

## Article

# Interactive Video-Based Passive Drinking and Forced Drinking Education to Reduce Intention to Drink in Adolescents: A Pre-Post Intervention Study

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**Abstract:** Passive and forced drinking harm was prevalent but less recognized in Chinese adolescents. We educated adolescents on such harm to reduce their intention to drink. Students (n=1244) from 7 secondary schools in Hong Kong participated in a video-based health talk on passive and forced drinking harm. Paired t-test was used to assess their change in knowledge of passive and forced drinking, health and social harm of drinking after the health talk. McNemar's chi-squared test and adjusted multivariable logistic regression (AOR) were used to assess their change in intention to drink and intention to quit. Students were less likely to drink (OR 0.29, 95% CI 0.19-0.42) and more likely to quit drinking (OR 3.50, 1.10-14.6) after the health talk. Increased knowledge of passive drinking was associated with less intention to drink (AOR 0.93, 0.90-0.97), increased knowledge of health harm (adjusted b 0.06, 0.05-0.08), and social harm of drinking (adjusted b 0.12, 0.10-0.16). Similar associations were observed in forced drinking (intention to drink: AOR 0.87, 0.79-0.96; health harm: adjusted b 0.16, 0.12-0.19; social harm: adjusted b 0.36, 0.28-0.43). We showed preliminary evidence that the health talk on passive and forced drinking reduced the intention to drink in adolescents.

**Keywords:** Adolescents; passive drinking; forced drinking; alcohol misuse; interactive video-based education; pre-post intervention study

## Introduction

Harmful use of alcohol is affecting both developed and developing countries [1]. It contributes to 3 million deaths worldwide and is one of the leading risk factors for premature death and disability-adjusted life year loss (DALYs) in adolescents [2]. Harmful drinkers develop regular drinking habits at this stage [3,4]. In Hong Kong (HK), 66.7% of adult binge drinkers had drunk alcohol below the legal age (18 years old), and 16.6% of adult drinkers had underage drinking habits (n=1087) [5]. Alcohol use is prevalent in adolescents. In a representative sample of HK secondary students (n=23288), 21.5% were current drinkers, and 7.5% binge drank in the past 12-month [3] (five or more standard drinks for males; four or more standard drinks for females on one occasion; one standard drink contains 10 gram of pure alcohol) [6]. Although the prevalence of current drinking (drink at least one standard drink in the past 30-day) [4] in adolescents was lower than in western countries (e.g., 57% in European countries and 39% in the United States) [7], interventions are needed to stop the growing trend of harmful alcohol use for this target population.

The adverse effects of alcohol are not limited to drinkers themselves but also to people surrounding the drinkers. Passive drinking is defined as harm resulting from others' drinking; serious harm includes sexual harassment, unwanted intercourse, and physical assaults by the drinking person [8]. Adolescents were the primary victim of passive drinking [9]. 2 in 5 local secondary students experienced passive drinking in the past 30-day

[3]. Adolescence is the most critical developmental stage in life, and environmental factors highly shape their development [10]. Parental drinking was linked to early initiation of alcohol consumption, harmful alcohol use, delinquency, and risky behaviors (e.g., unsafe sex and drug abuse) in adolescents [11,12,13]. Costs of morbidity and death from passive drinking were high. In Australia, the morbidity of child abuse caused by drinking parents costs AU\$3.6 million annually [14].

Forced drinking is defined as drinking alcohol unwillingly, including drinking under force, playing drinking games, and drinking due to social pressure [3]. Drinking is considered socially acceptable and one of the important cultures in China [15]. Moderate alcohol consumption was perceived as beneficial to health; many parents trained their children to drink alcohol and regarded it as a behavior for success in Chinese society [16]. HK adolescents grew up in an alcohol-friendly and pro-drinking environment; toasting and being invited to drink by peers and family members were common in secondary students [3]. Our survey found that 1 in 5 HK Chinese secondary students experienced forced drinking in life, 7.1% drank under peer pressure, and 6.3% were forced to drink by family members [3]. These activities predisposed adolescents to alcohol intoxication [17].

