Does Short-form Video Application Shape Your Life?
An Empirical Study of TikTok Usage and Persuasive Behavior Change in China

RUINA WANG
ABSTRACT

Persuasive Technology (PT) was pioneered by BJ Fogg. The theory has been developed in several aspects and applied in education, health, entertainment, and online shopping. Short-form video application TikTok first launched in the media market in 2016. During the global COVID-19 pandemic period, the growing popularity of TikTok helped it reach over 800 million users. As the new form of social media, it is persuasively shaping people’s life. The paper aims to investigate the relationship between behavior change and TikTok usage.

Quantitative and qualitative research methods were used to investigate 178 participants. The research mainly focused on Chinese university students whose ages are around 18 to 25 as the target group. The result shows that 57.3% of participants feel the behavior change and 15.7% of them are not sure about that. In the qualitative research, from the in-depth interview, participants who are not sure about the effect also make using TikTok a habit without perception.

The findings of this paper provide evidence that TikTok as a persuasive system has effects on users’ behavior and even changed their attitudes. The ethical concerns and sustainability are also discussed in the following parts.

ABSTRAKT


Kvantitativa och kvalitativa forskningsmetoder användes för att undersöka 178 deltagare. Forskningen fokuserade främst på kinesiska universitetsstudenter vars ålder är runt 18 till 25 som målgrupp. Resultatet visar att 57,3 % av deltagarna känner att beteendet förändras och 15,7 % av dem är inte säkra på det. I den kvalitativa forskningen, från djupintervjun, gör deltagare som inte är säkra på effekten också att använda TikTok till en vana utan uppfattning.

Resultaten av detta dokument ger bevis på att TikTok som ett övertygande system har effekter på användarnas beteende och till och med förändrat deras attityder. De etiska aspekternas och hållbarhet diskuteras också i följande delar.
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Author Keywords
TikTok; Persuasive System Design; User Behavior Change; Human-Computer Interaction

1 Introduction
Short-form video applications that have a duration from fifteen seconds to one minute, like Douyin Kuaishou first launched in the media market in 2016. In 2017, the international version of Douyin called TikTok was launched in the US market. During the global COVID-19 pandemic period, the growing popularity of TikTok helped it reach over 800 million users [6]. These applications are rewriting the social media experience, the boundary of this kind of application is not only limited to entertainment, but also expands to shopping, education, travel, and social activities. Many studies revealed that short-form video applications’ role in health care, entertainment, and education [15]. Therefore, studies of short-form video applications have been heated investigated, and discussed.

PT was first introduced by Fogg as “an attempt to change attitudes or behaviors or both” [7]. Researchers connected PT with social media platforms such as Facebook, Instagram, and the online video platform YouTube to investigate user behavior changes [5, 14]. However, few study explored how PT works in short-form video applications and how it changes users’ behaviors. Fogg claimed that: “people are more readily persuaded by computing technology products that are similar to themselves in some way, and they will be persuaded to change their attitudes or behavior in ways the product suggests” [7]. This also works for short-form video applications; users only receive the contents that they are interested in when using the application. This project plans to exemplify PT theory in short-form video applications and then use quantitative and qualitative researches to investigate how PT in short-form video applications influences user behaviors.

Now TikTok’s markets are not only in its home country: China, but also widely spread to the US, European, and South Asia markets. Under different country backgrounds and legal systems [18], TikTok usage has been restricted, for example in the US in 2020, Trump issued an executive to ban it. Considering the country’s background, China could be the entry to investigate the relationship between TikTok usage and persuasive behavior change. In this study, the author aims to investigate how the short-form video application shapes its user’s life, and try to find the
relationship between PT and TikTok user behavior change in China.

The rest of this paper continued as follows. In the next, the academic literature supports PT, persuasive system design model, and Fogg Behavior Model are described. The development of TikTok is also introduced. Then, the paper introduces the design concept of the whole research: TikTok analysis, target group, quantitative research, qualitative research. After the design part, data collection and result analysis are introduced. Finally, the relationship between PT and TikTok usage has been discussed. The ethical concern, sustainability, limitation, and future work are discussed in the same section, and then conclusions are drawn.

