exercise adherence.*

H6b: *Exercise proficiency negatively influences the relationship between social-oriented SRE features and users' social engagement, such that for exercise beginners, social-oriented SRE features have a stronger positive impact on social engagement.*

3.5. Exercise Adherence and Well-being

The benefits of physical activity on physical and mental health have been highlighted in various disciplines, such as psychology, medical science, sports, and health management (Herzog et al., 2002). Since exercise adherence is a stable and persistent behavior that is performed regularly to achieve predefined goals (Carey et al., 2004; Robison & Rogers, 1994), it is more or less ritual-characterized by some degree of rigidity. Prior research shows that ritual behaviors are associated with a wide range of intrapersonal psychological and behavioral consequences, such as reduced anxiety (Brooks et al., 2016), improved performance, and self-control (Tian et al., 2018). Repetitive ritualistic behaviors promote an individual's feeling of self-discipline (Tian et al., 2018) and enjoyment (Vohs et al., 2013). In the exercising context, specifically, repeated exercise can build self-control over time (Muraven et al., 1999). Literature also shows a positive relationship between exercise and psychological outcomes such as satisfaction and self-esteem (Tiggemann & Williamson, 2000). In the long term, physical exercise contributes to the promotion of positive psychological dimensions (Scully et al., 1998) and quality of life (Berger & McInman, 1993) of exercisers. Another study conducted by Grant and her colleagues (2009) affirms physical exercise as a means to promote life satisfaction. Following this line of research, we argue that

exercise adherence can facilitate the development of self-discipline, and life satisfaction and alleviate exhaustion. Therefore, we propose:

H7a: *Exercise adherence positively affects an individual's feeling of self-discipline.*

H7b: *Exercise adherence negatively affects an individual's emotional exhaustion.*

H7c: *Exercise adherence positively affects an individual's life satisfaction.*

3.6. Social Engagement and Well-Being

Positive outcomes of social engagement are often more psychological than physical, such as subjective well-being and life satisfaction (Valenzuela et al., 2009). Prior studies have generally found substantial benefits of social support and social engagement on mental health, such as decreasing symptoms of anxiety and depression, reducing stress levels, enhancing self-esteem and self-confidence, and promoting cognitive functioning and affective mental well-being (Fabrigoule et al., 1995; Herzog et al., 2002; Hultsch et al., 1993). In addition to the physiologic and psychological benefits, social engagement may also a promote healthy lifestyle (e.g., proper diet, and regular exercising), which ultimately enhances individual well-being. Therefore, we propose:

H8a: *Social engagement positively affects an individual's feeling of self-discipline.*

H8b: *Social engagement negatively affects an individual's emotional exhaustion.*

H8c: *Social engagement positively affects an individual's life satisfaction.*

In summary, we examine the impacts of both personal-oriented and social-oriented SRE features on fitness app users' exercise adherence and social engagement, how the effects of social-oriented SRE features might be moderated by user exercise proficiency, and the well-being consequences of exercise adherence and social engagement. Figure 1 summarizes the hypotheses in an overall research model.

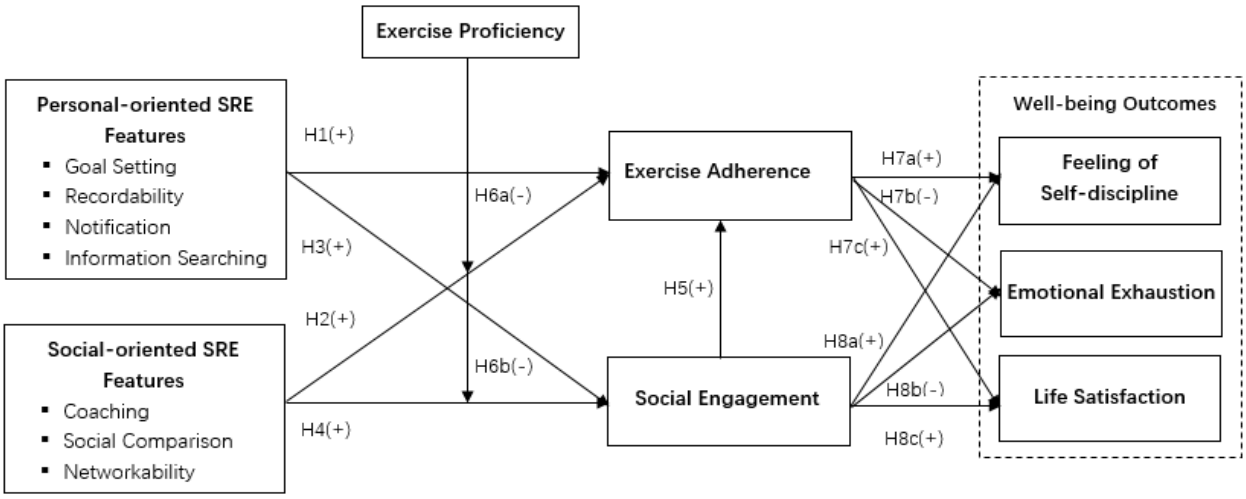

Figure 1. Research Model

4. METHOD

4.1. Measurement

Sports research calculates adherence as a percentage of time one's exercising contract is fulfilled (Robison et al., 1992; Robison & Rogers, 1994). However, as recording objectively the participants' exercise time was not feasible during the pandemic, it was hard to ensure the accuracy and reliability of self-reported exercise time by participants. We, therefore, followed a deductive approach to develop scales for exercise adherence. A deductive approach is appropriate for the development of exercise adherence measures because a solid theoretical foundation does exist (Hinkin, 1998). Exercise adherence was measured using 5 items drawing on the Self-Regulation Questionnaire (Carey et al., 2004) and scale capturing repeated (Verplanken & Orbell, 2003) routine behaviors. Social engagement was measured using the scale developed by Algesheimer et al. (2005) and Ray et al. (2014).

Personal-oriented and social-oriented SRE features were operationalized as two formative constructs for two reasons. First of all, the four subconstructs of goal setting, recordability, notification, and information searching captured different aspects of personal-oriented features. Similarly, coaching, social comparison, and networkability represented three dimensions that collectively formed the social-oriented features. Second, the first-order subconstructs did not necessarily covary; for example, an increase in the

notification feature would not result in an increase in the information searching feature. Therefore, consistent with the prior research on self-regulation (Wan et al., 2012), we modeled personal- and social-oriented SRE features as formative, second-order factors and created the superordinate second-order constructs using the factor scores for the first-order subconstructs. All the other constructs were modeled as reflective constructs.

Since prior research on fitness apps has developed a series of instruments measuring the first-order subconstructs, we adopted the validated measures of those features whenever possible. We made only minor changes to ensure that the expressions were consistent with our conceptualization of features. Specifically, the items for goal setting, notification, and information searching were measured using the scale developed by James et al. (2019). Measures of coaching were based on James et al. (2019) and Wan et al. (2012). Recordability was measured by four items adapted from Lee and Cho (2017) and James et al. (2019). Phang et al. (2015)'s scale measuring networkability was adapted to capture the data-sharing feature of fitness apps. Exercise proficiency was measured with one item by asking participants to self-report the degree of proficiency in doing exercise.

The feeling of self-discipline was measured using three items from Tian et al. (2018). We measured users' level of emotional exhaustion with nine items adapted from the emotional exhaustion subscale of the Maslach Burnout Inventory (Maslach & Jackson, 1986). This nine-item scale measures how often one feels emotionally overextended and exhausted by one's work. We replaced the wording of "work" with "life" to make the measuring items relevant to a more generic audience. Life satisfaction was measured using the 4-item scale by Brayfield and Rothe (1951). The full list of survey items and their sources are provided in Appendix A. All items were measured on a 7-point Likert-type scale, with points ranging from 1 ("strongly disagree") to 7 ("strongly agree").

Several control variables are included in the model based on prior fitness app literature (James et al., 2019). These variables include individual differential factors such as age and gender, and fitness app use characteristics such as app use frequency, length of ownership, and app use proficiency. App use

frequency measures the frequency with which an exerciser uses the fitness app in a given period. Length of ownership measures how long the exerciser has used the fitness app. App use proficiency captures the degree of familiarity with using the fitness app. The measurement scales of the app use characteristic variables are shown in Table 3.

A pilot study with 267 subjects was conducted to assess the wording of the questionnaire and the reliability, convergent validity, and discriminant validity of the key constructs. The analysis results (see Appendix B) indicate that all the construct measures have strong reliability, convergent validity, and discriminant validity.

4.2. Sample and Data Collection Procedure

Since we are interested in understanding the causal relationships between the users' evaluation of the app features and users' psychological well-being, cross-sectional data could not satisfy our needs. Resultantly, we sought to address these questions in a two-wave data collection on a broad set of fitness app users.

A two-wave survey study was conducted employing the built-in qualification features on Amazon Mechanical Turk (AMT) platform. In Time 1, following the scientific steps of James et al. (2019), we added four filtering questions at the beginning of the survey: (1) Do you currently use or have used a fitness app on your mobile device(s)? (2) Please specify which fitness app you use (or have used), if more than one, name one that you used most frequently. (3) Please indicate the main purpose of using this app (Exercise, Nutrition, Sleep Monitoring, or others), and (4) How long you have used this fitness app? Responses that did not pass the screening criteria (e.g., participants who did not use a fitness app, or used an app for purposes other than doing exercise) were ruled out from the data set. After answering the filtering questions, participants were asked to evaluate the features of the fitness app they named above and report their exercise proficiency level, exercise adherence, social engagement, and well-being. Of the 600 participants who

access the survey, after removing seven respondents who did not use an app for exercising purposes and 32 responses with incomplete data, we got 561 valid responses.

Four months later (Time 2), we solicited responses from the same participants of the Time 1 survey. Another filtering question was added to the original survey asking whether they were still using the fitness apps. After answering the filtering questions, participants were asked to evaluate their exercise adherence, social engagement, and well-being. Two batches of data were matched using the respondents' AMT worker ID. Out of 561 potential participants, 177 who had kept using fitness apps finished our second questionnaire, representing a response rate of 31.6%, and their responses constituted the sample for further data analysis. The demographic information for the sample and statistical information for control variables are presented in Table 2.

Table 2. Summary of Sample Demographics (N = 177)

Gender		Age		Ethnicity		Education	
Male	97	10–20 yrs.	2	White/Caucasian	71	Less than high school	1
Female	80	21–25 yrs.	36	Black/African American	3	Some high school	12
Total:	177	26–30 yrs.	55	Asian	89	Some college	25
		31–35 yrs.	36	Pacific Islander	1	College graduate	93
		36–40 yrs.	25	Latino	5	Postgraduate	46
		41–50 yrs.	19	Native American Indian	4	Total:	177
		51–60 yrs.	2	Middle Eastern	1		
		60 + yrs.	2	Other	3		
		Total:	177	Total:	177		

Table 3. Summary of Fitness App Use Characteristics (N = 177)

App use frequency		Length of ownership		App use proficiency	
Multiple times per day	38	Less than 6 months	18	Novice	21
Once per day	68	6 months to 1 year	64	Intermediate	63
Multiple times per week	41	1 to 2 years	53	Advanced	42
Once per week	18	2 to 4 years	35	Expert	51
Multiple times per month	7	5 or more years	7	Total:	177
Once per Month	2	Total:	177		
Less than once per month	3				
Total:	177				

4.3. Results

Means, standard deviations, Cronbach's alpha values, composite reliability (CR), average variance extracted (AVE), and intercorrelations are reported in Table 4. We first examined the measurement model using SmartPLS. Reliability was examined based on CR and AVE. As shown in Table 4, the CRs range from 0.85 to 0.96, and the AVEs range from 0.68 to 0.87. Therefore, all variables had composite reliability scores well above the recommended level of 0.70 (Bagozzi & Yi, 1988). All square roots of the AVE were above 0.5 (Fornell & Larcker, 1981) and were greater than the correlations among the latent constructs, indicating adequate convergent validity and discriminant validity (Barclay et al., 1995). All items' loadings and crossing loadings are reported in Appendix C.

Figure 2 presented the results of the structural model using the time-lagged data. It shows that 30.0% of the variance in the fitness app users' exercise adherence and 23.9% of the variance in the users' social engagement were explained by the two types of SRE features. The variance in the feeling of self-discipline, emotional exhaustion, and life satisfaction explained by exercise adherence and social engagement were 32.9%, 9%, and 23%, respectively. Personal-oriented SRE features were found to have a significant positive effect on fitness app users' exercise adherence ($\beta = 0.203$, $p < 0.001$), which supported H1. Social-oriented SRE features, as we predicted, had a significantly positive impact on users' exercise adherence ($\beta = 0.110$, $p < 0.01$), Therefore, H2 was supported. Personal-oriented SRE features had a significant, positive effect on fitness app users' social engagement ($\beta = 0.205$, $p < 0.001$), thus H3 was supported. Social-oriented SRE features significantly promoted users' social engagement ($\beta = 0.403$, $p < 0.001$), thus supporting H4. In support of H5, social engagement had a significantly positive impact on exercise adherence ($\beta = 0.320$, $p < 0.001$).

As we predicted, exercise proficiency negatively moderated the relationship between social-oriented SRE features and users' exercise adherence ($\beta = -0.200$, $p < 0.001$) such that the relationship was less positive when the user's exercise proficiency was high, thus H6a was supported. Similarly, exercise proficiency also negatively moderated the relationship between social-oriented SRE features and users'

social engagement, suggesting that the positive relationship became weaker when the user was an experienced exerciser (β = -0.123, $p < 0.05$). Thus, H6b was supported.

In terms of ultimate effect on well-being, exercise adherence had a significantly positive impact on the feeling of self-discipline (β = 0.338, $p < 0.01$) and a negative impact on emotional exhaustion (β = -0.245, $p < 0.01$), thus supported H7a and H7b. However, the effect of exercise adherence on life satisfaction was insignificant (β = -0.004, $p = 0.979$), therefore rejecting H7c. Finally, social engagement enhanced the feeling of self-discipline (β = 0.339, $p < 0.01$) and life satisfaction (β = 0.424, $p < 0.001$), thus H8a and H8c were supported. Contrary to our expectations, social engagement strengthened the feeling of emotional exhaustion (β = 0.209, $p < 0.05$), thereby rejecting H8b. We interpreted this counterintuitive result in the discussion section.

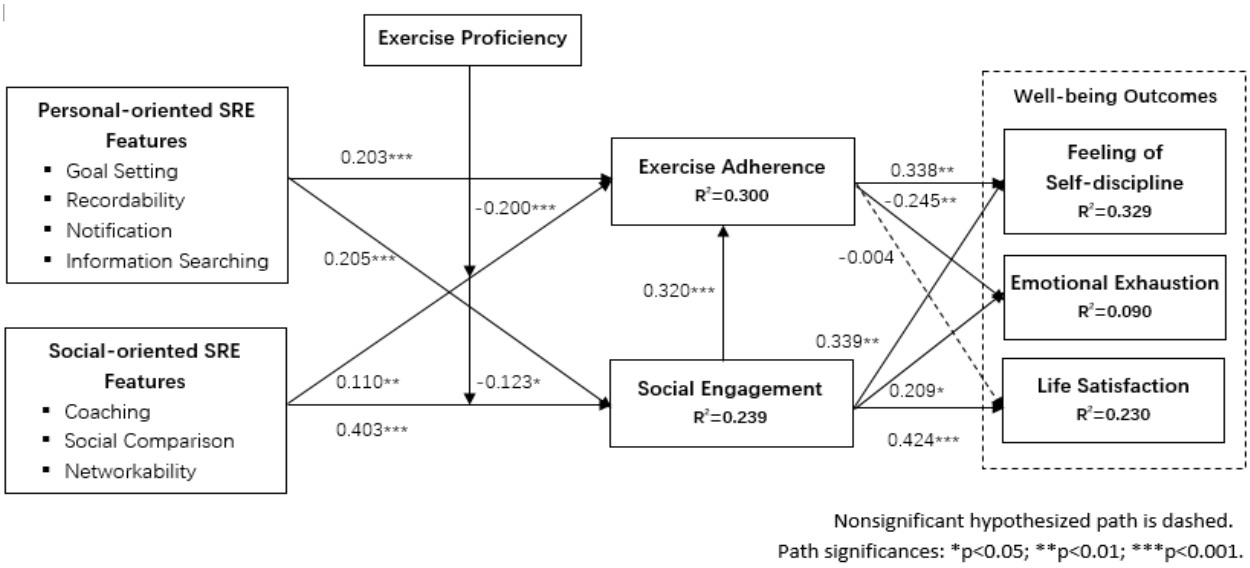

Figure 2. Results of the Time-lag Model

Table 4. Descriptive Statistics, Reliability, and Correlations of Constructs

	Mean	**SD**	**Alpha**	**CR**	**AVE**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. GoalSet	5.43	1.17	0.89	0.90	0.75	**0.86**											
2. Record	5.53	1.21	0.88	0.89	0.74	0.54	**0.86**										
3. Notify	5.43	1.31	0.92	0.94	0.81	0.53	0.53	**0.90**									
4. InfoSearch	5.25	1.29	0.90	0.94	0.77	0.54	0.45	0.57	**0.88**								
5. Coach	4.14	1.73	0.93	0.92	0.82	0.30	0.17	0.29	0.45	**0.90**							
6. Compare	4.79	1.54	0.89	0.94	0.75	0.35	0.42	0.39	0.40	0.48	**0.87**						
7. Network	4.65	1.70	0.92	0.95	0.87	0.30	0.39	0.39	0.46	0.58	0.76	**0.93**					
8. Adhere	5.47	1.14	0.89	0.92	0.70	0.40	0.39	0.38	0.41	0.25	0.34	0.34	**0.84**				
9. Engage	4.99	1.40	0.92	0.93	0.80	0.33	0.30	0.34	0.39	0.40	0.37	0.42	0.53	**0.89**			
10.Discipline	5.51	1.13	0.84	0.88	0.76	0.41	0.42	0.46	0.37	0.21	0.27	0.27	0.59	0.51	**0.87**		
11.Exhaustion	2.79	1.08	0.95	0.96	0.70	-0.07	-0.10	0.03	0.06	0.38	0.18	0.20	-0.02	0.14	-0.06	**0.84**	
12.Satisfaction	3.80	0.73	0.84	0.85	0.68	0.33	0.37	0.31	0.35	0.27	0.32	0.28	0.48	0.44	0.48	-0.10	**0.82**

The effects of control variables on five outcome constructs are reported in Table 5. Age is negatively related to social engagement (β = -0.067, $p < 0.05$), indicating more likelihood of young people to participate in online social activities than of older people. In the online community, young people tend to be more active in making friends, sharing exercise data, and commenting on posts. Older people are more cautious about privacy, and thus less willing to share health-related information with the public (Zhang et al., 2018). Age is also found negatively associated with emotional exhaustion (β = -0.195, $p < 0.001$), suggesting that older people are less likely to feel emotionally worn out and drained, which can be attributed to their richer experience in handling pressure, anxiety, and depression than young people. App use frequency (1=high, 7=low) is negatively related to exercise adherence (β = -0.115, $p < 0.05$) and life satisfaction (β = -0.146, $p < 0.05$) but positively related to emotional exhaustion (β = 0.137, $p < 0.01$), suggesting that regardless of specific app features, the exercisers who use fitness apps frequently, in general, are more likely to maintain exercise adherence, be less likely to feel exhausted and more satisfied with their overall quality of lives. Length of ownership (β = 0.104, $p < 0.05$) and app use proficiency (β = 0.100, $p < 0.01$) are found to be positively related to exercise adherence.

The results of the hypotheses tests are summarized in Table 6.

Table 5. Effects of Control Variables

Control variables	Exercise adherence	Social engagement	Feeling of self-discipline	Emotional exhaustion	Life satisfaction
Age	-0.018	-0.067*	-0.030	-0.195***	0.029
Gender	-0.097	-0.007	0.034	-0.021	0.021
AppUseFrequency	-0.115*	-0.033	-0.008	0.137**	-0.146*
LengthOfOwnership	0.104*	0.010	-0.042	0.085	0.001
AppUseProficiency	0.100**	0.055	-0.027	-0.029	0.041
Note: * significant at p<0.05 level; ** significant at p<0.01 level; *** significant at p<0.001 level.					

Table 6. Summary of Hypotheses and Results

Hypotheses	Results
H1: Personal-oriented SRE features are positively associated with users' exercise adherence.	Supported
H2: Social-oriented SRE features are positively associated with users' exercise adherence.	Supported
H3: Personal-oriented SRE features are positively associated with users' social engagement.	Supported
H4: Social-oriented SRE features are positively associated with users' social engagement.	Supported
H5: Social engagement is positively associated with exercise adherence.	Supported
H6a: Exercise proficiency negatively influences the relationship between social-oriented SRE features and users' exercise adherence.	Supported
H6b: Exercise proficiency negatively influences the relationship between social-oriented SRE features and users' social engagement.	Supported
H7a: Exercise adherence is positively associated with users' feeling of self-discipline.	Supported
H7b: Exercise adherence is negatively associated with users' emotional exhaustion.	Supported
H7c: Exercise adherence is positively associated with users' life satisfaction.	Not Supported
H8a: Social engagement is positively associated with users' feeling of self-discipline.	Supported
H8b: Social engagement is negatively associated with users' emotional exhaustion.	Not Supported^{+}
H8c: Social engagement is positively associated with users' life satisfaction.	Supported
Note: $^{+}$the result is significant but opposite to our hypothesis.	

4.4. Additional Analyses

4.4.1. The Direct Impact of App Features on Well-being

To understand how different app feature sets influence users' well-being directly, we examined the relationship between personal-oriented SRE features, social-oriented SRE features, and three well-being outcomes. The results are reported in Table 7. Specifically, both personal-oriented SRE features and social-oriented SRE features are not found to have significant impacts on the feeling of self-discipline and life satisfaction, suggesting that simply using two types of app feature sets may not be sufficient to improve users' feeling of the ability to control themselves and the evaluation of the quality of their lives. We find that personal-oriented SRE features have a significantly negative impact on users' emotional exhaustion ($\beta = -0.368$, $p < 0.001$), while social-oriented SRE features show a significantly positive effect on emotional exhaustion ($\beta = 0.389$, $p < 0.001$), implying that frequently using personal-oriented SRE features can alleviate users' feeling of emotional worn-out and drained because of accumulated stress from their lives. However, excessive use of social-oriented SRE features could bring more network activities, thus may increase anxiety deriving from social comparison and leading to chronic stress over time.

Table 7. Direct Impact of app Features on Well-being

	Subjective Well-being		
Fitness App Feature Sets	**Feeling of self-discipline**	**Emotional exhaustion**	**Life satisfaction**
Personal-oriented SRE features	0.193	-0.368***	0.187
Social-oriented SRE features	0.156	0.389***	0.173
Note: *** significant at p<0.001 level.			

4.4.2. Moderating Effect of Control Variables

To explore whether the relationships proposed in our research model are moderated by the control variables, we first tested how different control variables impact the relationship between two types of app feature sets and (1) exercise adherence, and (2) social engagement. Next, we tested the moderating role of control variables on the relationship between (1) exercise adherence, and (2) social engagement and well-being.

Among five control variables (i.e., age, gender, app use frequency, app use proficiency, and length of ownership), only three were found to have a significant impact. We reported significant results in Table 8. Gender (0 = male, 1 = female) shows a marginally significant positive influence on the relationship between social-oriented SRE features and exercise adherence, suggesting that social-oriented SRE features may have a stronger impact on exercise adherence ($\beta = 0.145$, $p < 0.1$) for female users than male users. Moreover, AppUseFrequency (1=high, 7=low) negatively moderates the relationship between personal-oriented SRE features and exercise adherence ($\beta = -0.262$, $p < 0.05$), implying that for exercisers who use fitness apps more frequently, personal-oriented SRE features seem to have a stronger influence to help users maintain adherence to exercise. AppUseFrequency is also found to positively moderate the relationship between social-oriented SRE features and exercise adherence ($\beta = 0.191$, $p < 0.1$), suggesting that social-oriented SRE features have a weaker impact on exercise adherence for the exerciser who uses fitness apps more frequently. Last, the relationship between social engagement and feeling of self-discipline is negatively moderated by AppUseFrequecy ($\beta = -0.242$, $p < 0.1$), indicating that for individuals who use

fitness apps more often, social engagement displays a stronger positive effect on the feeling of self-discipline. In addition, AppUseProficiency (1=low, 4=high) positively moderates the relationship between personal-oriented SRE features and exercise adherence ($\beta = 0.241$, $p < 0.1$), implying that for exercisers who are more familiar with fitness apps, personal-oriented SRE features seem to have a stronger influence to help users maintain adherence to exercise. AppUseProficiency is also found to negatively moderate the relationship between social-oriented SRE features and exercise adherence ($\beta = -0.158$, $p < 0.1$), suggesting that social-oriented SRE features have a weaker impact on exercise adherence for the exerciser who is more proficient in using fitness apps.

Table 8. Moderating Effects of Control Variables

Relation	Results
Gender x Social-oriented SRE features → Exercise adherence	0.145^{+}
AppUseFrequency x Personal-oriented SRE features → Exercise adherence	-0.262*
AppUseFrequency x Social-oriented SRE features → Exercise adherence	0.191^{+}
AppUseFrequency x Social engagement → Feeling of self-discipline	-0.242^{+}
AppUseProficiency x Personal-oriented SRE features -> Exercise adherence	0.241^{+}
AppUseProficiency x Social-oriented SRE features -> Exercise adherence	-0.158^{+}
Note: $^{+}$ significant at p<0.1 level; * significant at p<0.05 level.	