Cochrane systematic reviews found that school-based prevention programs were cost-effective in delaying the onset of harmful drinking in adolescents even with small effect sizes, and saved substantial government expenses on alcohol-related morbidity [18,19,20]. Yet, the content and mode of intervention delivery were still inconclusive. We aimed to raise awareness of the harm of passive and forced drinking in adolescents. We also investigated the effectiveness of interactive video-based education in reducing the intention to drink in this population.

## Methods

### *Study design*

We recruited local secondary schools from all five regions of Hong Kong and invited 347 (of all 479) schools to join. Seven schools (of 347, 2.02%) participated; refusal was mainly due to time and administrative issues. All Form 1-6 (Grade 7-12) students in the participating schools were invited to the video-based health talk. Invitation letters were sent to parents via the schools to explain the health talk's purpose and emphasize that participation was voluntary. Parents who refused to join were asked to have their children return blank questionnaires after the talk. Students' participation was voluntary, even with parental consent. Before the health talk, students were briefed about the self-administered anonymous questionnaires, and teachers were reminded not to influence students to answer the questions. The two surveys (pre- and immediate post-questionnaire) took 5-10 minutes to complete, and 10 minutes break was given to students before completing the post-questionnaire. The completed questionnaires were inserted into opaque envelopes and sealed immediately after completion. Students who completed both questionnaires (n=1244) were analyzed. Ethical approval was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (Ref. UW 19-400).

### *Intervention*

The interactive video-based health talk lasted for 45 to 60 minutes. It was divided into three sessions, which covered the topics of the harm of drinking, knowledge of passive and forced drinking, and strategies to reject drinking invitations. In the first session, students were asked to vote for the answers regarding the myths about drinking (e.g., whether drinking a small amount of red wine daily minimizes cardiovascular disease risk). Correct answers were provided and explained after each vote, and small gifts were given to students who had voted the correct answers. In the second session, students were introduced to passive drinking and forced drinking concepts, including the harm, situations, risk factors, and strategies to avoid those harm. We created age-appropriate cartoon

animations related to the harm of passive and forced drinking; they were shown in the health talk to enhance students' impressions. In the final session, students were taught the strategies to reject peers' or family members' drinking invitations (e.g., making excuses or saying no to alcohol without hesitation). Important points of the above information were summarized at the end of the health talk.

Measurements

Socio-demographic characteristics and drinking behaviors were collected at baseline. Students were asked if they agreed on the following 12-item of harm of passive drinking in the pre and post-questionnaires, including noise; sleep/study interrupted; emotionally hurt; feeling neglected; taking care of a drunk; verbal insulted; physical assault; sexual harassment; unwanted sex; financial loss; accident; properties damaged. Situations of forced drinking (5-item: asked by senior to drink; propose a toast to senior; drink under peer pressure; drink for others; playing drinking games), health harm of drinking (5-item: drinking: would affect health; would cause cancer, is addictive; would increase blood pressure; would cause weight gain), and social harm of drinking (9-item: drinking: would relieve stress; would induce happiness; would lead to poor academic performance; would increase one' maturity; would reduce next drunkenness; would increase own attractiveness; would help to make new friends; is appropriate for secondary students; benefits outweigh the risks) were assessed similarly. Intention to quit (yes vs. no) and intention to drink (yes vs. no) were assessed in the pre-and post-questionnaires. The satisfaction level and perceived effectiveness of the interactive video-based education were measured in the post-questionnaire.