2 Related Work

2.1 Persuasive Technology

In 1997, Fogg first introduced the study of computers as persuasive technologies at CHI 97 [8]. In the next year, he defined that “a persuasive computer is an interactive technology that attempts to change attitudes or behaviors in some way” [9]. Berdichevsky and Neuenschwander mentioned the potential ethical issues such as accuracy, disclosure principles about the PT [3]. Later, Fogg exemplified how computers act as persuasive social actors [3]. After that, Kampik, Nieves, and Lindgren updated the definition that “persuasive technologies as information systems that proactively affect human behavior, in or against the interests of its users”. They also defined four core requirements for the new definition: intentionally persuasive, behavior-affecting, technology-enabled, proactive [14].

PT has been investigated in Facebook, Instagram, YouTube and other social media platforms by several researches. In Facebook, it uses PT to persuade users to take quick action with pointed outcomes, direct and perhaps annoying notifications were used to prompts users [26]. For Instagram, it uses persuasive strategy, such as logical persuasion to convince consumers that the product has special benefits that satisfy consumers [27]. YouTube uses its recommendation system to persuade it users to engaged in the application, so the user can be exposed to advertisements as long as possible and consume advertisements [28]. Although many studies use PT to analyze social media platforms, TikTok as a new form of social media, few study has connected it to PT. So the PT theory would be applied to analyze TikTok in this paper.

2.2 Persuasive System Design Model

As an extension of Fogg’s PT research, Oinas-Kukkonen and Harjumaa introduced the definition of a persuasive system: “a computerized software or information system designed to reinforce, change or shape attitudes or behaviors or both without using coercion or deception” [17]. The definition has three potential successful outcomes for a persuasive system: reinforcement, change, or the shaping of attitudes and/or behaviors [17]. Later, Oinas-Kukkonen and Torning introduced Persuasive System Design Model as a framework that is used for designing and evaluating persuasive systems. The model suggested four principles for a persuasive system: primary task, dialogue, system credibility, and social support [19]. The detailed feature of each principle can be seen in Figure 1.

![Figure 1: Principles and features of Persuasive System Design Model [19, 25]](image)

This model has been widely used to design and evaluate persuasive systems. It provides detailed definition and explanation of each feature. So in this paper, the model will be used to evaluate how TikTok works as a persuasive system. In addition, each feature would be observed in TikTok as well.

2.3 Fogg Behavior Model

The Fogg Behavior Model (FBM) was born in 2009 as a new way to understand drivers of human behavior. The FBM consists of three principal factors: motivation, ability, and triggers. In other words, a target behavior happening needs to have sufficient motivation, ability, and triggers at the same time [10]. People with high motivation and high ability will perform the target behavior when prompted. The model has been applied in social marketing campaigns and health interventions to address behavior change and make strategies [1, 16]. Both studies exemplified how FBM was applied and developed to motivate people to perform the target behavior persuasively. FBM connected PT and behavior change, which could be very helpful to investigate TikTok as a persuasive system to affect user’s behavior.
2.4 Development of Douyin and Tiktok

Douyin is a short-form video application that was launched by Chinese tech giant ByteDance in September 2016. Next year, Tiktok as the international version of Douyin was launched US market in September. Both of them are short video applications that are featured by 15 to 60-second videos, largely constituted of user-generated content. Douyin and TikTok have similar system infrastructures but they exist in different markets, so they are supported by different governance mechanisms [13]. Restricted by the governance, ByteDance is struggling to adapt to heightened scrutiny to do its business. Compared with the US market, Douyin has a more open and slack policy in China. Douyin’s e-commerce GMV (Gross Merchandise Volume) in 2020 was an impressive $77 billion, while TikTok was still testing e-Commerce for the next step [12]. As China is the research gate of this paper, TikTok we mentioned in the following section only means the Chinese version.

3 Research Method

This section would display the design of the study and the reason to choose the target group as participants. The research design is mainly divided into three parts: TikTok analysis aimed to identify the relationship between the persuasive system and TikTok, quantitative research used questionnaires to collect participant data, qualitative research conducted an in-depth review to investigate details about participant’s user behavior changes.

3.1 TikTok Analysis

This section of the study will use Persuasive System Design Model to evaluate whether TikTok is designed as a persuasive system, and how the four principles of the Persuasive System Design Model have been used in TikTok. Detailed analysis and proof of TikTok as a persuasive design model were shown below in Table 1. The crossed boxes indicate that the feature was observed and had proofs in TikTok, the empty box means that the feature had no applied evidence in TikTok.