5. DISCUSSION

Proper physical activity has a crucial role in health management, which might be a major driving factor of the pervasive fitness apps in the market nowadays. However, we do not know clearly whether the popular fitness app features are effective in promoting user exercising adherence, or merely helping users feel socially engaged, and how these two consequences of fitness app features would influence users' well-being. As hypothesized, we found both personal-oriented and social-oriented SRE features led to enhanced exercise adherence and social engagement. Social-oriented SRE features not only show a direct influence on users' exercise adherence but also display an indirect impact on exercise adherence through social engagement. These results support the prior literature that highlights the important role of social features in

shaping individuals' exercise behavior (Molloy et al., 2010; Nakhasi et al., 2014; Zhu et al., 2017). Therefore, an exerciser who wants to establish long-term exercise habits, should not only focus on personal-oriented SRE features like goal setting or recording exercise performance but also leverage the beneficial impacts of peer encouragement and social comparison. In addition, our results show that exercise proficiency negatively moderates the relationship between social-oriented SRE features and (1) exercise adherence and (2) social engagement, implying that exercise beginners can benefit more from social-oriented SRE features in terms of maintaining physical activity and increasing social engagement. Furthermore, we found that the ultimate effects of exercise adherence and social engagement on three types of user well-being turned out to be mixed. We speculated that two reasons might explain the unexpected insignificant result of H7c. First, the construct of life satisfaction reflects an individual's satisfaction with personally important domains of life and their interpretation of the overall life (Diener et al., 2009). This broad nature makes it hardly representable by a single domain of physical exercise. Second, we collected the data in the middle of 2020, probably the toughest phase of the COVID pandemic. We suspected that participants were undergoing significant challenges and generally had a considerable level of worry about the prospect of their lives. As a result, regulated exercising turned out to be one aspect of their whole life, though not a predominant indicator of life satisfaction. For H8b, we found that increased social engagement worsened emotional exhaustion. This finding is consistent with the demands–resources model in the stress and burnout literature, which posits that overtaxing demands exhaust energy and lead to burnout and diminished mental health (Demerouti et al., 2001). In the social media context, researchers find that excessive social interactions and social information make individuals suffer from social overload, which is positively associated with emotional exhaustion (Maier et al., 2015; Fu et al., 2020). Our findings corroborate this stream of literature, showing that people may similarly feel overwhelmed by numerous social information, discussion, and comments even in the context of using fitness apps for positive lifestyle and health management. If not properly managing the social engagement caused by fitness apps, people may feel stressed and anxious rather than relaxed and enjoyable.

5.1. Theoretical Implications

By conducting a comprehensive investigation on the impacts of personal- and social-oriented SRE features on users' exercise adherence and social engagement, and their ultimate impacts on a user's well-being, we provide valuable implications to the theory and practice. First, drawing upon the SRT and research (Wan et al., 2012), we identified two sets of fitness app features, personal-oriented and social-oriented, and empirically verifying not only the direct effects of fitness app feature sets on users' physical and psychological self-evaluations but also their ultimate impacts on three dimensions of user well-being (i.e., the feeling of self-discipline, emotional exhaustion, and life satisfaction). Our study answers the call for a broader examination of the potential outcomes of using fitness apps over time (James et al., 2019) to uncover the underlying mechanism through which fitness app use enhances user well-being.

Our second major contribution lies in revealing the differentiated effects of exercise adherence and social engagement on different dimensions of well-being. On the one hand, although more regulated exercising activities enhance the positive feeling of self-discipline and reduce emotional exhaustion, they may not help with an overall evaluation of life satisfaction. On the other hand, social engagement as another parallel consequence of fitness app features demonstrates the mixed effect on those three dimensions of well-being—that is, a higher degree of social engagement brings both positive results, in terms of a good feeling of self-discipline and a higher level of life satisfaction, and a negative result of emotional exhaustion. This nuanced understanding, therefore, supplements prior research by providing insights regarding the potentially negative effect of social engagement. While social engagement stimulates exercise adherence and makes fitness app users feel good, an overly beneficial view of social engagement could be misleading and even dangerous. If a user has already been suffering from emotional exhaustion from some other aspects of his or her life, being a heavy social engager induced by the fitness app will make the situation even worse.

Third, we extend research on fitness apps by showing that user exercise proficiency has a significant negative moderating effect on the positive relationships between social-oriented SRE features and (1)

exercise adherence and (2) social engagement, but not on those relationships derived from personal-oriented SRE features. While device or app proficiency has often been studied in prior research (James et al., 2019), exercise proficiency is relatively under-investigated or, at best, is indirectly studied by recruiting only beginner exercisers or simply comparing the perceptual and behavioral differences between novices and experienced exercisers (Dawson & Brawley, 2000; Hsiao & Thayer, 1998). Our study has provided an important boundary condition to explain the effects of fitness app features.

Finally, the results of the control variables provide additional important insights into fitness app users' behavioral outcomes. Our findings indicate that regardless of specific features, successful use of fitness app, in general, can significantly help users lead more positive and healthier lives by establishing long-term exercise habits and less likely to feel exhausted, which ultimately improve their satisfaction with the overall quality of life.

5.2. Practical Implications

Practically, the findings of our study provide several guidance and useful suggestions for mobile app developers in designing and developing better fitness app products and for exercisers in optimizing the benefits of fitness technology adoption. First, both personal- and social-oriented SRE features can promote exercise adherence and social engagement. However, social features may benefit novices more than experienced exercisers. Therefore, if the target consumers are a more advanced group of exercisers, practitioners should focus on advertising the personal-oriented features such as user-friendly goal setting, superior recordability and notification, and powerful information searching features because they equally benefit from this group of features. On the contrary, social-oriented features may not be appealing to advanced exercisers since the benefits brought by this group of features are likely to diminish along with the accumulation of exercising experience.

Second, we observed that gender differences positively moderate the relationship between social-oriented SRE features and exercise adherence. For female users, social-oriented SRE features have a

stronger impact on exercise adherence. This finding suggests that females are more likely to seek assistance and guidance from peers or professionals during the exercise. Exercise performance comparison with other app users plays an important role in motivating females to maintain long-term exercise habits. In addition, social interactions such as exchanging exercise experience, providing encouragement to partners, and receiving support from friends and family are important factors in promoting females to take exercise regularly. The findings highlight the critical role of the social component of apps in facilitating female users' physical activity participation and well-being, thus providing guidance in the development of more effective fitness technologies. Therefore, app developers can increase users' involvement by adding more social elements in the app, such as gamification design, to overcome the common barriers during online social interaction such as privacy or security concerns in the design of future apps.

Third, in relation to fitness app usage, for exercisers who use fitness apps more frequently, personal-oriented SRE features have a stronger influence to help users maintain adherence to exercise. Conversely, social-oriented SRE features have a weaker positive impact on exercise adherence for the exerciser who uses fitness apps more frequently. These findings indicate that frequently using personal-oriented SRE features is more beneficial in helping maintain physical activity than the social-oriented SRE features. This is consistent with previous research showing that frequently monitoring exercise progress is associated with improvement in exercise activity (Yin et al., 2021). Conversely, frequently using apps reduces the positive influence of social-oriented SRE features on exercise adherence. This can be attributed to receiving information that is unwanted or redundant. An increase in using social-oriented SRE features can also generate more competition and pressure (e.g., leaderboard ranking), thus discouraging individuals' willingness to take exercise. From the app developer's point of view, we suggest that exercise performance comparison should not only consider the accumulated number of exercise data (e.g., total step counts) but also emphasize changes. For instance, the leaderboard can rank users' performance by comparing the incremental changes of their exercise data in this period with the last period, which may encourage users to exercise more in the long term.

6. CONCLUSION

Drawing upon the SRT, we propose a comprehensive model of fitness app features and test the impacts of app features on users' exercise adherence, social engagement, and well-being. Both personal-oriented and social-oriented SRE features help users to gain a better evaluation of their exercise adherence and social engagement, although the benefits of social-oriented features may weaken when users are proficient in exercising. We also demonstrate that exercise adherence and social engagement may have nuanced effects on three dimensions of well-being. We hope the findings of this study will provide some insights into fitness app research and broaden the prospect of behavioral science paradigms.

Like any single study, this research also has some limitations. First, user behavior is dynamic and constantly changing. We adopted the survey method in our study. Although the time-lagged research design may provide more feasible insights than cross-sectional studies, it could fully establish causality. Moreover, as discussed in the method section, although self-reported measures have been widely used in the prior health and exercise literature (Jeffery & French, 1999; Mitchell et al., 2013; Noland, 1989), we recognize that the measurement of exercise adherence is not completely accurate, but a suboptimal choice under the pandemic constraint. We encourage future research to employ field experiment methods and consider using factual data (e.g., exercise logs and screenshots) from various exercise trackers to objectively measure exercise adherence and provide more convincing empirical evidence on the causal effect relationships between fitness app features, exercise adherence and social engagement, and well-being outcomes. Second, we only considered exercise proficiency as our moderating variable. However, other personal or contextual factors may also exhibit influence on the effect of fitness app features on the health-related outcomes of app users. For example, user personality, motivation, paid users or not, and many other factors may influence whether a user would benefit from various app features. Last, since our data were collected on AMT, the participants who took the earlier survey may have stopped working on AMT in the meantime, which results in a relatively small sample size for the follow-up survey. Although it is acceptable given the

model complexity, we encourage future research to increase the sample size and examine the difference between the non-responding and responding samples when resources permit.

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Appendix A: Construct Scales and Sources

Goal setting (Adapted from James et al. 2019)
GoalSet1: This fitness app enables me to set exercise goals.
GoalSet2: Being able to establish my exercise goals is an important feature of this fitness app.
GoalSet3: This fitness app can let me develop goals for my exercise.
GoalSet4: In general, this fitness app enables me to create exercise goals.
Recordability (Adapted from Lee & Cho 2017; James et al. 2019)
Record1: This fitness app enables me to record my exercise data and/or the number of calories burned.
Record2: This fitness app can show the trends from my exercise data and/or graph it.
Record3: Keeping records of my exercise data and calories burned is a very necessary feature of this fitness app.
Record4: This app gives me visual cues (e.g., status bar, colors) about my exercise progress.
Notification (Adapted from James et al. 2019)
Notify1: This fitness app can remind me to do an exercise activity.
Notify2: This fitness app notifies me to perform exercise activities.
Notify3: This fitness app provides me with reminders when I need to do an exercise activity.
Notify4: This fitness app prompts me when I need to perform an exercise activity.
Information searching (Adapted from James et al. 2019)
InfoSearch1: Enabling exercise information searching (e.g., exercise routes, new exercise routines, etc.) is an important feature of this fitness app.
InforSearch2: This fitness app enables me to access useful information and knowledge about doing exercises.
InfoSearch3: This fitness app can let me find exercise information that is relevant to me.
InfoSearch4: This fitness app enables me to browse exercise information (e.g., exercise routes, new exercise routines, etc.).
Coaching (Adapted from James et al. 2019; Wan et al. 2012)
Coach1: This fitness app can provide me coaching from a live personal trainer.
Coach2: This fitness app enables me to seek assistance from an expert /coach when I have difficulty in exercising.
Coach3: This fitness app can let me obtain feedback from a live coach about how my exercise activities are going.
Coach4: In general, this fitness app could have a live coach guiding me through my exercise regimen.
Social Comparison (Adapted from James et al. 2019)
Compare1: This fitness app allows me to post my exercise data in a public forum (e.g., leaderboard, ranking).
Compare2: This fitness app can compare my exercise activities to other people's exercise activities.
Compare3: This fitness app lets me see how other people's exercise activities compare to mine.
Compare4: This fitness app enables me to rank my exercise activities relative to others' exercise activities.
Networkability (Adapted from Phang et al. 2015)
Network1: This fitness app enables me to reach other users who also want to discuss fitness activities.
Network2: This fitness app allows me to network with other users who are also interested in fitness activities.
Network3: This fitness app supports me in communicating with other users who also think fitness activities important.
Network4: In general, this fitness app can make me connected with other fitness app users.
Exercise adherence (Adapted from Carey et al. 2004; Verplanken & Orbell 2003)
Adhere1: I set exercise goals for myself and keep track of my progress.
Adhere2: I'm able to accomplish the exercise goals I set for myself.
Adhere3: I can stick to my exercise plan that is working well.
Adhere4: I do exercise frequently.
Adhere5: Exercise belongs to my (daily, weekly, monthly) routine.
Social engagement (Adapted from Algesheimer et al. 2005; Ray et al. 2014)
Engage1: When participating in a fitness/exercise group, I feel better afterward.
Engage2: I feel better when participating in a fitness/exercise group because I am able to support other people.

Engage3: I feel better when participating in a fitness/exercise group because I am able to reach personal goals.
Engage4: In general, I socially benefit in a fitness/exercise group.
Feeling of self-discipline (Tian et al. 2018)
Discipline1: I feel disciplined when making decision regarding fitness exercising.
Discipline2: I feel mentally strong when making decision regarding fitness exercising.
Discipline3: I feel sharp and focused when making decision regarding fitness exercising.
Emotional exhaustion (Maslach & Jackson 1986)
Exhaustion1: I feel like I am at the end of my rope.
Exhaustion2: I feel burned out from my life.
Exhaustion3: I feel frustrated by my life.
Exhaustion4: I feel I am working too hard on my life.
Exhaustion5: I feel emotionally drained from my life.
Exhaustion6: I feel used up at the end of the day.
Exhaustion7: I feel fatigued when I get up in the morning and have to face another day.
Exhaustion8: I feel connecting with people all day is really a strain for me.
Exhaustion9: I feel connecting with people directly puts too much stress on me.
Life satisfaction (Brayfield & Rothe 1951)
Satisfaction1: I feel fairly well satisfied with my present life.
Satisfaction2: Most days I am enthusiastic about my status.
Satisfaction3: I find real enjoyment in my life.
Satisfaction4: I consider my life rather pleasant.
Exercise Proficiency (Self-generated)
Please describe your proficiency in doing exercise: novice, intermediate, advanced, or expert.
Note: Except exercise proficiency, all items were measured on a 7-point scale from “strongly disagree” to “strongly agree”.

Appendix B: Pilot Study

Sample and Data Collection Procedure

We conducted a cross-sectional survey on college students at a public university in the United States. Participants were recruited through an electronic subject pool system on a voluntary basis. Each participant would gain extra credits in the subject whose instructors signed to join the research pool program. The web-based survey questionnaire was developed using Qualtrics. A total of 267 students participated in the online survey. Participants were asked to first name one fitness app they used most frequently, and then to answer the questions regarding the fitness app features, exercise proficiency, exercise adherence, social engagement, and some demographic information. 44% of the participants were female, two-thirds were in the range of 21 to 25 years old (67%) and another 30% were 20 years old or below. The sample was comprised of White/Caucasian (68.9%), Latino (18%), Black/African American (5.2%), Asian (4.1%), and others (3.8%).

Construct reliability, convergent validity, and discriminant validity

We first assessed the construct reliability of key variables by identifying Cronbach's alpha. All constructs had reliability scores above the recommended level of 0.70 (Nunnally & Bernstein, 1994). Next, we performed the Principal Components Analysis (PCA) to assess the measurement properties of the items. Appendix B shows that nine factors with eigenvalues greater than one are extracted, with all items loading greater than 0.7 and loading on its principal construct much higher than on other constructs. Convergent validity was evaluated by the average variance extracted (AVE). Table B1 shows that all the AVE values ranged from 0.55 to 0.77. As can be seen in Table B1, the square root of the average variance extracted for each construct is higher than the inter-construct correlations. All these results suggest satisfactory discriminant validity (Barclay et al., 1995). Therefore, the pilot study verified the quality of exercise adherence measure to be good.

Table B1. Descriptive Statistics, Reliability, and Correlations of Constructs

	Mean	SD	Alpha	CR	AVE	1	2	3	4	5	6	7	8	9
1. GoalSet	5.41	1.35	0.92	0.94	0.75	**0.86**								
2. Record	5.85	1.16	0.89	0.91	0.72	0.25**	**0.85**							
3. Notify	5.22	1.50	0.94	0.96	0.74	0.40**	0.30**	**0.86**						
4. InfoSearch	4.97	1.58	0.93	0.95	0.76	0.26**	0.07	0.30**	**0.87**					
5. Coach	3.00	1.57	0.89	0.92	0.67	0.19**	0.05	0.22**	0.47**	**0.82**				
6. Compare	4.59	1.53	0.90	0.94	0.68	0.16**	0.29**	0.41**	0.10	0.24**	**0.83**			
7. Network	4.20	1.78	0.95	0.97	0.55	0.17**	0.18**	0.33**	0.14*	0.24**	0.72**	**0.74**		
8. Adhere	5.20	1.40	0.93	0.95	0.77	0.14*	0.03	0.11	0.20**	0.12	0.10	0.08	**0.88**	
9. Engage	5.01	1.42	0.90	0.91	0.72	0.22*	0.10	0.23**	0.18**	0.24**	0.16**	0.16**	0.27**	**0.85**

Notes: * Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).

Table B2. Factor Loadings and Cross-Loadings

	GoalSet	Record	Notify	InforSearch	Coach	Compare	Network	Adhere	Engage
GoalSet1	**0.901**	0.210	0.325	0.230	0.159	0.050	0.096	0.155	0.184
GoalSet2	**0.894**	0.268	0.382	0.264	0.181	0.144	0.195	0.088	0.220
GoalSet3	**0.883**	0.189	0.349	0.185	0.148	0.146	0.139	0.140	0.182
GoalSet4	**0.921**	0.280	0.366	0.269	0.192	0.146	0.166	0.130	0.191
Record1	0.171	**0.782**	0.221	0.036	0.002	0.225	0.119	-0.031	0.035
Record2	0.233	**0.895**	0.300	0.072	0.045	0.281	0.185	0.087	0.115
Record3	0.204	**0.866**	0.208	0.003	0.007	0.202	0.167	0.029	0.066
Record4	0.258	**0.891**	0.327	0.133	0.075	0.214	0.167	0.011	0.126
Notify1	0.411	0.305	**0.902**	0.256	0.171	0.276	0.254	0.108	0.193
Notify2	0.351	0.266	**0.926**	0.251	0.244	0.352	0.306	0.055	0.218
Notify3	0.340	0.305	**0.939**	0.284	0.199	0.353	0.336	0.117	0.194
Notify4	0.359	0.318	**0.926**	0.285	0.211	0.363	0.340	0.128	0.234
InfoSearch1	0.216	0.118	0.273	**0.866**	0.397	0.057	0.099	0.128	0.200
InfoSearch2	0.237	0.048	0.212	**0.942**	0.463	0.074	0.109	0.206	0.157
InfoSearch3	0.273	0.097	0.270	**0.923**	0.449	0.113	0.154	0.249	0.155
InfoSearch4	0.229	0.055	0.320	**0.921**	0.426	0.092	0.131	0.170	0.156
Coach1	0.116	-0.049	0.215	0.421	**0.883**	0.122	0.128	0.122	0.226
Coach2	0.182	0.067	0.232	0.488	**0.881**	0.167	0.200	0.134	0.217
Coach3	0.195	0.135	0.147	0.334	**0.832**	0.250	0.244	0.081	0.132
Coach4	0.174	0.061	0.159	0.373	**0.853**	0.235	0.225	0.087	0.228
Compare1	0.090	0.264	0.304	0.126	0.212	**0.851**	0.648	0.092	0.125
Compare2	0.100	0.254	0.328	0.044	0.166	**0.922**	0.683	0.036	0.132
Compare3	0.121	0.251	0.338	0.109	0.204	**0.932**	0.728	0.070	0.141
Compare4	0.160	0.221	0.346	0.062	0.195	**0.913**	0.704	0.094	0.185
Network1	0.172	0.197	0.306	0.130	0.234	0.690	**0.927**	0.064	0.174

Network2	0.168	0.183	0.311	0.127	0.210	0.705	**0.952**	0.088	0.139
Network3	0.126	0.172	0.320	0.140	0.223	0.721	**0.950**	0.083	0.165
Network4	0.159	0.180	0.327	0.117	0.179	0.759	**0.937**	0.100	0.175
Adhere1	0.146	0.052	0.042	0.150	0.076	0.051	0.062	**0.894**	0.202
Adhere2	0.107	0.028	0.108	0.176	0.141	0.087	0.165	**0.871**	0.298
Adhere3	0.170	0.072	0.089	0.202	0.125	0.032	0.037	**0.849**	0.188
Adhere4	0.122	0.023	0.099	0.183	0.064	0.091	0.053	**0.919**	0.201
Adhere5	0.093	0.038	0.143	0.212	0.136	0.104	0.069	**0.903**	0.293
Engage1	0.223	0.121	0.154	0.188	0.213	0.109	0.097	0.264	**0.827**
Engage2	0.137	0.085	0.198	0.136	0.240	0.200	0.231	0.281	**0.886**
Engage3	0.219	0.140	0.236	0.168	0.180	0.151	0.172	0.227	**0.912**
Engage4	0.177	0.064	0.207	0.145	0.211	0.111	0.097	0.170	**0.873**

Note: GoalSet = Goal Setting; Record = Recodability; Notify = Notification; InforSearch = Information Searching; Coach = Coaching; Compare = Social Comparison; Network = Networkability; Adhere = Exercise Adherence; Engage = Social Engagement.

Appendix C: Factor Loadings and Cross-Loadings in Main Study

Table C. Factor Loadings and Cross-Loadings

	GoalSet	Record	Notify	InfoSearch	Coach	Compare	Network	Adhere	Engage	Discipline	Exhaustion	Satisfaction
GoalSet1	**0.843**	0.459	0.437	0.440	0.200	0.269	0.227	0.345	0.230	0.346	-0.104	0.249
GoalSet2	**0.868**	0.472	0.499	0.482	0.280	0.266	0.253	0.353	0.322	0.372	-0.031	0.261
GoalSet3	**0.879**	0.455	0.447	0.487	0.301	0.312	0.302	0.364	0.337	0.368	-0.045	0.317
GoalSet4	**0.867**	0.469	0.435	0.473	0.261	0.285	0.252	0.334	0.254	0.343	-0.089	0.302
Record1	0.428	**0.843**	0.415	0.313	0.077	0.308	0.303	0.279	0.187	0.337	-0.072	0.261
Record2	0.434	**0.845**	0.460	0.396	0.142	0.364	0.359	0.346	0.236	0.321	-0.076	0.316
Record3	0.496	**0.888**	0.488	0.420	0.214	0.377	0.362	0.381	0.320	0.414	-0.075	0.379
Record4	0.477	**0.864**	0.445	0.393	0.127	0.294	0.306	0.326	0.261	0.350	-0.107	0.298
Notify1	0.490	0.483	**0.895**	0.504	0.255	0.322	0.360	0.349	0.298	0.422	0.047	0.274
Notify2	0.474	0.481	**0.918**	0.530	0.262	0.266	0.321	0.357	0.340	0.430	0.032	0.278
Notify3	0.476	0.453	**0.891**	0.518	0.258	0.294	0.352	0.322	0.306	0.394	0.035	0.291
Notify4	0.451	0.480	**0.885**	0.499	0.259	0.363	0.384	0.339	0.291	0.389	0.010	0.263
InfoSearch1	0.493	0.434	0.498	**0.858**	0.376	0.352	0.415	0.394	0.371	0.345	0.054	0.346
InfoSearch2	0.471	0.369	0.504	**0.889**	0.419	0.281	0.382	0.350	0.331	0.304	0.078	0.298
InfoSearch3	0.501	0.383	0.534	**0.889**	0.373	0.301	0.396	0.352	0.331	0.358	0.040	0.312
InfoSearch4	0.438	0.371	0.462	**0.865**	0.416	0.334	0.422	0.318	0.320	0.299	0.055	0.273
Coach1	0.280	0.169	0.247	0.414	**0.909**	0.438	0.524	0.236	0.355	0.196	0.323	0.248
Coach2	0.274	0.163	0.283	0.440	**0.905**	0.463	0.523	0.238	0.347	0.192	0.338	0.234
Coach3	0.251	0.102	0.256	0.362	**0.922**	0.466	0.543	0.213	0.385	0.172	0.397	0.249
Coach4	0.298	0.184	0.257	0.419	**0.878**	0.422	0.495	0.205	0.344	0.191	0.311	0.247
Compare1	0.301	0.399	0.338	0.347	0.372	**0.844**	0.648	0.304	0.302	0.222	0.085	0.288
Compare2	0.310	0.377	0.338	0.314	0.474	**0.915**	0.715	0.279	0.345	0.219	0.156	0.267
Compare3	0.282	0.324	0.275	0.309	0.445	**0.913**	0.694	0.263	0.287	0.182	0.186	0.259
Compare4	0.277	0.303	0.280	0.326	0.475	**0.902**	0.704	0.304	0.329	0.204	0.219	0.266
Network1	0.284	0.348	0.381	0.440	0.558	0.678	**0.898**	0.312	0.374	0.226	0.228	0.234

Network2	0.263	0.363	0.349	0.389	0.490	0.737	**0.934**	0.310	0.368	0.254	0.157	0.272
Network3	0.283	0.369	0.362	0.448	0.569	0.715	**0.937**	0.322	0.417	0.268	0.178	0.289
Network4	0.283	0.360	0.367	0.431	0.522	0.734	**0.935**	0.353	0.417	0.278	0.163	0.285
Adhere1	0.414	0.379	0.350	0.375	0.222	0.295	0.312	**0.852**	0.447	0.508	-0.017	0.417
Adhere2	0.275	0.288	0.244	0.337	0.222	0.303	0.305	**0.778**	0.438	0.440	0.012	0.403
Adhere3	0.371	0.363	0.347	0.327	0.126	0.218	0.240	**0.853**	0.449	0.548	-0.103	0.373
Adhere4	0.322	0.318	0.327	0.332	0.243	0.270	0.301	**0.852**	0.438	0.492	0.005	0.400
Adhere5	0.297	0.283	0.321	0.325	0.219	0.264	0.309	**0.844**	0.430	0.489	0.012	0.403
Engage1	0.294	0.288	0.316	0.372	0.371	0.350	0.408	0.471	**0.896**	0.441	0.144	0.393
Engage2	0.249	0.212	0.271	0.317	0.387	0.317	0.392	0.456	**0.890**	0.418	0.167	0.375
Engage3	0.334	0.305	0.331	0.358	0.300	0.301	0.353	0.470	**0.901**	0.461	0.103	0.420
Engage4	0.315	0.258	0.311	0.336	0.358	0.297	0.370	0.483	**0.883**	0.496	0.092	0.399
Discipline1	0.331	0.365	0.348	0.281	0.217	0.247	0.279	0.486	0.411	**0.835**	0.002	0.413
Discipline2	0.352	0.338	0.395	0.334	0.177	0.153	0.195	0.486	0.429	**0.879**	-0.056	0.393
Discipline3	0.393	0.383	0.440	0.358	0.153	0.206	0.251	0.568	0.483	**0.892**	-0.107	0.447
Exhaustion1	-0.045	-0.109	0.050	0.095	0.385	0.180	0.215	0.018	0.184	-0.026	**0.868**	-0.033
Exhaustion2	-0.079	-0.103	0.044	0.055	0.347	0.167	0.186	-0.029	0.135	-0.038	**0.894**	-0.088
Exhaustion3	-0.073	-0.049	0.004	0.035	0.273	0.158	0.149	-0.087	0.083	-0.113	**0.846**	-0.173
Exhaustion4	-0.084	-0.088	0.028	0.047	0.316	0.132	0.146	0.036	0.163	-0.018	**0.801**	-0.004
Exhaustion5	-0.059	-0.080	-0.012	-0.004	0.288	0.152	0.160	-0.040	0.073	-0.076	**0.862**	-0.164
Exhaustion6	-0.086	-0.073	0.006	0.018	0.277	0.129	0.136	-0.050	0.081	-0.064	**0.852**	-0.128
Exhaustion7	-0.090	-0.105	0.011	0.037	0.287	0.147	0.139	-0.077	0.059	-0.123	**0.835**	-0.165
Exhaustion8	-0.026	-0.053	0.022	0.073	0.295	0.150	0.145	-0.054	0.037	-0.097	**0.773**	-0.068
Exhaustion9	0.000	-0.008	0.075	0.105	0.307	0.131	0.141	0.013	0.087	-0.033	**0.780**	-0.050
Satisfaction1	0.180	0.267	0.190	0.250	0.200	0.227	0.208	0.323	0.291	0.345	-0.016	**0.788**
Satisfaction2	0.262	0.287	0.234	0.293	0.256	0.291	0.282	0.420	0.410	0.408	-0.001	**0.852**
Satisfaction3	0.301	0.335	0.291	0.304	0.233	0.239	0.250	0.421	0.396	0.412	-0.145	**0.836**
Satisfaction4	0.321	0.328	0.289	0.312	0.195	0.235	0.213	0.394	0.350	0.413	-0.158	**0.817**

Note: GoalSet = Goal Setting; Record = Recordability; Notify = Notification; InforSearch = Information Searching; Coach = Coaching; Compare = Social Comparison; Network = Networkability; Adhere = Exercise Adherence; Engage = Social Engagement; Discipline = Feeling of Self-discipline; Exhaustion = Emotional Exhaustion; Satisfaction = Life Satisfaction.