Statistical analysis

A total of 127 students (9.3%) with missing answers for over half of the questionnaire were excluded. Paired t-test was used to measure the change in students' knowledge of passive drinking (total score: 12), forced drinking (total score: 5), health harm of drinking (total score: 5), and social harm of drinking (total score: 9) after the health talk. McNemar's chi-squared test was used to assess the change of intention to quit (yes vs. no) and intention to drink (yes vs. no) after the health talk. The associations of knowledge of passive drinking and forced drinking with knowledge of drinking harm, intention to drink, and intention to quit were analyzed using multiple linear regression (adjusted unstandardized coefficient, b) and logistic regression (adjusted odds ratio, AOR), adjusting for sex, school grade levels, perceived affluence, and corresponding pre-talk score. The associations of socio-demographic characteristics with post-talk scores of passive drinking and forced drinking were analyzed using multiple linear regression, mutually adjusting for baseline socio-demographic characteristics and pre-talk scores. Stata 15.1 was used for all analyses. A two-tailed P-value of less than 5% was considered statistically significant.

Results

Table 1 shows that 57.9% of students were female, 81.6% were middle school grade level, and 58.5% perceived their family affluence as average. 63.6% never had drunk alcohol, and 16.8% drank at least monthly.

Table 1. Socio-demographic characteristics and drinking behaviors of 1244 participants .

	n <sup>a</sup> .	%	(95% CI)
Sex			
Male	513	42.1	(39.4-44.9)
Female	705	57.9	(55.1-60.6)
School grade level <sup>b</sup> .			

Middle school (F.1-3)	1010	81.6	(79.3-83.6)
High school (F.4-6)	228	18.4	(16.4-20.7)
Perceived family affluence			
Below average	305	24.8	(22.5-27.3)
Average	719	58.5	(55.6-61.2)
Above average	206	16.7	(14.8-18.9)
Drinking frequency			
Never	752	63.6	(61.0-66.3)
Yearly or less	232	19.6	(17.4-22.0)
Monthly or less	103	8.7	(7.2-10.5)
1-3 times per month	64	5.4	(4.3-6.9)
1-6 times per week	19	1.6	(1.0-2.5)
Everyday	13	1.1	(0.6-1.9)

a. Observation (n) is not 1244 due to nonresponse.

b. Forms 1-6 are equivalent to Grade 7-12 in the North American-based system.

Table 2 shows a significant increase in the scores of students' knowledge of passive drinking (total score 12: 4.78 vs. 5.83,  $P<0.001$ ), forced drinking (total score 5: 2.27 vs. 2.72,  $P<0.001$ ), health harm of drinking (total score 5: 3.13 vs. 3.58,  $P<0.001$ ), and social harm of drinking (total score 9: 4.36 vs. 5.43,  $P<0.001$ ) after the health talk. The odds ratio from McNemar's chi-squared test shows that students were more likely to quit (OR 3.50, 95% CI 1.10-14.6) and less likely to drink alcohol (OR 0.29, 0.19-0.42) after the health talk.

Table 2. Change in knowledge of passive drinking, forced drinking, drinking harm, intention to quit, and intention to drink after the health talk in 1244 participants <sup>a</sup>.

	Pre mean (SD) / n (%)	Post mean (SD)/ n (%)	P-value <sub>b</sub>	OR (95% CI) <sup>c</sup>
<u>Passive drinking</u>				
Harms (total score=12)	4.78 (3.87)	5.83 (4.57)	<0.001	
<u>Forced drinking</u>				
Situations (total score=5)	2.27 (1.64)	2.72 (2.00)	<0.001	
<u>Knowledge of drinking harm</u>				
Health harm (total score=5)	3.13 (1.23)	3.58 (1.42)	<0.001	
Social harm (total score=9)	4.36 (2.89)	5.43 (3.23)	<0.001	
<u>Intention to quit</u> (n= 127)	37 (29.1)	47 (37.0)	<0.05	3.50 (1.10-14.6) *
<u>Intention to drink</u> (n= 942) <sup>d</sup>	472 (50.1)	383 (40.7)	<0.001	0.29 (0.19-0.42) ***

a. Observation (n) only included consistent answers to drinking frequency questions and excluded students who never drink and stop drinking.

b. P-value was calculated by McNemar's chi-squared test and paired t-test.

c. The odds ratio was calculated by McNemar's chi-squared test.

d. Observation (n) is not 1244 due to nonresponse.

\*  $P<0.05$ ; \*\*  $P<0.01$ ; \*\*\*  $P<0.001$ .

