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Young people's social withdrawal intention during COVID-19 in Hong Kong: A three-wave longitudinal study

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ABSTRACT

Worldwide physical distancing measures and lockdowns might have triggered and normalised *hikikomori* or prolonged social withdrawal behaviour especially among young people. The study aimed to examine the potential contributing COVID-related, psychological, family and school factors that related to one's intention to social withdrawal among young people during semi-lockdowns in Hong Kong. A three-wave longitudinal survey was conducted between June 2020 and June 2021. Mixed-effects logistic regression analyses were performed to investigate the association of COVID-related, psychological, and family and school factors with social withdrawal intention. 632 young people aged 10–20 years from 11 schools completed baseline and follow-up measures. The response rate was 83.05 %. At follow-ups, 39.40 % of the respondents reported to have social withdrawal intention. 37.18 % of the respondents felt helpless about COVID-19. The regression models showed loneliness, mother working from home, and hopelessness about COVID-19 at baseline were positive associated with persistent social withdrawal intention at follow-ups. Father working from home at baseline, better school bonding, and better family environment at the second wave were negatively associated with social withdrawal intention. Early identification of young people with poor psychological well-being, especially loneliness, and intention for being socially withdrawn should become a prioritised research and service focus in the post-COVID-19 period.

1. Introduction

Prolonged social withdrawal behaviour among young people, or *hikikomori*, has gained increased attention globally during the COVID-19 pandemic (Rooksby et al., 2020). Governments, youth studies researchers, and families have been worried that worldwide physical distancing measures and lockdowns could trigger and normalise withdrawal behaviour among both the young and the working-age populations (Kato et al., 2020; Rooksby et al., 2020; Wong, 2020). Prolonged social withdrawal behaviour negatively influences not only an individual's psychological and social well-being but also his or her wider education and workforce participation. Hence, *hikikomori* is understood as a psycho-socio-cultural phenomenon with multifaceted contributing factors, for example, psychopathology, family disharmony, bullying, school dropout, work failure, and increased competition due to globalisation (Li and Wong, 2015; Muris and Ollendick, 2023).

Prolonged social withdrawal behaviour is a relatively young research focus and many existing studies that examine this behaviour relied on data collected from individuals who had already withdrawn for years and were likely to have been receiving some form of support or interventions (Bagnato, 2021; Hamasaki et al., 2021; Katsuki et al., 2020; Martinotti et al., 2020; Roza et al., 2020a,b). Accordingly, the discussion of implications mainly focuses on clinical populations and potential high-intensity interventions (Funakoshi et al., 2021; Ismail, 2020; Kubo et al., 2021; Ranieri, 2018; Roza et al., 2020) rather than prevention or early intervention (Hamasaki et al., 2021b; Hihara et al., 2022). Nonetheless, cross-sectional studies in Japan have started to examine young people in Japan who have the desire for being hikikomori, and empathic for others with hikikomori, named as the affinity group for hikikomori, but the numbers of such studies remain very limited.

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Since prolonged social withdrawal behaviour is engaged in as a way of detaching oneself from society and negative life events, such behaviour might have been easily justified by the legitimacy of home-staying with the easy fulfilment of basic needs without leaving homes during the prolonged influence of the COVID-19. Therefore, the present immediate post COVID-19 time is a critical period for early identification of those who are at risk for social withdrawal and preventing them from following the *hikikomori* trajectory that may increase the risk of exposing young people to developing psychopathology and suicidal and self-harm behaviour (Zhu et al., 2021a).

To inform preventive policies and initiatives to reduce the potential impact of prolonged social withdrawal at the post COVID-19 era, this longitudinal study aimed to examine the multifaceted factors that may have contributed to the changes of intention of social withdrawal among high school students using a three-wave longitudinal research design because most people with withdrawal behaviour develop social withdrawal tendencies at the mid-adolescent period when they are in high schools. It was hypothesized that (1) psychological, family, and school factors are associated with social withdrawal intention based on findings in previous studies (Hamasaki et al., 2021a,b; Hamasaki et al., 2020; Li and Wong, 2015; Wong and Li, 2021) and (2) COVID-related factors predict persistent social withdrawal intention during and after the outbreaks.

2. Methods

A three-wave school-based longitudinal survey was conducted during two school resumptions in June of 2020 2021, and 2022. Since mid-January 2020, Hong Kong had experienced five waves of COVID-19 outbreaks from 2020 to 2022. Unlike the lockdown measures implemented in other countries, the local government encouraged office workers to work from home and advised people to stay home and avoid outdoor activities, but citizens were allowed to go outdoors without legal restrictions. One of the key public health measures impacting all school-going young people in Hong Kong was that all schools suspended face-to-face teaching several times during the outbreaks. Specifically, schools resumed on May 27, 2020, after the first wave of the outbreak and until the summer holiday started in early July 2020. From 2020 to 2022, school was on and off suspended due to the pandemic. The Waves 2 and 3 data were collected in June in 2021 and 2022 in school when face-to-face teaching was resumed after the first, third, and fifth waves of COVID-19 outbreaks.