Chapter 2

Disaggregating the Differential Impacts of Privacy Policy: Insights from Host Information Disclosure on Accommodation Sharing Platforms

ABSTRACT

Recent years have witnessed the increasing embracement of accommodation-sharing services via online community platforms. Meanwhile, users' privacy concerns over social interactions and online transactions on these platforms are escalating. The goal of this research is to investigate whether and how privacy policy can properly mitigate hosts' privacy concerns, enhance perceived benefits, and subsequently encourage their information disclosure on the accommodation sharing platforms (ASPs). To investigate this problem, we conducted two studies: a scenario-based survey of 665 respondents about the effects of the privacy policy and a controlled experiment with 443 subjects on the treatment effects of privacy policy clauses regulating the platform vs. those regulating users. Our research uncovers a mismatch between the privacy concern that the current privacy policy intended to address and the privacy concern that hinders the hosts' information disclosure. Specifically, the hosts are more concerned about the other users' misappropriating the private information that the hosts disclose on the platform than the platforms' privacy invasion behaviors, but this major concern is not significantly mitigated by the current privacy policy. Moreover, our findings show that privacy policy engenders two types of perceived benefits, among which social benefit has a stronger effect than economic benefit on the hosts' intentions to disclose information on ASPs. These results contribute to the privacy literature and provide practical implications to the accommodation sharing platforms.

Keywords: Accommodation Sharing Platforms (ASPs), Privacy Policy, Information Disclosure, Privacy Concerns, Social Benefits, Economic Benefits.

1. INTRODUCTION

In recent years, more people have embraced accommodation-sharing services via online community marketplaces such as Airbnb.com, Couchsurfing.com, Homestay.com, and Vacation Rental by Owner (VRBO.com). A survey conducted by Pew Research Center reports that about 11% of American adults stayed overnight in a private residence using a home-sharing site in 2015. In 2017, over 33.9 million adults in the United States used Airbnb for their travel (Lock 2020). These online services, named accommodation sharing platforms (ASPs) by prior studies (Krasnova et al. 2015; Teubner and Flath 2019; Wang et al. 2020; Zervas et al. 2017), are two-sided collaborative consumption platforms that connect accommodation providers and consumers in the travel and tourism markets and enable them to initiate and carry out transactions with each other electronically. ASPs radically reduce the costs of accommodation services and improve transaction efficiency by optimizing the process of matching hosts and renters, increasing supply-side flexibility, facilitating searchable listings for consumers, and reducing transaction overheads (Möhlmann 2015; Zervas et al. 2017).

ASP, as a combination of social media and e-commerce platform, attracts the general public's attention, which brings both benefits and risks to the hosts' information disclosure on the platforms. On the one hand, hosts can gain extra income by renting out their surplus properties and cumulate social capital via building a trusting relationship with visitors. On the other hand, since trading with strangers on ASPs involves social interactions characterized by information asymmetry, both the hosts and the guests can have privacy concerns during the transactions. Although ASPs are becoming increasingly popular in the tourism and rental markets and have significantly impacted the economy, consumers' concerns about their privacy are increasingly growing. For example, Airbnb reported a data security incident that occurred within its service, exposing the data of Airbnb hosts to other platform users. The exposed data includes hosts' personally identifiable information (PII), account passwords, phone numbers, property addresses, and property access codes (DecisionMarketing 2020).

The issue of privacy concern and information disclosure has received a great deal of attention in the IS field (e.g., Awad and Krishnan 2006; Hong and Thong 2013; Kolotylo-Kulkarni et al. 2021; Malhotra et al. 2004; Pavlou et al. 2007; Smith et al. 2011). While consumers are faced with similar concerns in ASPs as in the general e-commerce context, hosts who disclose private information on ASPs may suffer additional risks, such as explicit or implicit threats to hosts' safety, well-being, and health (Hu et al. 2020). Thus, the findings of the literature about privacy concerns and information disclosure on traditional e-commerce platforms may not be directly applied to the ASP setting due to the following key differences. First, since ASP hosts open the doors of their private homes or houses to strangers, the information they disclose tends to be highly personal and sensitive, including hosts' belongings, properties and the intimate insights into their private spheres (Lutz et al. 2018; Teubner and Flath 2019). For example, Airbnb hosts typically post pictures of the authentic interior of their properties, associated facilities, and surrounding attractions, and text description about their personal background, occupation, hobby, and even other family members' information. Such personal information opens possibilities of intrusions into hosts' daily lives and even physical damage or loss of amenities. Second, the audience or recipients of the information disclosed by ASPs' hosts are more diverse, including platform operators, other platform users, and the general public. In contrast, in a traditional e-commerce context, consumers' personal information such as credit card and locational data is only released to and kept by the platform operators (Teubner and Flath 2019). Third, the motivation of ASP hosts to release information is different from customers of e-tailers. ASP hosts strategically disclose information to signal trustworthiness and credibility to shorten the social distance with the visitors, while consumers share their personal information to fulfill the transaction or to exchange for monetary benefits or service (Xu et al. 2011). Due to these differences, the existing literature lacks a clear understanding of the influence of privacy concern in the accommodation sharing context and the interrelationship between hosts' motivational factors, platform protection features (i.e., privacy policy), and specific behavioral consequences (i.e., information disclosure). Such an understanding will benefit the design, marketing, and deployment of ASPs and contribute to enhancing the engagement of individuals on the platform.

A privacy policy informs users of a firm's data protection practice in order to enhance their willingness to provide personal information. Some studies (Bansal et al. 2015; Hui et al. 2007; Wang and Herrando 2019; Wu et al. 2012) have explored users' perceptions of the privacy policy and the factors that may predict a user's intention to disclose personal information or to purchase online. For example, Hui et al. (2007) found that a website's privacy statement or providing monetary incentives positively impacts users' information disclosure. Wirtz et al. (2007) showed that the absence of a privacy policy could exacerbate users' concerns, which result in consumers' defensive measures such as fabricating personal information, using privacy protection technologies, and refusal to purchase. However, little is known about the underlying mechanism of how privacy policy impacts individual users' disclosure behaviors. That is, whether the privacy policy really enhances users' perception of expected benefit, alleviates their concerns, and ultimately strengthens their disclosure intention. In particular, researchers have paid little attention to the information privacy and self-disclosure behaviors in the context of accommodation sharing, especially from the *service providers'* (i.e., *hosts*) perspective (Teubner and Flath 2019). Thus, there is a need for explicit theorization and systematic investigation of the drivers and impediments that jointly influence a service provider's decision-making process. Therefore, this research aims to gain insights into this topic by answering the following research questions:

1. *How does a privacy policy influence hosts' privacy concerns, perceived benefits, and information disclosure on the ASPs?*
2. *What are the mechanisms of the impacts of the privacy policy and privacy concerns on hosts' disclosure of personal information?*
3. *How to enhance the hosts' disclosure of personal information by improving privacy policy design*?

By answering these questions, we bridge three theoretical gaps. First, the existing conceptualizations of privacy concern only consider the concern from a consumer (buyer)'s point of view and are unable to capture the uniqueness from the service provider (seller)'s angle. As a result, these conceptualizations are insufficient to explain a service provider's disclosure behavior and have reported mixed findings on the role of privacy policies on information disclosure. For instance, through a survey with 823 users on four

different websites, Xu et al. (2011) found that privacy policy significantly reduced individuals' privacy concerns by increasing privacy control and mitigating perceived risk. However, Wu et al. (2012) suggested that only certain dimensions (i.e., access, security, and enforcement) of the privacy policy can alleviate users' privacy concerns. Second, extant privacy literature primarily emphasizes the role of individual privacy perception on privacy disclosure. The role of contextual factors, such as platform-level social and policy factors, in shaping disclosure behavior have not been explored in depth (Smith et al. 2011). ASPs provide various privacy-enhancing features (e.g., privacy policy) to safeguard users' information, aiming to help alleviate privacy concerns and induce information disclosure (Hu et al. 2020). There is a need to examine how the individual factors (e.g., privacy concern and benefit expectancy) and platform factors (e.g., privacy policy) interplay to affect personal information disclosure collectively. Third, prior literature (Bansal et al. 2015; Guo et al. 2021; Wu et al. 2012) suggests that different dimensions of privacy policy content (i.e., notice, choice, access, security, and enforcement) may influence individuals' evaluation of privacy policy quality, privacy concern, trust belief, and information disclosure behavior in different ways. It is thus essential to examine how different privacy policy clauses impact hosts' perceptions and behaviors differently on APSs.

The purpose of the current research is to bridge the above-mentioned theoretical gaps by illuminating the underlying mechanism of different motivational factors and the impact of platform protection features on hosts' information disclosure on ASPs. To address the first two gaps, and thereby understand how privacy policy influences the drivers and barriers of the hosts' voluntary disclosure, we use a scenario-based online survey to collect first-hand data on users' direct responses to an ASP's privacy policy and verify the proposed theoretical model, in which the factors of social benefits, economic benefits, two dimensions of privacy concerns, and platform privacy policy are linked to explain hosts' intention to disclose personal information. To address the third theoretical gap, and thereby understand how different types of privacy policy clauses influence host disclosure behavior, we conducted a 2x2 between-subject experiment to test how those provisions influence hosts' privacy concerns, perceived benefits, and their

behavior to share information on the ASPs. We employ multiple methods in this research to capitalize on their strengths and compensate for the limitations of each approach.

Our study complements the existing privacy literature on a unique user group, i.e., hosts on ASPs, by demonstrating that hosts' participation in ASPs depends on extrinsic benefits, privacy concerns, and platform features. Therefore, we provide supporting empirical evidence to earlier theoretical developments that emphasize the role of privacy calculus on an individual's self-disclosure behavior. Additionally, this study takes the first step to bridge the gap in the existing literature that has so far ignored the different dimensions of privacy concern. Our research advances this body of knowledge by showing that on ASPs, hosts can have both concerns about privacy invasions by the platform and privacy concerns from other platform users' opportunistic behaviors. More importantly, we identify a mismatch between the privacy concern that the current privacy policy focuses on and the concern that matters for hosts' information disclosure intention. Specifically, the hosts are more concerned about other users misappropriating the private information that the hosts disclose on the platform than the platforms' privacy invasion behaviors. However, this major concern cannot be reduced by the current privacy policy. Moreover, we propose a feasible solution to effectively address hosts' privacy concerns about platform users' opportunistic behaviors and significantly improve hosts' information disclosure intention. The findings of this research would have practical implications for platform owners and policymakers on privacy policy design and implementation.

2. THEORETICAL BACKGROUND

This section reviews the extant information disclosure literature and compares the difference between this study with related literature to understand the uniqueness of privacy concerns and information disclosure in accommodation sharing context. We propose that the economic perspective and platform design features could work together to shape service providers' information disclosure on ASPs. We then present our hypotheses and research model.

2.1 Extant Information Disclosure Literature

Past works have examined a range of issues related to individuals' willingness to disclose their personal information online in various contexts (see Table 9). For example, in the healthcare context, researchers (Bansal et al. 2010) find that patients' intention to disclose health-related information depends on their trust to the platform, privacy concern about the misuse of their personal health information, and the level of information sensitivity. In online health communities, users disclose their health information to obtain informational and emotional support and establish a reciprocal relationship with others (Kordzadeh and Warren 2017; Zhang et al. 2018). In the e-commerce context, consumer's willingness to share private information to exchange for personalized advertising or service is determined by their purchasing experience, concerns over the process firms utilize to collect and use consumer data, consumer characteristics, and culture/climate (Awad and Krishnan 2006; Dinev and Hart 2006; Kolotylo-Kulkarni et al. 2021; Malhotra et al. 2004; Smith et al. 2011). Firms can motivate consumers' disclosure intention by building trust and mitigating consumers' privacy fear through explicit communication of a privacy policy, displaying privacy seals, and increasing consumers' perceived information transparency (Awad and Krishnan 2006; Smith et al. 2011). Table 1 summarizes the closely related studies and shows how our research differs from them.

Our review highlights three major distinctions from the literature. First, prior studies' research interests predominantly focus on self-disclosure behavior from consumer's point of view. Our study takes a novel angle by investigating seller's information disclosure in an emerging context, ASP. Second, most of the extant studies employ survey as their major methodologies. It is thus difficult to infer any causal relationship of the results and unclear whether the findings would be robust in other contexts. Our study takes a multimethodological approach. Specifically, we first conduct a scenario-based survey to collect first-hand responses of users' direct responses to an ASP's privacy policy, e.g., the effects of the privacy policy on their concerns and the perceived benefits, and the subsequent influence on their privacy disclosure intentions. We then corroborate our findings through an experiment to assess how different types of privacy

policy clauses facilitate service providers' disclosure behavior. Third, extant privacy literature primarily has emphasized the role of individual-level mechanisms. The role of contextual factors in shaping disclosure behavior has been neglected (Smith et al. 2011). Our study goes beyond only testing individual perceptions and includes platform privacy policies that may help improve ASP practice by mitigating the privacy fears of participants.

Table 9. Summary of the Literature on Information Disclosure

Article	Context	Disclosure Subject	Focus of Analysis	Research Method	Sample Size
Malhotra et al. (2004)	Online shopping	Consumer	Consumer	Interview & Survey	449
Awad and Krishnan (2006)	Online personalized service	Consumer	Consumer & Platform	Survey	401
Dinev and Hart (2006)	E-commerce transactions	Consumer	Consumer	Survey	369
Hui et al. (2007)	Mobile computing device	User	User	Experiment	109
Pavlou et al. (2007)	Online shopping	Consumer	Consumer	Survey	521
Bansal et al. (2010)	Healthcare	Patient	Patient	Survey	367
Li et al. (2010)	E-commerce transactions	Consumer	Consumer	Experiment	182
Bansal et al. (2015)	Not specified	Consumer	Consumer & Platform	Experiment	667
Teubner and Flath (2019)	Sharing economy	Seller/Host	Seller/Host	Survey	237
This study	**Accommodation sharing platforms**	**Seller/Host**	**Seller/Host & Platform**	**Survey & Experiment**	**665 & 443**

2.2 Information disclosure in Accommodation Sharing Context

In the traditional (both B2C and C2C) e-commerce context, prior studies (Malhotra et al. 2004; Awad and Krishnan 2006; Dinev and Hart 2006; Hui et al. 2007; Pavlou et al. 2007; Li et al. 2010) have focused on various drivers and barriers to information disclosure from a buyer's perspective. However, hosts' motivation and disclosure behavior are significantly different in accommodating sharing context. We summarized the differences between sellers' privacy concerns and information self-disclosure on ASPs and

buyers' privacy concerns and information self-disclosure on traditional e-commerce platforms in Table 10.

Table 10. Comparison of Information Disclosure on ASPs and Traditional E-commerce Platforms

	E-commerce Platforms	**ASPs**
Disclosure subject	Buyer	Seller (Host)
Motivation	Fulfilling transaction	Advertising & Social
Information type	Payment & Location	Property & Personal
Audience/ Recipients	Business owners	Business owners & Public
Product type	Goods & Services	Services
Interaction	Online	Online & Offline

On traditional E-commerce platforms, consumers provide financial information (e.g., credit card, PayPal, and billing address) for payment, location information (e.g., address and zip code) for delivery services, or personalized recommendations (e.g., promotion and advertising) (Xu et al. 2011). Consumers' credit card information and location information are kept by the business owners (e.g., the E-commerce platform firms). Sellers and buyers communicate online with almost zero offline interaction.

By contrast, information published by the hosts on ASPs is more personal and sensitive, including the hosts' contact information, belongings, properties, and intimate insights into their personal spheres (Lutz et al. 2018; Teubner and Flath 2019). All those information is displayed to a vast number of individuals whose integrity and trustworthiness are doubtful. Since the assets are still possessed by the hosts after transactions, disclosure of such private information may bring serious security problems for both hosts' personal and property safety. For instance, a host in San Francisco blogged about returning from a work trip to find her home ransacked. Her guests had stolen her passport, credit card, laptop, and her grandmother's jewelry (Carville 2021). More importantly, the motivation to release information differs between seller and buyer. From hosts' (sellers') perspective, they strategically disclose information to signal the quality of their listings in return for economic benefit and to establish a trusting relationship with consumers for social benefit (Bridges and Vásquez 2018; Cheng and Jin 2019; Ert et al. 2016). All those differences indicate several significant limitations of extant research and have implications for theoretical examinations on privacy concerns and information disclosure in the context of ASPs.

2.3 Host's Concerns in ASP Context

Host's concerns in the ASP context consist of two dimensions, privacy concern and security concern (Table 11).

Table 11. Host's Concern in ASP Context and its Dimensions

Dimension	Sub-dimension	Definition
Privacy Concerns	Privacy Concern about Platform	Hosts' concern about the platform's inability or unwillingness to protect their personal information from improper use, disclosure to third parties, and secondary use without their consent.
	Privacy Concern about User	Hosts' concern that other platform users may act opportunistically on the hosts' private information.
Security Concerns	Personal Safety Concern	Host's concern about the incidents where they may be abused, threatened, or assaulted by a guest including an explicit or implicit challenge to hosts' safety, well-being, and health.
	Property Safety Concern	Host's concern that any condition, practice, or violation that causes a substantial probability of property damage, loss, or misuse.

In the IS literature, privacy concerns refer to individuals' concern for controlling the acquisition and subsequent use of their personal information, which impacts their behavioral reactions (Castamada and Montoro 2007; Smith et al. 2011). A large body of studies has examined the negative impact of consumers' privacy concerns on consequences such as willingness to disclose information, engagement in e-commerce, and actual purchase (Smith et al. 2011). Another stream of research examines the antecedents of consumers' privacy concerns, including information characteristics (information type and information sensitivity), personal factors (demographics, personality, and cognition), and social and cultural aspects (Malhotra et al. 2004; Phelps et al. 2000; Dinev et al. 2006).

In the ASP context, hosts' exposure to the privacy risk derives not only from the platform's inability and unwillingness to protect their personal information but also from other platform users' opportunistic behavior. For example, an Airbnb host in Dallas reported to the police that one of her previous guests kept harassing her through messages and showing up around her apartment since he got her location information

and contact information via the transaction on ASP (Strapagiel 2018).[1] We, therefore, contend that hosts' concerns on ASP consist of two distinct aspects, namely, privacy concern about platform and privacy concern about user. Following Xu et al. (2011)'s recommendation for conceptualizing privacy concerns in a situation-specific context, we define privacy concern about platform as hosts' concern about the platform's inability or unwillingness to protect their personal information from improper use, disclosure to third parties, and secondary use without their consent (Pavlou et al. 2007). Privacy concern about user is defined as hosts' concern that other platform users may act opportunistically on the hosts' private information. Platform users' opportunism includes collecting, processing, disseminating, and invading a host's private information for unauthorized use or scam activities.

Existing studies have mostly constrained the conceptualizations of privacy concerns from buyer' perspective in e-commerce settings (Dinev and Hart 2006; Malhotra et al. 2004; Pavlou et al. 2007) while neglecting the privacy concern stemming from the interactions with platform users. A notable exception is a recent study by Zhang et al. (2022) that proposes a peer privacy concern construct in the social networking sites (SNSs) context and defines it as "the general feeling of being unable to maintain functional personal boundaries in online activities as a result of the behavior of online peers". They further decompose peer privacy concern into four dimensions: information privacy, psychological privacy, communication privacy, and virtual territory privacy.

Zhang et al. (2022) provide a good starting point for investigating users' privacy needs by shifting research focus from traditional e-commerce settings with online vendors to privacy violations from online peers. While insightful, the conceptualization of peer privacy concern cannot be directly applied to host privacy concern in the ASP context since the relationships between hosts and guests on ASPs are different from the relationships between peers on SNSs. On ASPs, there is a high level of information asymmetry, since property listings are open to the public but hosts typically have no information about the potential gusts or general platform visitors whose integrity is doubtful. While on SNSs, information asymmetry is

[1] While former guests can receive the host information from the host, other users who are not former guests could do that same if they receive the host information from the platform.

relatively lower given that information leaking is usually done by the target's peers who have stronger social ties with the target. The risk of privacy invasion for peers on SNSs is much lower than that for hosts on ASPs.

The second dimension of ASP hosts' concern is security concern, consisting of two sub-dimensions: personal safety concern and property safety concern. Personal safety concern is defined as a host's concern about the incidents where they may be abused, threatened or assaulted by a guest including an explicit or implicit challenge to hosts' safety, well-being and health. For example, an Airbnb host in Dallas reported to the police one of her previous guests kept harassing her through messages and showing up around her apartment since he knew where she lives (Strapagiel 2018). Property safety concern is defined as a host's concern that any condition, practice, or violation that causes a substantial probability of property damage, loss, or misuse. For instance, an Airbnb host, who works as a photographer, reported to the police that his camera equipment and electronics were stolen by a guest, as were at least 50 percent of his clothes, his social insurance card and a photo ID (Breen, 2017).

2.4 Privacy Policy Literature

Privacy policy, also named privacy statement, is a comprehensive description that companies provide to inform users of a website's information practices (Xu et al. 2011). Such policies explain to customers how websites will collect, store, and use consumers' personal data and consequently inform them about the websites' security tools and protection systems (Xu et al. 2011). The proliferation of new technologies with advanced capabilities for social features potentially incurs huge consumer concern about whether service providers properly collect and use their information. Privacy policy can inform users of service providers' practices, improve transparency, reduce information asymmetry, and help alleviate users' privacy concerns (Zhao et al. 2012).

As users need to spend time and effort on reading and understanding privacy policy before forming their judgment, their perception of the overall effectiveness of the privacy policy becomes an important predictor of the quality of provisions and regulations described by the privacy policy. Perceived

effectiveness of privacy policy is defined as "the extent to which a consumer believes that the privacy notice posted online can provide accurate and reliable information about the firm's information privacy practices" (Xu et al., 2011).

Previous research has identified the critical role of privacy policies in building user trust. For example, Wang and Herrando (2019) found that consumers are willing to trust social-commerce sites if these sites can guarantee privacy and data protection by implementing privacy features (e.g., a privacy policy statement) and data and payment protection mechanisms. In the healthcare context, patients become more likely to exchange health information when cognitive trust and emotional trust are formed (Esmaeilzadeh 2020). Other scholars have considered the effects of the privacy policy on consumers' privacy concerns. For instance, drawing upon communication privacy management theory, Xu et al. (2007) showed that individuals' perceptions of institutional privacy assurances (i.e., privacy policies and industry privacy self-regulation) are posited to negatively influence privacy concerns by strengthening user's risk control and reducing perceived risk. Additionally, some studies have investigated the impact of different dimensions of the privacy policy on users' privacy perception. For example, Guo et al. (2021) revealed that three privacy policy dimensions (i.e., transparency, control, and protection) influence the perceived effectiveness of privacy policy by enhancing perceived corporate benevolence. By contrast, privacy control positively affects the perceived effectiveness of privacy policy by reducing perceived vulnerability. Existing studies have also examined the consequences of an effective privacy policy, including users' information disclosure, purchase intention, and willingness to be profiled. Hui et al. (2007) suggested that the presence of a privacy statement induced more people to share their personal information with the website. However, in a laboratory experiment with 206 participants, Berendt et al. (2005) argued that privacy policy has no impact on disclosure choice because consumers often do not monitor and control their actions sufficiently in online interaction. Due to the contradictory findings on the presence and strength of privacy policies in the literature, more research should be conducted to examine the specific roles of different privacy policy content in the online environment.

3. RESEARCH MODEL AND HYPOTHESES

3.1 The Impact of Privacy Policy on Hosts' Privacy Concerns

Prior research shows that the privacy policy's completeness can alleviate users' privacy concerns over their self-disclosure online (Andrade et al. 2002; Wu et al. 2012). An accurate and reliable privacy policy can heighten consumers' beliefs about their ability to control the release and dissemination of personal information, thus lowering their perceived uncertainty and concerns about sharing personal information (Xu et al. 2011). Privacy policy, if taking users' problems and needs into consideration, is an essential aspect of high-quality services, which could enhance users' trust and satisfaction with the platform and generally lessen users' privacy concerns (Guo et al. 2021).