Table 3 shows an increase in knowledge of passive drinking (adjusted b 0.06, 95% CI 0.05-0.08) and forced drinking (adjusted b 0.16, 0.12-0.19) after the health talk was associ-

ated with an increase in knowledge of health harm of drinking. Similar positive associations were observed for knowledge of social harm of drinking (passive drinking: adjusted b 0.12, 0.10-0.16; forced drinking: adjusted b 0.36, 0.28-0.43). Students with increased knowledge of passive drinking (AOR 0.93, 95% CI 0.90-0.97) and forced drinking (AOR 0.87, 0.79-0.96) were less likely to drink after the health talk.

**Table 3.** The association of knowledge of passive drinking and forced drinking with knowledge of health harm and social harm of drinking, intention to drink, and intention to quit in 1244 participants.

Variables	b (95% CI) /OR (95% CI) <sup>a</sup>	P-value <sup>b</sup>
<u>Knowledge of health harm (total score=5)</u>		
Passive drinking (post-score)	0.06 (0.05, 0.08)	<b>&lt;0.001</b>
Forced drinking (post-score)	0.16 (0.12, 0.19)	<b>&lt;0.001</b>
<u>Knowledge of social harm (total score=9)</u>		
Passive drinking (post-score)	0.12 (0.10, 0.16)	<b>&lt;0.001</b>
Forced drinking (post-score)	0.36 (0.28, 0.43)	<b>&lt;0.001</b>
<u>Intention to drink (Yes vs. No)</u>		
Passive drinking (post-score)	0.93 (0.90, 0.97)	<b>&lt;0.01</b>
Forced drinking (post-score)	0.87 (0.79, 0.96)	<b>&lt;0.01</b>
<u>Intention to quit (Yes vs. No)</u>		
Passive drinking (post-score)	1.02 (0.95, 1.09)	>0.05
Forced drinking (post-score)	1.04 (0.89, 1.22)	>0.05

a. Regression was adjusted by sex, school grade level, perceived affluence, and pre-talk score.

b. P-value was calculated by multiple linear regression and logistic regression.

\* P<0.05; \*\* P<0.01; \*\*\* P<0.001.

Table 4 shows that students who were female (adjusted b 0.70, 95% CI 0.23-1.18) and from Form 1-5 (adjusted b range 3.81-4.53, all P<0.05) had a significant increase in knowledge of passive drinking after the health talk, adjusting for pre-talk scores and potential covariates. Similar positive associations were observed for forced drinking (female: adjusted b 0.28, 0.07-0.49; Form 1-5: adjusted b range 1.34-1.53, all P<0.05).

**Table 4.** The association of socio-demographic characteristics with the post-talk score of passive drinking and forced drinking in 1244 participants

Variable	Pre mean (SD)	Post mean (SD)	P-value <sup>a</sup>	b (95% CI) <sup>b</sup>	P-value <sup>c</sup>
<u>Passive drinking</u>					
Harm (total score=12)					
Sex					
Male	4.83 (4.10)	5.48 (4.70)	<b>&lt;0.01</b>	REF	
Female	4.79 (3.69)	6.16 (4.46)	<b>&lt;0.001</b>	0.70 (0.23, 1.18)	<b>&lt;0.01</b>
School grade level <sup>d</sup>					
Form 6	5.71 (5.22)	2.00 (4.47)	>0.05	REF	
Form 5	4.46 (3.67)	5.44 (4.34)	<b>&lt;0.01</b>	4.00 (0.84, 7.16)	<b>&lt;0.05</b>
Form 4	4.11 (3.26)	5.52 (4.54)	<b>&lt;0.001</b>	3.97 (0.87, 7.07)	<b>&lt;0.05</b>
Form 3	5.18 (4.03)	6.53 (4.72)	<b>&lt;0.001</b>	4.53 (1.48, 7.58)	<b>&lt;0.01</b>
Form 2	5.01 (3.98)	5.62 (4.40)	<b>&lt;0.05</b>	3.81 (0.75, 6.86)	<b>&lt;0.05</b>
Form 1	4.52 (3.79)	5.72 (4.56)	<b>&lt;0.001</b>	4.25 (1.20, 7.30)	<b>&lt;0.01</b>
Perceived family affluence					
Affluent	5.21 (4.24)	4.67 (4.48)	>0.05	REF	
Above average	4.97 (4.09)	5.82 (4.51)	<b>&lt;0.05</b>	1.10 (-0.29, 2.48)	>0.05
Average	4.74 (3.76)	5.89 (4.55)	<b>&lt;0.001</b>	1.20 (-0.06, 2.47)	>0.05
Below average	4.40 (3.66)	5.80 (4.56)	<b>&lt;0.001</b>	1.30 (-0.05, 2.65)	>0.05
Poor	5.67 (4.45)	6.36 (4.83)	>0.05	1.40 (-0.07, 2.87)	>0.05
<u>Forced drinking</u>					
Situation (total score=5)					
Sex					