<table>
<thead>
<tr>
<th>Principal</th>
<th>Feature</th>
<th>x: yes/</th>
<th>Proof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction</td>
<td>x</td>
<td>Users who watch and change different videos only need to scroll up and down.</td>
<td></td>
</tr>
<tr>
<td>Tunneling</td>
<td></td>
<td>TikTok provides different information content for different user groups, e.g. beginners and professionals.</td>
<td></td>
</tr>
<tr>
<td>Tailoring</td>
<td>x</td>
<td>Video contents are provided based on the user's watching history and user tag, and rank in your friends.</td>
<td></td>
</tr>
<tr>
<td>Personalization</td>
<td>x</td>
<td>If users shoot videos, the weekly report presents videos view time and visitor amount.</td>
<td></td>
</tr>
<tr>
<td>Self-monitoring</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rehearsal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praise</td>
<td>x</td>
<td>When users publish a video, TikTok would show a pop-up window to praise and encourage users to share it.</td>
<td></td>
</tr>
<tr>
<td>Rewards</td>
<td>x</td>
<td>TikTok rewards users money who invite friends to download and sign up for the first time.</td>
<td></td>
</tr>
<tr>
<td>Reminders</td>
<td>x</td>
<td>TikTok sends text messages or pushes messages to its users as reminders.</td>
<td></td>
</tr>
<tr>
<td>Suggestion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Similarity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liking</td>
<td>x</td>
<td>TikTok has its original filters, beautifying the</td>
<td></td>
</tr>
<tr>
<td>Social role</td>
<td>System Credibility Support</td>
<td>Social Support</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>appearance, it also has a sticker that allows users to interact with the app.</td>
<td>Official news, much TikToker use video to record, they provide their user experience.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Trustworthiness</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Expertise</td>
<td>Experts in different fields have their official accounts to share their core knowledge.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Surface credibility</td>
<td>The system should have a competent look and feel.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Real-word feel</td>
<td>Users can contact specific people through the message board or by sending individual messages.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Authority</td>
<td>For official accounts and expert accounts, they have an authentication tag that shows on their page.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Third-party endorsements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verifiability</td>
<td>Products on TikTok are supported by offering links to other shopping websites.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Social learning</td>
<td>Users can use TikTok to see others performing the behavior and the video played volume and liking amount.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Social comparison</td>
<td>Users can share and compare likes and favorites click amounts.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Normative influence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social facilitation</td>
<td>TikTok live provides links to the shop and the shopping data will be sent back to retailers, they sell products and TikTok gets trade fees.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Cooperation</td>
<td>Online friend competition, each week a weekly report shows who have most played video and likes.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Recognition</td>
<td>For users who have succeeded in reaching certainly played volume would be published to bigger groups to get more played volume.</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

### 3.2 Participants

In this study, Chinese university students are chosen as the study subject based on reasons: First, TikTok first launched in China in 2016, as the first marketplace, it becomes the most popular app in China. TikTok has 600 million daily active users, which account for over 60% of internet users in China [22]. Second, the average age of Chinese university students is between 18-24, which matches the majority of TikTok’s users that are 18-24 years old from first-tier Chinese cities [20, 23]. University students are relatively autonomous and free to choose apps and content according to personal preference. University students in different cities with different majors also provide diverse data to this study. Third, China has not released any regulations or laws relating to persuasive technologies. There are also no academic or social concerns about persuasive technologies in China. With the surge of short-form video apps and users in China, people’s awareness of persuasive technologies needs to be raised urgently. Participants were mainly reached by student group chats from four universities (Beijing Institute of Graphic Communication, Chongqing Technology and Business University, Beijing Language and Culture University, Shandong Normal University).

In total, 193 participants joined this research, 178 valid results were collected.

### 3.3 Quantitative Survey Design

The quantitative survey was conducted using online questionnaires. The questionnaire was structured with multiple-choice questions. The survey cycle lasted eight days, from November 5th to November 12th. The questionnaire consists of two sections: the demographics section about basic information, the TikTok usage section about user behaviors.

The demographics section includes age, gender, grade (freshman, sophomore, junior, senior, master, Ph.D. student), major, faculty of each participant.
The TikTok usage section surveyed participants’ Phone Operating Systems, phone usage habits, TikTok usage habits, and participants’ willingness to join the in-depth interviews. This section is comprised by following questions:

- Do you use TikTok? (response: Yes/No)
- How long do you use your phone every day or your screen time every day? (response range from below one hour to ten hours and above)
- How long do you use TikTok every day? (response range from below one hour to ten hours and above)
- Do you feel using TikTok affects your attitude or behavior, including study, work, entertainment, transport, healthy, social network, shopping, etc? (response: Yes/No/Not sure)
- Would you like to participate in an interview for around 30 minutes about TikTok usage? (If yes, please leave your contact information.)