2.1. Participants

Young people aged 10–20 years and from 11 schools participated in the three-wave survey. Parental consent and students' assent were collected prior to the survey. To reduce the concern associated with being labelled, students were assured that their participation was voluntary, and their teachers were not able to access their responses. The paper-pen surveys were conducted in classrooms. To ensure the quality of the responses, two trained research assistants introduced the study to the students, answered queries, and provided guidance on how to complete the questionnaire when appropriate, without intruding on the participants. After the students finished the questionnaires, research assistants packed and sealed the questionnaires and took the packages back to the principal investigator's university office with locked cabinets. The Chinese versions of the questionnaire was used, and a few booklets of the English translation were prepared for each classroom. The English translation would be provided to students upon request. All participants in this study received souvenirs (worth USD $5) after finishing the follow-up survey. All procedures involving human subjects/patients were approved by the Human Subjects Ethics Sub-Committee of the Principal Investigator's University (No. HSEARS20161222006 & HSEARS20210414004-01).

2.2. Measures

2.2.1. Primary outcomes

Social withdrawal intention. We adapted the social withdrawal behaviour or *hikikomori* measure items (Teo and Gaw, 2010; Wong et al., 2015) to examine whether the participants had any social withdrawal intention although they were not in a state of social withdrawal at wave 2 and 3. The two key questions were 1) *Do you hope to spend all day at home;* and 2) *Do you want to avoid social occasions and access to people.* If the participants answered "*yes*" to both questions, they were considered as people with social withdrawal intention. To examine the change of social withdrawal intention across waves, the participants were classified into four groups namely (Group 1: N-N) without social withdrawal intention at Wave 2 and 3; (Group 2: Y-N) having social withdrawal intention at Wave 2 but not at Wave 3; (Group 3: N-Y) without social withdrawal intention at Wave 2 but then having it at Wave 3; and (Group 4: Y-Y) having social withdrawal intention at Waves 2 and 3. We also asked the reasons, developed based on previous studies' findings, for the social withdrawal intention by providing options, including academic, relationship with family, social difficulties, health, personal development prospects, lack of money, relationship with friends, peer pressure, mental health, and other reasons. Participants were asked to check all the related reasons for the social withdrawal intention.

2.2.2. Predictors

Demographic characteristics (including gender, age, school) and COVID-19 related factors were measured at baseline (Wave 1). Psychological factors included depression, general anxiety, social anxiety, and loneliness were measured throughout the survey period (Wave 1–3). To further explore how the family and school environment may have been impacted by the long period of influence by COVID-19, we added additional items that measured the family and school situations at Wave 2 and 3.

2.2.3. COVID-related factors

To explore the influence of COVID-19 on the participants during the early outbreak, some self-developed perceived-vulnerability items related to COVID-19 were included in the questionnaire, with reference to the Perceived Risk of HIV Scale (Napper et al., 2012). Using yes-no questions, the items assess perceptions of personal risk and the local community's risk. The items included 1) *I feel helpless due to COVID-19*; and 2) *I feel that my local community is vulnerable to outbreak of COVID-19*. Whether respondents' parents Work From Home (WFH) was assessed through two questions: *How often does your father/mother work from home in a week*? Respondents rated the frequency from 0 (seldom), 1 (sometimes) to 2 (always).

2.2.4. Psychological factors

Depression was measured using the Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001; Wang et al., 2014). It consists of nine items for assessing depression symptoms in the past 2 weeks (e.g., *feeling tired or having little energy*). Response options, with respect to frequency, range from 0 (not at all) to 3 (nearly every day). Higher scores represent more frequent depressive symptoms. PHQ-9 has high internal consistency ($\alpha = .84$) among Hong Kong adolescent participants (Wang et al., 2014). The presence of suicidal ideation was used as a single-item measurement tool and analysed as a predictor of changes in social withdrawal behaviour intension.

Anxiety was measured using the Generalised Anxiety Disorder-7 scale (GAD-7; Spitzer et al., 2006), which consists of seven items that assess general anxiety symptoms in the past 2 weeks (e.g. *worrying too much about different things*). Response options, with respect to frequency, range from 0 (not at all) to 3 (nearly every day). Higher scores represent a higher level of generalised anxiety symptoms. GAD-7 has excellent internal consistency (αs of age 10 to 17 range from 0.93 to 0.95) (Spitzer et al., 2006).

Social anxiety was measured using the Social Anxiety Scale (SAS; La Greca, Dandes, Wick, Shaw and Stone, 1988), which consists of 10 items to measure participants' social anxiety level (e.g. *I worry about doing something new in front of other classmates* and *I worry about being teased*). Participants specified how much each item was a true description of themselves, ranging from 0 (*never true*) to 2 (*always true*). Higher scores represent more serious social anxiety. SAS has high internal consistency (α = .89, 0.90, 0.90 at Wave 1, 2 and 3 respectively) and good test-retest reliability (r = 0.67) (La Greca et al., 1988).

Loneliness was measured by a single-item question: *How often do you feel lonely*? Respondents rated the frequency from 0 (not at all) to 3 (nearly every day). Higher scores indicate greater loneliness. This is a commonly used format to measure loneliness in academic research studies (Goodman et al., 2015; Zhu et al., 2021a).

Stress was measured by a single-item question: *How do you feel about your stress over the past two weeks?* Respondents rated the stress level from 0 (no stress) to 10 (huge stress) at Wave 1, while they rated the stress level from 1 (no stress) to 7 (huge stress) at Waves 2 and 3. The stress levels at each wave were standardized to generate a common scale for stress level. Higher scores indicate a greater stress level.