The privacy policies posted on the ASPs describe a varied collection of information practices to protect hosts' privacy. For example, on ASPs, not all the information released by the host is visible to platform visitors immediately and directly. Some highly sensitive information, like driver license and government ID, is verified by the platforms and never released to consumers. Selected information such as contact information and home address is accessible to the guests only when they participate in a transaction with a host. All those practices specified by the privacy policies can help mitigate the negative effect of privacy fears of participants on their intentions and behaviors. When hosts perceive that they are enabled by the platform to control when and how their private information is used by others, the psychological threat of privacy intrusion on information disclosure would be weakened (Olivero and Lunt 2004). Therefore, we propose the following hypotheses:

H1a: Privacy policy reduces hosts' privacy concerns about platform.

H1b: Privacy policy reduces hosts' privacy concerns about user.

3.2 The Impact of Privacy Policy on Perceived Benefits

When providing accommodation sharing services, hosts obtain an economic reward by allocating their idle resources through collaboration and social benefit by establishing a friendship with travelers (Belk 2014; Hamari et al. 2016). Privacy policy can enhance hosts' benefit prospects in the following two ways.

First, privacy literature suggested that firms' ability to influence consumers' beliefs on trust and a firm's reputation depends on whether firms can send explicit signals (e.g., privacy policy) with high clarity and credibility to consumers regarding their intention to protect privacy (Tang et al. 2008). When individuals are informed of how their private information will be handled and protected by an organization, information asymmetry will be reduced, and their trust perception towards the company will be enhanced (Esmaeilzadeh 2020; Wu et al. 2012). Thus, they will feel more comfortable and safer when doing business and making social interactions with other peers on the platform (Zhou 2017).

Second, prior studies showed that resource providers will benefit more if they perceive that the platform can reach a larger number of potential customers (Teubner and Flath 2019). Marketing research shows that trust and a firm's reputation are critical factors in attracting and retaining consumers (Ghorban and Tahernejad 2012; Keh and Xie 2009; Park and Kim 2003). Trusting ASP's competence in protecting users' private information, hosts can easily deduce that other people will have similar perceptions and be willing to use the ASP, thus offering them a more extensive potential customer base. Hence, we argue that hosts will perceive more economic and social benefits if the platform can safeguard their personal and property data by providing a comprehensive privacy policy statement. Therefore, we propose the following hypotheses:

H1c: Privacy policy increases hosts' perceived economic benefit.

H1d: Privacy policy increases hosts' perceived social benefit.

3.3 Privacy Calculus and Host's Information Disclosure

Privacy calculus theory is commonly employed to explain individuals' disclosure behavior (Dinev and Hart 2006; Kolotylo-Kulkarni et al. 2021; Kordzadeh and Warren 2017; Min and Kim 2015; Xu et al. 2009). Privacy calculus theory states that individuals' information disclosure intentions depend on their perceived benefit and perceived risk. Specifically, perceived benefit (potential gain) positively influences disclosure intention, while perceived risk (expected loss) negatively affects disclosure intention (Dinev and Hart 2006). As a result, people will consider sharing information if the perceived benefits of disclosure are higher or at least no less than their perceived risks.

The privacy calculus theory is widely applied to investigate information disclosure intention and behavior in different contexts (e.g., e-commerce, online social networks, and online healthcare). However, limited research focuses on information disclosure on ASPs. Similar to other users, ASP users also perform a cost-benefit analysis to decide whether to disclose private information. Numerous studies have examined the negative impact of privacy concerns on individuals' willingness to disclose information, engagement in e-commerce, and purchase intention (Smith et al. 2011). Some early research has offered insights into various antecedent variables of individuals' privacy concerns, including information characteristics (e.g., information type and information sensitivity), individual factors (e.g., demographics and personality), and social and cultural aspects (Malhotra et al. 2004; Dinev et al. 2006). Moreover, in the social media context, Xie and Karan (2019) examined users' privacy management on Facebook and found that social identity information and entertainment information tend to be shared more freely, while sensitive data such as contact information is mostly withheld. Another study, by Choi and Sung (2018), explored users' privacy concern on photo-sharing SNS platforms (i.e., Instagram and Snapchat) and found that users express more privacy concern when sharing information on a large social network with weak-tie relationships than on the platform with a small network sharing strong ties.

In the context of accommodation sharing, service providers' exposure to the risks derives from both the platform's privacy invasions and other users' privacy infringement, since the information of other users'

background and trustworthiness is inaccessible to the hosts. When hosts have high privacy concerns about the ASP, they worry that the platform can't protect their personal information and property information effectively and may share their data without their authorization, which may lead to potential negative consequences for their safety. Similarly, when hosts have great concerns about other users' behavior, their trust perception towards guests will be low, and their perception of the probability that a guest may take opportunistic behavior will be enhanced. Since individuals are motivated to minimize negative outcomes, we expected that the behavioral intention to provide information would be low when their perceptions of privacy concerns are high.

Furthermore, we contend that privacy concern about other users' misbehavior plays a more important role in hosts' information disclosure intention than the privacy concern about platform in the ASP context. Prior research has confirmed the significant impact of institutional trust on privacy concerns, risk beliefs, and intentions to disclose information (Dinev and Hart 2006). Institutional trust is defined as an individual's belief that the data-requesting stakeholder or medium will not misuse their data (Anderson and Agarwal 2011; Bansal et al. 2010; Dinev and Hart 2006). Firms are motivated to develop a reputation for trustworthiness, build institutional trust among consumers, and reduce their privacy concerns associated with platform participation and transaction. In consumer behavior research, for example, Andrade et al. (2002) found that the high reputation of a company decreases online users' concern about self-disclosure and makes them more likely to register with the website. From the hosts' point of view, well-known ASP firms have established a great brand reputation. Therefore, hosts have strong institutional trust in the firm and believe that their privacy can be protected by institutional safety nets such as privacy laws and industry regulations. In such a case, the consumer's privacy concern can be alleviated to some extent. In addition, hosts consider ASPs as channels to advertise their listings. Their motivation to adopt the platform is different from the buyer's angle. They voluntarily disclose information to signal the quality of their properties in order to attract potential consumers to join the transaction. As a result, privacy concern about the platform becomes less important since hosts treat the platform as their business partner and proactively interact with it and rely on the platform to bring them monetary benefits and social benefits. Meanwhile,

hosts typically have limited or no access to other platform users' information, whose motivation to use the platform and integrity are completely unpredictable to hosts. More important, relative to the damage done by the platform's privacy violation, the damage done by other platform users to the host would be more certain and severe because platform users can target a specific host to cause immediate trouble while the platform most likely misuses the host' private information for marketing purposes whose negative consequences are distal and uncertain. We, therefore, posit that hosts' privacy concern about user has a stronger negative influence on information disclosure intention than privacy concern about platform. Based on the discussion above, we propose the following three hypotheses:

H2a: Privacy concern about platform negatively influences information disclosure intention.

H2b: Privacy concern about user negatively influences information disclosure intention.

H2c: Privacy concern about user has a stronger influence on information disclosure intention than privacy concern about platform.

Perceived benefits could be material or social, such as economic gains or rewards, personalized service, information access, social presence, or online awareness (Lowry et al. 2011; Xu et al. 2011). In the accommodation sharing context, hosts participate in ASPs to gain economic rewards by renting out their surplus resources. In fact, about 51 percent of Airbnb hosts say that the income from hosting accommodation helps them afford their homes (Airbnb 2019). Prior literature has provided rich empirical evidence that economic benefits substantially drive individuals' information disclosure (Hui et al. 2007; Xu et al. 2011). For instance, through a field experiment with 109 subjects, Hui et al. (2007) found that subjects are more willing to disclose private information when monetary incentives are provided. In marketing research, Barwise and Strong (2002) showed that consumers prefer to give online adverting permission if monetary incentives are offered. They further explained that financial incentives can increase consumers' tolerance for adverts and induce a perception that the service is not simply "junk mail". In addition, Xu et al. (2009) showed that providing financial compensation constitutes an extra consumer outcome, likely increasing the consumer's judgments of the benefits of information disclosure. In line with this research,

we posit that hosts' intention to disclose information will be stronger if they perceive a high economic benefit.

Besides the economic benefit, in ASPs, hosts can also gain social benefit by getting in touch with other people, making new friends, or maintaining existing friendships (Belk 2014; Hamari et al. 2016). When renting out a room, Airbnb hosts are open to social interaction with guests ranging from small talk to sharing a meal. According to the Airbnb report (2019), 84 percent of Airbnb hosts have recommended local restaurants to guests. Around 69 percent of Airbnb hosts have suggested local cultural activities to guests such as museums, festivals, and historical sites (Airbnb 2019). The social interaction generates valuable social capital for both the hosts and guests. Besides, social interaction can also generate positive emotional support. For example, Kang and Na (2018) investigated the linkage between sharing economy businesses and consumers and find that mutual influence (i.e., information exchange and active response to others' demands) and emotional connection have significant effects on building social relationships. Communication, smiling, eye contact with new people, or simply being in the presence of unfamiliar guests will create happy emotions for the pro-social type of individuals. Hosts may also gain social benefit by sharing their rooms to forge friendships or connections, according to Chip Conley, Airbnb's head of global hospitality and strategy (Guesty 2015).

The relationship between social benefit and disclosure intention has been extensively researched in several contexts. Healthcare research has shown that social benefits such as information exchange and emotion sharing are positively related to disclosure intention. For example, Zhang et al. (2018) showed that in online health communities, social support (i.e., informational support and emotional support) through social interaction with other patients positively influence personal health information disclosure intention. Kordzadeh and Warren (2017) differentiated social benefit into personal benefit and community benefit and found that both types of social benefit increase patients' disclosure intention. In the social network context, the motivation to establish social ties and manage the relationship is found to be positively associated with sharing information on social network sites (SNSs) (Min and Kim 2015). Further, a cross-cultural study shows that users' social gratifications are positively related to their willingness to have an

open profile on SNSs (Trepte et al. 2017). We follow this line of research stating that hosts are more likely to disclose personal information when they perceive a high social benefit.

Although studies have suggested that both economic and social motivations are important drivers for peer-to-peer platform participation (Bellotti et al. 2015; Hamari et al. 2016; Hawlitschek et al. 2016), it is still not clear which motivations play a more salient role. For example, via an online survey with 605 participants, Hawlitschek et al. (2016) showed that income and social experience significantly contribute to service providers' participation in peer-to-peer sharing behavior. This finding is confirmed by Bellotti et al. (2015) with an interview-based study. However, neither study has compared the relative importance of economic and social motivations. Other researchers reveal a relationship between the economic value of the shared good and the importance of different motivations (i.e., economic, social, and environmental motivations) (Böcker and Meelen 2017). They note that sharing expensive assets such as accommodation is predominantly motivated by financial gains. Following this line of research, we expect that economic benefit will have a stronger influence on information disclosure intention than social benefit. Accordingly, we propose the following three hypotheses:

H3a: Economic benefit positively influences information disclosure intention.

H3b: Social benefit positively influences information disclosure intention.

H3c: Economic benefit has a stronger influence on information disclosure intention than perceived social benefit.

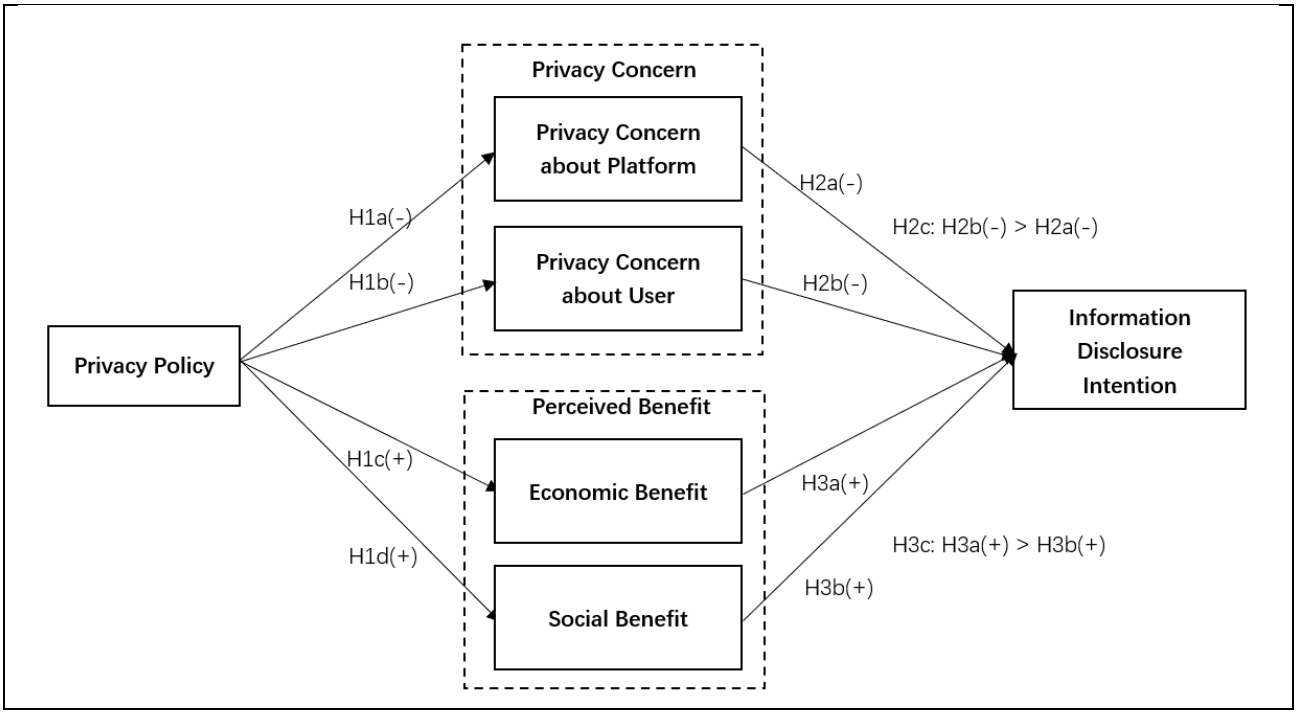

Figure 3. Research Model 1

In summary, we examine the impacts of the privacy policy on hosts' privacy concerns, perceived benefits, and information disclosure intention. Figure 3 summarizes the hypotheses in an overall research model.

4. RESEARCH METHODOLOGY

To test our hypotheses, two studies are conducted, with Study 1 based on a scenario-based survey and study 2 based on a two-by-two factorial experiment. Study 1 consists of a base model (model 1) and an extended model (model 2). In model 1, we examine the impact of the current privacy policy on different antecedent variables of information disclosure and the direct influence of privacy concern on information disclosure intention in the accommodation sharing context. In model 2, we investigate the underlying mechanism between privacy concern and information disclosure intention by adding security concern. In the follow-up Study 2, we show how the host's privacy concerns, perceived benefits, and disclosure intention are influenced by privacy policy applicable to the platform vs. that applicable to the users.

4.1 Study 1: The Impact of Privacy Policy on Host's Information Disclosure Intention

4.1.1 Scale Development

The scales to measure the constructs in our proposed model were developed based on an extensive literature review. We derived the measurement instruments that have been validated in prior literature and adapted them to fit the context of this research. All the constructs along with the sources and measurement items are presented in Appendix A. All items are measured on a seven-point Likert scale anchored on "1 = strongly disagree" and "7 = strongly agree".

We adapt four items generated by Liu et al. (2005) to measure a host's perception of the platform privacy policy. To understand the role of the host's privacy concern, two constructs are used in our study. Questions pertaining to the host's privacy concern about platform and privacy concern about user are adapted from Dinev and Hart (2006).

To understand the role of the host's perceived benefits, we consider perceived economic benefit and perceived social benefit. Economic Benefit is measured with three items developed by Teubner and Flath (2019). Social benefit is measured with three items developed by Bucher et al. (2016). The dependent variable hosts' information disclosure intention is measured with three items adapted from Gefen and Straub (2003).

We consider several control variables to account for the alternative explanation of the results due to extraneous factors, including demographic characteristics such as participants' age, gender, education, ethnicity, and annual household income. We also ask participants whether they have used any ASP before. If yes, we further ask them to specify if they use the platform to rent out a spare room or look for accommodation.

4.1.2 Survey Scenario

To test our hypotheses, we conducted a scenario-based survey in which participants are assumed to be the hosts in an ASP. The participants were given the scenario that they planned to rent out a guest room in

their apartment on an ASP. They took some photos of the room and other parts of the apartment and its surroundings. However, they noticed that if the pictures were published on the ASP, other platform users or even the public would gain detailed insights into their personal and private lives. Once the scenario was explained to the participants, they were asked to read a privacy policy, which summarizes key privacy practices and data management policies. This privacy policy is adapted from a latest privacy policy of a leading ASP company. Once the participants read the provisions in the privacy policy, they were asked to complete a questionnaire measuring their perceptions of the privacy policy, two constructs of privacy concerns, two constructs of perceived benefits, and information disclosure intention.

4.1.3 Sample and Data Collection

A web-based questionnaire survey was developed using QuestionPro. We tested the hypotheses by conducting a cross-sectional survey on Amazon Mechanical Turk. To improve the data quality, only the participants who are householders are qualified to join the survey. There are 725 participants who access the survey. After removing 60 responses with incomplete data, we obtain 665 valid responses, among which 47.52% are female, about 43.61% are in the range of 25 to 34 years old, and another 26.92% are 35 to 44 years old. The sample is comprised of full-time employment (63.16%), part-time employment (13.08%), unemployed (4.51%), and self-employed (9.24%). The respondents' demographics and control variables are summarized in Table 12.

Table 12. Demographic Information and Control Variables (N = 665)

Gender		**Age**		**Ethnicity**	
Male	349	Under 18 yrs.	0	White/Caucasian	403
Female	316	18–24 yrs.	50	Black/African American	69
Total:	665	25–34 yrs.	290	Asian	113
		35–44 yrs.	179	Pacific Islander	5
		45–54 yrs.	96	Hispanic or Latino	42
		55–64 yrs.	42	Native American Indian	13
		64 + yrs.	8	Multiracial	7
		Total:	665	Other	13
				Total:	665
Education		**Employment**		**Household Income**	

High school	39	Full-time	420	Less than 59,999	329
Some college	52	Part-time	87	60,000-99,999	182
Trade/vocational/technical	21	Unemployed	30	100,000-149,999	116
Associates	48	Self-employed	66	150,000-199,999	14
Bachelors	351	Homemaker	20	More than 200,000	14
Masters	136	Retired	15	Prefer not to say	10
Professional	7	Other	27	Total	665
Doctorate	11	Total	665		
Total:	665				

4.1.4 Data Analyses and Results

We first examine the construct reliability of key variables by identifying Cronbach's alpha. All constructs had reliability scores above the recommended level of 0.70 indicating that the measures are reliable (Nunnally and Bernstein 1994). Next, we perform the principal components analysis (PCA) to assess the measurement properties of the items. Table B2 shows that all item loadings are greater than the threshold of 0.7 and loading on its principal construct much higher than on the other constructs. Convergent validity is evaluated by the average variance extracted (AVE). As shown in Table B2, the square root of the AVE for each construct is higher than the inter-construct correlations. All these results suggest satisfactory discriminant validity (Barclay et al. 1995). The results of reliability, convergent validity, and discriminant validity of the instrument are shown in Appendix B.

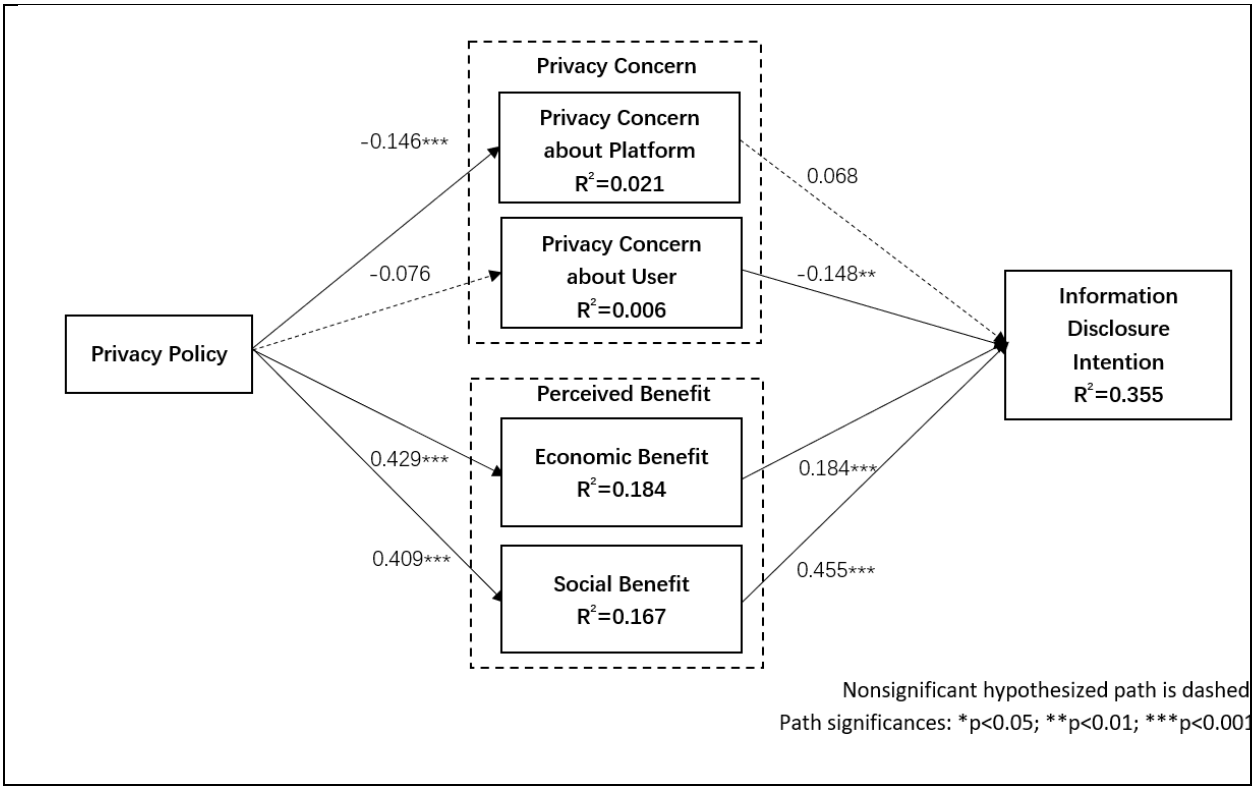

Figure 4. Model 1 Testing Results

Figure 4 presents the standardized path coefficients and the explained variances of the dependent variables. Our results show that 2.1% of the variance in the host's privacy concern about platform, 0.6% of the variance in the host's privacy concern about user, 18.4% of the variance in the host's perceived economic benefit, and 16.7% of the variance in host's perceived social benefit are explained by the privacy policy. Our results show that 35.5% of the variance in ASPs hosts' intention to disclose information is explained by antecedent variables considered in this model.

As hypothesized, we find that the privacy policy has a direct significant influence on the host's privacy concern about platform (β=-0.146, $p<0.001$), thus H1a is supported. However, we find no significant impact of the privacy policy on the host's privacy concern about user (β=-0.076, $p=0.112$), indicating that the existing privacy policy can only mitigate the host's concern about the platform's privacy invasion, but cannot reduce hosts' concern about other users' opportunistic behavior, thus H1b is not supported.

Consistent with the proposed research model, we find that the privacy policy exerts a significant positive influence on economic benefit (β=0.429, $p<0.001$), thus H1c is supported. In addition, the privacy

policy is also found to have a significant positive effect on social benefit (β=0.409, p<0.001), thus H1d is supported.

In terms of the dependent variable in the research model, surprisingly, privacy concern about platform does not significantly impact disclosure intention (β=0.068, p=0.226). Therefore, H2a is not supported. As expected, privacy concern about user is found to have a significant negative impact on the hosts' information disclosure intention (β=-0.148, p<0.01), thus H2b is supported. We thus conclude that privacy concern about user has a stronger impact on hosts' information disclosure intention than privacy concern about platform based on the Wald test results (F=225.6, p<0.001), therefore, H2c is supported. For the two constructs of benefits, we find that economic benefit (β=0.184, p<0.001) and social benefit (β=0.455, p<0.001) both have positive influences on a host's information disclosure intention, confirming the existing literature that has highlighted the importance of social factors and economic factors that motivate people to share personal information. Hence, H3a and H3b are supported. We then carried out the Wald test to test for the path coefficient difference between economic benefit and social benefit. Results indicate that the coefficient for social benefit is significantly higher than the coefficient for economic benefit (F=62.2, p<0.001), suggesting that social motivation has a stronger influence on hosts' information disclosure intention than economic motivation, thus, H3c is not supported. In addition to the Wald test results presented above, to further examine the robustness of our results, we follow Tonidandel and LeBreton (2011) to conduct the relative importance analysis (see Appendix C). The results are consistent with Wald test results.

Besides age, we find no significant impact of control variables on a host's intention to disclose private information on ASPs. Age is found to negatively influence the host's information disclosure intention (β=-0.082, p<0.05), suggesting that young people are more willing to share private information on ASPs than older people.

Table 13. Summary of Hypotheses and Results

Hypotheses	Supported
H1a: Privacy policy negatively affects hosts' privacy concern about platform.	Yes
H1b: Privacy policy negatively affects hosts' privacy concern about user.	No
H1c: Privacy policy positively affects economic benefit.	Yes
H1d: Privacy policy positively affects social benefit.	Yes
H2a: privacy concern about platform negatively influences information disclosure intention.	No
H2b: privacy concern about user negatively influences information disclosure intention.	Yes
H2c: Privacy concern about user has a stronger influence on information disclosure intention than privacy concern about platform.	Yes
H3a: Economic benefit positively influences information disclosure intention.	Yes
H3b: Social benefit positively influences information disclosure intention.	Yes
H3c: Economic benefit has a stronger influence on information disclosure intention than social benefit.	No

4.1.5 Additional Analysis

To further explore the underlying mechanism between hosts' privacy concern and information disclosure in the ASP context, we added two constructs of security concern into Model 1. The measurement items for personal safety concern and property safety concern were adapted from (Malazizi et al. 2018) with four items, respectively. The results of structural model were displayed in Figure 5. Consistent with Model 1, we found that the privacy policy has a significant negative influence on host's privacy concern about platform (β=-0.112, $p<0.01$). However, we found no significant impact of privacy policy on host's privacy concern about user (β= -0.112, $p=0.561$). In addition, privacy policy exerted a significant positive influence on economic benefit (β=0.484, $p<0.001$) and social benefit (β=0.435, $p<0.001$). Both economic benefit (β=0.162, $p<0.001$) and social benefit (β=0.482, $p<0.001$) have positive influences on a host's information disclosure intention.