3.4 Qualitative Survey Design
The qualitative survey adopted in-depth interviews as the survey method. The in-depth interview was conducted with six interviewees who have joined the survey and were willing to attend the in-depth interview. Interviews lasted 24 to 45 minutes. Six interviewees were chosen from 178 valid results of the survey before. The in-depth interview aimed to investigate the relationship between TikTok usage habits and the persuasive system, and whether TikTok has effects on users’ attitudes and behavior change. This interview cycle lasted four days, from November 28th to December 1st. The in-depth interview consists of the following questions:

- When did you download TikTok for the first time?
- Do you remember the reason you download TikTok for the first time?
- Can you tell me the frequency of using TikTok?
- Please indicate the environment and time or the occasions when you use your TokTok.
- What is the reason for you to use TikTok? Do you have more reasons to use it daily?
- Do you know Persuasive Technology and Fogg Behavior Model? (If yes, can you explain it briefly; If no, the interviewer will explain elaborately. Figure 2 would be presented to the interviewee)
- Discuss Persuasive Technology definitions and their applications in TikTok with the interviewee.
- Do you think TikTok has effects on your opinions and behavior? Why?

Interviews were conducted remotely by Wechat voice call and followed the local government recommendations on covid-19. All interviews were recorded with the consent of interviewees.

3.5 Data collection and analysis
Tencent survey was third party questionnaire tools. The author used Tencent survey to count, filter, and analysis data that collected from the quantitative research. Data from the qualitative survey were recorded by phone recorder. For the quantitative survey, 193 results were collected. After manually checking, 178 valid results were collected in the end. Quantitative data analyses were conducted by using Microsoft Excel and IBM SPSS Statistics 26. Screen time and TikTok time were analyzed in gender, major, grade, and Phone Operating System. The original interviews were transferred into transcription and recorded in Microsoft Word.

4 Results

4.1 Quantitative Survey Results
For the quantitative survey, 193 results were collected, and there are 178 valid results. There are 104 female participants (58.4%) and 74 male participants (41.6%) joined the research. Participants’ age ranged from 18 to 29, the main age groups were between 19 and 24 (see Figure 3). Phone Operating System was counted, there were three kinds in total: Android, IOS, and Harmony. There are 92 Android users, 62 IOS users, and 23 Harmony users, which accounted for 51.7%, 34.8%, and 12.9% separately (see Figure 4). According to statistics, participants are from nine disciplines: Engineering (n=36, 20.2%), Science (n=73, 41.0%), Medicine (n=1, 0.6%), Literature (n=19, 10.7%), Economics (n=26, 14.6%), Management (n=9, 5.1%), Law (n=4, 2.2%), Education (n=6, 3.4%), Art (n=4, 2.2%).

![Figure 3: Participant amount of age and gender](image)

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4.1.2 TikTok Usage

In 178 valid results, 122 participants (68.5%) use TikTok and 56 participants (31.5%) do not use it (see Figure 5). The average screen time of all participants is 5.94 hours per day. TikTok users’ average screen time is 6.04 hours per day, and non-TikTok users’ screen time on average is 5.72 hours per day. For participants who use TikTok spend more time on their phones than those who do not use it. The figure also shows a tendency that participants who use TikTok, their screen time is more concentrated between 2 and 8 hours; who do not use TikTok, their screen time is normally between 2 and 5 hours. In addition, different Phone Operating System shows connections with screen time. For participants who use TikTok, Android users average screen time is 5.86 hours per day, TikTok time is 1.93 hours per day; IOS users average screen time is 6.30 hours per day, TikTok time is 1.62 hours per day; Harmony users average screen time is 6.22 hours per day, TikTok time is 1.66 hours per day (see Figure 6).

There are 49 male participants and 73 female participants who use TikTok. Based on different gender, the average screen time for female participants is 5.85 hours per day and TikTok time is 1.67 hours per day; screen time for male participants is 6.32 hours per day and TikTok time is 1.99 hours per day. For female participants who use TikTok, their TikTok time accounts for 28.5% of their screen time. While male participants spend more time on TikTok, their TikTok time accounts for 31.4% of their screen time.