2.2.5. Family and school factors

The family relationship was measured with three items (Shek, 2006): 1) *I am very satisfied with the relationship between me and my parents;* 2) *I actively share with my parents what happens to me;* and 3) *I actively share my feelings with my parents*. Higher scores indicate a better relationship with parents. The Cronbach αs of the scale at Wave 2 and 3 were 0.84 and 0.86 respectively.

The family environment was measured with five items from the Family Environment Scale (Liau et al., 2015), which measures participants' perceived home-living environment: 1) *It is pleasant living with my parents and family;* 2) *I can always discuss things that are important to me;* 3) *I feel uncomfortable at home;* 4) *There are too many arguments at home;* and 5) *Generally, there is nothing good about home.* Reversed items were recorded, and higher scores indicate a better perceived home environment. The Cronbach αs of the scale at Wave 2 and 3 were 0.84 and 0.82 respectively.

School bonding was measured with the three-item Positive and Negative Affect Schedule (PANS) (Roeser et al., 1996), which assesses the general valence of students' emotional experience while in school. Items for the PANS included 1) *I like being at school;* 2) *Most of the time, being in school puts me in a good mood;* and 3) *I am happier at school than when I am not at school*. Higher scores indicate a more positive affect towards school. The scale's Cronbach αs at Wave 2 and 3 were 0.83 and 0.82 respectively.

2.3. Statistical analysis

All statistical analyses were conducted using the statistical software R for Windows (R version 4.0.3). Descriptive statistics were presented as means and standard deviations for continuous variables and as numbers and percentages for categorical variables. The chi-square test and one-way analysis of variance (ANOVA) were used to compare the categorical and continuous variables, respectively, among the four social withdrawal intention groups. Student's t-test with a Bonferroni correction was used post hoc to assess differences between every two groups. Attrition analysis was conducted to compare the respondents who completed the measures of social withdrawal intention and those who did not.

Mixed-effects logistic regression (with schools set as the random effect) was performed to investigate the associations of COVID-related factors, psychological, family, and school factors (predictors) with social withdrawal intention (outcome). Multiple regression was conducted to predict social withdrawal intention based on all factors. All the models were adjusted for age and gender. Adjusted odds ratios (OR) with 95 % confidence intervals (CI) were calculated as a measure of the strength of association. A p-value<0.05 was considered statistically significant. The generalised variance inflation factor (GVIF) was employed to assess multicollinearity among the predictor variables. The VIF quantifies the degree and strength of correlation between the predictors in the regression model. To make GVIFs comparable across predictors, we suggested using GVIF^(1/(2*Df)), where Df is the number of coefficients in the subset (Fox and Monette, 1992). A VIF value below 5 suggests a low correlation between that predictor and the other predictors. VIF values between 5 and 10 indicate a moderate degree of correlation, while values exceeding 10 signal high, unacceptable levels of correlation among the model predictors.

3. Results

3.1. Characteristics of respondents

Among 761 respondents at Wave 1, 129 (16.95 %) did not report their social withdrawal intention at Wave 2 and 3. The response rate was 83.05 %. Attrition analysis showed that respondents who did not complete the measures of social withdrawal intention had higher risk for depression (OR = 1.10, 95 % CI = 1.06–1.14, p < .001), general anxiety (OR = 1.09, 95 % CI = 1.06–1.13, p < .001), loneliness (OR = 2.17, 95 % CI = 1.47–3.20, p < .001), social anxiety (OR = 1.88, 95 % CI = 1.23–2.88, p = .003), stress (OR = 1.41, 95 % CI = 1.13–1.77, p = .003), and suicidal ideation (OR = 2.41, 95 % CI = 1.59–3.64, p < .001) than those who completed the measures.

Table 1 shows the characteristics of the 632 respondents (mean age = 12.58 ± 1.43 years, 60.00 % female). At either two follow-ups, 39.40 % (n = 249; mean age = 12.72 ± 1.38 years, 74.30 % female) of the respondents reported to have social withdrawal intention. There were no significant differences among the four social withdrawal groups in terms of respondents' age. In general, the severity of psychological issues, i.e., general and social anxiety, suicidality, loneliness, increased from Group 1 (without any social withdrawal intention) to 4 (having social withdrawal intention throughout the survey period). Table 2 shows the reasons for respondents' social withdrawal intention. Many of the respondents indicated that they wanted to withdraw due to social difficulties through the study period.

3.2. The association of psychological, family and school factors with social withdrawal intention

Table 3 reveals the major factors at Waves 1–3 for predicting social withdrawal intention analysed by multiple regression. Group 2 participants were more likely to be female. Father always work from home (WFH) at Wave 1 and better school bonding at Wave 2 were negatively associated with social withdrawal intention at Wave 2. Group 3 participants were more likely to have their mother WFH a few days a week at Wave 1. Better family environment at Wave 2 was negatively associated with social withdrawal intention at Wave 3, whereas better family environment at Wave 3 was positively associated with the intention at Wave 3. Group 4 participants were more likely to have loneliness, mother always WFH, and always feeling helpless due to COVID-19, but less likely to have father WFH a few days a week at Wave 1. The GVIF values for the predictor variables ranged from 1.3 to 7.8, and the GVIF^(1/(2*Df)) values ranged from 1.2 to 2.8, both indicating an acceptable level of correlation among the model predictors.

