Research Article

Investigation of Hong Kong Students’ Esports Participation Intentions Using the Theory of Planned Behavior Approach: A Structural Equation Model

Pak-Kwong Chung,1 Kai-ling Ou,1 Ming Yu Claudia Wong,1 Ka-Lai Lau,1 and Ka-Man Leung2

1Hong Kong Baptist University, Kowloon, Hong Kong
2The Education University of Hong Kong, New Territories, Hong Kong

Correspondence should be addressed to Kai-ling Ou; 21482268@life.hkbu.edu.hk

Received 29 December 2021; Accepted 8 March 2022; Published 4 April 2022

Academic Editor: Zheng Yan

Esports have grown to become a core part of popular culture in many countries, including Hong Kong. Albeit the low participation rates in Esports in Hong Kong, it was starting to gain traction, yet the local Esports advocates were experiencing challenges in promoting and popularizing the Esport. Hence, the current study was aimed to identify and reveal the determinants of participating in Esports, as well as strengthen the work on Esports behaviors using the theory of planned behavior (TPB), a reliable and valid prominent theory in predicting human behavior across a plethora of contexts, ranging from health-related behaviors to sport consumption behaviors. In the current study, the convenience sampling method was used to recruit over 2000 students (secondary school, N = 1567 (female = 615); university students, N = 1525 (female = 255). The students were invited to participate in the survey for collecting their perception on Esports participation using TPB-based questionnaire. Results were analyzed using theoretical analysis and structural equation modeling (SEM). The results show that both secondary school and university students have positive attitudes toward Esports. The outcomes indicated that participating in Esports develops social networks, and people with professional Esports’ skills capability and being fortitude tend to be models of Esports participation. However, inadequate resources are a significant barrier to participation in the Esports business. The SEM model verified that the variables of intention in Esports participation among the students in Hong Kong with an adequate goodness of fit index. As a whole, the current study has identified the factors and determinants of Esports’ intention and behavior among Hong Kong students, which were successfully displayed in terms of the theory of planned behavior. In addition, the findings are expected to provide the Hong Kong government with a documented framework to advocate Esports-related policies on a long-term basis.

1. Introduction

The last decade has seen a rapid rise of Esports around the globe. Once considered a fringe activity [1], Esports has become a core part of popular culture in many countries. Industry reports such as the one from Newzoo [2] substantiate this observation. The report revealed that in 2019, the number of global audiences for Esports was 443 million, and the industry made US$950 million. Even more staggering is the fact that these numbers are expected to grow even higher. The same report forecasted that by 2023, the Esports audience number would rise to 646 million, and the industry will become a US$1.56 billion business.

However, since Esports has evolved from video game competitions in the 1950s [3], a negative reputation has always been attached. According to the Oxford dictionary (2018), video games are variously referred to “A game played by electronically manipulating images produced by a computer program on a monitor or other display,” without competition system or prizes involved. Despite video games are
considered as drivers of all Esports activities and competitions, Esports refers to “A multiplayer video game played competitively for spectators, typically by professional gamers.” It requires skills, strategies, tactics, rules and regulations, institutionalized, teamwork, prize, and training, thus implies physical exertion and motivated performance by the internal and external awards [4]. Hence, its “sportification” nature makes it similar to traditional sports [5]. Yet, there were still different negative consequences of Esports which are well-documented in both the popular and research literature; some of the examples included adverse health impact [6, 7], detrimental to academic pursuit, discrimination, and toxic online gaming culture [8, 9].

Despite the questionable reputation, Esports is thriving in many places, especially among the youth population. In addition, more and more science educators are using video games as a means to engage students in inquiry-based science learning [10]. Under this backdrop, the sport marketing researchers are prompted to explore the motivators driving this current high level of engagement from the public, both as players and spectators. Subsequently, a wealth of research on this subject matter has been conducted. Nonetheless, there are still some places where Esports is only starting to gain traction, and the local Esports advocates are experiencing challenges in promoting and popularizing the sport.

Hong Kong, which has been slower than other Asian countries and regions in the development of Esports, did not have its first Esports tournament until 2016. Comparing with its neighboring regions and countries, the development of Esports in South Korea, Mainland China, and Singapore were originated in 1997, 2003, and 2008 [6, 11, 12]. There is a high level of interest and engagement in video games among Hong Kong youth. Studies have shown that video gaming is prevalent among local students. In a study that tracked the digital devices’ usage of 7585 primary school students, it was found that 36.9% of them spent most of their screen time on video gaming [13]. Another study that involved 2006 primary school students also revealed that, on average, they spent 3.6 days and over 8 hours on gaming per week [14]. However, when it comes to adolescents aged 15–29 years, a survey showed that relatively less of them (13.4%) had participated in Esports competitions in the last 6 months [15].

Given this scenario, there is an apparent unalignment between the high interest of video gaming and the rate of Esports participation. To better understand, the grassroots information about their perceptions of Esports participation in order to predict future Esports behaviour and to help practitioners in Esports developing areas design a comprehensive Esports marketing strategy. The present study aims to develop a model that can serve this purpose. This model’s components are derived from the Esports Participation Questionnaire, an instrument developed by utilizing the theory of planned behavior (TPB) [16]. The three dimensions that comprise the TPB-attitude toward the behavior, subjective norms, and perceived behavior control provided the theoretical platform to delineate individuals’ perception of Esports and demonstrate how that perception impacts the intention and behavior toward Esports.

This study will also further extend the literature on Esports behaviors. The research team argues that the benefit of employing TPB to examine Esports behaviors is twofold. First, this approach reveals the factors that influence the intention to engage in the activity. Second, it also allows the researchers to validate if there is a disconnection between the intention to participate in Esports and the actual Esports behavior, which causes the low participation rate of Esports in Hong Kong. At the field level, the findings from this research should afford the industry practitioners with information to design an effective strategy to educate and market Esports to the public. It will be crucial in building a core fan-base to further develop and substantiate the Esports industry locally.

2. Literature Review

The rapid growth of Esports and its economic development potential had been noted in Hong Kong, where Hong Kong Esports (HKE) Limited was established in 2013. Since then, it has been hosting the Hong Kong Esports Finals annually [17]. Subsequently, several other Esports organizations were also established, namely, Hong Kong Student Esports Association in 2013 and “E-sports Association Hong Kong” (E-sports Association Hong Kong) in 2015. In 2017, the government funded HK$35 million for the first Hong Kong Esports Festival, which attracted around 50,000 video games, K-pop fans, and tourists to Hong Kong. In the 2018–2019 budget, the government allocated HK$100 million to Cyberport to promote the Esports industry’s development.

While the government in Hong Kong has started providing financial resources to jumpstart the industry, the development of Esports is still considered at the infancy stage. In comparison, Esports amass to substantial economic returns in other countries. According to an analysis of individual markets from Newzoo [18], other significant markets besides China include the US (with 186 million players, 48.5 million Esports audience, and generated US$32.9 billion revenue), Japan (with 66.8 million players, 12.4 million audiences, and US$17.9 billion in revenue), and South Korea (with 28.4 million players, 12.1 million audiences, and US$5.76 billion in revenue). Moreover, it should be noted that even though China has the most significant market with the sheer volume of players and revenue generated, South Korea is considered by many the birthplace of professional Esports [19–21]. Esports has been developed for a much longer time in Korea and is entrenched into the mainstream culture [21]. It is just as typical for a group of people going to the internet café called PC bang locally to play Esports as going to the movie theatres on the weekends.

Given the Esports development level in our neighboring countries, it is evident that Hong Kong has a lot of room to grow in Esports. Yet amid the tremendous economic potential Esports can offer, the current Esports participation rate in Hong Kong is relatively low. One of the reasons can attribute to the public’s negative attitude toward Esports/gaming. For the most part, they are concerned with the impact of Esports participation and long screen time on mental and
physical health, such as gaming addiction or risky behaviors [22, 23].

Previous local research has highlighted such concerns. In 2014 and 2017, the Department of Health, Hong Kong (DH), surveyed the healthy use of the Internet and electronic screen products among students from 24 local secondary schools across the territory. The survey found that 33.9% of secondary school students spent more than 3 hours a day on average on internet and electronic screen products. Furthermore, over 70% of parents reported that they had arguments with their children about their screen time. Although the public also expressed concerns about video games, such as “gaming addiction,” however, there is currently little clarity that has been achieved in terms of diagnosing the criteria and appropriate symptoms of “gaming addiction,” as “video game addiction” is not a stable concept and clinical impairment may be low; given the ongoing controversy, the classification of video game addiction as a mental disorder is premature [24].

Instead of predicting the negative uncertainties of the Esports industry, it is better to embrace the industry as a new zeitgeist and harness its features to bring potential benefits it brings to society. More recently, increasing research has shown the benefits of playing active video games, specifically physical and psychological health [25–27]. Merino-Campos and colleagues [28] conducted a systematic review on benefits in skills and health, and the results found that active video games could improve motor, intellectual, and physical capacities related to physical activity and education, such as increased moderate-vigorous physical activity. These positive outcomes were also established in Chinese studies [27, 29]. Other technical skills including improvement in visual-spatial abilities, hand-eye coordination, and action speed were also suggested to be connected to the practice of Esports [1, 30–32]. To further demonstrate the physical aspect of Esports participants, Kari, Siutila, and Karhulahti [33] conducted a three-year mixed quantitative and qualitative studies among 115 professional Esports players. The results showed 55.6% of them did physical exercises to contribute to their Esports career, and on average, they spent 1.08 hours daily on exercising. In terms of Esports player’s mental health, lots of researchers found that Esports helped to improve self-regulatory skills, as well as cognitive, motivational, emotional, social benefits, and life goal achievement [1, 31, 34, 35].