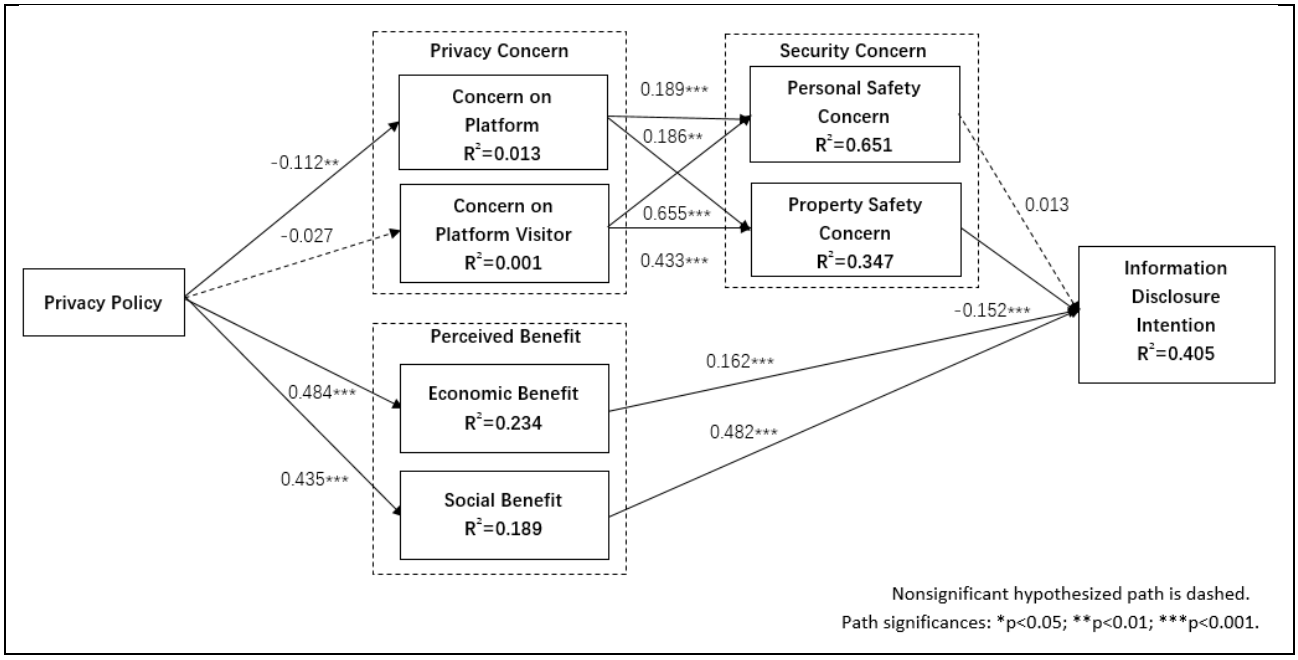

Figure 5. Model 2 Testing Results

More important, a host's privacy concern about platform has significant positive impacts on personal safety concern (β=0.189, p<0.001) and property safety concern (β=0.186, p<0.01). Similarly, we found that the impacts of a host's privacy concern about user on personal safety concern (β=0.655, p<0.001) and property safety concern (β=0.433, p<0.001) are significant. However, personal safety concern did not have a significant impact on disclosure intention (β=-0.152, p<0.001). Property safety concern was found to have a significant negative impact on the hosts' information disclosure intention (β=-0.152, p<0.001). These results suggest that ASP hosts' are concerned about ASP privacy invasion by the ASP platform and users because they are afraid that their property safety may be endangered as a result of the privacy violation.

Therefore, study 1 verifies the quality of construct measurement in the proposed model to be good and confirm that the results support the positive effect of drivers (social benefit and economic benefit) and negative impact of barriers (privacy concern about user) on the intentions of disclosing information on ASPs. We summarize the results of hypothesis tests in Table 5.

More interestingly, the results of the path analysis reveal a mismatch among privacy policy, privacy concerns, and information disclosure intention. Specifically, the privacy policy exerts a significant negative influence on hosts' privacy concern about platform, but hosts' privacy concern about platform doesn't

significantly impact information disclosure intention. Meanwhile, privacy policy is not associated with hosts' privacy concern about user, but hosts' privacy concern about user has a significant negative influence on information disclosure intention. These results motivate us to further analyze the privacy policy content.

4.2 Study 2: The Differential Impacts of Privacy Policy

The previous survey results demonstrate that the existing ASP privacy policy can significantly address a host's concern about platform's privacy invasion but cannot mitigate a host's privacy concern about users' opportunistic behavior, which has been shown to be more critical for the host's information disclosure in Study 1.

To check the generalizability of this mismatch issue, we further collected the privacy policies of fifty most popular ASPs according to Global Alexa Ranking, including Airbnb, VRBO, Couchsurfing among others (see Appendix D for a full list). After removing the duplicated privacy policies and those with non-English languages, we obtained thirty-two distinct privacy policies.

After scrutinizing each of the thirty-two privacy policies, we find that the ASPs' privacy policies contain similar provisions. They only concentrate on the platform's data management practice such as what information will be collected, why it will be collected and how their private data will be used and shared by the platform but overlook the importance of safeguarding the hosts' privacy from being misused by other platform users.

To shed light on the direction of how to improve the privacy policy, and to understand how different privacy policy content influence the hosts' privacy concerns, we design a scenario-based 2 (high/low platform-focused clauses) x 2 (high/low platform user focused clauses) between-subjects factorial experiment to study how different levels of privacy policies applicable to the platform and those applicable to the platform users influence hosts' privacy concerns, perceived benefits, and information disclosure intention. Given the void of real data and empirical evidence, our controlled experiment is a feasible and appropriate approach to investigate the problem. We define platform-focused clauses as the provisions that regulate platform-related behavior in the privacy policy, while user-focused clauses refer to the provisions

that regulate platform user-related behavior in the privacy policy. Specifically, the study consists of four groups of participants whose privacy is protected by the high platform-focused clauses and high user-focused clauses (HH) in the privacy policy, high platform-focused clauses and low user-focused clauses (HL), low platform-focused clauses and high user-focused clauses (LH), and low platform-focused clauses and low user-focused clauses (LL) in the privacy policy.

4.2.1 Participants

A total of 433 participants recruited from Amazon's Mechanical Turk (MTurk) completed the experiment. To generate high-quality data, we followed Peer et al.' (2014) criteria and employed the built-in qualification features of MTurk to filter participants who reside in the United States and had completed at least 500 Human Intelligence Tasks (HITs) with an approval rate of at least 95%. Participants completed the experiment within an average of 7 minutes.

4.2.2 Study Scenario

The scenario for the experiment is similar to the scenario in study 1, which is based on advertising accommodation services on an ASP. The participants were told that they planned to rent out a guest room in their apartment on an ASP. They took photos of the room, amenities, and the surroundings of the apartment. However, they noticed that if the pictures were published on the ASP, other platform users or even the public would gain detailed insights into their personal and private lives. Once the scenario was explained to the participants, they were asked to read the privacy policy statement and decide whether they would like to publish renting information on the ASP.

4.2.3 Experimental Treatment Conditions

This study aims to understand how users' perception of privacy policy influences their intention to disclose information on the ASP. First, to help participants understand what information would be shared on the platform, they were given an example of the ASP listing and were told that their posts on the ASP

could include sensitive private personal information such as their names, face picture, occupation, hobby, and other background information and property information such as rough property address, pictures of the inside view of their apartment, and the surroundings of the property. Second, to better observe the influence of privacy policy on participants' privacy concerns and disclosure intention, we control their privacy concerns to be high by giving them some newspaper reports containing examples of how guests misappropriate hosts' private information posted on ASPs in the past. All participants were given the same information at the beginning of the experiment. After they read the instruction and newspaper reports, they were given a description of the privacy policy, including platform-focused clauses and user-focused clauses. Platform-focused clauses and user-focused clauses were described using a figure that showed, on five parameters, the degree to which participants' privacy would be protected (see Figure 6).

(a) Platform-focused clauses (high)

Your contact information, account, and profile information will not be shared with third parties.	Your identity verification information (e.g., government ID) is kept confidential.	Your payment information is stored with encryption.	We will not share your geolocation information unless with your consent.	We protect your personal information from unauthorized access.

(b) Platform-focused clauses (low)

Your contact information, account, and profile information may be shared with third parties.	We cannot guarantee the confidentiality of your identity verification information (e.g., government ID).	Your payment information is stored without encryption.	We take no responsibility for the leakage of your geolocation information.	We cannot ensure the security of the personal information you transmit to our platform.

(c) User-focused clauses (high)

Your personal information will not be shared with other platform users.	We protect the security of your account credentials from being stolen by other platform users.	We protect your information against unauthorized access by other platform users.	Your contact information is protected from being collected by other platform users.	Your exact location information will not be disclosed to other platform users unless with your consent.

(d) User-focused clauses (low)

Your personal information may be shared with other platform users.	Your account credentials may be stolen by other platform users.	We take no responsibility for unauthorized use of your private information by other platform users.	Your contact information may be collected by other platform users.	We cannot guarantee that your exact location information is inaccessible to other platform users.

Figure 6. Levels of Privacy Protection

In the HH condition, participants were provided with the first version of ASP's privacy policy, which summarized five key privacy practices and data management policy provisions regarding platform-focused clauses and another five policy provisions regarding user-focused clauses. This version of the privacy policy provided a high overall privacy-protection level for both platform-focused clauses and user-focused clauses. In the HL condition, participants were provided with the second version of ASP's privacy policy with a high overall privacy-protection level for platform-focused clauses and a low privacy-protection level for user-focused clauses. In the LH conditions, participants were provided with the third version of ASP's privacy policy which provided a low privacy-protection level for platform-focused clauses and a high privacy-protection level for user-focused clauses. In the LL condition, participants were provided with the fourth version of ASP's privacy policy with a low privacy-protection level for platform-focused clauses and a low privacy-protection level for user-focused clauses. In each condition, once the participants read the information on the privacy policy, as a manipulation check, they were asked to report their satisfaction with the two types of clauses separately. Finally, participants were asked to complete a questionnaire that measures their perceptions of privacy concern about platform, privacy concern about user, perceived economic benefit and social benefit, and intention to publish personal and property information on the ASP.

All other survey details (length, purpose, and payment) are the same in all conditions to optimize treatment equivalence. The manipulated independent variables are platform-focused clauses and user-focused clauses in the privacy policy. The following statements are used to verify the effectiveness of the platform-focused clauses and user-focused clauses manipulation: I am satisfied with the protections provided in the privacy policy. These manipulation verification items are answered on a seven-point Likert

scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree), with higher scores indicating higher satisfaction with platform-focused clauses and user-focused clauses.

The primary dependent variables are privacy concern about platform, privacy concern about user, economic benefit, social benefit, intention to disclose personal information on ASP, and intention to disclose property information on ASP. The measurement items for each construct in study 2 are the same as in study 1, except that we decompose information disclosure intention into two parts, namely, intention to disclose personal information and intention to disclose property information. The decomposition can help us gain more insights into the impact of two types of privacy policy clauses on hosts' sharing intention regarding specific types of information. Besides the measurement of subjects' information disclosure intention, to better capture their actual disclosure behavior, we also ask participants to indicate the specific information that they choose to reveal (see Appendix E).

4.2.4 Results

Table 14 provides a breakdown of notable descriptive statistics for all variables across conditions in the pre-test. We first analyze pre-test data by employing a multivariate analysis of variance (MANOVA) to check the difference among the group subjects in each treatment. The results in Table 15 show that no significant differences are found across conditions in any of the eight constructs and control variables, indicating that there is no significant difference between four condition groups in the pre-test phase, therefore, randomization is successful.

Table 14. Mean and Standard Deviations in Different Conditions in Pre-test

	Group1 (HH)	**Group2 (HL)**	**Group3 (LH)**	**Group 4 (LL)**
Privacy concern about platform	5.08 (1.13)	4.72 (1.13)	4.95 (1.17)	4.93 (1.17)
Privacy concern about user	5.18 (1.02)	5.01 (1.26)	5.06 (1.26)	5.30 (1.13)
Personal safety concern	5.19 (1.17)	4.99 (1.39)	5.05 (1.28)	5.10 (1.25)
Property safety concern	5.35 (1.23)	5.24 (1.26)	5.37 (1.13)	5.34 (1.28)
Economic benefit	5.51 (0.84)	5.33 (0.99)	5.46 (0.90)	5.42 (1.16)
Social benefit	5.19 (0.97)	4.85 (1.16)	4.86 (1.17)	4.94 (1.29)
Intention to disclose property information	4.82 (1.38)	4.41 (1.49)	4.55 (1.46)	4.46 (1.75)

Intention to disclose personal information	4.75 (1.50)	4.47 (1.52)	4.46 (1.49)	4.35 (1.80)
Age	3.95 (1.29)	3.70 (1.08)	3.89 (1.21)	3.97 (1.11)
Gender	1.53 (0.50)	1.58 (0.59)	1.47 (0.50)	1.51 (0.50)
Income	4.03 (2.18)	4.60 (2.76)	4.32 (2.57)	3.86 (2.31)
Number of observations	107	103	113	110

Table 15. MANOVA Results for Pre-test

Dependent variables	**Platform-focused clauses**		**F**	**User-focused clauses**		**F**
	High	**Low**		**High**	**Low**	
Privacy concern about platform	4.90 (1.23)	4.94 (1.17)	0.14	5.01 (1.15)	4.82 (1.24)	2.88
Privacy concern about user	5.10 (1.14)	5.18 (1.16)	0.57	5.12 (1.10)	5.16 (1.20)	0.10
Personal safety concern	5.09 (1.28)	5.07 (1.26)	0.02	5.12 (1.23)	5.04 (1.32)	0.41
Property safety concern	5.30 (1.24)	5.36 (1.20)	0.30	5.36 (1.17)	5.29 (1.27)	0.35
Economic benefit	5.42 (0.92)	5.44 (1.04)	0.05	5.48 (0.87)	5.37 (1.08)	1.30
Social benefit	5.02 (1.08)	4.90 (1.23)	1.12	5.01 (1.09)	4.90 (1.23)	1.32
Intention to disclose property information	4.61 (1.45)	4.51 (1.61)	0.55	4.68 (1.43)	4.44 (1.63)	2.83
Intention to disclose personal information	4.61 (1.51)	4.04 (1.65)	1.82	4.60 (1.50)	4.41 (1.67)	1.66
Age	3.83 (1.20)	3.93 (1.16)	0.89	3.92 (1.25)	3.84 (1.10)	0.60
Gender	1.56 (0.49)	1.49 (0.50)	2.03	1.50 (0.50)	1.55 (0.50)	0.87
Income	4.31 (2.49)	4.09 (2.45)	0.97	4.18 (2.38)	4.22 (2.56)	0.05
Number of observations	210	223		220	213	

Table 16 provides descriptive statistics for all variables across conditions in the post-test. To explore the roles of the platform-focused clauses and user-focused clauses in the post-test phase, a series of two-

way ANOVAs are performed. The overall results of the post-test are summarized in Table 17. Specifically, the main effect of platform-focused clauses on privacy concern about platform is significant ($F(1, 429)= 41.27$, $p<0.001$), with participants in the low platform-focused clauses condition ($M=5.42$, $SE=1.19$) rating higher than participants in the high platform-focused clauses condition ($M=4.65$, $SE=1.37$). The main effect of user-focused clauses on privacy concern about platform is not significant ($F(1, 429)=2.91$, $p=0.09$).

Table 16. Mean and Standard Deviations in Different Conditions in Post-test

	Group1 (HH)	**Group2 (HL)**	**Group3 (LH)**	**Group 4 (LL)**
Privacy concern about platform	4.94 (1.29)	4.33 (1.37)	5.32 (1.21)	5.52 (1.16)
Privacy concern about user	4.84 (1.34)	5.07 (1.35)	4.76 (1.23)	5.59 (1.12)
Personal safety concern	4.95 (1.32)	4.98 (1.31)	4.85 (1.30)	5.46 (1.24)
Property safety concern	5.22 (1.32)	5.23 (1.23)	5.32 (1.10)	5.59 (1.15)
Economic benefit	5.44 (0.80)	5.18 (0.81)	5.20 (1.01)	5.11 (1.26)
Social benefit	5.25 (1.19)	4.73 (1.30)	4.85 (1.32)	4.72 (1.59)
Intention to disclose property information	5.02 (1.36)	4.36 (1.60)	4.42 (1.58)	4.05 (1.91)
Intention to disclose personal information	5.05 (1.40)	4.36 (1.66)	4.30 (1.61)	3.92 (1.89)
Disclose property information	0.63 (0.49)	0.65 (0.48)	0.68 (0.47)	0.67 (0.47)
Disclose personal information	0.93 (0.26)	0.86 (0.34)	0.94 (0.23)	0.85 (0.35)
Number of observations	107	103	113	110

Table 17. ANOVA Results for Post-test

Dependent variables	**Platform-focused clauses**		**F**	**User-focused clauses**		**F**
	High	**Low**		**High**	**Low**	
Privacy concern about platform	4.65 (1.37)	5.42 (1.19)	41.27***	5.14 (1.26)	4.95 (1.40)	2.91
Privacy concern about user	4.95 (1.35)	5.17 (1.24)	3.16	4.79 (1.28)	5.34 (1.26)	18.94***
Personal safety concern	4.96 (1.31)	5.15 (1.31)	2.36	4.90 (1.31)	5.22 (1.29)	6.33*
Property safety concern	5.22 (1.28)	5.45 (1.13)	3.98*	5.27 (1.21)	5.41 (1.20)	1.47
Economic benefit	5.31 (0.81)	5.16 (1.14)	2.56	5.32 (0.92)	5.15 (1.06)	3.26

Social benefit	5.00 (1.69)	4.79 (1.46)	2.57	5.05 (1.12)	4.72 (1.23)	6.32*
Intention to disclose property information	4.70 (1.52)	4.24 (1.76)	8.46**	4.71 (1.51)	4.20 (1.77)	10.56**
Intention to disclose personal information	4.71 (1.56)	4.11 (1.76)	14.20***	4.67 (1.56)	4.13 (1.78)	11.57**
Disclose property information	0.64 (0.48)	0.68 (0.47)	0.72	0.65 (0.48)	0.66 (0.47)	0.03
Disclose personal information	0.89 (0.31)	0.90 (0.30)	0.04	0.93 (0.24)	0.85 (0.35)	7.03**
Number of observations	210	223		220	213	

Note: * significant at p<0.05 level; ** significant at p<0.01 level; *** significant at p<0.001 level.

To explore the impacts of platform-focused clauses and user-focused clauses on privacy concern about user, a two-way ANOVA is performed with privacy concern about user as the dependent measure. The main effect of user-focused clauses on privacy concern about user is significant ($F(1, 429)=18.94$, $p<0.001$), with participants in the low user-focused clauses condition ($M=5.34$, $SE=1.26$) rating higher than participants in the high user-focused clauses condition ($M=4.79$, $SE=1.28$). The main effect of platform-focused clauses on privacy concern about user is not significant ($F(1, 429)=3.16$, $p=0.08$).

The main effect of user-focused clauses on personal safety concern was significant ($F(1, 429)=6.33$, $p<0.05$), with participants in the low user-focused clauses condition ($M=5.22$, $SE=1.29$) rating higher than participants in the high user-focused clauses condition ($M=4.90$, $SE=1.31$). The main effect of platform-focused clauses on personal safety concern was not significant ($F(1, 429)=2.36$, $p=0.13$).

The main effect of platform-focused clauses on property safety concern was significant ($F(1, 429)=3.98$, $p<0.05$), such that participants in the low platform-focused clauses condition ($M=5.45$, $SE=1.13$) rated higher than participants in the high platform-focused clauses condition ($M=5.22$, $SE=1.28$). However, user-focused clauses main effects ($F(1, 429)=1.47$, $p=0.23$) was insignificant in this analysis. Thus, regardless of the level of user-focused clauses regulation, participants who were exposed to the privacy policy offering high platform-focused clauses were less likely to be concerned about their property safety than participants in other conditions.

Next, we examine the main effects on economic benefit. The results show that neither platform-focused clauses main effects ($F(1, 429)=2.56$, $p=0.11$), nor user-focused clauses main effects ($F(1, 429)=3.26$, $p=0.07$), are significant.

Another two-way ANOVA shows that the main effect of user-focused clauses on social benefit is significant ($F(1, 429)=6.32$, $p<0.05$), with participants in the high user-focused clauses condition ($M=5.05$, $SE=1.12$) rating higher than participants in the low user-focused clauses condition ($M=4.72$, $SE=1.23$). However, platform-focused clauses' main effect ($F(1, 429)=2.57$, $p=0.11$) is insignificant, suggesting that regardless of platform-focused clauses level, participants exposed to the privacy policy offering high user-focused clauses perceive more social benefit than participants in other conditions.

We also conducted a two-way ANOVA with intention to disclose property information as the dependent variable. The results show a significant main effect for platform-focused clauses on intention to disclose property information ($F(1, 429)=8.46$, $p<0.01$), with participants in the high platform-focused clauses condition ($M=4.70$, $SE=1.52$) rating higher than participants in the low platform-focused clauses condition ($M=4.24$, $SE=1.76$). The tests also result in a significant main effect of user-focused clauses on intention to disclose property information ($F(1, 429)=10.56$, $p<0.01$), with participants in the high user-focused clauses condition ($M=4.71$, $SE=1.51$) rating higher than participants in the low user-focused clauses condition ($M=4.20$, $SE=1.77$).

We also find that using intention to disclose personal information as the dependent measure yielded a significant main effect for platform-focused clauses ($F(1, 429)=14.20$, $p<0.001$), with participants in the high platform-focused clauses condition ($M=4.71$, $SE=1.56$) rating higher than participants in the low platform-focused clauses condition ($M=4.11$, $SE=1.76$). The main effect of user-focused clauses on intention to disclose personal information is also significant ($F(1, 429)=11.57$, $p<0.01$).

For actual disclosure behavior, the results show that platform-focused clauses' main effect on both property information disclosure ($F(1, 429)=0.72$, $p=0.39$) and personal information disclosure ($F(1, 429)=0.04$, $p=0.83$) are insignificant. Moreover, user-focused clauses have a significant main effect of on personal information disclosure ($F(1, 429)=7.03$, $p<0.01$), with participants in the high user-focused clauses

condition (M=0.93, SE=0.24) rating higher than participants in the low user-focused clauses condition (M=0.85, SE=0.35), but dose not show a significant main effect on disclose property information (F(1, 429)=0.03, p=0.86).

We perform an extensive series of robustness analyses to ensure the validity of our results (see Appendix F).

5. GENERAL DISCUSSION AND IMPLICATIONS

The primary goal of this research is to explore the impacts of the privacy policy, perceived economic benefits, perceived social benefits, and privacy concerns on ASP hosts' information disclosure intention and the underlying mechanism. To this end, we first propose a conceptual model from the hosts' perspective and argue that privacy policy can promote the host's intention to disclose information on ASPs by reducing hosts' privacy concerns and enhancing perceived benefits. Next, we explore two types of privacy clauses and the relationship between different concerns, benefits, and information disclosure. Several important findings are illuminated.

5.1 Theoretical Implications

Given the lack of study on the effect of the privacy policy and privacy concerns in the accommodation sharing context, this study makes several important contributions to privacy and information disclosure literature. First, our proposed model explains hosts' decision-making by viewing privacy policy as a key role in the context of ASPs. Specifically, we focus on privacy policy as the antecedent of hosts' motivational factors, and we further examine how different concerns and benefits affect hosts' decision-making processes. While prior IS studies focused on exploring the direct effect of the privacy policy in predicting consumer information disclosure intention (e.g., Hui et al. 2007), this study brings further insights by explaining the underlying mechanism of how privacy policy and individual factors jointly influence hosts' decision making.

Second, we differentiate general online privacy concerns into privacy concern about platform and privacy concern about user. This is due to the nature of ASPs, in which the audience of the information disclosed by service providers is not only the platform per se but also other platform users. Our results in study 1 show that the existing privacy policy cannot effectively mitigate hosts' concerns about other platform users' opportunistic behavior. From a host's point of view, well-known ASP firms have established excellent brand reputations. People believe that their privacy can be well-protected by firms' privacy-protection practices. Therefore, the trust relationship between the platform and host can alleviate their privacy concern to some extent. In addition, hosts consider ASPs as a channel to advertise their listings. Their motivation to adopt the platform is different from the buyer's angle. They voluntarily disclose information to signal the high quality of their properties in order to attract potential consumers to join the transaction. In such cases, privacy concern about platform becomes less important since they proactively interact with the platform and rely on the platform to bring them monetary benefits or social benefits.

Third, we conducted an experiment to test the influence of different privacy clauses on hosts' privacy concern and disclosure intentions. Consistent with our expectations, the results show that platform-focused clauses can significantly reduce hosts' privacy concern about platform but do not have a significant influence on privacy concern about user. Meanwhile, user-focused clauses can significantly reduce hosts' privacy concerns about platform user but do not significantly impact privacy concerns about platform. Both types of privacy clauses can successfully enhance hosts' intention to disclose personal and property information.

5.2 Practical Implications

Designing an efficient privacy policy is crucial to companies around the world. Understanding the effects of different privacy clauses is necessary to develop privacy policies better. Although previous studies have investigated the impact of privacy policies on customer privacy perceptions and behaviors, few studies have examined the separate effects of privacy policy contents. Do different policy clauses play the same role? How do different privacy policy clauses influence user privacy perceptions and behaviors?

Our study shed some light on the answers to these questions by separately examining the influences of different privacy clauses. The findings would provide guidelines on privacy policy design and implementation in practice.