In 178 participants, there are 122 participants use TikTok. For participants who use TikTok, there is 68.0% (n=122) of them feel that using TikTok has effects on their attitudes and behaviors; only 33.9% participants (n=56) think
TikTok would not affect or not sure about the effect on human’s attitude and behavior (see Figure 8).

**Figure 8: Behavior effect and TikTok usage**

### 4.2 Qualitative Survey Results

#### 4.2.1 Participant information of in-depth interview

From 178 quantitative survey results, 43 participants are willing to join the qualitative survey. In the end, six participants were chosen randomly as the interviewees. The interviewees are from different majors, and their phone operating systems are different as well. The detailed information about interviewees can be seen in Table 2. In the following section, the participant’s number will be used as the abbreviation of each interviewee.

### Table 2: Participant information of in-depth interview

<table>
<thead>
<tr>
<th>Participant No.</th>
<th>Age</th>
<th>Gender</th>
<th>Major</th>
<th>Study Program</th>
<th>Grade</th>
<th>O S</th>
<th>Screen Time</th>
<th>Tik Tok Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>24</td>
<td>Female</td>
<td>Engineering</td>
<td>Environment Engineering</td>
<td>Master</td>
<td>IOS</td>
<td>8.5</td>
<td>3.5</td>
</tr>
<tr>
<td>P2</td>
<td>27</td>
<td>Male</td>
<td>Engineering</td>
<td>Geological Engineering</td>
<td>Master</td>
<td>IOS</td>
<td>6.5</td>
<td>3</td>
</tr>
<tr>
<td>P3</td>
<td>22</td>
<td>Male</td>
<td>Engineering</td>
<td>Materialogy</td>
<td>Senior</td>
<td>An droid</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>P4</td>
<td>19</td>
<td>Female</td>
<td>Literature</td>
<td>Journalism and Communication</td>
<td>Soph o</td>
<td>An droid</td>
<td>10+</td>
<td>5.5</td>
</tr>
<tr>
<td>P5</td>
<td>19</td>
<td>Female</td>
<td>Literature</td>
<td>Journalism and Communication</td>
<td>Soph o</td>
<td>Harmony</td>
<td>7</td>
<td>1.5</td>
</tr>
<tr>
<td>P6</td>
<td>19</td>
<td>Female</td>
<td>Management</td>
<td>Business Management</td>
<td>Soph o</td>
<td>Harmony</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

#### 4.2.2 TikTok Usage with Fogg’s FBM

After introducing concepts of PT and the FBM, interviewees were asked to describe their core motivation, simplicity factor, and triggers. Among six participants, all of them mentioned that pleasure as the core. All participants mentioned that by using TikTok, they found more interesting content than before, such as film narration, game commentary, funny video, dance video, etc. P1, P2, P4, and P6 also said they want to use TikTok to know the latest news and hot issues. In addition, P4 indicated that she also acted as a TikTok blogger to earn money. P6 said social acceptance is also one motivation to use it.

P4: “I think the core motivation for me to use TikTok is because it makes me happy. I can also use TikTok to earn money. By using TikTok, I can better understand the hot issues and new in the society and have common topics with my friends.”

P6: “It is funny to use TikTok, I can always get new information and videos that match my interests. TikTok has powerful algorithms, so it can always attract my attention and interest when I use it. Besides, the friends and classmates around me are using it, I want to know what they are watching so I want to use it.”

In simplicity factors, P1, P2, P3 and P5 think time is the most important factor to improve their ability. TikTok is famous for its short form that only lasts for 15 seconds, and the one-click switching function. P1, P2, P6 mentioned that TikTok improved the efficiency to get information, this can be viewed as a physics effort factor. Participants indicate that by using TikTok, they do not need to search or investigate in the website or other apps, the video will display the most important information interactively. All participants agree that the video form makes the content more direct and attractive, they are more willing to watch rather than to read. So this is also connected to the brain cycle factor.

P1: “Each video of TikTok only lasts for 15 seconds, even it has a longer time now, it still won’t be over 3 minutes. Especially in the odd time, I can not do so many things, the short time video has become the best way to kill time. It makes use of a small time period. Before TikTok lunched, I normally use websites or search engines to look at news, I spend most of my time picking the relevant topic or scrolling up and down. TikTok’s video saves my time and it can recommend the news I want to know, when I want to...
change content, the only thing I need to do is one-click switching. I can also enjoy the individuation active recommendation information service for free.”