As there is a lack of consensus on the impact of Esports/gaming currently, it is reasonable to believe that there is room for Esports advocates to change the public’s perception of the sport. Moreover, for a developing market like Hong Kong, the field practitioners must have grassroots information that can help them to devise a comprehensive marketing strategy. For these reasons, the current study aims to access the people’s view on Esports participation in Hong Kong. Specifically, the study will focus on the local youth population. According to Cyberport [17], most of the population playing Esports in Hong Kong were age 15 to 21 years old (85%). Developing the Esports industry to keep pace with the world will help promote the Hong Kong economy and create more divertive career opportunities for local young people. In line with this thinking, the current study aims to (a) examine the participation of Esports among secondary and university students in Hong Kong; (b) use theory-based determinants (the attitude, perceived norms, and perceived behavioral control) to explore the participants’ perception toward Esports among secondary and university students in Hong Kong; and (c) to examine the relationship among the determinants using the theory of planned behavior model.

2.1. The Theory of Planned Behavior and Research in Esports Behaviors. TBP has been a prominent theory in predicting human behavior across a plethora of contexts, ranging from health-related behaviors [36, 37], volunteer behavior [38, 39], physical activity and exercise [40, 41] to sport consumption behaviors [42–44]. The theory was extended from Ajzen and Fishbein’s previous work on the theory of reasoned action (TRA) [45, 46]. TRA was evolved from Fishbein’s [47] work on the relationship between attitude and behavior. Under this premise, the attitude refers to the individual’s evaluation of the behavior and the expected outcome for undertaking said behavior [48]. The gist of TRA is that the proximal determinant of volitional behavior is the behavioral intention, and the intention embodies an individual’s conscious decision to put in the effort to execute the said behavior [49]. In TRA (and later TBP), behavioral intention is influenced mainly by an individual’s attitude toward the behavior; thus, it acts as a mediator between attitude and behavior [50].

Another determinant in the TRA is termed as subjective norm. It depicts the social pressure individual encounters from the significant people or groups to undertake (or not undertake) the said behavior. Critically, TRA was posited within the perimeter where the said behavior was volitional. Therefore, as Fishbein [51] alluded to later, the predictability of this TRA model was not as efficient when (1) the said behavior was not wholly volitional, (2) there was a choice problem involved in the scenario, and (3) the individual’s intention was measured when insufficient information was available to formulate a confident intention ([52], p. 325). A third component, perceived behavioral control (PBC), was introduced to the TRA model to rectify this limitation. As a result, TBP was formed.

PBC concerns situations when the behaviors are not completely volitional, when the individual’s perception of control over the said behavior would affect their intention toward the behavior, thus contributing to the prediction of behavior. In essence, this dimension entails “the perceived ease or difficulty of performing the behavior” ([16], p. 188). Furthermore, it is also related to the individual’s perception if they have the necessary skill and resources to undertake the behavior and the potential obstacles presented in relation to the execution of the behavior ([53], p. 474). Essentially, TBP has remedied the shortcoming of TRA by enhancing the applicability of this original theory to those more complex behaviors that are not necessarily volitional. In line with this view, the TBP model looks pertinent in the current research context, especially when Esports is developing in Hong Kong. The perceived lack of skills from
the players and the shortage of opportunities to participate regularly can be considered obstacles that influence the PBC. Consequently, it can impact the behavior intention toward Esports as well.

The research of Esports behavior thus far has been mostly revolved around the motivations for consumption (e.g., [32, 54–57]), and only a few have incorporated a predictive element into their studies (e.g., [58, 59]). Therefore, with the utilization of TPB, this study intends to continue this line of research and to further expand the work on Esports behaviors through an established behavioral theory. This study will also look to provide the industry practitioners with information that would aid them in predicting consumption behaviors from the potential clients.

3. Method

3.1. Participants. Based on the survey conducted by Cyberport [17] and Hong Kong Federation of Youth Groups [15], the major population of Esport players was aged 15–29 years old. Hence, the population of this study was Hong Kong secondary school and university students aged 29 years or below. Other inclusion criteria for participants are permanent residency in Hong Kong and literacy in Cantonese.

In the current study, a total sample size of 2115 students has participated in the survey, which is an adequate sample size to an estimated parameter (at least 10:1 ratio) for confirmatory factor analysis and structural equation modeling as suggested by Hu and Bentler [60]. Also, this sample-sized has met the guidelines of conducting a population-based survey suggested by the World Health Organization [61], which is within 2% of the true population of Esports based on the findings of Hong Kong Federation of Youth Groups [15].

3.2. Procedures. The period of this study was from March to September 2020. At first, the newly developed questionnaire had gone through a pilot test with five university students (three of them were participants and two nonparticipants) and two Esports experts from ER Esports to evaluate the questionnaire’s length, wording, and formatting. Before data collection, an invitation letter was sent to randomly selected secondary schools. Both paper and web-based questionnaires with consent forms were provided to the schools as options. Due to the COVID-19, there was no positive reply from the selected schools, so convenience sampling was applied to reach other schools in the districts. With principals’ consent, a trained research assistant sent web-based questionnaires or handed out paper questionnaires for data collection to the responsible teachers.

An invitation e-poster attached with a QR code for the web-based questionnaire was sent to students via mass email for the universities. In schools where we could not obtain the student mailing lists, the e-poster was sent to the student affairs office or physical education teachers at the school for promotion. All participants completed only one time, and the average completion time was with 10 minutes. Prior to administering the questionnaires, permission was granted from the institutional review board for research with human subjects of the university. Informed consent forms accompanying the questionnaires were sent to secondary schools for approval by the principals and parents prior to recruitment of students under the age of 18. Similarly, an informed consent form was attached to the web-based questionnaire, and before completing the questionnaire, participants were asked to tick a box to clearly read the study and sign their consent to participate in this study. After collecting data, all participants were entered into our random drawing, and 50 winning students received HK$500 supermarket vouchers. Participants were informed of the confidentiality of the data and free to discontinue their participation in this study.

3.3. Measures. Participants were asked to respond to questions about their demographic information, including their age, gender, education level, school, housing, and family income. Next, based on the theory of planned behavior (TPB), Esports Participation Questionnaire was developed to explore Hong Kong teenagers and young adults’ Esports participation and their respective attitude toward the sport.

The Esports Participation Questionnaire [62] uses standardized questions, tapping into TPB constructs to measure participants’ attitudes, subjective norms, and perceived behavioral control (direct measures), and indirect measures as suggested by Ajzen [16]. The questionnaire was on a 5-point Likert scale. The items of the direct measures included the following:

(1) Intention to participate in Esports in the coming six months (4 items)

Example question: “In the coming six months, I will participate in Esports competitions” 1 (strongly disagree) to 5 (strongly agree)

(2) Attitude toward Esports participation (4 items)

Example question: “Do you think your participation in Esports competition in the next six months will be?” 1 (very harmful) to 5 (very beneficial)

(3) Subjective norms about participating in Esports (4 items)

Example question: “Many people or groups I value think I should be competing in Esports in the next six months” 1 (strongly disagree) to 5 (strongly agree)

(4) Perceived behavioral control of participating in Esports (4 items)

Example question: “It will be easy for me to compete in Esports in the next six months” 1 (strongly disagree) to 5 (strongly agree)

Apart from the standardized questions for direct measures, the indirect measures’ items were developed based
on the results of the qualitative study [63]. The interview
guide of this qualitative study was developed using TPB; the
results revealed the perceptions of Hong Kong younger
adults on the beneficial and deleterious outcome, subjective
norms, and barriers and facilitators of Esports participation.
According to the above outcome, a residual section on the
questionnaire, the indirect measure, was identified following
Ajzen’s [64] questionnaire structure to examine more Hong
Kong teenagers’ behavioral, normative, and control beliefs
on Esports’ participants.