Male	2.04 (1.68)	2.45 (2.08)	<0.001	REF	
Female	2.45 (1.58)	2.96 (1.91)	<0.001	0.28 (0.07, 0.49)	<0.01
School grade level <sup>d</sup>					
Form 6	2.29 (2.06)	1.14 (2.04)	>0.05	REF	
Form 5	2.29 (1.63)	2.71 (2.00)	<0.05	1.45 (0.06, 2.83)	<0.05
Form 4	2.18 (1.55)	2.71 (1.99)	<0.001	1.38 (0.03, 2.74)	<0.05
Form 3	2.36 (1.54)	2.85 (2.01)	<0.001	1.48 (0.14, 2.81)	<0.05
Form 2	2.29 (1.67)	2.64 (1.93)	<0.001	1.34 (0.005, 2.68)	<0.05
Form 1	2.21 (1.72)	2.75 (2.05)	<0.001	1.53 (0.20, 2.87)	<0.05
Perceived family affluence					
Affluent	2.74 (1.69)	2.40 (1.99)	>0.05	REF	
Above average	2.13 (1.68)	2.71 (1.96)	<0.001	0.52 (-0.08, 1.13)	>0.05
Average	2.33 (1.60)	2.79 (1.99)	<0.001	0.48 (-0.07, 1.04)	>0.05
Below average	2.09 (1.59)	2.65 (1.97)	<0.001	0.48 (-0.11, 1.07)	>0.05
Poor	2.38 (1.84)	2.61 (2.18)	>0.05	0.36 (-0.28, 1.00)	>0.05

a. P-value was calculated by paired t-test.

b. All variables were mutually adjusted and adjusted for the pre-talk score.

c. P-value was calculated by multiple linear regression.

d. Form 1-6 are equivalent to Grade 7-12 in the North American-based system.

\* P<0.05; \*\* P<0.01; \*\*\* P<0.001.

Table 5 shows that 47.8% of students were satisfied with the health talk, 78.7% agreed it heightened their knowledge of passive and forced drinking, and 61.6% agreed it facilitated discussion about drinking problems with parents.

**Table 5.** Overall satisfaction levels and perceived effectiveness of the health talk in 1244 participants.

	n <sup>a</sup>	% (95% CI)
Do you satisfy with the workshop?		
Not satisfy	205	16.7 (14.7-18.9)
Neutral	436	35.5 (32.9-38.2)
Very satisfy	587	47.8 (45.0-50.6)
Do you agree that the workshop helped broaden your knowledge of passive and forced drinking?		
Disagree	261	21.3 (19.1-23.7)
Agree	964	78.7 (76.3-80.9)
Do you agree that the workshop facilitates discussing the drinking problem with your parents?		
Disagree	470	38.4 (35.7-41.2)
Agree	754	61.6 (58.8-64.3)

a. Observation (n) is not 1244 due to nonresponse.