P2: “I get used to using it when I am eating. Compared with movies or teleplay, which need to take at least one hour to watch the full part, TikTok 15 seconds video allows me to get the whole thing in a very short time. There is a lot of content about movie clips, so it saves my time to watch. I feel consistency is very important for me. If I could not watch a video in one time, when I choose another time to continue watching, I will lose the state and mood.”

P6: “I normally use TikTok to watch the news and hot issues. I think by the video form, the reality and facts can be shown more objectively than words. I seldom read comments below the video, I think those comments are involved with personal emotion, which will influence my opinion to some extent. But for other kinds of video content, I am open-minded, I think TikTok is the diverse platform to share and show your opinions.”

The responses of six participants showed high motivation and high ability to use TikTok. During the interview time, they didn’t talk too much about behavior triggers, most of them already get used to using TikTok at fixed times, such as lunchtime, commute time, and time before bedtime.

P1 and P3 indicated that they check TikTok frequently because it reminded them they receive new messages from their friends. As core motivation and simplicity factors are already satisfied for participants, the signal can be easily found as the behavior trigger.

P1: “I will open TikTok from time to time to see if my friends share interesting videos or information with me.”

P3: “I now choose more to interact with my friends through TikTok. When they share a video or post a new activity, I will click to watch it. I think TikTok is more like my real social platform.”

4.2.3 Evaluation of TikTok usage
During the interview, participants were asked to evaluate their TikTok time, most of them believe that they use it one to two hours per day, and P4 thinks the TikTok usage time is around two to three hours. When participants checked the TikTok usage time, P1, P2, P4 indicated that the use time of TikTok has exceeded expectations, much longer than expected.

P2: “I think my usage hours should be about one to two hours, but I didn’t expect it to be more than three hours. I usually look at it when I eat or before going to bed at night, but usually, I forget the time.”

4.2.4 Behavior change for interviewees
Participants first downloaded TikTok because of friend recommendations and advertising. P5 said she downloaded TikTok because of school curriculum research. From the first time they tried TikTok, they kept using it until now.

P1, P2, P3 think that using TikTok has changed their attitudes and behaviors, while P4, P5 are not sure about it, P6 thinks using TikTok does not affect her life.

For participants who think TikTok changed their attitudes and behaviors:

P1: “At the beginning, I use TikTok for pleasure, now I changed my usage habit a lot. I use it to study, listen to books and do shopping. By watching videos, it makes things more attractive than pictures. There are professional bloggers to share their experiences, and online shopping bloggers sell products at cheaper prices than normal online websites, and book readers share their opinion about a book. With these contents, my time and energy were saved, because I do not need to investigate by myself, more professional people have worked on it.”

P2: “I think TikTok changed my method of searching for problems and the way of thinking, even my self-control ability. I used to use Zhihu, Weblog to search problems, which are words answer. Now I prefer to use TikTok, there are various opinions, and I feel that all the answers or opinions are in line with my values. Sometimes, I cannot help to use it for a very long time.”

For participants who are not sure about the effect:

P4: “I already get used to using TikTok, I think it’s my daily habit to use it. I can see more things beyond my vision by using it. If I found contents are different from my perception, I would think that the difference between real-world and TikTok world.”

P5: “I’m not sure about the effect. I think perhaps there are some subtly affect, for example, I used to read books before sleep, now I watch TikTok more than read a book. But I don’t think it can really change my behavior or attitude.”

For participants who think there are no effects of using TikTok:

P6: “I only watch the contents or bloggers I like. It is only a channel for me to know the world, so it won’t change my behavior or attitude.”

Although few participants are not sure or deny the effect of using TikTok, their user habit has been cultivated by TikTok. Everyone uses TikTok at fixed times and opens it several times per day without feeling time flies.

4.2.5 Effect of TikTok
In the final part of the interviews, the effect of TikTok has been discussed. Participants believe the positive impact is greater than the negative impact. For positive impact, TikTok can bring happiness and fun to users, it improves the efficiency of time and broadens visions, it provides a platform to show personal life. For negative impact, participants feel that it wastes time, affects their thinking, and even spread anxiety. Many users feel addicted to TikTok, they cannot control themselves to stop watching. Some participants also feel the short time forces them to accept the opinion of the video, they don’t have time to think about it and immediately next video comes. Some bloggers use video content for false promotion, to create an illusion for their audience, which will mislead parts of users. Especially teenagers can be easily influenced as they don’t have a fully developed view of right and wrong, values, and worldview.
5 Discussion

This section aimed to analyze which type of behaviors has been affected by TikTok and how these behaviors are being performed by PT. To get a deeper understanding of the relationship between behavior changes and TikTok usage, ethical concerns and sustainability also have been discussed. In the final part, limitations and future work provide directions for the next step of research.