For behavioral beliefs, items are formulated to assess the
strength of the behavioral beliefs and the evaluation of the
outcome or experience. It includes Hong Kong teenagers’
views on the beneficial and deleterious outcomes (goal set-
ting and achievement, physical health, socialization and
teamwork, psychological benefits, academic and time distrib-
ution, physical strain, negative social image, and perception
toward Esports participation). The example questions were
below:

(1) Benefits outcome: increase social skills

   Behavioral belief strength

   “My participation in Esports in the next six months will
   increase my social skills (meeting new people, improving
   friendships),” 1 (strongly disagree) to 5 (strongly agree)

   Outcome evaluation

   “Increase my social skills (meeting new people, improv-
ing friendships) is…” 1 (extremely bad) to 5 (extremely good)

(2) Deleterious outcome: time-consuming

   Behavioral belief strength

   “My participation in Esports competitions in the next six
   months will be time-consuming),” 1 (strongly disagree) to 5
   (strongly agree)

   Outcome evaluation

   “The time-consuming for me is…” 1 (extremely bad) to 5
   (extremely good)

   Normative beliefs are formulated to assess the strength
   of the normative belief and the motivation to comply with
   the referent individual or group. It includes participants’
   perceived social norms (people with particular characteris-
tics or conditions as modeling) or significant others (parents,
   peers, teachers). For example:

   (1) Significant others: parents

   Injunctive normative belief strength

   “Do my parents and family think I should compete in
   Esports in the next six months?” 1 (strongly disagree) to 5
   (strongly agree)

   Motivation to comply

   “I want to do what my parents and family think I should
do”, 1 (strongly disagree) to 5 (strongly agree)

   Control beliefs are formulated to assess the likelihood
   that the factor will be present and the factor’s power to fac-
   ilitate or impede performance of the behavior. It is about the
   barriers and facilitators (balance between academic and
   Esports, capability, career prospect and future reality, psy-
   chological benefits, and peer encouragement and support)
of participating in Esports. For example:

   (1) Sample control factor: academic hindrance

   Control belief strength

   “I expect my academic to be hindered by my participa-
tion in Esports in the next six months.” 1 (strongly disagree)
to 5 (strongly agree)

   Power of control factor

   “The academic hindrance will make it easy for me not to
   compete in Esports for the next six months.” 1 (strongly dis-
   agree) to 5 (strongly agree)

   According to Ajzen [65], the equation of indirect mea-
sures is summing the products of control belief strength
times perceived power, for example, if participant perceived
the belief strength of participating Esports in the next six
month will increase he/she social skills is 4, and the per-
ceived power of increase my social skills is 5, then the total
perceive behavioral control of social skills is 4 times 5, which
is 20, hence, the maximum rating of the indirect factors will
be 5 times 5 is equal to 25.

   The reliability and validity of the Esports Participation
   Questionnaire were documented as well. All scales involved
in the questionnaire showed adequate internal consistency
with Cronbach’s α above 0.8. It showed adequate goodness
of fit indices in all subscales, with all subscales’ chi-square
values below 5, comparative fit index (CFI) and non-
normalized fit index (NNFI) rated 0.90 or above, and standard-
ized root mean square residual (SRMR) and root mean
square error of approximation (RMSEA) values below 0.08
[66]. Because the confirmatory factor analysis showed some
different outcomes among the secondary school students
and university students, some different outcomes were
deleted correspondingly to access the goodness of fit model;
however, to show more determinants of Esports intention of
participants, this study separate two samples (secondary
school and university students) for analysis (please see
Figure 1 for the investigation model).

3.4. Statistical Analyses. The data were analyzed using Statis-
tical Package for the Social Sciences (SPSS) (Version 26).
Descriptive statistics, such as frequency, mean, and standard
deviation, of the demographic information and the TPB vari-
bles or factor were computed to examine the prevalence of
Esports participation and the factors influencing Esports
participation among Hong Kong secondary school and uni-
versity students. An independent t-test was done to identify
potential differences in the influencing factors between
Esports players and general secondary school and university
students, as well as between gender. The TPB model factors
were also computed to examine the prevalence of Esports
participation and the factors influencing Esports participa-
tion among Hong Kong university students. Pearson corre-
lation was used to analyze the relationship among the
influencing factors among participants’ intention and behav-
ior in playing Esports. The confirmatory factor analysis
(CFA) and structural equation modeling (SEM) were con-
ducted by using the LISREL (Version 10.3). Under the usage
of the maximum likelihood estimation (MLE), the goodness of fit models were determined according to the following criteria: (1) chi-square ranged 2 to 5, (2) comparative fit index (CFI) [60] and non-normed fit index (NNFI) rated as .90 or above as a model of good fit [60], (3) standardized root mean square residual (SRMR) value of .08 or below as a model of good fit [60], and (4) root mean square error of approximation (RMSEA) value as .08 or below with a 90% confidence interval that holds within this value which was considered as a model of good fit [66].

4. Results

4.1. Demographics. In the current study, twenty-five secondary schools have agreed to participate in this study. These schools were located in 11 Hong Kong districts (New Territories and Hong Kong Island). A total of 1576 students have completed the web-based and hardcopy questionnaires. After data clearance that excluded the missing and outliers, 1164 (male = 533; female = 615) valid data were included in the study. Among the secondary school students, forty-eight of them had participated in Esports in the last six months. Because according to the psychometric properties measurement of TPB mode [62], good fit when separated secondary school and university samples. Therefore, in this study, the two samples of secondary schools and universities were analyzed separately.

On the other hand, ten UGC-funded universities with 1525 web-based questionnaires had been returned. After data screening and cleaning of cases from incomplete questionnaires, 951 university students went into further data analysis. Among the 951 students (male = 490; female = 255), 56 participated in Esports in the past half years. Most of them were degree students (60.5%) studying in Kowloon City (78.2%), and nearly 27.3% of students reported that their household income was USD 3,850 or higher. Participants’ demographics are shown in Table 1.

4.2. Esports Competition Participation. The survey started off by inquiring about the participation of both secondary and university students in Esports competition in the past six months. Most of the secondary students (95.9%) did not participate in any Esports competition during the period, with only 4.1% (n = 48) answered they did. Those who had participated in Esports in the stated period had competed on average about 19 times in the past 6 months (SD = 93.55). Regarding the time spent on Esports competition and practice, they spent on average 19 hours (SD = 39.93) each month on competition and 3.5 (SD = 4.27) hours daily on practicing.

For the university student, a vast majority of them (94.1%) also stated they did not participate in any Esports competition in that period, with the remaining 5.9% said they did. For those university students (n = 56) that had Esports experience, on average, they participated 14.25 times (SD = 44.83) during the six months, somewhat lower than the secondary students. The average number of hours they spent on Esports competition each month was 20 hours (SD = 39.6) and 2.68 hours (SD = 2.75) each day. Both figures (average time spent per day and per month) are fairly close to those of secondary students.

Regarding their favorite games, the two favorite games among the secondary students who competed in Esports were PUBG (45.8%) and Rainbow 6 (39.6%), while PUBG (41.1%) and League of Legends (LOL) (39.3%) were the preferred game of choice among the university Esports competition participants. Most of the respondents’ parents (62.5%) in secondary group knew about the Esports participation and showed support (68.8%). And 78.6% of the parents in university group knew the respondents competed in Esports; among these respondents, 62.5% feel their parents supported their involvement. Esports participants are shown in Table 2.
(both participants and nonparticipants) was slightly positive ($M = 3.28$, $SD = 0.63$). Yet, they also felt negative about receiving support from the significant others or group ($M = 1.99$, $SD = 0.89$) on participation. Additionally, they had a negative perception ($M = 2.63$, $SD = 0.92$) about the ease of participating in Esports competition over the next six months. As a result, they had a low intention level ($M = 2.06$, $SD = 0.96$) to participate in Esports competition.

### Table 1: Sociodemographic characteristic of participants (secondary school, $N = 1164$; university, $N = 951$).

| Age | Secondary School | Age | University students | Age |
|-----|------------------|-----|---------------------|-----|
| Below 15 yrs. | 47 | 40.0% | Yes | 48 | 4.1% |
| 15-19 yrs. | 1098 | 94.3% | No | 1116 | 95.9% |
| 20-25 yrs. | 12 | 1.0% | |  |  
| N/A | 7 | 0.6% | |  |  
| Gender | | | |  |  
| Male | 533 | 45.8% | |  |  
| Female | 615 | 52.8% | |  |  
| N/A | 16 | 1.4% | |  |  
| Participate Esports in last 6 months | | | |  |  
| Yes | 48 | 4.1% | |  |  
| No | 1116 | 95.9% | |  |  
| Secondary grade | | | |  |  
| Form 1 | 3 | 0.3% | |  |  
| Form 2 | 31 | 2.7% | |  |  
| Form 3 | 478 | 41.1% | |  |  
| Form 4 | 531 | 45.6% | |  |  
| Form 5 | 78 | 6.7% | |  |  
| N/A | 43 | 3.7% | |  |  
| School location | | | |  |  
| Kowloon City | 1 | 0.1% | |  |  
| Yuen Long | 104 | 8.9% | |  |  
| Northern District | 146 | 12.5% | |  |  
| Southern District | 14 | 1.2% | |  |  
| Tuen Mun | 110 | 9.5% | |  |  
| Sha Tin | 304 | 26.1% | |  |  
| Shum Shui Po | 69 | 5.9% | |  |  
| Wai Chai | 40 | 3.4% | |  |  
| Tsuen Wan | 1 | 0.1% | |  |  
| Kwai Chung | 4 | 0.3% | |  |  
| Kwai Tsing | 226 | 19.4% | |  |  
| Sai Kung | 32 | 2.7% | |  |  
| Kwan Tong | 112 | 9.6% | |  |  
| N/A | 1 | 0.1% | |  |  
| House type | | | |  |  
| Private house | 281 | 24.1% | |  |  
| Homeownership scheme | 155 | 13.3% | |  |  
| Public housing | 607 | 52.1% | |  |  
| Others | 84 | 7.2% | |  |  
| N/A | 37 | 3.2% | |  |  
| Household income | | | |  |  
| USD2,567 and below | 375 | 32.2% | |  |  
| USD2,567-USD3,850 | 368 | 31.6% | |  |  
| USD3,851-USD5,134 | 189 | 16.2% | |  |  
| USD5,135-USD6,418 | 57 | 4.9% | |  |  
| USD6,419 and above | 81 | 7.0% | |  |  
| N/A | 94 | 8.1% | |  |  