4. Discussion

The boundary between *hikikomori*, or prolonged social withdrawal behaviour, and normal seclusion or physical-social inactivity has become blurred under the influence of the COVID-19 epidemic, during which lockdown policies had been implemented in most parts of the world. This novel study has for the first-time provided longitudinal empirical data to examine the factors that associate with the change

Table 1
Characteristics of respondents (n = 632).

	Social withdrawal intention[a]				Overall	Post hoc tests					
	Group 1 N:N (n = 383)	Group 2 Y:N (n = 64)	Group 3 N:Y (n = 97)	Group 4 Y:Y (n = 88)		1 vs 2	1 vs 3	1 vs 4	2 vs 3	2 vs 4	3 vs 4
	mean (SD)/n (%)				p						
Wave 1											
Age	12.49 (1.48)	12.70 (1.26)	12.72 (1.48)	12.75 (1.35)	0.25	>0.99	0.95	0.77	>0.99	>0.99	>0.99
Gender					<0.001	0.01	0.02	<0.001	>0.99	>0.99	0.29
Male	189 (49.35)	17 (26.56)	31 (31.96)	16 (18.18)							
Female	194 (50.65)	47 (73.44)	66 (68.04)	72 (81.82)							
PHQ-9	4.16 (4.59)	5.89 (4.56)	5.95 (4.34)	7.91 (4.97)	<0.001	0.03	0.004	<0.001	>0.99	0.048	0.02
Suicidal ideation					0.01	0.83	>0.99	0.01	>0.99	>0.99	0.49
No	320 (83.55)	48 (75.00)	78 (80.41)	60 (68.18)							
Yes	63 (16.45)	16 (25.00)	19 (19.59)	28 (31.82)							
GAD-7	2.78 (3.98)	3.80 (4.65)	4.38 (4.97)	6.54 (5.93)	<0.001	0.57	0.01	<0.001	>0.99	0.001	0.01
Social anxiety	0.63 (0.46)	0.99 (0.48)	0.77 (0.49)	0.97 (0.51)	<0.001	<0.001	0.10	<0.001	0.05	>0.99	0.06
Stress	−0.17 (0.99)	0.06 (0.96)	0.29 (0.97)	0.42 (0.79)	<0.001	0.44	<0.001	<0.001	0.89	0.18	>0.99
Loneliness					<0.001	<0.001	0.02	<0.001	>0.99	>0.99	0.08
No	298 (77.81)	35 (54.69)	61 (62.89)	38 (43.68)							
Yes	85 (22.19)	29 (45.31)	36 (37.11)	49 (56.32)							
Father WFH					0.07	>0.99	0.46	0.21	>0.99	0.72	>0.99
None	152 (50.84)	25 (48.08)	30 (37.04)	29 (42.65)							
A few days	106 (35.45)	21 (40.38)	35 (43.21)	21 (30.88)							
Always	41 (13.71)	6 (11.54)	16 (19.75)	18 (26.47)							
Mother WFH					0.13	>0.99	0.17	>0.99	>0.99	>0.99	>0.99
None	142 (50.71)	21 (39.62)	29 (38.67)	25 (42.37)							
A few days	75 (26.79)	17 (32.08)	32 (42.67)	17 (28.81)							
Always	63 (22.50)	15 (28.30)	14 (18.67)	17 (28.81)							
Feel helpless due to COVID-19					0.16	>0.99	>0.99	0.19	>0.99	>0.99	0.42
Seldom	246 (64.74)	40 (62.50)	59 (60.82)	48 (55.17)							
Sometimes	100 (26.32)	18 (28.12)	31 (31.96)	23 (26.44)							
Always	34 (8.95)	6 (9.38)	7 (7.22)	16 (18.39)							
Felt local community is vulnerable					0.48	>0.99	>0.99	>0.99	>0.99	>0.99	>0.99
Seldom	323 (84.78)	54 (84.38)	77 (79.38)	76 (87.36)							
Sometimes	38 (9.97)	9 (14.06)	13 (13.40)	6 (6.90)							
Always	20 (5.25)	1 (1.56)	7 (7.22)	5 (5.75)							
Wave 2											
PHQ-9	4.82 (4.77)	9.35 (5.94)	7.73 (5.72)	10.99 (6.00)	<0.001	<0.001	<0.001	<0.001	0.34	0.35	<0.001
Suicidal ideation					<0.001	<0.001	0.40	<0.001	0.06	>0.99	0.002
No	318 (83.03)	34 (53.12)	72 (74.23)	42 (47.73)							
Yes	65 (16.97)	30 (46.88)	25 (25.77)	46 (52.27)							
GAD-7	3.63 (4.44)	7.05 (6.44)	6.74 (5.87)	9.53 (6.10)	<0.001	<0.001	<0.001	<0.001	>0.99	0.02	0.002
Social anxiety	1.65 (0.79)	2.33 (0.69)	2.02 (0.86)	2.39 (0.73)	<0.001	<0.001	<0.001	<0.001	0.11	>0.99	0.01
Stress	−0.26 (0.98)	0.27 (0.87)	0.34 (0.94)	0.43 (0.88)	<0.001	<0.001	<0.001	<0.001	>0.99	>0.99	>0.99
Loneliness					<0.001	<0.001	<0.001	<0.001	>0.99	>0.99	0.06
No	277 (72.51)	27 (42.19)	49 (50.52)	27 (30.68)							
Yes	105 (27.49)	37 (57.81)	48 (49.48)	61 (69.32)							
School bonding	3.32 (0.73)	3.13 (0.70)	3.10 (0.76)	3.02 (0.83)	<0.001	0.37	0.06	0.004	>0.99	>0.99	>0.99
Family relationship	2.98 (0.68)	2.65 (0.71)	2.66 (0.74)	2.46 (0.71)	<0.001	0.003	0.001	<0.001	>0.99	0.53	0.24
Family environment	3.20 (0.58)	2.92 (0.58)	2.95 (0.55)	2.84 (0.67)	<0.001	0.002	0.001	<0.001	>0.99	>0.99	>0.99
Wave 3											
PHQ-9	5.02 (4.80)	6.98 (5.34)	9.46 (5.93)	10.68 (5.91)	<0.001	0.03	<0.001	<0.001	0.02	<0.001	0.6704
Suicidal ideation					<0.001	0.02	<0.001	<0.001	>0.99	0.04	0.77
No	323 (84.55)	44 (68.75)	56 (57.73)	40 (45.45)							
Yes	59 (15.45)	20 (31.25)	41 (42.27)	48 (54.55)							
GAD-7	3.65 (4.38)	5.64 (5.40)	7.38 (5.71)	10.02 (5.67)	<0.001	0.02	<0.001	<0.001	0.17	<0.001	0.002
Social anxiety	1.85 (0.76)	2.11 (0.73)	2.17 (0.78)	2.46 (0.71)	<0.001	0.06	0.00	<0.001	>0.99	0.03	0.05
Stress	−0.17 (0.95)	0.04 (0.97)	0.36 (0.95)	0.44 (0.75)	<0.001	0.59	<0.001	<0.001	0.18	0.05	>0.99
Loneliness					<0.001	0.01	<0.001	<0.001	>0.99	0.08	0.27
No	263 (68.67)	30 (46.88)	40 (41.24)	23 (26.14)							
Yes	120 (31.33)	34 (53.12)	57 (58.76)	65 (73.86)							
School bonding	3.33 (0.67)	3.21 (0.56)	3.15 (0.78)	3.02 (0.66)	<0.001	>0.99	0.13	0.001	>0.99	0.53	>0.99
Family relationship	2.98 (0.68)	2.69 (0.70)	2.63 (0.75)	2.59 (0.69)	<0.001	0.01	<0.001	<0.001	>0.99	>0.99	>0.99
Family environment	3.17 (0.56)	2.89 (0.61)	2.90 (0.57)	2.86 (0.64)	<0.001	0.002	<0.001	<0.001	>0.99	>0.99	>0.99