5.1 Behavior and Attitude Change

Although behavior change and attitude were mentioned in PT theory in the same time, there were subtle difference between each other. For behavior change, PT has proven effectively in helping people behavior change sever domains. For example, applications and systems help people stop smoking [29], eat healthily [30], increase physical activities [31]. In this study, the behavior change of TikTok would be user’s usage behavior change. For example, TikTok users get used to using other application to achieve some goals (online shopping, reading, film watching, travel and food guiding, etc.), while now they choose to use TikTok. Attitude refers to general individual evaluations regarding objects, places, people, and issues [32]. Attitude change affects the belief change on behavior change, so the persuasive attitude change can be viewed as the attitudes of the TikTok users are modified in the desired direction.

By using the persuasive system design model to evaluate TikTok, the author discovered that TikTok’s functions met the four principles of the model. From the analysis of quantitative research, 57.3% of participants have recognized that using TikTok has affected their behavior and attitudes, and 15.7% of participants indicated that they were not sure about that (see figure 8). The reason why they were not sure about the effect was related to the behavior change. TikTok used several design principles to help its users keep moving towards their target behaviors: keep users’ long-term content views and engagement in TikTok [24]. According to the qualitative research results, TikTok did get users following its target. Participants have formed the habit that when they have free time, they would open TikTok. In the beginning, users on this platform may only want to watch funny content. Now the fully developed platform affords more roles, such as online shopping, socializing, search engine, studying, etc. Participants indicated that the video form was more creditable than plain words description, they also said the video form was more attractive and easy to concentrate on. Especially under the pandemic social background, TikTok has become a crucial way to know the world outside. Three qualitative research mentioned that they started to buy products on TikTok now. In the past, they preferred to use Taobao, JD. From FBM and qualitative analysis, motivations like “pleasure/pain”, “acceptance/rejection”, “hope/fear” make persuasion more effective. The simplicity factors “time”, “money”, “physical effort”, “brain cycles” also facilitate the persuasive process. With a simple trigger, the likeliness to perform the target behavior would easily increase to a high level.

Persuasive triggers also played a crucial way to develop TikTok usage habits. Message notification, phone rings, red notification signal, friend online invitations, and so on, which helps users to get used to using it without notification. In addition, TikTok uses machine learning and natural learning process to collect and calculate users’ interests, users enjoyed the customized service, some of them were even addicted to it. Over half of qualitative research participants admitted that when they started to use it, it would be hard to stop using it. Meanwhile, videos with sound effects made users immersed in the contents, and the 15 seconds time also weakens the perception of time passage. Users did not feel time passage when they focused on the video contents, the sound, and visual effect would create an immersive environment to the one who use it. So when they realize to check the time, several 15 seconds time has been passed.

Participants also indicated that the recommendation algorithm of TikTok chose the video contents rather than themselves. When similar contents were constantly pushed to the participants, they would accept or believe the content opinion even their minds were contrary before. They also mentioned that for new things they first know by TikTok, the content they watched would leave deep impression. If similar contents were pushed several times, participants would believe that how the new thing works in the real life and would prefer to try or choose in the real life, even if the contents were fake creation, exaggerating the effect.

Based on the result analysis, TikTok can be proved as an application of PT, and it affects user behaviors and attitudes persuasively. For behaviors: Participants use TikTok longer and more frequently than before, TikTok was also used to achieve more goals rather to achieve one goal in one application than before. For attitudes: TikTok makes participants more acceptable of different opinions, and they think that video contents in TikTok are reliable than other applications.

PT can be a clue to analyze the relationship between behavior change and the usage of new media applications. Besides, the application designers also need to consider the long-term effects of user psychology and physics. Especially for newly emerged applications, which may enter into a “grey area” without limitations and related laws.

5.2 Ethical Concerns of TikTok usage

The qualitative research results from two participants are concerned about TikTok’s impact on children. The video contents on TikTok were created and edited by normal
users, contents would be sent to several target groups based on TikTok algorithms. Some violent and pornographic content may be directly distributed to underage users. Although TikTok has set the underage mode for teenagers below 18 years old, the registration and login process only need to use the phone number to verify the identification, and the real-name certification process is not mandatory.