### (b)

| Gender | Secondary School | |  |  
| Male | 255 | 26.8% | |  |  
| Female | 490 | 54.5% | |  |  
| N/A | 206 | 21.7% | |  |  
| Participate Esports in last 6 months | | | |  |  
| Yes | 56 | 5.9% | |  |  
| No | 895 | 94.1% | |  |  
| Educational Background | | | |  |  
| Diploma | 62 | 6.5% | |  |  
| Sub-degree | 66 | 6.9% | |  |  
| Degree | 575 | 60.5% | |  |  
| Others | 42 | 4.4% | |  |  
| N/A | 206 | 21.7% | |  |  
| School location | | | |  |  
| Kowloon City | 492 | 51.7% | |  |  
| Sha Tin | 66 | 6.9% | |  |  
| Sai Kung | 13 | 1.4% | |  |  
| Tai Po | 20 | 2.1% | |  |  
| Tuen Mun | 77 | 8.1% | |  |  
| Yau Tsim Mong | 19 | 2.0% | |  |  
| Kwai Tsing | 33 | 3.5% | |  |  
| Central and West | 3 | 0.3% | |  |  
| Kwan Tong | 2 | 0.2% | |  |  
| N/A | 226 | 23.8% | |  |  
| House type | | | |  |  
| Private house | 262 | 27.5% | |  |  
| Homeownership scheme | 130 | 13.7% | |  |  
| Public housing | 295 | 31.0% | |  |  
| Others | 58 | 6.1% | |  |  
| N/A | 206 | 21.7% | |  |  
| Household income | | | |  |  
| USD2,567 and below | 247 | 26.0% | |  |  
| USD2,567-USD3,850 | 242 | 25.4% | |  |  
| USD3,851-USD5,134 | 134 | 14.4% | |  |  
| USD5,135-USD6,418 | 49 | 5.2% | |  |  
| USD6,419 and above | 73 | 7.7% | |  |  
| N/A | 206 | 21.7% | |  |  

Human Behavior and Emerging Technologies
4.4. Esports’ Participation Influencing Factors: Indirect Measures of TPB. Based on the indirect measures of the TPB model, the most and least influential factors affecting secondary students’ Esports participation were revealed. The results indicated that causing family conflicts due to Esports gaming ($M = 6.47, SD = 3.65$) was considered as the least influential factor in affecting their perceived behavioral beliefs in Esports participation. At the same time, they felt developing social networking ($M = 13.15, SD = 5.46$) and enhancing team collaboration ($M = 13.13, SD = 5.38$) were most influential. Surprisingly, parental support ($M = 7.65, SD = 4.03$) was not the most influential significant other in affecting Esports participation, whereas having fortitude ($M = 10.72, SD = 4.54$) and Esports’ skills capability ($M = 11.24, SD = 4.91$) tended to interference with their Esports participation. Finally, in respect of the barriers to participating in the Esports career, the factors of lack of Esports’ technique, skills, and capability ($M = 13.73, SD = 6.46$); impeding academic progress ($M = 12.98, SD = 5.65$); and inadequate resources to support Hong Kong Esports development ($M = 12.92, SD = 5.73$) were desired to be the most significant barriers to partake in an Esports career, regardless of gender difference.

As for the university student, the results also indicated that inducing family conflicts due to Esports gaming ($M = 5.63, SD = 3.24$) was the least influential factor in affecting the students’ perceived behavioral beliefs in Esports participation. Instead, they felt that gaining social networks ($M = 14.65, SD = 5.18$), developing communication skills ($M = 14.68, SD = 5.03$), and able to achieve team collaboration ($M = 15.10, SD = 5.14$) were the most influential. Like the finding in the secondary student group, parental support ($M = 8.12, SD = 3.81$) was considered the least influential significant factor in Esports participation. Conversely, students indicated that one’s financial condition ($M = 12.56, SD = 4.69$) and Esports’ skills capability ($M = 12.96, SD = 5.30$) were more pivotal in interfering with their Esports participation. Lastly, the university students expressed that inadequate Esports’ technique, skills, and capability ($M = 13.66, SD = 5.74$); difficulties in time management ($M = 15.50, SD = 6.54$); and the insufficient recourses in supporting Hong Kong Esports development ($M = 14.24, SD = 5.56$) were the three most significant barriers for them to participate in the Esports career, gender differences notwithstanding. Descriptive data of direct and indirect measures of TPB factors of Esports participants is shown on Table 3.

4.5. Differences in Esports Participation Intentions and Other TPB Direct Measures in terms of Esports Participation and Genders. The results suggested there were significant differences in all the TPB direct measures. The construct of Esports participation intention showed the largest mean difference at $M = 1.41, SD = 0.3; F(1,1909) = 89.75, p = .000$. Because of the substantial differences in variances between Esports participants and nonparticipants group, the Welch’s test was conducted. The results from the Welch’s test also indicated a significant difference between the groups $F_W(1, 1090) = 112.52, p = .000$. As far as the comparison between the male and female groups, an independent t-test was conducted and found that there were significant differences in the intention to participate, attitude toward Esports, subjective norms, and perceived behavioral control (males are more likely than girls to be intention in participating in Esports, to be influenced by people or groups who value them, and to perceive that they are more likely to participate in Esports). In contrast, there was no significant difference in attitudes toward Esports, $t(734) = 1.85, p = .065$.

Similar to the secondary student group, the result from university student group also indicated significant differences in all TPB direct measures between Esports competition participants and non-Esports competition participants, with the level of intention in Esports participation that showed the largest mean difference at $M = 1.47, SD = 0.12; F(1,949) = 144.07, p = .000$. Because of the substantial differences in variances between Esports participants and nonparticipants group, the Welch’s test was conducted. The results from the Welch’s test also indicated a significant difference between the groups $F_W(1,949) = 105.04, p = .000$. Moreover, there were significant differences in the intention,

| Table 2: Esports participants. | University students |
|-------------------------------|---------------------|
| **Secondary school**          | **University students** |
| Time spent on Esports         | Time spent on Esports |
| Number of participation (Ave.)| Time (M)            |
| 18.96 (min: 0–max: 600)       | SD: 93.95           |
| Hour (M)                      | Number of participation (Ave.) |
| SD: 5.56                      | 14.25 (min: 0–max: 300) |
| 3.5 (min: 0–max: 20)          | Hour (M)            |
| SD: 2.68                      | SD: 4.83            |
| Most popular game             | Most popular game   |
| PUBG                          | Ranking             |
| 1                             | %                  |
| Rainbow 6                     | PUBG                |
| 2                             | 45.8               |
| League of Legends             | League of Legends   |
| 3                             | 39.6               |
| Parent’s attitude             | Parent’s attitude   |
| Number                        | Number              |
| 30                            | %                  |
| Support                       | Support             |
| 33                            | 62.5               |
|                                | 35                 |

Time (M) SD: 1.949, Number of participation (Ave.) SD: 93.95, Hour (M) SD: 4.83, Most popular game Ranking %.
subjective norms, and perceived behavioral control between gender (similar with secondary group; however, it showed no significant differences in attitudes toward Esports participation with \( t(444) = 0.71, p = 0.078 \).

Additionally, Esports competition participants rated comparatively high in perceiving physical injuries as a negative aspect of participating in Esports, in which this was not highly rated among non-Esports competition participants.

Table 3: Descriptive data of direct and indirect measures of TPB factors of participants.

| Secondary school | University students |
|------------------|---------------------|
| **Direct measure of TPB** | **Direct measure of TPB** |
| min = 1; max = 5 | min = 1; max = 5 |
| **Intention to participate in Esports** | **Intention to participate in Esports** |
| Mean | SD | Mean | SD |
| 2.12 | 0.99 | 2.06 | 0.95 |
| **Attitude toward Esports** | **Attitude toward Esports** |
| Mean | SD | Mean | SD |
| 3.31 | 0.59 | 3.28 | 0.65 |
| **Subjective norm toward Esports** | **Subjective norm toward Esports** |
| Mean | SD | Mean | SD |
| 2.00 | 0.91 | 1.99 | 0.89 |
| **Behavioral control over Esports** | **Behavioral control over Esports** |
| Mean | SD | Mean | SD |
| 2.38 | 0.95 | 2.63 | 0.92 |
| **Indirect measure of TPB** | **Indirect measure of TPB** |
| min = 1; max = 25 | min = 1; max = 25 |
| **Behavioral belief** | **Behavioral belief** |
| **Highest influences_ benefits** | **Highest influences_ benefits** |
| Mean | SD | Mean | SD |
| Social networking | 13.15 | 5.46 | Team collaboration | 15.10 | 5.18 |
| Team collaboration | 13.13 | 5.38 | Communication skills | 14.68 | 5.03 |
| Concentration | 13.00 | 5.50 | Social networking | 14.65 | 5.18 |
| **Highest influences_ barriers** | **Highest influences_ barriers** |
| Mean | SD | Mean | SD |
| Lack of Esports’ technique, skills, and capability | 13.73 | 6.46 | Lack of Esports’ technique, skills, and capability | 13.66 | 5.74 |
| Impeding academic progress | 12.98 | 5.65 | Difficulties in time management | 15.50 | 6.54 |
| Inadequate resources | 12.92 | 5.73 | **Lowest influence** | 14.24 | 5.56 |
| **Low influences** | **Low influences** |
| Mean | SD | Mean | SD |
| Family conflicts | 6.47 | 3.65 | Family conflicts | 5.63 | 3.24 |
| **Normative belief** | **Normative belief** |
| Mean | SD | Mean | SD |
| Esports participants with high capability | 11.24 | 4.91 | Esports participants with high capability | 12.95 | 5.30 |
| Esports celebrity with a character of fortitude | 10.72 | 4.54 | Esports player with financial support | 12.56 | 4.69 |
| Esports player with financial support | 10.51 | 4.39 | Esports player with good mental quality | 12.36 | 4.52 |
| **Low influences** | **Low influences** |
| Mean | SD | Mean | SD |
| Parental support | 7.65 | 4.03 | Parental support | 8.12 | 3.81 |
| Public | 8.05 | 3.44 | Peers who do not participate in Esports | 8.32 | 3.29 |
| Peers who participate in Esports | 8.06 | 3.63 | Public | 8.41 | 3.66 |
| **Control belief** | **Control belief** |
| **High influences** | **High influences** |
| Mean | SD | Mean | SD |
| Academic disruptions | 13.73 | 6.47 | Difficulties in time management | 15.50 | 6.54 |
| Inadequate Esports’ technique, skills, and capability | 12.98 | 5.65 | Insufficient Esports recourses | 14.24 | 5.56 |
| Insufficient Esports recourses | 12.92 | 5.70 | **Low influences** | 13.65 | 5.74 |
| **Low influences** | **Low influences** |
| Mean | SD | Mean | SD |
| Gender differences | 9.92 | 5.04 | Gender differences | 10.41 | 5.56 |
| Inconvenient location of Esports venues | 10.37 | 4.73 | Inconvenient location of Esports venues | 10.54 | 5.54 |
| Insufficient group size | 10.76 | 4.75 | Insufficient group size | 12.08 | 5.29 |
Furthermore, Esports competition participants in both groups tended to rate high in the facilitators of participating in Esports, including feel accomplished, supported by peers and able to assert themselves. Yet, barriers of participating in Esports tended to berate higher among non-Esports competition participants.