## Discussion

This is the first quasi-experimental study to use interactive video-based intervention to educate adolescents on the harm of passive and forced drinking to reduce their intention to drink and promote quitting. Our previous survey found that their harms were prevalent in Chinese adolescents; 38.9% and 21.9% of secondary students had ever experienced passive and forced drinking, respectively [3,21]. For over a decade, adolescents suffered from alcohol-related assaults from others' drinking, and a substantial proportion of them was hospitalized because of physical abuse by drinking parents and alcohol intoxication from peers' forced drinking [13,17]. Our findings showed that the overall knowledge of drinking harm, passive drinking, and forced drinking increased compared to baseline; they also reported less intention to drink after the health talk. The results provided preliminary evidence that the novel interactive video-based education was feasible to empower students' capability to avoid those harms and promote their motivation to quit drinking.

Our study showed that increased knowledge of forced drinking was associated with less intention to drink. Forced drinking (e.g., playing drinking games or being invited to



drink by peers) was linked to increased alcohol consumption. These drinking activities provide opportunities for learning drinking behaviors from peers [18,22]; drinking with peers reinforces the perceived positive social reward of drinking and promotes motivation to drink [18]. In addition, playing drinking games was identified as a crucial predictor of harmful drinking in adolescents [23]. Study found that drinking game players were more likely to binge drink and engage in heavy episodic drinking on a drinking occasion than non-game players [23]. Adolescents who participated in drinking games during secondary school were associated with a higher risk of alcohol abuse in university [24]. Our results provide implications that educating adolescents about the harm of forced drinking was crucial to de-normalize drinking behaviors and prevent them from developing risky drinking practices.

We found that the intervention increased adolescents' knowledge of passive and forced drinking, except for older students (Grade 12) and those who perceived themselves as affluent. Older students were more likely to drink and resort to alcohol to cope with stress and anxiety as they had more external stressors (e.g., academic stress and social obligation) than younger students [25]. In addition, older students were exposed to more pro-drinking behaviors and alcohol advertisements on social media; alcohol industries advocated the benefits of drinking on these platforms and advertised that people from higher social classes would drink alcohol (e.g., red wine and whiskey) for leisure and uplift their social status [26]. These risk factors reinforced the positive social rewards of drinking. Adolescents from higher socioeconomic status (SES) also had more alcohol misuse problems [27]. Students with higher perceived family affluence were more likely to hear parents saying the benefits of drinking and pouring alcohol for parents [28]. Parents with higher SES were reported more as red wine drinkers and encouraged their children to try alcohol for health [28]. Our results provide support for persuading parents with higher SES not to drink in front of children and not to advocate the benefits of drinking to them.

### Limitations

This study had some limitations. First, the intention to drink and intention to quit were assessed immediately after the health talk; follow-up data is needed to confirm the long-term outcomes. Second, the causal effects between the intervention and outcomes cannot be concluded, and confounding bias might exist due to lack of randomization; we minimized its effects by adjusting for potential confounding variables, and a randomized controlled trial is needed to provide more robust evidence. Third, students' experience taking the pre-test questionnaire might affect their performance on the post-test questionnaire (testing effect). Therefore, we implemented 10 minutes washout period after the health talk to minimize its effect on students' performance on the post-test questionnaire.

### Conclusions

We found that our interactive video-based education increased students' overall knowledge of drinking harm; they also reported less intention to drink after the intervention. Increased knowledge of passive and forced drinking were associated with increased knowledge of drinking harm and less intention to drink. Students who were older and perceived themselves as affluent were not receptive to our intervention; more intensive intervention is needed for these specific groups. This study provides implications that educational programs at school, such as teaching students about the knowledge of passive and forced drinking, can be a feasible strategy to prevent students from underage drinking and developing alcohol misuse problems in the future.

### Author Contributions

M.P.W., S.Y.H. conceived and designed the study. M.P.W., S.Y.H. and Y.W. collected the data. S.L.C. and Y.W. analyzed the data. S.L.C. wrote the first draft of the manuscript. All authors critically revised and approved the final version of the manuscript.

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**Data Availability**

The dataset generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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**Conflicts of Interest**

The authors declare there is no conflict of interests.



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