[a] The participants were classified into four groups namely (Group 1: N-N) without social withdrawal intention at Wave 2 and 3; (Group 2: Y-N) having social withdrawal intention at Wave 2 but not at Wave 3; (Group 3: N-Y) without social withdrawal intention at Wave 2 but then having it at Wave 3; and (Group 4: Y-Y) having social withdrawal intention at Waves 2 and 3. Abbreviations: WFH = Work From Home; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = General Anxiety Disorder-7 scale.

Table 2
Reasons for social withdrawal intention.

Reasons	Social withdrawal intention groups[a]			χ^2 test	
	Group 2 Y: N (n = 64)	Group 3 N: Y (n = 97)	Group 4 Y:Y (n = 88)	2 vs 4	3 vs 4
	n (%)			p	
Wave 2					
Study	20 (31.25)	–	34 (38.64)	>0.99	–
Relationship with family members	12 (18.75)	–	16 (18.18)	>0.99	–
Social difficulties	32 (50.00)	–	49 (55.68)	>0.99	–
Physical health status	7 (10.94)	–	6 (6.82)	>0.99	–
Personal development prospects	6 (9.38)	–	18 (20.45)	0.31	–
Poor	14 (21.88)	–	28 (31.82)	0.73	–
Relationship with friends	25 (39.06)	–	23 (26.14)	0.39	–
Peer stress	19 (29.69)	–	20 (22.73)	>0.99	–
Mental health status	10 (15.62)	–	23 (26.14)	0.53	–
Wave 3					
Study	–	43 (70.49)	43 (66.15)	–	>0.99
Relationship with family members	–	13 (39.39)	11 (31.43)	–	>0.99
Social difficulties	–	49 (79.03)	57 (81.43)	–	>0.99
Physical health status	–	10 (30.30)	15 (34.88)	–	>0.99
Personal development prospects	–	20 (50.00)	19 (44.19)	–	>0.99
Poor	–	27 (57.45)	31 (60.78)	–	>0.99
Relationship with friends	–	18 (50.00)	18 (40.00)	–	>0.99
Peer stress	–	22 (52.38)	26 (54.17)	–	>0.99
Mental health status	–	22 (50.00)	24 (52.17)	–	>0.99

[a] The participants were classified into four groups namely (Group 1: N-N) without social withdrawal intention at Wave 2 and 3; (Group 2: Y-N) having social withdrawal intention at Wave 2 but not at Wave 3; (Group 3: N-Y) without social withdrawal intention at Wave 2 but then having it at Wave 3; and (Group 4: Y-Y) having social withdrawal intention at Waves 2 and 3.

patterns of the presence and absence of social withdrawal intention during the 3-year long pandemic. Identifying the predictors that are related to the change patterns with panel data allows us to examine whether the COVID-related public health measures would have an impact on young people's psycho-social status and propose initiatives that can based on data relationships that are closer to casual than purely correlational relationships.