4.6. TPB Model in Hong Kong Esports Participation. Table 4 illustrates the correlation matrix between the dependent variables and independent variables (intention and behavior) among Hong Kong secondary school and university students. The correlation results indicated that the independent variables, including attitude, subjective norms, perceived behavioral control, positive factors, negative factors, significant others, personal conditions, and barriers, were significantly correlated with the intention to participate in Esports. Conversely, university students indicated that Esports’ negative factors and policy had a significant negative correlation with both their intention and behavior. Furthermore, despite Esports’ negative factors and policy had shown to affect secondary school students’ intentions, it did not show significant association with their behavior in participating in Esports.

Before conducting the structural equation modeling (SEM), confirmatory factor analysis (CFA) was done to affirm the goodness of fit of each measurement model. Table 5 shows the results of the CFA for all the individual measurement models of the current study. All measurement models achieved a good fit model upon conducting SEM.

4.7. Structural Equation Model (SEM) Results. The structural equation model was formed according to the TPB model, with “positive” and “negative” as the latent indicators of behavioral beliefs; “significant others” and “personal condition” as latent indicators of normative beliefs; and “barriers,” “facilitators,” and “policy” as latent indicators of control Beliefs. They were linked to the respective direct measures, including attitude, subjective norms, and perceived behavioral control, respectively. See Figure 1 for the examined TPB model. Table 6 shows the results of the SEMs’ goodness of fit index of both target groups, and Table 7 shows the summary of goodness of fit of the measurement models.

4.8. Secondary School Students. Among the secondary school students sample, the proposed model showed an adequate model of fit indices with, $X^2(6390.81/1328 = 4.81)$, CFI = 0.913, NNFI = 0.89, SRMR = 0.108, RMSEA = 0.057 (90%CI = 0.056 – 0.059). All direct measures and indirect measures, including positive factors, significant others, personal condition, facilitators, and barriers of Esports, as well as the policy of Esports showed significant pathways toward Esports intentions. Yet, among the TPB model pathways, the model has shown an insignificant standardized solution between “negative” components of behavioral beliefs and attitude. With the particular path removed, the model fit indices showed insignificant change in the chi-square value, by just reducing 0.01 ($X^2 (6393.09/1329 = 4.80)$). In other words, the insignificant path did not significantly affect the overall model fit in representing the intention aspects of Hong Kong Secondary School students in participating in Esports. The path result of the model diagram is shown in Figure 2 and Table 8.

4.9. University Students. Among the university school students sample, the proposed model showed an adequate model of fit indices with $X^2(4236.57/1264 = 3.37)$, CFI = 0.906, NNFI = 0.87, SRMR = 0.094, and RMSEA = 0.056 (90%CI = 0.054 – 0.058). In addition to the original CFA results, three items from behavioral beliefs and one item from control belief were removed due to the high standardized residual (32.2-50.2). Moreover, other than the covariance identified in the CFA results and the path originated from the TPB model, additional correlations between items in the direct measures were found during the SEM analysis. All direct and indirect measures, including positive factors, significant others, facilitators, and barriers of Esports, showed significant pathways toward Esports intentions. Yet, the model has also shown insignificant standardized solutions between “negative” components of behavioral beliefs and attitude, between “personal condition” components of control beliefs and subjective norms, and between the “policy” component of control beliefs and perceived behavior control. With the particular path removed, the model fit indices showed insignificant change in the chi-square value by just increasing for 0.02 ($X^2 (4294.36/1267 = 3.39)$). In other words, the insignificant paths did not significantly affect the overall model fit in representing the intention aspects of Hong Kong university students participating in Esports. The path result of the model diagram is shown in Figure 3 and Table 9.

5. Discussion

The current study aims to investigate the Esports participation behavior and intentions among Hong Kong secondary school and university students, using the theory of planned behavior approach. This study suggests that the development of Esports in Hong Kong is still in the early stage, as reflected in the low participation rate in the Esports competition. However, it should be noted that since recent reports have shown there are still more male Esports gamers than female [67, 68], therefore, this study may be slightly biased toward nongamer, as it has surveyed more females (52.6%, among those that disclosed their gender). The outcomes of the SEM models have summarized the variables that could have affected Hong Kong secondary school students’ and university students’ intention in Esports participation. Among the secondary school students, all the variables showed significant association with their intentions in participating in Esports. Yet, the path of the negative factors of Esports toward attitude was shown as insignificant in the SEM model. Most of the variables, except the facilitators and policy, showed significant association with their intention among the university students. Yet, the path of negative factors of Esports and the personal condition of playing Esports, as well as policies related to Esports, toward the
respective direct measures was insignificant in the SEM model. It should be noted that the Esports behavior of students was not included in the SEM model analysis due to the inconsistency of the type of data; the SEM model was not able to reveal outputs of data that was combined with continuous and categorical data.

When closely examined the indirect measures of the TPB model, both the secondary and university student

| TPB variables                  | I   | A   | SN  | PBC  | BB-P | BB-N | NB-SO | NB-PC | CB-B | CB-F | CB-P | B   | M   | SD  |
|-------------------------------|-----|-----|-----|------|------|------|-------|-------|------|------|------|-----|-----|-----|
| **Secondary school students** |     |     |     |      |      |      |       |       |      |      |      |     |     |     |
| Intension (I)                 | —   | —   | —   | —    | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Attitude (A)                  | .325** | — | —   | —    | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Subjective norms (SN)         | .673** | .206** | — | —    | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Perceived behavioral control (PBC) | .617** | .205** | .742** | — | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Behavioral beliefs-positive (BB-P) | .352** | .409** | .215** | .295** | — | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Behavioral beliefs-negative (BB-N) | .249** | .093** | .376** | .276** | .072* | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Normative beliefs-significant others (NB-SO) | .437** | .277** | .502** | .437** | .380** | .433** | —     | —     | —    | —    | —    | —   | —   | —   |
| Normative beliefs-personal conditions (NB-PC) | .331** | .341** | .236** | .255** | .661** | .175** | .558** | —     | —    | —    | —    | —   | —   | —   |
| Control beliefs-barriers (CB-B) | -.127** | -.038 | -.162** | -.157** | .086** | -.021 | -.129** | .093** | —     | —    | —    | —    | —   | —   | —   |
| Control beliefs-facilitators (CB-F) | .120** | .198** | .069* | .093** | .393** | .036 | .136** | .386** | .542** | —     | —    | —    | —   | —   | —   |
| Control beliefs-policy (CB-P) | .057 | .158** | -.014 | -.015 | .337** | -.028 | .048 | .322** | .603** | .555** | —     | —    | —    | —   | —   | —   |
| Behavior (B)                  | -.274** | -.107** | -.202** | -.211** | -.149** | -.019 | -.203** | -.167** | .083** | -.062* | -.002 | —     | —   | —   | —   |
| **University students**       |     |     |     |      |      |      |       |       |      |      |      |     |     |     |
| Intension (I)                 | —   | —   | —   | —    | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Attitude (A)                  | .326** | — | —   | —    | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Subjective norms (SN)         | .638** | .223** | — | —    | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Perceived behavioral control (PBC) | .450** | .238** | .459** | — | —    | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Behavioral beliefs-positive (BB-P) | .275** | .545** | .143** | .239** | — | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Behavioral beliefs-negative (BB-N) | .187** | -.043 | .313** | .108** | -.045 | —    | —     | —     | —    | —    | —    | —   | —   | —   |
| Normative beliefs-significant others (NB-SO) | .408** | .339** | .432** | .344** | .463** | .250** | —     | —     | —    | —    | —    | —   | —   | —   |
| Normative beliefs-personal conditions (NB-PC) | .122** | .315** | .020 | .209** | .498** | -.074* | .462** | —     | —    | —    | —    | —   | —   | —   |
| Control beliefs-barriers (CB-B) | -.215** | -.139** | -.227** | -.183** | .053 | -.020 | -.162** | .117** | —     | —    | —    | —    | —   | —   | —   |
| Control beliefs-facilitators (CB-F) | .314** | .410** | .243** | .240** | .768** | .268** | .473** | .332** | .008 | —     | —    | —    | —   | —   | —   |
| Control beliefs-policy (CB-P) | -.034 | .043 | -.136** | -.051 | .178** | -.061 | -.010 | .218** | .638** | .115** | —     | —    | —    | —   | —   | —   |
| Behavior (B)                  | -.363** | -.112** | -.294** | -.270** | -.127** | -.078* | -.280** | -.108** | .157** | -.145** | .113** | —     | —   | —   | —   |