In Europe, there are many discussions about ethical concerns, dark patterns of PT [3, 4, 11]. However, among 6 participants of qualitative research, even for participants from media backgrounds, no one knows before. In addition, there is no research about PT in China.

Three of six participants pointed out that their attitudes have been effect by the contents they watched in TikTok, they could feel the subtle effect but they did not realize that was PT. It was also evident that the participants in the qualitative research were lacking in understanding of how designing technology can affect human behaviors and attitudes, and they were changed subtly without perception and permission.

5.3 Impact of TikTok and Sustainability

The sustainability perspective is also important to evaluate the impact of TikTok. The contents on TikTok are based on user-generated content, according to the algorithm setting, high-volume or high-like rate contents would be sent to a bigger target group. So many users choose to copy or imitate personal original content, and some users edit film and television works and upload, which threatens the copyright of the original authors.

The video contents are also important regarding sustainability. Yong generations especially for generation Z, who are growing with TikTok and use it to raise their voices. It would be more important to operate a platform that guides them to behave properly than use artificial algorithms to attract users without limitation. In addition, TikTok also develops online live shopping businesses. TikTok’s anchors bundle two or three times the number of products, and they declared that they provided the lowest prices in the market with a limited time. Live shopping also used persuasive principles to attract users to do increased consumption, which leads to negative effects for the environment.

5.4 Limitations & Future Work

The study took quantitative and qualitative methods to investigate the research question. However, due to the time limitation, only 178 university participants joined the research, which may not enough to represent the whole university student group. More questionnaires should be distributed in the future. Besides, from the qualitative research, participants said some of them estimated their TikTok usage time rather than check it on the app. So the data collection and validation need to be improved as well. Considering the different study backgrounds of university students, more participants should be involved in the qualitative research. In addition, considering the good development of TikTok in China, the study chose Chinese university students as the target group. Future research should focus on different user groups in different districts.

5.5 Critical Evaluation of the Research

Humans behavior and attitude changes can be seen in many aspects in several ways. These changes happened subjectively based on humans’ self-awareness. Both of them as human’s activities are hard to distinguish the difference objectively. In this case, PT as a relatively well-developed theory of behavior and attitude changes, and there are several related researches can be referenced to help the study. So, the author chose to use PT as the guideline to conduct this research.

Behavior and attitude changes are not short time changes, although this study has found several changes, long time researches should be conducted in the future to find more influence factors and changes. PT is one way to analyze behavior and attitude changes, more theories could involve in to analyze changes in more comprehensive ways.

6 Conclusion

TikTok has been investigated in several fields, such as health care, entertainment, and education [15]. However, based on the author’s research, very little research has been done in this area that connected PT and TikTok user behavior change. The author believes that this work is fairly unique to investigate the relationship between PT and TikTok user behavior change.

Based on the results and discussion, the research question can be answered: Firstly, TikTok has been observed as a persuasive system to affect participants lives. Secondly, TikTok has effect on participant behaviors and attitudes. For behaviors, TikTok persuaded participants that changed their application usage habits and made them get used to using it in the fixed time. Participants attitudes also changed by using TikTok. It makes participants more acceptable of different opinions, and they think that video contents in TokTok are reliable than other applications.

Quantitative and qualitative research methods were taken to investigate 178 participants, who were university students in China. TikTok was identified as a persuasive system by using the Persuasive System Design Model at the beginning. From the quantitative research result, 57.3% of participants (N=178) indicated that TikTok influenced their behavior, and 15.7% of participants (N=178) were not sure about it. Combined in-depth interview with FBM, participants showed high motivation and high ability to perform the target behavior: using TikTok, TikTok also had its persuasive triggers to motivate and cultivate users to use it. Furthermore, the results also show that TikTok users in this study have blurry feelings about the passage of time.
These users as participants in this study have gotten used to using TikTok as a daily activity when they focused on the video content, the sound, and visual effect would create an immersive environment for users, so they would not realize or recognize the passage of time.

The evidence from qualitative research participants also shows that participants’ opinions have been affected subtly by using TikTok. Except for the research results, the author also discussed the ethical concern and sustainability perspective of TokTok usage. The designers of TikTok should also focus their attention on underage users’ usage and content copyright problems. This study can be the entry to investigate the connection between short video application and persuasive behavior change.

REFERENCES