There are some interesting and unique findings were generated from this longitudinal study. First, the non-respondents of the social withdrawal intention items seem to have different profiles than the respondents. Second, as postulated, the participants with withdrawal intention throughout the study period seemed to have the more negative psycho-social-environmental issues than their counterparts with no such intention. Third, although the SARS-CoV-2 virus had mostly affected middle-aged adults, and its related deaths were mainly elderly in Hong Kong, young people were concerned by the pandemic but the helplessness feelings about the COVID-19 were prevalent among the Group 4 participants. This may be the group of young people that had been more impacted by the prolonged effects of the COVID-19. Fourth, we found that social and study difficulties issues were the main reasons for social withdrawal intention reported by participants in Group 4. Fifth, based on the multiple regression models, the influences of family members and family environment at different waves seemed to play multidirectional prevention, elimination, and promotion roles on the youth social withdrawal intention phenomenon; and loneliness seems to be the key to intervene for the youth social withdrawal phenomenon.

It is important to highlight that our attrition analysis showed that the non-completers of the social withdrawal intention items comprised of around 17 % of the overall study population, and had poorer psychological status, i.e., higher loneliness and suicidal ideation, than the completers. We postulated that some of these non-respondents might have denied about their withdrawal intention or preferred to use more passive ways, e.g., avoidance, to cope with their developmental stressors. Regardless, this is a group of participants that require attention and future research on adolescent withdrawal intention may need to find ways to early identify, assess, and assist this group of young people at the school setting.

Previous studies on examining actual prolonged social withdrawal behaviour generally found that males are more likely to be hikikomori. However, it concerned us that this pandemic and its public health measures might have facilitated the development of an environment in which many people can function without leaving their homes and which may have significantly changed the females' daily-living patterns and attracted females to be withdrawn who would not have prior to the pandemic. According to a panel study that was conducted in eight Organization for Economic Cooperation and Development countries, women were found to be more likely to perceive COVID-19 as a very serious health problem and to agree and comply with restrictive public policy, and gender differences in attitudes and behaviour were large in all countries (Galasso et al., 2020). Our concerns that pandemic might have attracted females to be withdrawn and remained as withdrawn for female young people were slightly relieved because being female was a significant factor for changing the status from being withdrawn at Wave 2 but out of it at Wave 3. In other words, it seemed that some female young people might have started the affinity to social withdrawal at the beginning of the pandemic, but that preference did not persist among them. We speculate that one of the potential reasons was that the withdrawn female young people at Wave 2 had become less intended to withdrawal probably they were more familiarised with the social distancing measures and newer ways for socialisation had been adopted in a much more timely way that their male counterparts.

Another interesting finding is that the working arrangement of fathers and mothers during the study period had different contribution to their intention to withdrawal physically at home or socially. Young people participated in our study whose mother working at home at baseline were more likely to develop social withdrawal intention, but a father working at home was negatively associated with intended withdrawal behaviour. We speculate that the experience of having mother working from home during the early phase of the pandemic might have enhanced the provided a sense of warmth provided by mothers to young people in a constricted environment, which might have enhanced their led to their development of a social withdrawal intention for spending more time at homes with lesser social interactions of people without the fear of being infected. However, father working from home, on the other hand, may have both created a sense of pressure for young people by being under constant observation and contributed to their not wanting to be at home most of the time since many working fathers spent less time at homes before the pandemic. Regardless, previous studies have found poor family relationships is one of the risk factors for social withdrawal behaviour. For examples, Hamasaki et al. (2020)'s study that compared the patterns of family communication and environment between 20 hikikomoris and 80 control individuals and found that the hikikomori group had significant higher scores for conflict between parent and child and lower scores for communication between parents. In our unpublished qualitative study with 10 local high school students who had experienced and exhibited a combinations of social withdrawal tendencies such as skipping school, poor social skills, and poor social relationships with classmates or friends and data analysis using Interpretive Phenomenological Analysis found that poor family relationship

Table 3
Associations of COVID-related factors, psychological, family and school factors at Wave 1–3 with social withdrawal intention analysed by multiple mixed-effects logistic regression models.