**p < 0.01.
groups revealed similar factors that deem to have significant impacts on Esports participation. For instance, the similar sentiment shared by both groups on attitude toward Esports competition suggests that they are drawn to Esports by the social elements. This finding is also similar to the previous studies on the more casual gamers [69, 70]. Communication skills development and achieving team works are also considered important as well, akin to the findings on video gaming in earlier literature [71–74]. In terms of the factors that impact Esports participation, both groups expressed skill level, and fortitude play a significant role. Also, while the research team assumed family and friends would be influential in the respondent’s participation, given the study’s sample mostly from a Chinese background, the result is shown otherwise. It can be implied that most young people are so used to having family and friends disapproved of their video game hobby. As a result, they do not base their participation decision on this negative feedback anymore. Finally, both cohorts perceived the lack of skill and inadequate resources from the local Esports industry as the two major barriers.
that prevent them from engaging Esports at a higher level. The local Esports marketers should be able to utilize this information when addressing the preconception about the skill level needed to participate in Esports, as well as the need to highlight the social aspects of Esports to the potential consumers.

These findings reflect currently the local Esports participants that do not necessarily consider Esports as a competitive endeavor or a potential career path. Instead, they deem Esports as a progression from video games, with the massive online battle arena (MOBA) games like PUBG and LOL that provide platforms for them to socialize, develop communication skills, and experience teamwork success. Collectively, the findings signified in this early development stage are that it is more sensible to market and highlight the social aspects of Esports so that it can attract more interest and participation initially. It is critical to nurture the local gamers’ interest in Esports so that a group of core fans and competitors can be formed where the industry to be built upon. As the industry becomes more mature and amass a stable group of followers, it could be beneficial to emulate the model in South Korea, where a government-sanctioned Esports association was established with the aim to promote and develop Esports as a viable career path [75].

Previous literature had identified various significant factors that would have affected people’s Esports’ consumption and intentions [32, 57, 76]. Despite Sjöblom and Hamari [57] research only revealed the factors that affected people’s intention to watch Esports, the mentioned factors like social integration, personal integrative, and releasing tension were shown as significant positive factors in affecting Esports’ participation in the current study. Moreover, research studies have shown determinants, including hedonic motivation, effort expectancy [58], and gaining self-concept [77], as critical factors in affecting Esports’ intention, in which these determinants were also in line with the positive determinants stated in the current study, such as enhancing students’ perseverance in achieving the goal of Esports, as well
as make them feel life is accomplished and enriched after participating in Esports. Yet, the solely negative factor documented by the existing literature was peer pressure [32, 78]. At the same time, this is also related to the identified normative beliefs latent factors—significant others. However, with most of the existing literature focused on Esports players, it might not identify other significant others as the current study did, such as teachers, parents, and the general public.

Other than the positive factors and significant others, the facilitators and barriers of participating in Esports were significant in affecting Esports perceived behavioral control as to intention. The research of Lee and Schoenstedt [32] revealed that having a competition to show and display one’s Esports ability and equipped skills for games were significant impacting factors of Esports game playing, thus reflecting the identified facilitators of the current study. Besides, a systematic review [77] revealed that mastery of skills, pursuing self-improvement, gaining self-esteem, accomplishment and social recognition, and being equipped with formal institutional rules and Esports governance were essential elements that attracted players to treat Esports as a career. These elements were considered a holistic cover of the facilitators and barriers indicated in the current study, yet even in conformity with some of the identified policy indicators. Although the policy determinants were revealed as insignificant in affecting Hong Kong university students’ Esports intention, it is worthy of being indicated in general, which could also facilitate new policy initiatives and implications for future investigation.

Additionally, secondary school students were also affected by the personal condition of being an Esports player. In the same systematic review [77], it was identified that the characteristics of Esports players include (1) being with great knowledge and skills in video gaming, (2) able to make fast and strategic decisions, (3) enabling self-motivation, (4) enable a game-life balance either during competition or training, (5) able to cope with harassment, (6) able to maintain a positive mindset, and (7) with a stable physical and mental condition. It is worth noting that the current research had indicated up to 5 of the elements mentioned in Table 9: Significant path results of the TPB model of university students.

| Path                             | Coefficients (β) | Direct effect | Indirect effect | Total effect |
|---------------------------------|------------------|---------------|-----------------|-------------|
| Positive ➔ intention           | 0.133            | —             | 0.662           | 0.133       |
| Significant others ➔ intention | 0.246            | —             | 0.36            | 0.246       |
| Facilitators ➔ intention       | 0.022            | —             | 0.22            | 0.022       |
| Barriers ➔ intention           | -0.074           | —             | -0.074          | -0.074      |
| Attitude ➔ intention           | 0.20             | 0.20          | —               | 0.20        |
| Subjective norms ➔ intention   | 0.36             | 0.36          | —               | 0.36        |
| Perceived behavioral control ➔ intention | 0.36 | 0.36 | — | 0.36 |

Figure 3: The structural equation model of university students.
above. Essentially, Hong Kong students showed a common perception toward the traits and quality of being Esports players, and the secondary school students, in particular, treated these traits as essential as well.

It is worthy to note that the result of this study differs from previous related literature. For example, utilizing the uses and gratification theory, Weiss and Schiele [79] found that competition, challenge, and escapism prompt continuous Esports gameplay, but not social relationship. Likewise, in recent research that grounded in the Unified Theory of Acceptance and Use of Technology 2 [80], Jang and Byon [58] discovered four critical factors, hedonic motivation, price value, effort expectancy, and flow, to be influencing in Esports consumer gameplay intention. With the research subjects from these two studies being more experienced Esports players, it is reasonable to presume that as the players’ career progress, their motives to engage in the sport will change as well.

Finally, another area of interest from the findings is the difference in participation intention and TPB measures between genders. The findings indicate that there are differences between the two gender groups across both secondary and university students. There were significant differences in the intention, attitude, subjective norms, and perceived behavior control over Esports in the secondary students group; there was significant differences in the intention, subjective norms, and perceived behavior control, but no significant difference in the attitude in the university group. This finding entails that potentially different psychological factors will impact intention to participate in Esports unequally between the two genders. More research is needed in a different context to validate this finding. However, for the practitioners in the field, this finding signified that it would be advantageous to focus on these psychological factors when devising specific marketing plans for the different two gender groups in both secondary and university school students. Indeed, the current substantial differences in participation levels between genders can allude to a homogenized marketing strategy without a specialized promotional plan toward the female demographic. An industry-wide marketing campaign that focuses on educating the public about contemporary gaming and removing participation barriers might yield a more effective result in recruiting new players, especially the female Esports players.

6. Contribution

As a whole, the current study has identified the factors and determinants of Esports’ intention and behavior among Hong Kong students, which were successfully displayed in terms of the theory of planned behaviour. Although the goodness of fit index was not as perfect as assumed, it provided an adequate picture in reflecting the overall interrelationship between the determinants and intentions of Esports. Hence, it could be seen as able to contribute to the literature on Esports and its related industry by identifying the determinants of students’ participation in Esports, including the possible health issues created and the mental status achieved, as well as identifying the relating governing structure of Esports in terms of a theoretical framework. The following paragraph will discuss more potential contribution suggestions on Home Affairs Bureaus and Leisure and Culture Services Department, Education Bureau, and Hong Kong Schools Sports Federation.

Firstly, to bring local Esports to be in line with the world, more regular Esports competition and tournaments should be hold and create employment opportunities for potential Esports professionals, and Esports athletes, such as coaches, referred, anchors, or tournament managers to ensure that their Esports journey would not be interrupted.

Furthermore, the current research being part of a Hong Kong public policy research on “The Development of Esports in Hong Kong” also aimed to provide the Hong Kong government with a documented framework to advocate Esports-related policies on a long-term basis; Education Bureau is suggested to provide guidelines on developing Esports-related education courses and programs in the current education curricula, as well as providing Esports practitioners or game companies with a cooperation guide for developing Hong Kong’s Esports markets; actions include standardizing the teaching and practice of Esports, working with educational institutions to build a healthy Esports environment, developing Esports-related expertise (e.g., video content creation, event planning and operations, event commentary and hosting, and Esports club management), and proving the legitimacy of the industry and the viability of Esports education.

In addition, investing funds to cultivate professional Esports players, establishing an Esports association to support Esports, provide expertise and advice, and increasing the visibility of Hong Kong Esports in the international area. For example, to enhance Esports development in secondary schools and universities, the government can consider providing financial support for setting up training facilities as well as forming Esports school teams to nurture future Esports talents and offer interschool Esports competition opportunities. For the effectiveness of these policies on public, including parents and teachers, it should be discussed and investigated in future research.