First, policymakers should recognize that users' perception of privacy concerns will be greatly reduced when the privacy policy is comprehensive. Thus, policymakers can consider the two types of privacy policy clauses as significant criteria when evaluating the effectiveness of a privacy policy. Additionally, the results show that different privacy clauses do not necessarily exert the effects on privacy concerns in the same way. It is worth noting that both types of privacy clauses can influence individuals" intention to disclose personal and property information. In contrast, platform-focused clauses can only reduce the privacy concern about platform, and user-focused clauses can only reduce hosts' concerns about platform users' opportunistic behaviors. Thus, it is better to combine platform-focused clauses and user-focused clauses in the privacy policy because a privacy policy with only a high level of either clause cannot reduce users' overall privacy concerns.

Second, ASP hosts' intentions to disclose their private information are based on the trade-off between their privacy concerns and the benefits of information disclosure. Therefore, hosts must adequately handle the risk of potential negative outcomes of releasing information. To enhance user engagement, platform owners should increase the benefits of information disclosure and, in the meanwhile, decrease users' privacy concerns to improve their disclosure intentions. ASP hosts should be aware that privacy leaks can bring severe negative consequences to their property and personal safety. Protecting their private information and strategically disclosing the information is highly important as they obtain benefits and mitigate risks to the utmost extent.

Third, a novel aspect of accommodation sharing service is to provide opportunities for meeting new people and creating rewarding interpersonal communications. From platform owners' perspective, they actively emphasize and advertise such social value by offering travelers a sense of belonging and local experience. The results of our experiment show that user-focused clauses can significantly enhance hosts perceived social benefits. Therefore, it is essential for policymakers to complement the existing privacy

policy by including comprehensive provisions to guard against platform users' opportunistic behavior in order to promote hosts' social activities.

6. CONCLUSION

This study examines the impact and mechanism of the privacy policy on ASP hosts' information disclosure intention. The results of this study show that privacy policy can increase hosts' disclosure intention by mitigating their privacy concerns in different ways and by inducing perceived social and economic benefits in privacy disclosure. As such, this study contributes to the privacy policy literature by revealing the mechanism of how the platform's privacy policy drives hosts' privacy disclosure and highlighting the critical roles of hosts' concern regarding the users' privacy invasion behaviors and the perceived social benefit on their information disclosure intention. It informs platform owners regarding how the users are influenced by the current privacy policy and how to revise the privacy policy to motivate them to share their personal information on the platform.

This study is limited to individuals' information disclosure behavior from hosts' perspectives in an accommodation sharing context. In future studies, we will extend to other social community platforms to provide more insights into privacy policy design and to better understand users' comprehension of privacy policy and the subsequent privacy disclosure behaviors on general social platforms.

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Appendix A. Measurement Items

Economic benefit (Adapted from Teubner and Flath 2019)
ECO1: Advertising my guest room through the accommodation sharing platform will generate financial profits for me.
ECO2: Advertising my guest room through the accommodation sharing platform will improve my economic situation.
ECO3: Advertising my guest room through the accommodation sharing platform allows me to make money from something I own.
Social benefit (Adapted from Bucher et al. 2016)
SCO1: Hosting accommodation sharing service is a good way to meet new people.
SCO2: Hosting accommodation sharing service is a good way to interact with other people.
SCO3: Hosting accommodation sharing service is a good way to build relationship with other people.
Privacy concern about platform (Adapted from Dinev and Hart 2006)
PCP1: I am concerned that the accommodation sharing platform will misuse my information.
PCP2: I have doubts as to how well my information is protected by the accommodation sharing platform.
PCP3: I am concerned that the accommodation sharing platform would use my information in a way I did not foresee.
PCP4: I am concerned that the accommodation sharing platform would share my personal information without my authorization.
Privacy concern about user (Adapted from Dinev and Hart 2006)
PCU1: I am concerned about submitting information on the accommodation sharing platform, because of what others might do with it.
PCU2: When submitting information on the accommodation sharing platform, I am concerned that other users would misuse my information.
PCU3: When submitting information on the accommodation sharing platform, I am concerned that other users would publish my information without my consent.
PCU4: When submitting information on the accommodation sharing platform, I am concerned that other users would collect my information.
Personal safety concern (Adapted from Malazizi et al. 2018)
PSC1: I am concerned about my personal safety due to the information I submit on Airbnb.
PSC2: I am concerned to be harassed due to the information I submit on Airbnb.
PSC3: I am concerned about potential danger due to the information I submit on Airbnb.
PSC4: I am concerned to be stalked due to the information I submit on Airbnb.
Property safety concern (Adapted from Malazizi et al. 2018)
RSC1: I am concerned about my property being misused by guests.
RSC2: I am concerned about my property being damaged by guests.
RSC3: I am concerned about my property being dirtied by guests.
RSC4: I am concerned about my property being stolen by guests.
Privacy policy (Adapted from Liu et al. 2005)
PP1: This platform informed what personal information would be collected about me.
PP2: This platform explained why personal information was being collected.
PP3: This platform explained how my personal information will be used.
PP4: This platform gave me a clear choice of what information will be publicly visible.
Information Disclosure on ASPs (Adapted from Gefen and Straub 2003)
IDA1: I am very likely to advertise my guest room information on the accommodation sharing platform.

IDA2: I would offer my guest room information through the accommodation sharing platform
IDA3: I would not hesitate to provide the necessary information about my guest room through the accommodation sharing platform.

Note: All items are measured on a 7-point scale from "strongly disagree" to "strongly agree".

Appendix B. Measurement Reliability and Validity

Table B1. Inter-construct Correlation Matrix and AVE

	Mean	SD	Cronbach's Alpha	AVE	1	2	3	4	5	6	7	8
ECO	5.307	1.113	0.834	0.751	0.866							
IDI	4.612	1.555	0.930	0.877	0.371	0.936						
PSC	4.605	1.541	0.918	0.802	-0.089	-0.110	0.896					
PCP	4.471	1.572	0.913	0.794	-0.156	-0.123	0.668	0.891				
PP	5.287	1.233	0.845	0.684	0.429	0.415	-0.030	-0.142	0.827			
PRC	5.068	1.521	0.917	0.800	0.001	-0.270	0.545	0.511	-0.010	0.894		
SOC	4.846	1.405	0.868	0.792	0.422	0.528	-0.051	-0.092	0.409	-0.217	0.890	
PCU	4.657	1.554	0.941	0.849	-0.101	-0.168	0.788	0.735	-0.075	0.573	-0.068	0.922

Note: ECO = Economic Benefit; IDI = Information Disclosure Intention; PSC = Personal Safety Concern; SOC = Social Benefit; PRC = Property Safety Concern; PCP = Privacy Concern about Platform; PP = Privacy Policy; PCU = Privacy Concern about User.

Table B2. Factor Loadings

	IDI	ECO	PSC	PCP	PP	PRC	SCO	PCU
IDI1	**0.929**	0.331	-0.080	-0.089	0.378	-0.233	0.507	-0.140
IDI2	**0.943**	0.366	-0.112	-0.120	0.408	-0.254	0.490	-0.161
IDI3	**0.936**	0.345	-0.117	-0.137	0.381	-0.269	0.486	-0.172
ECO1	0.309	**0.861**	-0.085	-0.116	0.384	0.006	0.364	-0.081
ECO2	0.318	**0.865**	-0.066	-0.129	0.346	0.018	0.340	-0.075
ECO3	0.337	**0.873**	-0.080	-0.159	0.383	-0.020	0.391	-0.104
PSC1	-0.109	-0.057	**0.863**	0.564	-0.004	0.458	-0.002	0.704
PSC2	-0.092	-0.090	**0.904**	0.613	-0.048	0.501	-0.055	0.699
PSC3	-0.110	-0.067	**0.915**	0.620	-0.015	0.521	-0.049	0.724
PSC4	-0.084	-0.106	**0.899**	0.595	-0.040	0.471	-0.077	0.695
PCP1	-0.103	-0.072	0.607	**0.858**	-0.123	0.452	-0.045	0.647
PCP2	-0.131	-0.168	0.607	**0.904**	-0.125	0.461	-0.107	0.673
PCP3	-0.116	-0.161	0.578	**0.893**	-0.143	0.445	-0.088	0.633
PCP4	-0.088	-0.155	0.587	**0.908**	-0.116	0.460	-0.088	0.665
PP1	0.279	0.348	0.085	-0.023	**0.726**	0.090	0.243	0.038
PP2	0.345	0.406	-0.053	-0.127	**0.877**	-0.029	0.380	-0.071
PP3	0.343	0.329	-0.040	-0.125	**0.854**	-0.031	0.355	-0.088
PP4	0.400	0.336	-0.066	-0.176	**0.843**	-0.042	0.359	-0.107
PRC1	-0.286	0.004	0.499	0.479	-0.017	**0.889**	-0.178	0.539
PRC2	-0.227	0.021	0.492	0.458	0.012	**0.909**	-0.187	0.510
PRC3	-0.218	-0.011	0.463	0.436	-0.001	**0.894**	-0.220	0.497
PRC4	-0.230	-0.012	0.494	0.451	-0.030	**0.885**	-0.194	0.499
SOC1	0.415	0.410	-0.077	-0.131	0.395	-0.180	**0.882**	-0.103
SOC2	0.527	0.345	-0.009	-0.025	0.348	-0.191	**0.899**	-0.022
SOC3	0.462	0.375	-0.054	-0.095	0.351	-0.208	**0.889**	-0.060

PCU1	-0.153	-0.107	0.719	0.676	-0.094	0.541	-0.068	**0.916**
PCU2	-0.167	-0.115	0.745	0.695	-0.078	0.534	-0.068	**0.930**
PCU3	-0.149	-0.066	0.719	0.653	-0.053	0.531	-0.042	**0.918**
PCU4	-0.151	-0.082	0.720	0.685	-0.052	0.506	-0.072	**0.923**

Note: ECO = Economic Benefit; IDI = Information Disclosure Intention; PSC = Personal Safety Concern; SOC = Social Benefit; PRC = Property Safety Concern; PCP = Privacy Concern about Platform; PP = Privacy Policy; PCU = Privacy Concern about User.

Appendix C. Relative Importance Analyses

To further examine the robustness of H2c and H3c, we follow Tonidandel and LeBreton (2011) to conduct the relative importance analysis. In our analysis, we are interested in understanding the contribution of two pairs of predictors: privacy concern about platform and privacy concern about user, and perceived economic benefit and perceived social benefit. Our ultimate DV in this relative importance analysis is information discourse intention. Table C1 provides the complete findings.

Table C1. Relative Weight Analyses of Predictors on Information Disclosure Intention

Construct	CI Lower	CI Upper	Relative Weight	Rescaled Relative Weight
Privacy concern about platform	-0.003	0.012	0.004	1.08%
Privacy concern about user	0.002	0.037	0.016	4.12%
Economic benefit	0.050	0.113	0.081	21.39%
Social benefit	0.218	0.345	0.278	73.41%

Note: Predictors are significant if zero is not in the CI.

Specifically, the rescaled relative weights indicate that the greatest amount of explained variance in information disclosure intention is attributable to social benefit (73.41%), followed by economic benefit (21.39%), privacy concern about user (4.12%), and privacy concern about platform (1.08%). Our relative importance analysis provides concrete evidence that privacy concern about user contributes more variance to information disclosure intention than privacy concern about platform, while economic benefit contributes less variance to information disclosure intention than social benefit.

Further, comparative relative weights (Azen and Budescu 2003) are calculated to (1) test the statistical significance in relative weight between privacy concern about platform and privacy concern about user, and (2) test the statistical significance in relative weight between economic benefit and social benefit. As Table C2 shows, the relative weight of privacy concern about user is significantly greater than that of privacy concern about platform, and the relative weight of the social benefit is statistically greater than that of the economic benefit relative weights at $p < 0.05$. Therefore, H2c is supported, while H3c is not supported, which is consistent with the results of the Wald test.

Table C2. Comparative Relative Weights

Relative Weight	95% CI
Privacy concern about user – privacy concern about platform	(0.001, 0.030)
Social benefit – economic benefit	(0.131, 0.263)

Note: Predictors are significantly different if zero is not in the CI

Appendix D. Top 50 Accommodation Sharing Sites

Table D. Top 50 Accommodation Sharing Sites

Rank	Platform	Rank	Platform	Rank	Platform
1	Booking.com	18	Spain Holiday	35	Pour Les Vacances*
2	Airbnb	19	Chambres Hotes*	36	Corporate Housing by Owner
3	VRBO	20	Top Rural*	37	Atraveo
4	Couchsurfing	21	TUI Villas	38	GuestHouser
5	HomeAway*	22	HolidayCottages	39	OwnerDirect
6	FeWo-direkt*	23	Cottages.com	40	Holiday Home
7	Abritel*	24	Niumba*	41	BedyCasa*
8	HomeAway UK*	25	The Plum Guide	42	9Flats
9	Homelidays	26	Wyndham Vacation Rentals	43	Friendly Rentals
10	Luxury Retreats*	27	Vacation Rentals*	44	Housetrip*
11	FlipKey	28	TurnKey	45	Only Apartments
12	Rentalia	29	Cottages In Canada	46	Villas of Distinction
13	Holiday Lettings	30	Canada Stays*	47	Home Escape
14	Alugue Temporado*	31	Novasol	48	Snaptrip
15	Homestay	32	Villa Plus	49	Book2Trip*
16	MisterBnb	33	Bookabach*	50	Vacation Rentals by Choice*
17	Stayz*	34	OneFineStay		

Note: * are removed due to non-English languages or duplication.

Appendix E. Actual Disclosure Behavior Measurement

Please select all the information you would like to disclose on the accommodation sharing platform.

Personal Information:

Name

Age

Gender

Face picture

Occupation

Hobby

Family member

Phone number

Property Information:

Address (location)

Picture of kitchen

Picture of bathroom

Picture of bedroom

Picture of dining room

Picture of surroundings

Text description of kitchen

Text description of bathroom

Text description of bedroom

Text description of dining room

Text description of surroundings

Appendix F. Robustness Check

Two-stage Least Squares (2SLS) Estimation

First, to account for the endogeneity of privacy concern about platform and privacy concern about user, we employ the two-stage least squares (2SLS) estimation method. Our main estimation equations for stage 1 and stage 2 show as follows:

$$DV = \beta 0 + \beta 1 * PCP + \beta 2 * PCU + \beta 3 * ECO + \beta 4 * SCO + \beta 5 * Control + \varepsilon \quad (1)$$

Stage 1: $$\widehat{PCP} = \delta 0 + \delta 1 * PC + \delta 2 * PCU + \delta 3 * ECO + \delta 4 * SCO + \delta 5 * Control + \varepsilon \quad (2)$$

$$\widehat{PCU} = \gamma 0 + \gamma 1 * PCP + \gamma 2 * UC + \gamma 3 * ECO + \gamma 4 * SCO + \gamma 5 * Control + \varepsilon \quad (3)$$

Stage 2: $$DV = \beta 0 + \beta 1 * \widehat{PCP} + \beta 2 * \widehat{PCU} + \beta 3 * ECO + \beta 4 * SCO + \beta 5 * Control + \varepsilon \quad (4)$$

where DV is the dependent variable of interest (i.e., intention to disclose property information and intention to disclose personal information). PCP represents privacy concern about platform. PCU represents the privacy concern about user. ECO and SCO represent economic benefit and social benefit, respectively. PC stands for platform-focused clauses, while UC stands for user-focused clauses. $\widehat{PCP}$ is the estimate of privacy concern about platform by replacing PCP with PC. Similarly, $\widehat{PCU}$ is the estimate of privacy concern about user by replacing PCU with UC. Control is the vector of control variables including age, gender, and annual income.

Specifically, we use the platform-focused clauses as the instrument for privacy concern about platform and user-focused clauses as the instrument for privacy concern about user in the first stage because those instrumental variables are correlated with the explanatory variable but have no direct effects on the dependent variables. Platform-focused clauses and user-focused clauses are strictly exogenous because they are binomial variables whose values are randomly set in the experiment. Then, we compute the fitted values of privacy concern about platform and privacy concern about user from the first stage regression and use the fitted values to replace the actual value of privacy concern about platform and privacy concern about user in the second stage regression model. The results are reported in Table F1.

Table F1. Results of the 2SLS regression models (Robust Standard Errors in parentheses)

	Model 1 **(DV= Intention to disclose property information)**	**Model 2** **(DV= Intention to disclose personal information)**
Main effect		
Privacy concern about platform	-0.018 (0.180)	-0.251 (0.202)
Privacy concern about user	-0.560* (0.228)	-0.538* (0.256)
Economic benefit	0.281*** (0.076)	0.333*** (0.085)
Social benefit	0.746*** (0.037)	0.745*** (0.041)
Control		
Age	-0.116** (0.044)	-0.104* (0.049)
Gender	-0.052 (0.113)	-0.087 (0.127)
Income	0.003 (0.019)	0.027 (0.021)
Observations	866	866
R^2	0.453	0.345

Note: * significant at p<0.05 level; ** significant at p<0.01 level; *** significant at p<0.001 level.

Model 1 explains 45.3% of the variance in intention to disclose property information. Privacy concern about platform does not have a significant impact on intention to disclose property information (β=-0.018, p=0.92) thus, H2a is not supported. Privacy concern about user has significant negative effects on the intention to disclose property information (β=-0.560, p<0.05), hence, H2b is supported. As we hypothesized, H3c is strongly supported based on the Wald test results (F=260.4, p<0.001). Economic benefit (β=0.281, p<0.001) and social benefit (β=0.746, p<0.001) both have positive influences on intention to disclose property information, therefore, H3a and H3b are supported. H3c is strongly supported based on the Wald test results (F=32.4, p<0.001). For control variables, only age is found to have a negative impact on intention to disclose property information (β=-0.116, p<0.01).

Model 2 explains 34.5.0% of the variance in intention to disclose personal information. Consistent with the results in Study 1, privacy concern about platform does not have a significant impact on intention to disclose personal information (β=-0.251, p=0.21), therefore, H2a is not supported. As we expected, privacy concern about user has a significant negative effect on intention to disclose personal information (β=-0.538, p<0.05), thus H2b is supported. As expected, H2c is supported according to Wald test results (F=252.2, p<0.001). Economic benefit (β=0.333, p<0.001), and social benefit (β=-0.745, p<0.001), are found to have a significant positive impact on intention to disclose personal information, hence, H3a and H3b are supported. Wald test results indicate that the coefficient for social benefit is significantly higher than that for economic benefit (F=37.7, p<0.001), thus H3c is not supported. For control variables, only age is found to have a negative effect on intention to disclose personal information (β=-0.104, p<0.05).

Treatment Effects of Two Types of Privacy Clauses

To verify the treatment effects of two types of privacy clauses on hosts' privacy concern about platform and privacy concern about user, we estimate the following equation to compare the pre-test and post-test data across four combinations of condition groups.

$$DV=\beta 0 + \beta 1*Treatment + \beta 2*Time + \beta 3*Treatment*Time + \varepsilon \quad (5)$$

Specifically, to explore the treatment effect of platform-focused clauses, we fix user-focused clauses at the same level. We test the difference between groups with high platform-focused clauses and low platform-focused clauses. As Table F2 shows, the difference between HH and LH groups and between HL and LL groups on privacy concern about platform are significant, confirming that the privacy policy with high platform-focused clauses can successfully mitigate participants' privacy concern about platform.

Next, we take a similar approach to check the treatment effect of user-focused clauses by fixing platform-focused clauses at the same level and test the difference between groups with high user-focused clauses and low user-focused clauses. Table F2 shows that the difference between HH and HL groups and the difference between LH and LL groups on privacy concern about user are both significant, indicating that the participants exposed to the privacy policy offering high user-focused clauses are more likely to

perceive low privacy concern about user. In sum, the analyses confirm our conclusion from Study 2 to be robust.

Table F2. Results of Treatment Effects across Different Conditions

Dependent variables	**Platform-focused clauses**		**User-focused clauses**	
	HH vs LH	**HL vs. LL**	**HH vs HL**	**LH vs LL**
Privacy concern about platform	-0.50*	-0.97***	0.25	-0.22
Privacy concern about user	-0.04	-0.23	-0.40*	-0.59**

Note: * significant at p<0.05 level; ** significant at p<0.01 level; *** significant at p<0.001 level.

Overall, results from the main analysis are confirmed by robustness checks: both property and personal information disclosure intentions are significantly and negatively related to the concern about users' privacy infringement, and significantly and positively related to the economic benefit and social benefit, while the concern about platform's privacy infringement is not significantly related to the information disclosure intention.

Chapter 3

Swipe Right: Dating App Features on LGBTQ+ User Mental Well-being

ABSTRACT

Building community is essential for marginalized groups as they take active steps to seek out and connect with others. To this end, developers have launched mobile dating apps for minority user groups to seek romantic partners, friends, or networking. Drawing on the literature of product feature design and social support for users' well-being, we study the role of dating app features on the mental health of LGBTQ+ users – a marginalized group with several apps tailored to building community or finding romantic partners. Using a mixed-methods research design, we collected both qualitative and quantitative data through in-depth interviews, online surveys and an experiment to investigate the influences of app features (i.e., communication, self-presentation, match, and search) on user mental well-being through perceived social support, self-acceptance of sexuality, and connection to the LGBTQ+ community. Results indicate that within the overall sample, these app features impact users' psychological consequences in different ways. Specifically, match directly improved user well-being, communication enhanced user perceived social support, and search promoted app user social support, self-acceptance, and LGBTQ+ community connection. In addition, feeling more comfortable with sexuality and having a stronger connection to the community were associated with improved mental health. Our results inform and extend previous work on app features and apply this insight to understand the needs of the understudied population and design inclusive products.

Keywords: LGBTQ+, Dating Apps, Social Support, Self-acceptance, Community Connection, Psychological Well-being

1. INTRODUCTION

Despite a societal push toward acceptance of those in the Lesbian, Gay, Bisexual, Transgender, and Queer (LGBTQ+) community, individuals who identify as sexual orientation minorities still face salient scrutiny. Recent reviews discuss the prevalence of bullying, discrimination, family disapproval, and social rejection, which may contribute to a stronger feeling of loneliness and poorer life satisfaction according to the Centers for Disease Control and Prevention (Byington et al. 2021; CDC 2017). As a result of this, extant research has also identified salient mental health challenges for LGBTQ+ employees including emotional and psychological stress, and a higher risk of depression, anxiety, and suicidal ideation compared to heterosexual individuals (Moagi et al. 2021; Rees et al. 2021; Rodgers 2017). Due to the deprivation of acceptance and the risk of violence, LGBTQ+ people find it difficult or even dangerous to seek friends or romantic interests in a face-to-face setting (Leskin 2020).

To mitigate these concerns and improve the potential of building community, developers have launched mobile dating apps, such as Grindr, Jack'd, Zoe and Taimi, for LGBTQ+ people to seek romantic partners, friends, or for networking (Wu & Ward, 2018). Other dating apps that used to only serve heterosexual users (e.g., Tinder), have also started offering services for LGBTQ+ users. Dating apps typically refer to third-party mobile applications with built-in GPS and social networking capabilities that are used to locate and interact with nearby users who are interested in offline meetings, dating, or sexual encounters. Those dating apps share some common features such as self-presentation, communication, matching and search. Users can display personal information (e.g., photos, age, height, weight, and background) through the *self-presentation* feature, and can browse other users' profiles and initiate immediate *communication* via text chat or even video call. In contrast to traditional dating sites, dating apps dramatically improve the efficiency of *matching* potential partners by generating a recommendation for users via app matching algorithms and providing location-based real-time interactions improving the possibility that two individuals will indicate interest in one another and *match*. Finally, the geolocation functionality allows

users to *search* for and locate potential romantic partners in close geographic proximity, which significantly facilitates actual offline meetings (Van De Wiele & Tong, 2014).

Dating apps are particularly popular among the LGBTQ+ community with roughly 55% of LGB identifying adults reporting that they had used a dating app at some point (Brown, 2020). According to a study by Pew Research Center (2020), among LGBTQ+ adults who are married or in a committed relationship, 28% of them met their partner via a dating app or site, compared with 11% of partnered straight adults; and among LGBTQ+ people who are single, 37% say they are using dating apps to look for a relationship or dates. Different from heterosexual users, whose main purpose for using such apps is to look for romantic relationships, sexual minority users have additional needs for self-recognition and social support from other community members. Despite evidence of the increasingly critical role of dating apps in the LGBTQ+ community, studies investigating the consequence of using such dating apps are limited, which calls for a deeper understanding of how these apps affect user behavior and well-being.

Building on the literature of product feature design (Ray et al. 2017; Ulrich & Eppinger, 2020) and social support for users' well-being (Yan, 2020), we explore whether and how different features of dating apps can improve the mental well-being of these sexual minority people. While prior literature offers great insights into users' behaviors on app adoption (Sumter and Vandenbosch 2019), the investigation into app use outcomes is limited. As such, we contribute to scholarship in this space in four primary ways. First, drawing upon the minority stress theory and identity development theory, we broaden previous research on heterosexual dating apps (Dai and Robbins 2021; Duguay 2017; Sumter et al. 2017) to test the potential consequences of dating app utilization for the unique user group of LGBTQ+ individuals. Second, we empirically test how dating app usage in LGBTQ+ populations might influence users' behavior and psychological health. Third, we explore the utility of dating apps as community-building tools for LGBTQ+ users, as the relationship between the socio-psychological effect of dating app use (i.e., feeling socially connected) and concrete attachment to this minority community is poorly understood. Finally, our findings provide practical implications for designing dating app features to meet the needs of LGBTQ+ users with different motivations (Kalkanci et al. 2019).

In this study, we explore the following three research questions:

1. *Do dating app features benefit LGBTQ+ user mental well-being?*
2. *What is the mechanism that each app feature plays a role on LGBTQ+ user mental well-being?*
3. *Does individual's privacy perception impact dating app use outcomes?*

To address the above research question, we conducted in-depth interviews with 15 dating app users who self-identified as LGBTQ+ individuals to gain insights into their perceptions of dating app use experience. In addition, we recruited LGBTQ+ dating app users from the Prolific platform and used a cross-sectional survey and online experiment to test the proposed research model. We empirically evaluated the direct impacts of dating app features related to user well-being and examined how the relationships are channeled by users' personal and social aspects of psychological outcomes, i.e., social support, self-acceptance, and community connection.

2. THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 Literature on LGBTQ+ Dating Apps

There are generally two major streams of research within the broad research area focused on dating apps. The first one aims at understanding demographic antecedents of dating app use and motivations (Kreager et al. 2014; Sumter et al. 2017; Sumter and Vandenbosch 2019). For example, prior studies show that men use dating apps more often than women and send 4 times more messages than women in online dating since men are generally playing an active role in sexual encounters, while women are expected to value a more passive sexual role and to invest in committed relationships (Kreager et al. 2014; Sumter and Vandenbosch 2019). Through an online survey with 163 users, Sumter et al. (2017) identify six motivations to use dating apps, including love, casual sex, ease of communication, self-worth validation, thrill of excitement, and trendiness. They further note that love motivation appears to be the strongest motivation among the six. In line with literature on online dating, men are more likely to report a casual sex motivation for using dating app than women (Sumter et al. 2017). The second one focuses on how various dating app

design features (e.g., user profile, geographic function) influence dating outcomes (Zhang et al. 2022). For instance, by employing human face recognition techniques, Zhang et al. (2022) uncovers that people tend to initiate a dating request to someone more attractive than themselves and are more likely to respond to attractive relationship initiators. They also unveil that geographical distance acts to undermine individuals' tendency to initiate a dating request when the initiator and the responder have a similar physical attractiveness level (Zhang et al. 2022).

While scholarship aimed at understanding the impact of dating app utilization is growing, this body of work largely draws from the perspective of heterosexual individuals. This is unfortunate, especially given that dating apps are gaining great popularity among non-heterosexual people due to their ease of use and anonymity (Gudelunas 2012). As disclosure of an LGBTQ+ identity is complex and involves a cost-benefit assessment (Arena Jr. and Jones 2017; Fletcher and Everly 2021), dating apps might provide a platform for connecting with one's community in a manner that is less risky. This risk likely weighs on LGBTQ+ employees who have not yet disclosed their identity openly in light of consistent evidence of mistreatment following disclosure. A comprehensive survey by the Center for American Progress (CAP 2020) revealed that 36% of LGBTQ+ individuals, who disclosed sextual orientation to others, experienced harassment or discrimination in their public, work, and personal lives. Further, 54% of LGBTQ+ individuals chose to hide their personal relationships to avoid experiencing discrimination and not want to be stereotyped or worry if doing so would cause the loss of relationships with co-workers and friends (Coffman et al. 2017). Given the perceived repercussions of disclosure, LGBTQ+ individuals might be more willing to test the waters of disclosure on apps designed to protect their identity and preserve confidentiality.

By analyzing the data from an LGBTQ+ consumer research panel, Badal et al. (2018) found that Grindr was the most frequently used LGBTQ+ dating app (60.2%), followed by Adam4Adam (23.5%), Jack'd (18.9%), and Scruff (18.7%). These apps generally have an interface with user profile consisting of a username, demographic description including age, height, weight, ethnicity, and a brief background introduction. All those attributes are optional and can be set invisible to the public. In addition, users can also choose to specify their app use purpose, such as "dates", "friends", and "networking" and current

relationship statuses like “single”, “dating”, “married” or “open relationship”. Finally, a unique feature of LGBTQ+ dating apps, especially for gay and bisexual men (GBM), is that it allows users to engage in serosorting in order to reduce HIV risk (Phan et al. 2021). Serosorting is the practice of using HIV status as a decision-making criterion in choosing sexual partners or conducting sexual behavior (Eaton et al. 2009). Prior literature shows that it is not uncommon for GBM to disclose their use of biomedical prevention strategies (such as pre-exposure prophylaxis or PrEP) and HIV status on dating apps (Bartels et al. 2021; Drückler et al. 2018; Goedel et al. 2016).

In general, dating apps all share similar features. In our study, we focus on the most commonly used features in dating apps outlined by Finkel et al. (2012), including communication, self-presentation, match, and search. We selected these features not just because of their commonality across dating apps, but because each has implications for community building in LGBTQ+ spaces. For example, communication provides the capabilities for app users to interact with other daters without time and location limitations through text, voice message, or video calls before offline interaction (Chen et al. 2020; Finkel et al. 2012). Self-presentation offers a way for users to display personal information, which allows LGBTQ+ individuals to present themselves in a manner they are most comfortable with. Searching enables users to explore other users’ profiles based on their own criteria, while matching allows users to get recommended potential partners generated by app matching algorithm, which efficiently provides better matching results than conventionally dating. While initially designed for heteronormative dating, many dating app companies (e.g., Tinder) have worked in recent years to address the growing calls for inclusivity within the LGBTQ+ community by adding more diverse sexual orientation options in response to the trend of inclusive product design and service innovation.

2.2 Minority Stress Theory and Social Support

To better understand the community-building role of dating app features, we leverage tenets of minority stress theory (Meyer 2003), which posits that negative evaluations by others such as prejudice directed at minority persons in society may result in adverse psychological outcomes (Meyer 2003). Specific to

LGBTQ+ individuals, minority stress theory outlines four minority stressors that can promote psychological distress, including heterosexist discrimination, internalized heterosexism, expectations of rejection, and concealment of sexual orientation (Meyer 2003). First, sexual minorities are exposed to external environmental conditions such as prejudice, harassment, and hate crimes (referred to as heterosexist discrimination). Second, the context of sociocultural stigmatization can promote sexual minority people's expectations of stigma, including awareness and vigilance of its potentiality. Third, sexual minority people may experience internalized heterosexism, defined as the internal denigration of sexual minority people and identities. Finally, sexual minorities make ongoing decisions about hiding or disclosing their identity.

Meyer (2003) theorized that stress-ameliorating factors including social support both at the individual level and community level are helpful in combatting minority stress. Social support is defined as the psychological or physical support an individual received through social ties to other individuals, groups, and communities (Lin et al. 1979). Prior empirical research has consistently demonstrated the significant impact of social support on improving mental, physical, and psychological health and acting as a resource against minority stress (Chaudoir et al. 2017; Scandurra al. 2017). For example, via online surveys of 110 older Portuguese gay men, researchers found that lack of support from family members and friends, and less connectedness to the LGBTQ+ community both contributed to loneliness (Ribeiro-Gonçalves et al. 2022). There are also several interventions that focus on social support found to be effective in mitigating feelings of minority stress in LGBTQ+ populations, such as LGBT health education, LGBT counseling course, LGBT cultural competency training and so on (Chaudoir et al. 2017). Two core elements of social support are informational support and emotional support. Informational support is the provision of advice, resources, or coping strategies to help others understand a stressful event better. Emotional support involves providing warmth, empathy, or encouragement to others (Yan 2020). In our work, we explore how facets of LGBTQ+ dating apps might predict feelings of support.

LGBTQ+ dating apps likely offer sexual minority individuals various supportive features to communicate and interact with other LGBTQ+ individuals. For instance, Gudelunas (2012) explored social dating apps that allowed for the creation of a virtual community of sexual minorities in which LGBTQ+ people can receive formal and informal support from other members. Based on the accessibility of certain app features such as the ability to self-represent, match potential, search range, or communication channels, we would expect that LGBTQ+ individuals might feel more ingrained in their community and report greater social support. The presence of these features likely gives LGBTQ+ employees a greater chance finding others to build a network of similarly identifying individuals. As more individuals are added to the network, it is likely that participants will report increased social support as a function of the app-related factors we have identified. Hence, we propose:

H1: *LGBTQ+ dating app features (i.e., communication, self-presentation, match, and search) positively impact app users' social support.*

2.3 LGBTQ+ Community Connection

We further expect that as social support grows, LGBTQ+ employees will feel a stronger connection with the larger sexual minority community. LGBTQ+ people indicate that one of their primary goals in using dating apps is to get connected with the LGBTQ+ community and build their social network (Gudelunas 2012). Community connection is defined as the degree of behavioral and emotional attachment or internal sense of belonging to one's community (Sherman et al. 2020; Sherman et al. 2022). The four core elements of this construct are membership, influence, reinforcement, and shared emotional connection. Membership is defined as "one's sense of belonging and to a sense of confidence that one has as a member as well as the aspects of acceptance from the group that facilitates belonging". Influence refers to a sense of mattering, which includes not only how a member makes a difference to the group but also how the community impacts its members. Reinforcement is "the feeling that members' needs will be met by the resources received through their membership in the group". The last element shared emotional connection refers to the commitment and belief that members have shared based on their similar experiences. Incorporating the

community literature and LGBTQ+ research (McMillan and Chavis 1986; Sherman et al. 2020; Sherman et al. 2022), we define LGBTQ+ community connection as the degree of emotional connectedness and internal sense of belonging that sexual orientation minority individuals feel about the larger LGBTQ+ community.

Social and emotional integration with LGBTQ+ networks can provide psychological benefits for members of the LGBTQ+ community. Developing a connection to the broader sexual minority community may help sexual minorities build resilience through the identification of role models and similar others. For example, through a qualitative study employing life story methodology, DiFulvio (2011) found that sexual orientation minority individuals more successfully adapted to challenges and threatening circumstances by forming close relationships with others within the broader LGBTQ+ community. Through these communities, participants find friendship and connection and can talk with and share with other members who may have also experienced disconnection and isolation in schools or family. Feeling a strong connection to the LGBTQ+ community could involve a sense of closeness to other community members (Frost and Meyer 2012). When sexual minority individuals feel supported by others in their social networks, this may spillover to influence their feelings of connectedness with the community as a whole. Therefore, we have the following hypothesis:

H2: *Social support positively impacts LGBTQ+ community connection.*

2.4 LGBTQ+ Individual's Self-Acceptance of Sexuality

While we expect social support to have a positive influence on community connection, we also expect it to influence individual level factors. Specifically, we anticipate that social support will have a positive relationship with LGBTQ+ individual's own acceptance of their sexual orientation. Self-acceptance of sexuality is defined as the degree of accepting one's sexuality as it is and feeling comfortable with it (Cass 1979; Perrin-Wallqvist and Lindblom, 2015). Building upon interpersonal congruency theory, Cass (1979) proposed a model of homosexual identity formation, in which he suggests that self-acceptance is achieved by resolving psychological conflicts due to awareness of one's homosexual orientation, which is followed

by establishing positive feelings and pride toward it, and finally integrating and valuing it as a part of the identity. Cass (1979)'s model of homosexual identity formation is further developed by Elizur and Mintzer's (2001) sexual identity development theory, in which they suggest that self-acceptance is achieved by eliminating internal negative attitudes, developing a positive sense of self, increasing sexuality disclosure, and increasing engagement and connection with sexual minority community.

Prior psychology literature shows that self-acceptance is closely related to frequent and regular interaction with similar others (Cass 1979). For instance, Frable et al. (1998) suggested that the presence of similar others can lift self-esteem and mood of students with concealable stigma (e.g., LGBTQ+). Specific to our population of interest, connecting virtually with other LGBTQ+ people can have a positive influence on self-acceptance of sexuality (Crowson and Goulding 2013). In line with this literature, we propose that when sexual minority individuals get more social support, they will be more able to connect and foster a deep meaningful connection with others and facilitate their identity development processes. In addition, through networking online, LGBQ persons are likely to find validation and support from others which is likely to reduce isolation and promote feelings of acceptance and belonging (Szymanski et al. 2021). Therefore, we have the following hypothesis:

H3: *Social support positively impacts users' self-acceptance of sexuality.*

2.5 Implications for psychological well-being

We expect that the positive consequences we have discussed to culminate in improved psychological well-being for LGBTQ+ individuals. First, LGBTQ+ community connection is closely related to greater psychological and social well-being among sexual minority people (Frost and Meyer 2012; Kertzner et al. 2009). Studies have generally found substantial benefits of community engagement on mental health, such as decreasing symptoms of anxiety and depression, reducing stress levels, enhancing self-esteem and self-confidence, and promoting cognitive functioning and affective mental well-being (Fabrigoule et al. 1995; Hultsch et al. 1993). In addition to the physiologic and psychological benefits, community engagement may also a promote healthy lifestyle, which ultimately enhances individual well-being. Together, this implies

that when LGBTQ+ individuals feel closer to the larger LGBTQ+ community, they will also report increased psychological well-being.

We also expect that self-acceptance will positively relate to psychological well-being. Generally, research on authenticity in LGBTQ+ individuals suggests that the more authenticity that one feels and expresses, the more they report improved well-being (Fletcher & Everly, 2021; Riggle et al., 2017). Prior LGBTQ+ literature suggests that low levels of self-acceptance of sexuality are found to be associated with high levels of self-reported minority stressors as well as poorer mental health outcomes (Camp et al. 2020). A recent review summarized past findings centered on the relationship between self-acceptance and mental health in LGBTQ+ individuals and found consistent evidence of a negative relationship between self-acceptance and mental health (Camp, Vitoratou, & Rimes, 2020). Indeed, this review reveals that lower self-acceptance relates to increased general distress, depression, as well as lower overall psychological well-being. In our work, we intend to replicate past findings to show that increased self-acceptance will relate to increased psychological well-being in our community of interest. Together, we advance the following hypotheses:

H4: *Increased community connection relates to increased psychological well-being in LGBTQ+ individuals.*

H5: *Increased self-acceptance of sexuality relates to increased psychological well-being in LGBTQ+ individuals.*

2.6 The Moderating Role of Privacy Concern

Privacy concern, as a critical construct in the IS and privacy literature, has been well-studied in various contexts including social media, the online health community, e-commerce and so on (Awad and Krishnan 2006; Bansal et al. 2010; Malhotra et al. 2004; Pavlou et al. 2007). LGBTQ+ individuals typically have strong privacy concerns - particularly personally identifiable information (PII) concerns - especially those who do not publicly disclose their sexual orientation due to anticipated discrimination (Thelwall 2011).

Personally identifiable information (PII) concerns refer to the potential risks of exposing or mishandling sensitive personal data that can be used to identify a previously anonymous individual. Compared to offline environments, dating apps provide an intimate and more secure platform equipped with various data protection features to safeguard users' personal information. For app users who have strong PII concerns, when they perceive high privacy protections and feel that their personal information is secure, they will be more comfortable sharing personal information and engaging in interactions with other users, which can lead to the development of deeper and more supportive relationships. In addition, if a dating app provides users with the ability to control who sees their profile and communicates with them, users may feel more in control of their interactions and more confident in their ability to using the app to find like-minded individuals who share their values and can provide them with emotional support. Therefore, we propose:

H6: *The relationship between dating app features (i.e., communication, self-presentation, match, and search) and social support will be moderated by privacy concerns such that when privacy concerns are higher, this relationship will become more negative.*

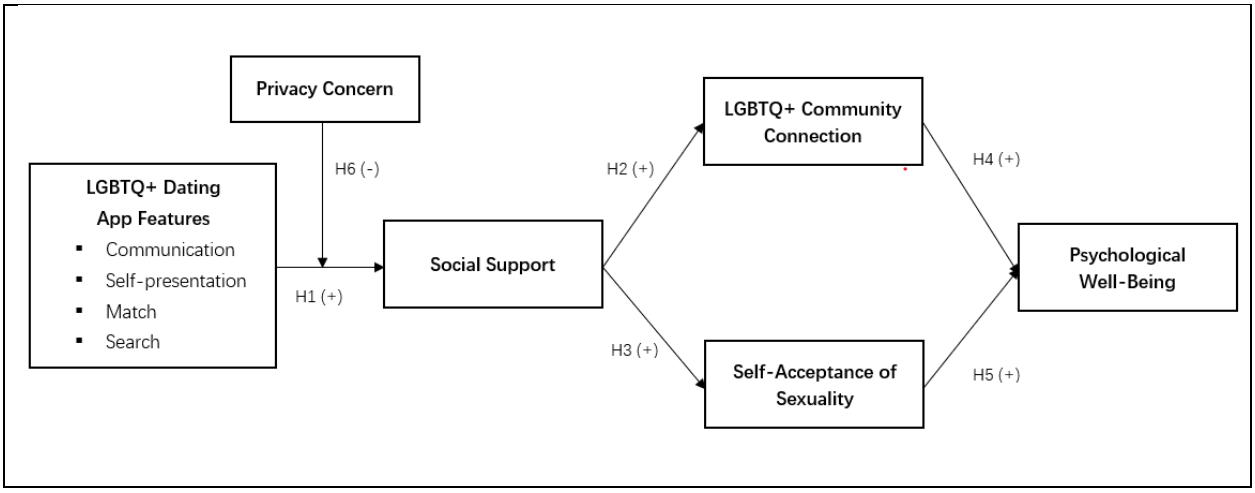


Figure 7. Research Model

In summary, we examine the impacts of LGBTQ+ dating app features on app users' social support, community connection, and self-acceptance, and the well-being consequences (see Figure 7).

3. METHOD

In order to gain insight into the users' perception and behaviors of LGBTQ+ dating app usage within the study area, we utilized a multi-method research design. In study 1, we interviewed 15 LGBTQ+ dating app users to get a deep understanding of their dating app use experience. In study 2, we designed an online survey and recruited 190 LGBTQ+ dating app users on Prolific to test our research model. In study 3, we employed an experimental design to examine the causal relationship identified in our survey study.

3.1. Study 1: Interview on LGBTQ+ Dating App Users

3.1.1 Sample and Data Collection Procedure

To be eligible to participate in study 1, participants had to self-identify as LGBTQ+ and have current or previous experience using dating apps. By recruiting from a range of settings and utilizing various recruitment methods, we were able to increase the likelihood of obtaining a diverse sample that accurately reflected the population of LGBTQ+ dating app users in the study area.

The data collection process in this study involved a face-to-face in-depth interview and online interview, which were semi-structured and lasted approximately 30 to 60 minutes. Participants who joined face-to-face interview were recruited from a LGBTQ+ community in Dallas-Fort Worth metropolitan area, Texas. Subjects who took the online interview were recruited from one of the most popular dating apps in the US. During the interviews, the interviewer followed a guide that was specifically designed to explore the participants' experiences and perceptions related to the use of dating apps in the LGBTQ+ community. The guide covered a range of topics, including the participants' motivations for using dating apps, their expectations and experiences with these platforms, and the impact that dating apps have had on their social lives and psychological wellbeing.

To provide a deeper understanding of the issues addressed in this paper, sample questions from the interview guide can be found in Appendix 2. The questions were selected based on their relevance to the

topics discussed in this study, such as the experiences of sexuality development, the role of dating apps in the participants' social lives, and the impact of these platforms on their mental health. By using a face-to-face in-depth interview as the primary data collection method, this study was able to provide rich, detailed insights into the experiences and perceptions of LGBTQ+ dating app users.

3.1.2 Results

A total of 15 LGBTQ+ individuals participated in the study. The average age was 32.3 years (SD = 11.5), with a range from 19 to 45 years old. In terms of ethnicity, eight identified as “White”, three identified as “Black/African American”, three identified as “Asian”, and one identified as “Latino”. Demographic information is located in Table 18.

Table 18. Demographic Information of Participants (N = 15)

Gender		**Age**		**Ethnicity**	
Male	8	Under 18 yrs.	0	White/Caucasian	8
Female	7	18–24 yrs.	3	Black/African American	3
Total:	15	25–34 yrs.	9	Asian	3
		35–44 yrs.	2	Latino	1
		45–54 yrs.	1	Total:	15
		Total:	15		
Sexual Orientation		**Length of App Use**		**Sexuality Disclosure**	
Lesbian	7	Less than 6 months	0	Disclosed	11
Gay	8	6 months to 1 year	1	Undisclosed	4
Total:	15	1 to 2 years	2	Total:	15
		2 to 4 years	5		
		5 or more years	7		
		Total:	15		

3.1.2.1 LGBTQ+ Dating App Features

In terms of dating app usage, participants all showed great familiarity with the features that our study focused on. They confirmed that the current popular LGBTQ+ dating apps are well-designed and easy to use. Subject 1 (33 years old, White) indicates, “Search feature gives me the flexibility to modify my

preferences over time since I use dating app for different purposes. When searching for a dater, face picture is a must. But for networking, I don't care how he looks like." (Subject 11, 25 years old, White). Similarly, subject 4 (32 years old, White) expresses:

I have found that the match feature on most dating apps is incredibly useful. It allows me to connect with people who have expressed mutual interest, eliminating the need for the tedious and time-consuming process of sending countless messages and waiting for a response, which really helps to streamline the dating process and ensures a more efficient experience.

3.1.2.2 LGBTQ+ Dating App Users' Privacy Concern

Participants reported experiencing two distinct attitudes regarding self-presentation: sharing and concern. These attitudes are influenced by a variety of factors such as the individual's current stage in life, the type of person they are interacting with, and the degree to which they feel the need to conform to social norms and expectations in order to feel comfortable. In the context of dating apps, individuals may present themselves in a way that aligns with their personal beliefs and values, or they may prioritize the opinions and desires of potential partners in order to increase their chances of finding a suitable match. It is important to recognize that the process of self-presentation in dating apps is complex and multifaceted and may involve a certain degree of strategic thinking and decision-making on the part of the individual user.

"I am very particular about how I share my photos. While many dating apps allow me to post photos on my public profile, I prefer to share them with select users that I have already matched with. This helps me to maintain a level of privacy and control over who has access to my photos, while also allowing me to present myself in the best possible light to potential matches." (Subject 7, 29 years old, Asian)

3.1.2.3 LGBTQ+ Community Connection

Overall, participants believed that dating apps play an important role in bringing them closer to the larger LGBTQ+ community and serve as a resource for obtaining social support for LGBTQ+ individuals. "Dating apps give me a way to meet people who share my values and interests, which enhanced my sense

of belonging and connection within the LGBTQ+ community," Subject 2 (34 years old, Black) said. Similarly, Subject 11 (40 years old, White) expresses:

"Using dating apps has been a positive experience for me, as I find it to be a pleasant and enjoyable way to connect with others who belong to the LGBTQ+ community. It allows me to share my experiences and discuss topics related to being gay with others who can relate to and understand them. These conversations may not be appropriate to have with straight people, as they may not have the same perspective or understanding of the issues that are relevant to the LGBTQ+ community."

3.1.2.4 LGBTQ+ Self-acceptance of Sexuality

Participants provided insight into their individual capacity for feeling at ease with their sexual orientation. It was found that an individual's level of comfort within their sexuality was influenced by the level of perceived acceptance from themselves and their surroundings, such as their family and friend networks, and any fears surrounding the disclosure of their sexuality. Interestingly, participants described feeling more comfortable and able to truly be themselves in gay spaces as compared to heterosexual spaces. Such findings further highlight the importance of creating inclusive and accepting environments for individuals to explore and express their sexuality without fear of judgment or discrimination. Subject 5 (26 years old, Asian) explained:

People in the gay bar and LGBTQ+ dating app are generally more accepting of different sexual orientations, leading to a greater sense of safety and belonging for those who identify as LGBTQ+. I can explore and express my sexuality without fear of judgement or discrimination.

The results of this interview study suggest that dating apps can bring a number of positive experiences for LGBTQ+ individuals, including personal benefits such as receiving social support and enhancing self-acceptance and social reward such as improving community connection. The majority of respondents commented on the positive outcomes of using dating app features, either significantly improving dating efficiency through search and match features or providing a highly interactive networking environment via

communication features. While many studies have documented and examined contributors to finding partners in online dating, little research has examined the underlying mechanism of dating app features on users well-being. Thus, in study 2, we investigated how each feature in dating app impact LGBTQ+ users' psychological outcomes.

3.2 Study 2: Hypothesis Testing

3.2.1 Sample and Data Collection Procedure

To complement our interview study, an online survey study was conducted employing the built-in qualification features on Amazon Mechanical Turk (MTurk) and Prolific. To recruit qualified subjects for our study, we added five filtering questions at the beginning of the survey: (1) Please specify your sexual orientation. (2) Do you currently use or have used an LGBTQ+ dating app (e.g., Grindr, Jack'd, Scruff, Taimi, and Zoe) on your mobile device(s)? (3) Please specify which dating app you use (or have used), if more than one, name one that you used most frequently. (4) Please indicate the main purpose of using this app (i.e., date seeking, casual sex, looking for friends, connecting LGBTQ+ community, killing time, or others), and (5) How long you have used this dating app? Responses that did not pass the screening criteria (e.g., participants who were not self-identified as LGBTQ+ individuals or did not use any LGBTQ+ dating app) were ruled out from the data set.

Participants were subsequently asked to evaluate the features of the dating app they named above and report their social support, LGBTQ+ community connection, self-acceptance of their sexuality, and well-being. Of the 212 participants who accessed the survey, we removed 15 respondents who were not self-identified as LGBTQ+ individuals and 7 responses with incomplete data for a total of 190 who were included in our analyses (demographic information located in Table 19).

Table 19. Demographic Information and Control Variables (N = 190)

Gender		**Age**		**Ethnicity**	
Male	102	Under 18 yrs.	0	White/Caucasian	168
Female	84	18–24 yrs.	26	Black/African American	9
Trans Male	3	25–34 yrs.	99	Asian	7
Trans Female	1	35–44 yrs.	32	Pacific Islander	0
Total:	190	45–54 yrs.	22	Latino	3
		55–64 yrs.	9	Native American Indian	2
		64 + yrs.	2	Middle Eastern	0
		Total:	190	Other	1
				Total:	190
Sexual Orientation		**Length of App Use**		**Sexuality Disclosure**	
Lesbian	46	Less than 6 months	19	Disclosed	46
Gay	52	6 months to 1 year	66	Undisclosed	52
Bisexual	84	1 to 2 years	71	Total:	190
Asexual	6	2 to 4 years	27		
Other	2	5 or more years	7		
Total:	190	Total:	190		

3.2.2 Measures

The scales to measure the constructs in our proposed model were developed based on an extensive literature review. In terms of dating app features, we adapted three items generated by Finkel et al. (2012) to measure communication. Questions pertaining to match and search were adapted from Finkel et al. (2012). The measurement of self-presentation is adapted from Finkel et al. (2012). Social support was measured with three items developed by Sherbourne and Stewart (1991). LGBTQ+ community connection was measured with four items developed by Bateman et al. (2011). Self-acceptance of sexuality was measured with nine items developed by Camp et al. (2022). Finally, psychological well-being was measured with three items adapted from Suh and Li (2022).