	Social withdrawal intention groups[a]					
	Group 2 Y:N (n = 64)		Group 3 N:Y (n = 97)		Group 4 Y:Y (n = 88)	
	OR (95 % CI)	p	OR (95 % CI)	p	OR (95 % CI)	p
Wave 1						
Age	1.21 (0.51–2.88)	0.66	1.03 (0.59–1.79)	0.92	1.08 (0.41–2.81)	0.88
Gender						
Male	Reference		Reference		Reference	
Female	**13.38 (2.38–75.16)** **	0.003	1.10 (0.42–2.88)	0.85	3.88 (0.58–26.06)	0.16
PHQ-9	1.18 (0.91–1.52)	0.21	0.96 (0.80–1.16)	0.67	0.93 (0.70–1.26)	0.65
Suicidal ideation						
No	Reference		Reference		Reference	
Yes	0.10 (0.01–1.34)	0.08	1.03 (0.24–4.48)	0.97	1.21 (0.11–12.78)	0.87
GAD-7	0.78 (0.59–1.03)	0.08	0.94 (0.79–1.11)	0.47	0.91 (0.68–1.21)	0.51
Social anxiety	6.46 (0.79–52.60)	0.08	0.76 (0.21–2.71)	0.67	0.19 (0.03–1.12)	0.07
Stress	1.01 (0.44–2.33)	0.98	1.50 (0.87–2.57)	0.14	2.24 (0.91–5.54)	0.08
Loneliness						
No	Reference		Reference		Reference	
Yes	4.03 (0.75–21.75)	0.11	1.50 (0.46–4.86)	0.50	**8.37 (1.59–44.18)** *	0.01
Father WFH						
None	Reference		Reference		Reference	
A few days	0.39 (0.09–1.75)	0.22	0.38 (0.12–1.19)	0.10	0.06 (0.01–0.54) *	0.01
Always	**0.02 (0.00–0.37)** **	0.007	0.31 (0.07–1.32)	0.11	0.54 (0.09–3.30)	0.51
Mother WFH						
None	Reference		Reference		Reference	
A few days	2.60 (0.42–16.00)	0.30	**4.97 (1.49–16.50)** **	0.009	1.94 (0.32–11.57)	0.47
Always	4.99 (0.55–45.52)	0.15	1.28 (0.35–4.66)	0.71	**7.02 (1.10–44.95)** *	0.04
Feel helpless due to COVID-19						
Seldom	Reference		Reference		Reference	
Sometimes	0.77 (0.16–3.66)	0.74	1.58 (0.56–4.40)	0.39	0.77 (0.13–4.49)	0.77
Always	4.63 (0.57–37.61)	0.15	0.84 (0.11–6.17)	0.86	**13.90 (1.05–183.16)** *	0.046
Felt local community is vulnerable						
Seldom	Reference		Reference		Reference	
Sometimes	2.42 (0.34–17.34)	0.38	1.86 (0.45–7.78)	0.39	0.15 (0.01–2.71)	0.20
Always	0.03 (0.00–2.10)	0.11	2.16 (0.15–30.39)	0.57	0.05 (0.00–2.51)	0.13
Wave 2						
PHQ-9	1.28 (0.95–1.71)	0.10	1.03 (0.86–1.25)	0.72	1.01 (0.77–1.31)	0.97
Suicidal ideation						
No	Reference		Reference		Reference	
Yes	1.97 (0.32–12.16)	0.47	0.51 (0.13–2.05)	0.34	2.93 (0.38–22.89)	0.31
GAD-7	0.80 (0.62–1.03)	0.09	1.02 (0.86–1.20)	0.86	1.03 (0.81–1.31)	0.82
Social anxiety	1.79 (0.52–6.13)	0.36	1.05 (0.44–2.50)	0.91	2.38 (0.62–9.14)	0.21
Stress	1.02 (0.37–2.76)	0.98	1.84 (0.89–3.82)	0.10	0.88 (0.29–2.68)	0.82
Loneliness						
No	Reference		Reference		Reference	
Yes	0.55 (0.12–2.61)	0.45	0.87 (0.28–2.73)	0.82	0.71 (0.14–3.52)	0.68
School bonding	**0.25 (0.07–0.97)** *	0.045	0.42 (0.17–1.04)	0.06	0.66 (0.19–2.36)	0.53
Family relationship	0.75 (0.15–3.64)	0.72	0.88 (0.31–2.46)	0.80	1.11 (0.21–5.96)	0.90
Family environment	0.39 (0.05–2.87)	0.35	**0.28 (0.08–0.93)** *	0.04	0.20 (0.03–1.52)	0.12
Wave 3						
PHQ-9	0.83 (0.63–1.09)	0.19	1.11 (0.95–1.30)	0.20	1.23 (0.90–1.67)	0.20
Suicidal ideation						
No	Reference		Reference		Reference	
Yes	6.52 (0.88–48.32)	0.07	2.54 (0.72–8.93)	0.15	1.70 (0.25–11.56)	0.59
GAD-7	1.22 (1.00–1.49)	0.05	1.03 (0.89–1.19)	0.67	1.04 (0.85–1.27)	0.72
Social anxiety	0.63 (0.21–1.92)	0.42	1.59 (0.61–4.13)	0.34	1.56 (0.40–6.11)	0.53
Stress	0.61 (0.23–1.59)	0.31	1.12 (0.60–2.10)	0.73	1.04 (0.35–3.09)	0.94
Loneliness						
No	Reference		Reference		Reference	
Yes	2.77 (0.58–13.29)	0.20	0.88 (0.31–2.45)	0.80	2.88 (0.56–14.79)	0.21
School bonding	0.78 (0.21–2.93)	0.71	1.18 (0.51–2.72)	0.69	0.70 (0.16–2.96)	0.62
Family relationship	0.29 (0.06–1.31)	0.11	0.46 (0.15–1.37)	0.16	2.56 (0.48–13.60)	0.27
Family environment	1.68 (0.29–9.79)	0.56	**6.45 (1.72–24.14)** **	0.006	0.62 (0.12–3.39)	0.58

*p < .05; **p < .01; ***p < .001.

[a] The participants were classified into four groups namely (Group 1: N-N) without social withdrawal intention at Wave 2 and 3; (Group 2: Y-N) having social withdrawal intention at Wave 2 but not at Wave 3; (Group 3: N-Y) without social withdrawal intention at Wave 2 but then having it at Wave 3; and (Group 4: Y-Y) having social withdrawal intention at Waves 2 and 3. Abbreviations: WFH = Work From Home; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = General Anxiety Disorder-7 scale.

dynamics was one of the five themes that contributed to the withdrawal intention and the students claimed that their parents do not understood them and being single children contributed to their sense of loneliness.