Data Availability

According to the approval ethic of informed consent statement: The answers participants provide in the study are confidential, which means that only the study investigators will have access to any information they share. All the data will also be kept confidential in any publication of the results of this study. The data will be reported/written in aggregate terms. The material will be maintained for up to 3 years.

Additional Points

Highlights. (i) Both secondary school and university students have positive attitudes toward Esports. (ii) Inadequate recourses in supporting Hong Kong Esports development is a significant barrier for both university and secondary school students to participate in the Esports business. (iii) The TPB model was validated as a potential model to study...
individuals’ attitudes, subjective norms, and behavioral control to predict their behavioral intentions toward Esports. (iv) Future research should further investigate Esports-related policies on a long-term basis on public, family, and education

Conflicts of Interest
The authors declare that they have no conflicts of interest.

Authors’ Contributions
Pak-Kwong Chung worked on conceptualization, study design, and supervision; Kai-ling Ou worked on data collection, data curation, and writing-original draft preparation; Ming Yu Claudia Wong performed the data analysis and writing-original draft preparation; Ka-Lai Lau contributed in writing-original draft preparation and writing-reviewing and editing; Ka-Man Leung worked on literature review and statistical analyses.

Acknowledgments
This paper and this research behind it would not have been possible without the exceptional support of the ER Esports Academy and the Career Centre of the Hong Kong Baptist University, for help recruiting potential participants as well as the support from the recruited secondary schools for completing the questionnaire survey for us. This work was supported by the Public Policy Research Funding [grant numbers 2019.A2.036.19C].

References
[1] D. C. Funk, A. D. Pizzo, and B. J. Baker, “ESport management: embracing eSport education and research opportunities,” Sport Management Review, vol. 21, no. 1, pp. 7–13, 2018.
[2] Newzoo, 2020 Global Esports Market Report: Key Trends, Market Sizing & Forecasts, Special Focus Topics and Rankings, Newzoo, 2020.
[3] D. A. L. Y. Jin, “Historiography of Korean Esports: perspectives on spectatorship,” International Journal of Communication, vol. 14, p. 19, 2020.
[4] J. J. Coakley and E. Pike, Sports in society: Issues and controversies, 2009, https://www.wolverhampton.ac.uk/media/departments/central-timetabling-unit/documents/CG2013-SSPAL-BA-(Hons)-Sports-Studies.pdf.
[5] H. Lopez-Gonzalez and M. D. Griffiths, “Understanding the convergence of markets in online sports betting,” International Review for the Sociology of Sport, vol. 53, no. 7, pp. 807–823, 2018.
[6] T. Chung, S. Sum, M. Chan, E. Lai, and N. Cheng, “Will Esports result in a higher prevalence of problematic gaming? A review of the global situation,” Journal of Behavioral Addictions, vol. 8, no. 3, pp. 384–394, 2019.
[7] K. Yin, Y. Zi, W. Zhuang et al., “Linking Esports to health risks and benefits: current knowledge and future research needs,” Journal of Sport and Health Science, vol. 9, no. 6, pp. 485–488, 2020.
[8] S. Adinolf and S. Türkay, “Toxic behaviors in Esports games: player perceptions and coping strategies,” in CHI PLAY 2018 - Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts, pp. 365–372, Melbourne VIC Australia, 2018.
[9] S. Türkay, J. Formosa, S. Adinolf, R. Cuthbert, and R. Altizer, “See no evil, hear no evil, speak no evil: how collegiate players define, experience and cope with toxicity,” in Conference on Human Factors in Computing Systems - Proceedings, pp. 1–13, Honolulu HI USA, 2020.
[10] A. Oliveira, R. Feyzi Behnagh, L. Ni, A. A. Mohsinah, K. J. Burgess, and L. Guo, “Emerging technologies as pedagogical tools for teaching and learning science: a literature review,” Human Behavior and Emerging Technologies, vol. 1, no. 2, pp. 149–160, 2019.
[11] J. Dal Yong, “Historiography of Korean Esports: perspectives on spectatorship,” International Journal of Communication, vol. 19328036, p. 14, 2020.
[12] J. Y. Yang, H. Y. Huang, and L. Zhang, “The present situation, problem, and development countermeasures of the eSports industry in China,” Journal of the Capital University of Physical Education and Sports, vol. 26, no. 3, pp. 201–205, 2014.
[13] HKU Li Ka Shing Faculty of Medicine, HKU Studies Reveal Hong Kong Children Overuse Digital Devices and Have Inferior Physical Fitness, University of Hong Kong Press Release, 2017, https://www.med.hku.hk/news/press/hku-studies-reveal-hong-kong-children-overuse-digital-devices-and-have-inferior-physical-fitness.
[14] University of Hong Kong Press, HKU Survey Reveals Gaming Addiction Problem Among Hong Kong Upper Primary Students, University of Hong Kong Press Release, 2017, https://www.hku.hk/press/news_detail_16488.html.
[15] Hong Kong Federation of Youth Groups, “e-Sports in Hong Kong,” 2018, https://yrc.hkfyg.org.hk/en/2018/01/30/e-sports-in-hong-kong-2/.
[16] I. Ajzen, “The theory of planned behavior,” Organizational Behavior and Human Decision Processes, vol. 50, no. 2, pp. 179–211, 1991.
[17] Cyberport, “Report on promotion of E-sports development in Hong Kong,” 2017, https://www.cyberport.hk/files/5a8260c50c63354373178/EN_e-sports%20report.pdf.
[18] Newzoo, Newzoo’s 2018 Report: Insights Into the $137.9 Billion Global Games Market, 2018, https://newzoo.com/insights/articles/newzoo-2018-report-insights-into-the-137-9-billion-global-games-market/.
[19] S. Kim, Inside the ‘World Cup of E-Sports’, Bloomberg, 2018, https://www.bloomberg.com/news/features/2018-11-04/inside-the-world-cup-of-esports.
[20] J. Lim, Ministry of Culture, Sports and Tourism Draws Up Standard Contract for Esports, The Korea Herald, 2020, http://www.koreaherald.com/view.php?ud=20200904000790.
[21] P. Mozur, For South Korea, E-Sports Is National Pastime, The New York Times, 2014, https://www.nytimes.com/2014/10/20/technology/league-of-legends-south-korea-epicenter-esports.html.
[22] World Health Organization, “ICD-11 for mortality and morbidity statistics (2018): QE22 hazardous gaming,” 2018, September 2018. https://icd.who.int/browse11/l-m/en/#/http://id.who.int/icd/entity/1586542716.
[23] World Health Organization, "ICD-11 for mortality and morbidity statistics (2018): 6C51 gaming disorder," 2018, November 2018, https://id.who.int/browse11-l-m/en#http://id.who.int/icd/entity/148597234.

[24] A. M. Bean, R. K. Nielsen, A. J. Van Rooij, and C. J. Ferguson, "Video game addiction: the push to pathologize video games," Professional Psychology: Research and Practice, vol. 48, no. 5, pp. 378–389, 2017.

[25] A. Happonen and D. Minashkina, "ffi

[26] J. H. Greenslade and K. M. White, "The prediction of above-average participation in volunteerism: a test of the theory of planned behavior and the volunteers functions inventory in older Australian adults," The Journal of Social Psychology, vol. 145, no. 2, pp. 155–172, 2005.

[27] M. A. Okun and E. S. Sloane, "Application of planned behavior theory to predicting volunteer enrollment by college students in a campus-based program," Social Behavior and Personality: An International Journal, vol. 30, no. 3, pp. 243–249, 2002.

[28] H. A. Hausenblas, A. V. Carron, and D. E. Mack, "Application of the theories of reasoned action and planned behavior to exercise behavior: a meta-analysis," Journal of Sport and Exercise Psychology, vol. 19, no. 1, pp. 36–51, 1997.

[29] L. R. Potwarka, "Exploring physical activity intention as a response to the Vancouver olympics: an application and extension of the theory of planned behavior," Event Management, vol. 19, no. 1, pp. 73–92, 2015.

[30] G. B. Cunningham and R. H. Lee, "Recreational activity?, no. 1, pp. 14, Springer, Cham, 2018.

[31] G. Godin and G. Kok, "ffi

[32] J. H. Greenslade and K. M. White, "The prediction of above-average participation in volunteerism: a test of the theory of planned behavior and the volunteers functions inventory in older Australian adults," The Journal of Social Psychology, vol. 145, no. 2, pp. 155–172, 2005.

[33] M. A. Okun and E. S. Sloane, "Application of planned behavior theory to predicting volunteer enrollment by college students in a campus-based program," Social Behavior and Personality: An International Journal, vol. 30, no. 3, pp. 243–249, 2002.

[34] H. A. Hausenblas, A. V. Carron, and D. E. Mack, "Application of the theories of reasoned action and planned behavior to exercise behavior: a meta-analysis," Journal of Sport and Exercise Psychology, vol. 19, no. 1, pp. 36–51, 1997.

[35] L. R. Potwarka, "Exploring physical activity intention as a response to the Vancouver olympics: an application and extension of the theory of planned behavior," Event Management, vol. 19, no. 1, pp. 73–92, 2015.

[36] G. B. Cunningham and R. H. Lee, "Recreational activity?, no. 1, pp. 14, Springer, Cham, 2018.