We considered several control variables to account for the alternative explanation of the results due to extraneous factors, including participants' age, gender, and ethnicity. We also asked participants to indicate their sexual orientation, sexuality disclosure status, and the length of dating app use. The full list of survey

items and their sources were provided in Appendix Table A1. All items were measured on a 7-point Likert-type scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree").

3.2.3 Results

Our model was tested using SmartPLS. We first examined the measurement model using SmartPLS. All variables had reliability scores well above the recommended level of 0.70 (Nunnally and Bernstein 1994). All square roots of the AVE were above 0.5 (Fornell and Larcker 1981) and were greater than the correlations among the latent constructs, indicating adequate convergent validity and discriminant validity (Barclay et al. 1995). Means, standard deviations, Cronbach alpha values, AVE values, and intercorrelations were reported in Appendix (Table A3). All items' loadings and crossing-loadings are reported in Appendix (Table A4).

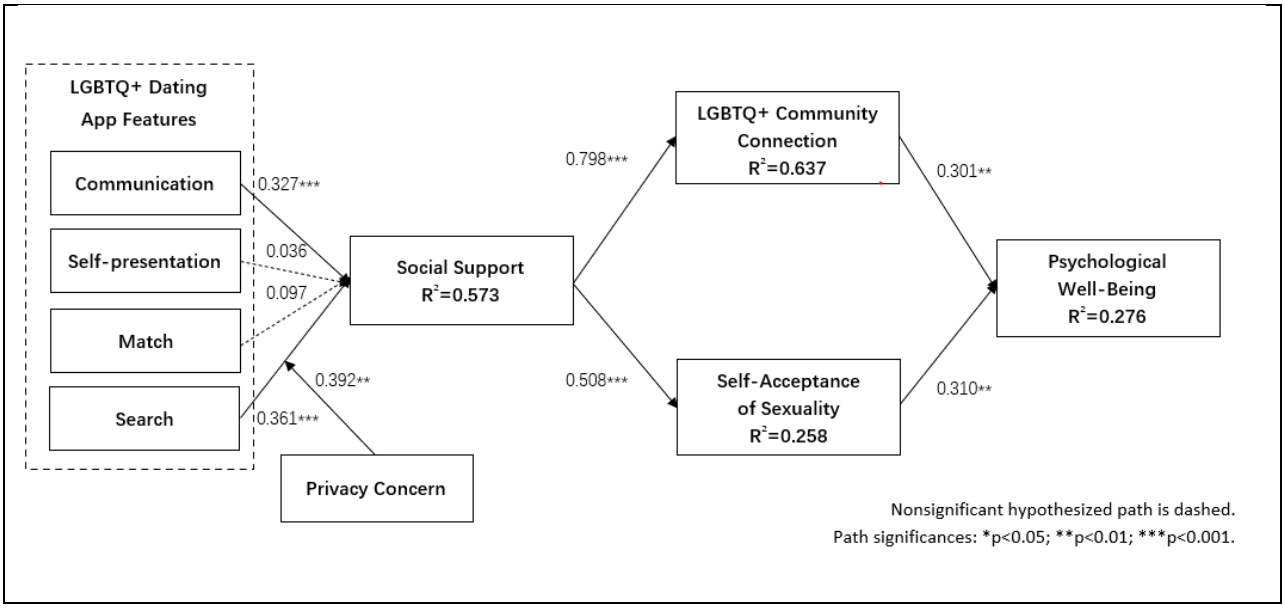


Figure 8. Model Results

Table 20. Model Results of Tested Hypotheses and Control Variables

Tested Hypothesis/Path	Path Coefficient	t-statistic	Support
Hypotheses			
H1a: Communication -> Social Support	0.327	3.290***	Yes
H1b: Self-presentation -> Social Support	0.036	0.297 (n/s)	No
H1c: Match -> Social Support	0.097	0.830 (n/s)	No
H1d: Search -> Social Support	0.361	3.449***	Yes
H2: Social Support -> LGBTQ+ Community Connection	0.798	19.541***	Yes
H3: Social Support -> Self-acceptance of Sexuality	0.508	5.575***	Yes
H4: LGBTQ+ Community Connection -> Psychological Well-Being	0.301	2.739**	Yes
H5: Self-acceptance of Sexuality -> Psychological Well-Being	0.310	2.849**	Yes
H6: Privacy Concern x Search -> Social Support	0.392	2.610**	Yes
Controls			
Length of App Use -> LGBTQ+ Community Connection	0.137	2.148*	—
Length of App Use -> Self-acceptance of Sexuality	0.168	2.109*	—
Note: Path Significances: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; n/s = not significant.			

Figure 8 presents the results of the structural model. In the model, 57.3% of the variance in social support was explained by the LGBTQ+ dating app features. Furthermore, 63.7% of the variance in the LGBTQ+ community connection and 25.8% of the variance in the self-acceptance of sexuality were explained by social support. The variance in psychological well-being explained by LGBTQ+ community connection and self-acceptance of sexuality was 27.6%.

In terms of the LGBTQ+ dating app features, communication was found to have a significant positive effect on social support ($\beta = 0.327$, $p < 0.001$), which supported H1a. Search showed a significant positive effect on social support ($\beta = 0.361$, $p < 0.001$), which supported H1d. However, self-presentation and match didn't have a significant impact on social support. In addition, social support exerted a significant positive influence on LGBTQ+ community connection ($\beta = 0.798$, $p < 0.001$), which supported H2. As we hypothesized, social support displayed a significant positive influence on self-acceptance of sexuality ($\beta = 0.508$, $p < 0.001$), which supported H3. In terms of ultimate effect on well-being, LGBTQ+ community connection had a significantly positive impact on users' psychological well-being ($\beta = 0.301$, $p < 0.01$). Self-acceptance of sexuality also showed a significantly positive impact on psychological well-being ($\beta = 0.310$, $p < 0.01$), thus supporting H4 and H5.

For moderating effect, privacy concern positively impacts the relationship between search feature and social support such that when users have stronger privacy concerns, search feature will have a stronger positive influence on users' social support ($\beta = 0.392$, $p < 0.01$).

For control variables, only Length of App Use had a significant, positive effect on app user's self-acceptance of sexuality ($\beta = 0.137$, $p < 0.05$) and a significant positive effect on app user's self-acceptance of sexuality ($\beta = 0.168$, $p < 0.05$).

3.2.4 Additional analysis

To understand the direct effects of app features, we examined the relationship between four app features and (1) LGBTQ+ community connection, (2) self-acceptance of sexuality, (3) psychological well-being and reported the results in Table 21. Specifically, communication, self-presentation and match are not found to have significant impacts on LGBTQ+ community connection and self-acceptance, suggesting that simply using those app feature sets may not be sufficient to shorten the psychological distance with LGBTQ+ group and improve the evaluation of their sexual orientation. Interestingly, we find that search has a significantly positive impact on users' LGBTQ+ community connection ($\beta = 0.406$, $p < 0.001$), and self-acceptance ($\beta = 0.299$, $p < 0.001$), implying that searching nearby people that meet user's preference is an important feature to enhance users' feeling of community belonging and make them feel comfortable with their sexuality. Regarding user's well-being, match is found to have a significant positive influence on individual's psychological well-being, suggesting that the potential partners recommended by dating apps can generally improve user's happiness and life satisfaction.

Table 21. Direct Impact of app Features on Well-being

App Features	LGBTQ+ Community Connection	Self-acceptance of Sexuality	Psychological Well-being
Communication	0.183	0.061	0.013
Self-presentation	0.195	0.156	0.149
Match	-0.069	0.158	0.283*
Search	0.406***	0.299*	0.204
Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.			

3.3 Study 3: The Causal Effect of App Features on Well-being

The previous survey results demonstrate that dating app features impact users' behaviors in different manners. Specifically, as showed in Table 3, search was positively associated with LGBTQ+ community connection and self-acceptance of sexuality. Match was positively associated with app users' psychological well-being. Communication and self-presentation were not found to have a significant impact on any of the outcome variables. To further investigate the causal effect of the relationships revealed in the survey and to understand how match and search features influence app users' behavior, we design a scenario-based between-subjects factorial experiment to study how different dating app features influence users' social support, privacy concerns, community connection, self-acceptance of sexuality and psychological well-being.

3.3.1 Participants

A total of 449 participants recruited from Prolific completed the experiment. All participants in our study were registered as U.S. residents and were paid 1.5 USD for their participation. We randomly assigned participants into three conditions (full features condition, search absent condition, and match absent condition) in a between-subjects design.

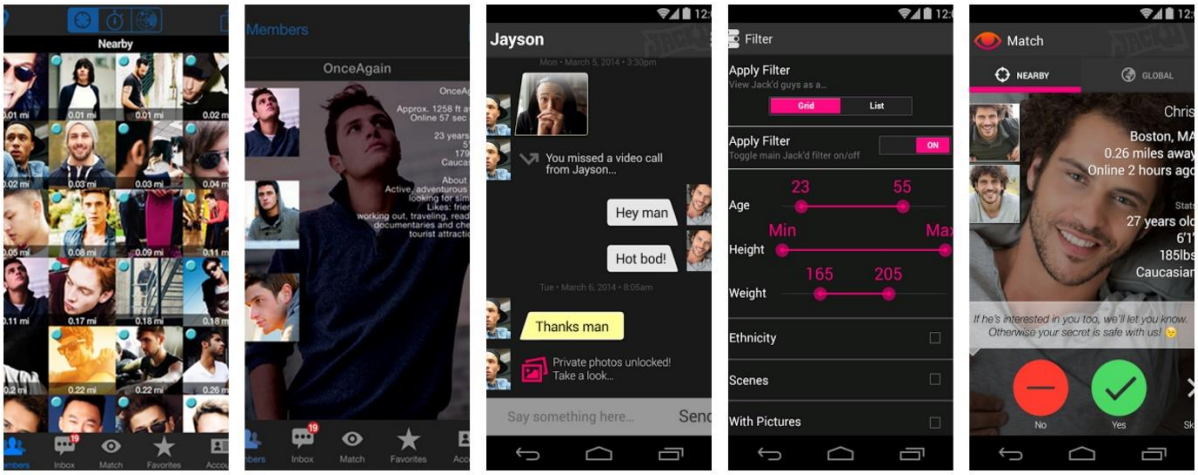
Table 22. Sample Demographic Information

	Full Features Condition (N=147)	Search Absent Condition (N=154)	Match Absent Condition (N=148)
Gender			
Male	100	90	91
Female	47	64	57
Age			
18–24 yrs.	13	17	15
25–34 yrs.	72	70	70
35–44 yrs.	35	37	30
45–54 yrs.	17	17	20
55–64 yrs.	10	13	13
64 + yrs.	0	0	0
Ethnicity			
White/Caucasian	109	113	108
Black/African American	15	13	13
Asian	11	10	9
Pacific Islander	1	2	0

Latino	7	9	7
Native American Indian	1	1	3
Middle Eastern	0	2	3
Other	3	4	5
Sextual Orientation			
Gay	100	90	91
Lesbian	47	64	57

3.3.2 Experimental Conditions and Procedure

This study aimed to build on our previous findings to better understand how users' perception of dating app features influence their social support, privacy concerns, community connection, self-acceptance of sexuality and psychological well-being in a manner that was higher in internal validity. All participants (in all conditions) were given the same information at the beginning of the experiment. They first viewed a screen presenting the following introduction to dating apps: "Dating apps generally have a user interface with a grid or list of a certain number of nearby users consisting of a thumbnail image, a small circle in the top-left corner indicating online/offline status, and distance information (see Figure 9 (a))."



(a) Platform	(b) Self-presentation	(c) Communication	(d) Search	(e) Match

Figure 9. Example of Dating App Features

Next, we manipulated the features that participants saw in the fictitious dating app. Specifically, participants in the full feature condition saw all four features with examples and description. For self-presentation (Figure 9 (b)), the following message was displayed: "Self-presentation offers a way for users

to display personal information, which can be skimmed by other potential partners. Users can post multiple pictures and more detailed profile information consisting of a user-chosen username, demographic description including age, height, weight, and a brief background introduction (e.g., hobby)." For communication (Figure 9 (c)), participants saw the following message: "Communication enables app users to interact with other daters without time and location limitations through text messages, voice messages, or video calls. Users can also share and exchange photos and short videos." For search feature (Figure 9 (d)), we showed information to the participants: "Searching enables users to explore other users' profiles based on their own criteria. Users can set their preferred ranges of age, height, weight, ethnicity, with/without pictures." In terms of match feature (Figure 9 (e)), participants saw the following message: "Matching allows users to get recommended potential partners generated by app matching algorithm. Users can press "Yes" or "No" to indicate their preference. If you press "Yes", potential partners will get notified. If you press "No", potential partners will not get notified."

Participants in the search absent condition only saw an example of a dating app with features including self-presentation, communication, and match. Similarly, participants in the match absent condition only saw an example of dating app with self-presentation, communication, and search features.

After being exposed to the dating app's features message, participants proceeded to a questionnaire session to report their experience. In each condition, once the participants read the information on the app features, as a manipulation check, they were asked to report their satisfaction with each feature. After that, participants were asked to complete a questionnaire that measures their perceptions of social support, privacy concern about using dating app, community connection, self-acceptance of sexuality and psychological well-being. The measurements derived from these questions are elaborated in study 1. Finally, participants were thanked and debriefed. All other experiment details (purpose, and payment) are the same in all conditions to optimize treatment equivalence.

3.3.3 Results

For match feature manipulation check, a t-test found that participants in the match-present condition were significantly more satisfactory than participants in the match-absent condition to perceive match feature satisfaction (t=3.29, p<0.001). For search feature manipulation check, a t-test found that participants in the search-present condition were significantly more satisfactory than participants in the search-absent condition to perceive search feature satisfaction (t=4.49, p<0.001). Therefore, both manipulations are successful.

To explore the roles of the match feature and search feature, a series of t-tests are performed. The overall results are summarized in Table 6. Specifically, the main effect of match on users' social support is not significant (t(293)= 0.44, p=0.66). The main effect of search on social is significant (t(299)=2.35, p<0.05). with participants in the search-presence condition (M=5.36, SE=1.26) rating higher than participants in the search-absence condition (M=5.02, SE=1.34).

Table 23. t-test Results (Standard Deviation in Parentheses)

Dependent variables	**Match**		**t**	**Search**		**t**
	Presence	**Absence**		**Presence**	**Absence**	
Social support	5.14 (1.41)	5.07 (1.37)	0.44	5.36 (1.26)	5.02 (1.34)	2.35*
Privacy concern	5.11 (1.35)	4.64 (1.47)	2.82**	5.44 (1.45)	4.92 (1.32)	3.42**
LGBTQ+ community connection	5.64 (1.12)	5.43 (1.05)	1.68	5.71 (1.06)	5.19 (1.45)	3.48**
Self-acceptance of sexuality	5.93 (0.85)	5.76 (0.98)	1.46	6.02 (0.69)	5.68 (1.18)	2.91**
Psychological well-being	5.08 (1.29)	4.72 (1.56)	2.54*	5.15 (1.23)	4.92 (1.17)	1.79
Age	3.68 (1.14)	3.70 (1.16)	0.21	3.66 (1.15)	3.67 (1.23)	0.08
Number of observations	147	148		147	154	

Note: * significant at p<0.05 level; ** significant at p<0.01 level; *** significant at p<0.001 level.

To explore the impacts of match and search features on users' PII concern, another t test was performed with PII concern as the dependent measure. The main effect of match on PII concern was significant ($t(293)=2.82$, $p<0.01$), with participants in the match-presence condition ($M=5.11$, $SE=1.35$) rating higher than participants in the match-absence condition ($M=4.64$, $SE=1.47$). The main effect of search on PII concern is also significant ($t(299)=3.42$, $p<0.01$), with participants in the search-presence condition ($M=5.44$, $SE=1.45$) rating higher than participants in the search-absence condition ($M=4.92$, $SE=1.32$).

The main effect of match on LGBTQ+ community connection was not significant ($t(293)=1.68$, $p=0.09$). The main effect of search on LGBTQ+ community connection was significant ($t(299)=3.48$, $p<0.01$), with participants in the search-presence condition ($M=5.71$, $SE=1.06$) rating higher than participants in the search-absence condition ($M=5.19$, $SE=1.45$).

The main effect of match on self-acceptance of sexuality was not significant ($t(293)=1.46$, $p=0.14$). However, search feature's main effects ($t(299)=2.91$, $p<0.01$) was significant in this analysis, such that participants in the search-presence condition ($M=6.02$, $SE=0.69$) rated higher than participants in the search-absence condition ($M=5.68$, $SE=1.18$).

Next, we examine the main effects on users' psychological well-being. The results show that only match feature's main effects ($t(293)=2.54$, $p<0.05$) was significant, with participants in the match-presence condition ($M=5.08$, $SE=1.29$) rating higher than participants in the match-absence condition ($M=4.72$, $SE=1.56$). Search was not found to have significant effect on users' psychological well-being ($t(299)=1.79$, $p=0.07$).

To summarize, the results of the experiments show that match feature has significant treatment effects on dating app users' privacy concern and psychological well-being. Search feature has significant treatment effects on dating app users' social support, privacy concern, community connection and self-acceptance of the sexuality. These results confirmed the findings in our survey study.

4. DISCUSSION

Dating apps play a crucial role in sexual minority individuals' social network building and community engagement. Through a series of one-on-one interview, we got in-depth understanding of LGBTQ+ individuals' opinion on dating app use experience. Based on an online survey with 190 LGBTQ+ people, we show that the match feature has a direct impact on user mental well-being, while the search and communication features influence users' well-being through providing LGBTQ+ users' social support in their identity developing process, promoting user acceptance of their sexual orientation, and helping users feel socially engaged in the LGBTQ+ community. We further verified the causality of the relationship uncovered in the survey. Our study advances the understanding of the potential outcomes of using dating apps and uncovers potential underlying mechanisms through which app use enhances user well-being.

Our findings reveal the differentiated effects of dating app features on LGBTQ+ people's psychological consequences. Our results show that communication feature impacts users' self-acceptance and community connection through social support, which highlights the important role of social support in developing LGBTQ+ individuals' gender identity. In addition, the search feature exerts significant positive impacts on social support, self-acceptance, and community connection, indicating that searching those app users who meet the specific requirements is more important than communicating with the general in developing a higher degree of self-acceptance and a good feeling of belonging to the LGBTQ+ community. Interestingly, match was found to have a direct significant influence on psychological well-being but not found to influence social support. This suggests match may directly improve the psychological well-being of those who seek dates via dating apps. The self-presentation feature did not appear to play a role in our model as a feature of dating apps. Our explanation is that people can have various motivations to adopt dating apps, such as date seeking, looking for casual sex, or friends and community connection. Self-presentation is a more individual-level romance-related feature, aiming at attracting other app users through pictures or text descriptions, which might have less impact on community-level outcomes.

The findings of our study also provide useful guidance and suggestions for mobile app developers in designing and developing better dating app products and for LGBTQ+ users in optimizing the benefits of social technology adoption. For example, since search features can promote self-acceptance and community connection, practitioners should focus on designing and advertising powerful searching features because users can benefit from this group of features.

Our results discovered the special needs of LGBTQ+ individuals for social support in self-acceptance of sexuality and community connection in order to improve their mental well-being and suggested designing the mobile app features according to these unique needs. This implication can be applied to feature design and selection of general products, that is, to consider the special needs of minority group customers and design inclusive products with those corresponding features to meet their needs.

5. CONCLUSION

In this study, we propose and test a comprehensive model of dating app features on a unique user group. We test how app features might have a downstream influence on user psychological well-being first through social support, followed by community connection and self-acceptance of one's identity. We found evidence that the use of LGBTQ+ dating apps helps users to gain a better evaluation of their personal and social psychological health, although these benefits varied based on different features. We also demonstrate that sexuality acceptance and community connection significantly positively affect well-being. We hope the findings of this study will provide some insights into LGBTQ+ research and inclusive product design research and broaden the prospect of operations research paradigms.

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Appendix

Table A1. Measurement Items

Communication (Finkel et al. 2012)
Communicate1: I use the app to easily communicate with potential partners.
Communicate2: I use the app to increases my ability to interact with potential partners.
Communicate3: I use the app to overcome time and place limitations for interacting with potential partners.
Self-presentation (Finkel et al. 2012)
Present1: I use the app to post pictures to show others an accurate reflection of who I am.
Present2: I use the app to post pictures for my profile to attract the potential matches.
Present3: I use the app to post information (e.g., age, height, weight, background) about myself.
Matching (Finkel et al. 2012)
Match1: This app generates good recommendations for partners.
Match2: This app generates large numbers of recommended partners.
Match3: Potential partners can easily be matched to me on this app.
Searching (Finkel et al. 2012)
Search1: I use the app to set up my own search criteria for partners.
Search2: I use the app to browse for potential partners based on my preferences.
Search3: I use the app to access useful information and knowledge about potential partners.
Social Support (Sherbourne and Stewart 1991)
Support1: I get help from other users when I want to learn about LGBTQ+ community.
Support2: I get good advice from other users regarding the LGBTQ+ community.
Support3: There is someone with whom I can enjoy talking about LGBTQ+ community.
Community Connection (Bateman et al. 2011)
Commitment1: I feel like a part of the group at LGBTQ+ community.
Commitment2: I have an emotional attachment to LGBTQ+ community.
Commitment3: LGBTQ+ community has personal meaning for me.
Commitment: I feel a sense of belonging to this LGBTQ+ community.
Self-acceptance of Sexuality (Camp et al. 2022)
Accept1: I accept my sexuality.
Accept2: I am comfortable with my sexuality
Accept3: I accept all parts of my sexuality
Accept4: I feel at peace with my sexuality
Accept5: I have come to terms with my sexuality
Psychological Well-being (Suh and Li 2022)
Well1: In general, how often do you feel positive?
Well2: How satisfied are you with your personal relationships?
Well3: To what extent do you lead a purposeful and meaningful life?
Privacy Concern (Self-developed)
Identity1: I am concerned about submitting personally identifiable information (e.g., face picture) on the app, because of what others might do with it.
Identity2: I am concerned about submitting personally identifiable information (e.g., face picture) on the app, because people around me (e.g., friends, colleagues) might find out my sexual orientation before I am able to disclose.
Identity3: I am concerned about submitting personally identifiable information (e.g., face picture) on the app, because others may recognize me.

Table A2. Inter-construct Correlation Matrix and AVE

	Mean	SD	Alpha	AVE	1	2	3	4	5	6	7	8
Accept	5.447	1.261	0.885	0.687	0.829							
Communicate	5.606	1.206	0.824	0.740	0.529	0.860						
Connect	5.522	1.258	0.869	0.719	0.477	0.583	0.848					
Match	5.512	1.215	0.856	0.776	0.550	0.805	0.535	0.881				
Present	5.457	1.236	0.815	0.729	0.537	0.768	0.566	0.805	0.854			
Search	5.556	1.227	0.837	0.754	0.569	0.762	0.627	0.744	0.707	0.869		
Support	5.496	1.293	0.883	0.810	0.508	0.708	0.798	0.658	0.620	0.707	0.900	
Wellbeing	5.127	1.258	0.791	0.704	0.454	0.489	0.449	0.548	0.517	0.512	0.457	0.839

Note: Accept = Self-acceptance of sexuality; Communicate = Communication; Connect = LGBTQ+ community connection; Present = Self-presentation; Wellbeing = Psychological well-being.

Table A3. Factor Loading

	Match	Search	Support	Accept	Connect	Communicate	Present	Wellbeing
Match1	**0.899**	0.621	0.602	0.522	0.511	0.727	0.747	0.491
Match2	**0.868**	0.635	0.560	0.415	0.443	0.687	0.710	0.518
Match3	**0.876**	0.712	0.575	0.513	0.458	0.712	0.669	0.439
Search1	0.678	**0.867**	0.587	0.451	0.518	0.666	0.616	0.404
Search2	0.649	**0.877**	0.634	0.536	0.562	0.692	0.615	0.453
Search3	0.613	**0.862**	0.620	0.492	0.554	0.627	0.610	0.475
Support1	0.578	0.638	**0.903**	0.435	0.690	0.623	0.536	0.399
Support2	0.565	0.627	**0.872**	0.457	0.723	0.595	0.524	0.408
Support3	0.630	0.645	**0.925**	0.478	0.741	0.691	0.611	0.427
Accept1	0.466	0.522	0.470	**0.755**	0.418	0.454	0.473	0.297
Accept2	0.449	0.431	0.389	**0.868**	0.356	0.448	0.412	0.374
Accept3	0.446	0.459	0.410	**0.872**	0.385	0.438	0.42	0.393
Accept4	0.476	0.487	0.389	**0.854**	0.394	0.470	0.494	0.457
Accept5	0.437	0.454	0.444	**0.787**	0.419	0.380	0.419	0.349
Connect1	0.525	0.668	0.743	0.423	**0.875**	0.582	0.542	0.459
Connect2	0.390	0.504	0.639	0.283	**0.814**	0.415	0.402	0.293
Connect3	0.447	0.495	0.660	0.466	**0.874**	0.487	0.470	0.363
Connect4	0.441	0.441	0.655	0.436	**0.826**	0.478	0.492	0.390
Communicate1	0.722	0.635	0.554	0.464	0.423	**0.844**	0.628	0.468
Communicate2	0.719	0.660	0.633	0.501	0.528	**0.881**	0.676	0.465
Communicate3	0.640	0.669	0.633	0.402	0.545	**0.854**	0.676	0.337
Present1	0.671	0.621	0.588	0.449	0.523	0.663	**0.874**	0.450
Present2	0.731	0.573	0.521	0.467	0.503	0.678	**0.852**	0.449
Present3	0.664	0.618	0.469	0.463	0.414	0.626	**0.835**	0.425
Wellbeing1	0.415	0.367	0.353	0.392	0.387	0.381	0.367	**0.844**
Wellbeing2	0.570	0.544	0.469	0.398	0.396	0.497	0.546	**0.835**
Wellbeing3	0.383	0.370	0.320	0.348	0.342	0.344	0.382	**0.838**

Note: Accept = Self-acceptance of sexuality; Communicate = Communication; Connect = LGBTQ+ community connection; Present = Self-presentation; Wellbeing = Psychological well-being.