Our unique finding has found that there are also multidimensional impacts on how paternal and maternal relationships impact their withdrawal intention. There is an emerging number of studies investigating the impact of the changed working pattern of working parents during COVID-19 (Toran et al., 2021; Yamamura and Tsustsui, 2021)

but there are very limited studies examining the impact on children of working parents who have worked from home during the pandemic, except some studies indicating that the incidence of child maltreatment increased when lockdowns were implemented (Bullinger et al., 2021). Future qualitative studies can explore the relationship between having parents working from home and withdrawal behaviour, because it is very likely that the COVID-19 pandemic may be the beginning of a change in work-life for most people. We also found that the family environment seems a protective factor against social withdrawal intention. It seems that parents who have made efforts to create a positive family environment help combat the development of misbehaviours in young people.

The study identified school engagement and positive family environment as protective factors against social withdrawal intention among adolescents. Vigilance to school non-attendance by parents and teachers is essential because non-attendance may signal a need for engagement and care. Physical or e-outreaching visitations to homes of potential at-risk families by professionals to assess the potential risk of developing a prolonged withdrawal behaviour is recommended. Parents and teachers should also realise that young people's possession of social and emotional skills that help them establish adequate relationships with others and face the challenges of the social context are at least as important as the literacy taught in the school curriculum. Parents can also learn and practice some parenting skills, for example, communication and listening techniques, that favour the creation of a compassionate and harmonious family climate for parents and children. May be more urgently, we need to examine the help-seeking intention and patterns of social withdrawal of at-risks young people to better bridge young people in need and youth services professionals.

Compared with the previous studies on prolonged social withdrawal behaviour, the strengths of this study include the large sample size of participants and the availability of many different types of predictors, including sociodemographic, psychological, family and school. Another strength is that the study adopted a preventive perspective that measures social withdrawal intention using a longitudinal study design. For instance, the study demonstrates that loneliness, which is a subjective feeling of having inadequate social connections or relationships, is a precursor to the intention for social withdrawal. In contrast, depression and anxiety, which are clinical mental health conditions, did not lead to an intention for social withdrawal. According to prior research, depression and anxiety are typically outcomes that result from prolonged social withdrawal behaviour. In other words, studies that look at intention with a longitudinal design may allow us to examine the differences of the strength of relationships, and maybe directions as well, between contributing factors to withdrawal intention and behaviour.

However, the findings need to be interpreted in the light of the two very important circumstances: 1) intention does not equate to behaviour and 2) the present study was conducted during the pandemic when public health and social distancing measures were in place. Therefore, to address point 1, more future studies are needed to identify more protective and preventive factors that lead to withdrawal behaviour. Secondly, it is important to note that the meaning of the social withdrawal intention level is likely to be varied especially under the situations when individuals were forced to maintain social distancing with others versus the situations when social withdrawal intention was more voluntarily when there were no pandemic-related preventive measures were implemented. Another potential limitation is that participants' social withdrawal intension was measured by two items instead of by the commonly used validated scale that measures *hikikomori behaviour*, i.e., the 25-item *Hikikomori* Questionnaire (Teo et al., 2018). We used the two items because, firstly, the findings of this study could be comparable with previous studies that examined intention rather than withdrawal behaviour and a full social withdrawal behaviour scale may not be fully applicable to participants who have just started the thoughts of withdrawal. The study is also limited by the absence of pre-pandemic comparison data. The direct relationship between the social withdrawal intention and the COVID-19 pandemic cannot be conclusively demonstrated based on the current data.

5. Conclusion

The COVID-19 pandemic has affected our lives profoundly in almost every aspect. This longitudinal study offers novel insights into the factors associated with social withdrawal intention among youth during the COVID-19 pandemic. Participants who maintained withdrawal intention reported more negative psychosocial issues (e.g., loneliness), underscoring the importance of early intervention. The study found that they also experienced heightened feelings of helplessness due to COVID-19. Surprisingly, mothers WFH was linked to increased withdrawal intention, while fathers WFH seemed to have the opposite effect, revealing the complex interplay between pandemic-induced family dynamics and adolescents' withdrawal intention. Prolonged social withdrawal behaviour not only negatively impacts young people but can also lead to long-term negative consequences for families and society (Wong and Li, 2021). Hence, if this emerging youth phenomenon is recognised as a significant issue in developed and high-income countries, a coordinated multi-agency collaboration will be needed to identify those at risk of continuing to withdraw from society (Zhu et al., 2021b). Governments and policy makers who have genuine concerns of the future generations and commitment to improve and sustain the well-being of countries' futures, may take reference from Wales to having a Future Generations Commissioner so that the government's thinking can be more long-term and people oriented, with each other and with the whole communities to be inclusive and involved to prevent foreseeable future challenges.

CRediT authorship contribution statement

Tim M.H. Li: Writing – review & editing, Writing – original draft, Resources, Formal analysis, Data curation, Conceptualization. **Shimin Zhu:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Paul W.C. Wong:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization.

Data availability

The data that support the findings of this study are available from the corresponding author, PWCW, upon reasonable request.

Declaration of competing interest

None declared.

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