[37] G. Godin and G. Kok, "ffi

[38] J. H. Greenslade and K. M. White, "The prediction of above-average participation in volunteerism: a test of the theory of planned behavior and the volunteers functions inventory in older Australian adults," The Journal of Social Psychology, vol. 145, no. 2, pp. 155–172, 2005.
The esports industry is booming, and it’s seeking new alternatives, *Computers & Sport*, vol. 21, no. 1, pp. 1–22, 2020.

M. Xiao, "Factors influencing Esports viewership: an approach based on the theory of reasoned action," *Communication & Sport*, vol. 8, no. 1, pp. 92–122, 2020.

L. T. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives," *Structural Equation Modeling: A Multidisciplinary Journal*, vol. 6, no. 1, pp. 1–55, 1999.

World Health Organization, *World health statistics 2005, 2005*, https://www.who.int/docs/default-source/gho-documents/world-health-statistic-reports/whostat2005en.pdf.

K. M. Leung, M. Y. C. Wong, K. L. Ou, P. K. Chung, and K. L. Lau, "Assessing Esports participation intention: the development and psychometric properties of the theory of planned behavior-based Esports intention questionnaire (TPB-ESport-Q)," *International Journal of Environmental Research and Public Health*, vol. 18, no. 23, p. 12653, 2021.

M. Y. C. Wong, P. K. Chung, K. Ou, and K. M. Leung, "Perception of Hong Kong teenagers and young adults on Esports participation: a qualitative study using theory of planned behavior," *Frontiers in Psychology*, vol. 12, p. 12, 2021.

I. Ajzen, *Constructing a Theory of Planned Behavior Questionnaire*, 2006.

I. Ajzen, "The theory of planned behavior: frequently asked questions," *Human Behavior and Emerging Technologies*, vol. 2, no. 4, pp. 314–324, 2020.

J. Jaccard and C. K. Wan, "Measurement error in the analysis of interaction effects between continuous predictors using multiple regression: multiple indicator and structural equation approaches," *Psychological Bulletin*, vol. 117, no. 2, pp. 348–357, 1995.

H. Bondy, *The esports industry is booming, and it’s seeking female applicants*, NBC NEWS. com, 2020.

K. A. Brown, A. C. Billings, B. Murphy, and L. Puesan, "Intersections of fandom in the age of interactive media: eSports fandom as a predictor of traditional sport fandom," *Communication & Sport*, vol. 6, no. 4, pp. 418–435, 2018.

D. Y. Wohl, C. Lampe, R. Wash, N. Ellison, and J. Vitak, "The ‘S’ in social network games: Initiating, maintaining, and enhancing relationships," in 2011 44th Hawaii international conference on system Sciences, pp. 1–10, IEEE, Kauai, HI, USA, 2011.

N. Yee, "Motivations for play in online games," *CyberPsychology & behavior*, vol. 9, no. 6, pp. 772–775, 2006.

A. Badatalla, J. Leddo, A. Islam, K. Patel, and P. Surapaneni, "The effects of playing cooperative and competitive video games on teamwork and team performance," *International Journal of Humanities and Social Science Research*, vol. 2016, p. 2455, 2016, https://www.researchgate.net/publication/311792939.

M. Barr, "Using video games to develop communication skills in higher education. Irish Conference on Game-Based Learning (IGBL)," 2016, http://eprints.gla.ac.uk/118817/.

M. Barr, "Video games can develop graduate skills in higher education students: a randomised trial," *Computers in Education*, vol. 113, pp. 86–97, 2017.

D. Johnson, L. E. Nacke, and P. Wyeth, "All about that base: differing player experiences in video game genres and the unique case of MOBA games," in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pp. 2265–2274, Seoul Republic of Korea, April 2015.

K. Jonasson and J. Thiborg, "Electronic sport and its impact on future sport," *Sport in Society*, vol. 13, no. 2, pp. 287–299, 2010.

D. Lee and L. J. Schoenstedt, "Comparison of eSports and traditional sports consumption motives," *ICHERP-SD Journal Of Research*, vol. 6, no. 2, pp. 39–44, 2011.

F. Bányai, M. D. Griffiths, O. Király, and Z. Demetrovicz, "The psychology of Esports: a systematic literature review," *Journal of Gambling Studies*, vol. 35, no. 2, pp. 351–365, 2019.

T. Tang, J. Kucek, and S. Toepfer, "Active within structures: predictors of eSports gameplay and spectatorship," *Communication & Sport*, vol. 216747952094274, 2022.

T. Weiss and S. Schiele, "Virtual worlds in competitive contexts: analyzing eSports consumer needs," *Electronic Markets*, vol. 23, no. 4, pp. 307–316, 2013.

V. Venkatesh, J. Y. L. Thong, and X. Xu, "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology," *MIS Quarterly: Management Information Systems*, vol. 36, no. 1, pp. 157–178, 2012.

American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders (DSM-5®)*, American Psychiatric Pub, 2013.

C. Baker, *Stewart Brand Recalls First "Spacewar" Video Game Tournament - Rolling Stone*, Rolling Stone Magazine, 2016, https://www.rollingstone.com/culture/culture-news/stewart-brand-recalls-first-spacewar-video-game-tournament-187669/.

M. Borowy, "Public Gaming: eSports and Event Marketing in the Experience Economy," p. 131, 2012, http://summit.sfu.ca/item/12463.

C. Boyd, *Face-off in Gaming Olympics*, BBC News, 2004, http://news.bbc.co.uk/2/hi/technology/3720588.stm.

C. Cheng, Fong, and A. Li, *Survey on the Gaming Habits of Hong Kong Upper Primary Students*, The University of the Hong Kong, 2017, https://www.hku.hk/press/news_detail_16488.html.

C. Choi, M. Hums, and C. H. Bum, "Impact of the family environment on juvenile mental health: Esports online game addiction and delinquency," *International Journal of Environmental Research and Public Health*, vol. 15, no. 12, pp. 2850, 2018.

G. B. Cunningham, S. Fairley, L. Perkins et al., "eSport: construct specifications and implications for sport management," *Sport Management Review*, vol. 21, no. 1, pp. 1–6, 2018.

D. Consolazio, *The History of Esports*, Hotspawn, 2018, https://www.hotspawn.com/guides/the-history-of-Esports/.
[89] Epic Games, *The Fortnite World Cup: A Record-Setting Tournament*, Epic Games, 2019, https://www.epicgames.com/fortnite/en-US/news/the-fortnite-world-cup-a-record-setting-tournament.

[90] S. E. Jenny, R. D. Manning, M. C. Keiper, and T. W. Olrich, “Virtual(ly) athletes: where Esports fit within the definition of “sport”,” *Quest*, vol. 69, no. 1, pp. 1–18, 2017.

[91] D. Y. Jin and F. Chee, “The politics of online gaming,” in *Gaming cultures and place in Asia-Pacific*, pp. 19–38, Routledge, 2009.

[92] J. Keilman, Robert Morris’ Video Gamers Enter 1st Competition, Chicago Tribune, 2014, https://www.chicagotribune.com/news/ct-varsity-video-game-players-met-20141017-story.html.

[93] R. K. L. Nielsen and V. M. Karhulahti, “The problematic coexistence of “internet gaming disorder” and Esports,” in *ACM International Conference Proceeding Series, Part F 1301*, pp. 795–796, Hyannis Massachusetts, 2017.

[94] D. O’Keefe, How Blizzard’s StarCraft Became South Korea’s National Pastime, The Esports Observer, 2018, https://esportsobserver.com/starcraft-ii-esports-essentials/.

[95] E. Ozkurt, *Esports in South Korea – A Short Overview of the Legal Ecosystem*, LawInSport, 2019, https://www.lawinsport.com/topics/item/Esports-in-south-korea-a-short-overview-of-the-legal-ecosystem.

[96] M. Porter, “It Was Once the Biggest eSport in the World, So What’s Happened to StarCraft?” VICE, 2015, https://www.vice.com/en_uk/article/nn945x/it-was-once-the-biggest-esport-in-the-world-so-whats-happened-to-starcraft-446.

[97] M. Quwaider, A. Alabed, and R. Duwairi, “The impact of video games on the players behaviors: a survey,” *Procedia Computer Science*, vol. 151, pp. 575–582, 2019.

[98] D. Royse, *College Esports: 7 Pioneering Programs in the Collegiate Gaming World*, Benzinga, 2019, https://www.benzinga.com/general/education/19/12/14957723/college-esports-7-pioneering-programs-in-the-collegiate-gaming-world.

[99] RotoGrinders, “The evolution of the daily fantasy sports industry,” 2016, https://rotogrinders.com/static/daily-fantasy-sports-timeline.

[100] M. Smohai, R. Urbán, M. D. Griffiths et al., “Online and offline video game use in adolescents: measurement invariance and problem severity,” *The American Journal of Drug and Alcohol Abuse*, vol. 43, no. 1, pp. 111–116, 2017.

[101] T. L. Snively, *History and Analysis of eSport Systems*, p. 66, 2014, https://repositories.lib.utexas.edu/bitstream/handle/2152/28652/SNAVELY-MASTERSREPORT-2014.pdf?sequence=1&isAllowed=y.

[102] Valve, *Dota 2 - The International*, Valve, 2019, https://www.dota2.com/international/overview.

[103] I. L. K. Wong and M. P. S. Lam, “Gaming behavior and addiction among Hong Kong adolescents,” *Asian Journal of Gambling Issues and Public Health*, vol. 6, no. 1, p. 6, 2016.