

PHYSICAL ACTIVITY AND SUICIDAL BEHAVIORS IN GAY, LESBIAN, AND BISEXUAL KOREAN ADOLESCENTS

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Abstract

The purpose of this study was to examine whether physical activities were related to suicidal behaviors in gay, lesbian, and bisexual Korean adolescents. In 2015, 68,043 adolescents participated in the 11th Korea Youth Risk Behavior Web-Based Survey project. However, only 628 of these 68,043 participants provided enough information about their romantic and sexual behaviour to be categorized as gay or bisexual boys ($n = 430$) or lesbian or bisexual girls ($n = 198$).

The relationships between physical activities and suicidal behaviours were evaluated by multivariate logistic regression analysis after adjustment for covariate variables such as economic status of the family, mental stress, frequency of smoking, and frequency of drinking.

There were no significant relationships between muscle-strengthening exercises and the suicidal behaviour categories (seriously considered, planned, and attempted) both in gay or bisexual boys and in lesbian or bisexual girls. Additionally, there were no significant relationships between vigorous physical activity and the suicidal behaviour categories in gay or bisexual boys. However, there were a significant relationship between vigorous physical activity and suicidal behaviour categories in lesbian or bisexual girls. There were slightly significant relationships between light physical activity (walking) and suicidal behaviour both in gay or bisexual boys and in lesbian or bisexual girls.

We concluded that, for gay or bisexual boys, light physical activity might be associated with a reduced risk of suicidal behaviours. However, vigorous physical activity and muscle-strengthening exercises were not associated with suicidal behaviours. For lesbian or bisexual girls, vigorous physical activity might be associated with a reduced risk of suicidal behaviours. However, muscle-strengthening exercises had no association with suicidal behaviours.

Keywords: *bisexual, gay, lesbian, physical activity, suicidal behaviours, youth*

The World Health Organization reports that every year over 800,000 people die from suicide; for 15–29 year-olds including adolescents, suicide was the second leading cause of death globally in 2012.¹ In the United States, the annual suicide rate was 12.93 per 100,000 individuals and suicide was the 10th leading cause of death in the US in 2016.² In Korea, the annual suicide rate was 27.3 per 100,000 individuals and Korea had the highest ranked suicide rate in 2014 among the countries in the Organization for Economic Cooperation and Development (OECD).³ Hence, suicide is a serious social and public health problem in Korea and worldwide.

Moreover, according to the Williams institute at the UCLA School of Law in 2011, approximately 9 million people (3.5% of adults) in the United States identify as gay, lesbian, or bisexual (LGB) and approximately 0.3% of adults are transgender.⁴ Although there are no official statistics for the gay, lesbian, bisexual, and transgender (LGBT) population in Korea, social and public health issues with diseases such as human immunodeficiency virus/acquired immune deficiency syndrome of the LGBT population have received much attention from the global public as well as in their respective societies.⁵

Interestingly, gay, lesbian, and bisexual people appear to have a greater risk for mental disorders and suicidal behaviour than heterosexual people.⁶ LGBT people face issues with institutionalized prejudice, social stress, social exclusion (even within their families), and anti-homosexual hatred and violence, and frequently internalize a sense of shame about their sexuality.^{6,7}

Helping youth to maintain or improve their physical activity may be critical to suicide prevention and/or treatment of suicidality. One of the general approaches for improving hopelessness and suicidality in adolescents involves both participation in sport and increased physical activity.^{8–10} However, even though previous studies have showed that physical activity is associated with a reduced risk of suicidal behaviours in adolescents, to our knowledge, there is no epidemiological evidence regarding the association between physical activity and suicidal behaviours focused on gay, lesbian, and bisexual adolescents. Therefore, the

purpose of this study was to examine whether physical activities were related to suicidal behaviours in gay, lesbian, and bisexual Korean adolescents.

MATERIALS AND METHODS

The 11th Korea Youth Risk Behavior Web-based Survey (KYRBWS-XI) in 2015 is a cross-sectional epidemiology study using a complex sample design that included multistage sampling, 132 stratifications, 44 clusters, and a 17-city-cluster sample strategy and a survey-sampling frame covering all of the Republic of Korea. Moreover, based on a complex sample design, 400 middle schools and 400 high schools from middle school first year (7th grade) to high school third year (12th grade) students who were aged 12–18 were sampled by KYRBWS-XI to assess the association between physical activities and suicidal behaviours in gay, lesbian, and bisexual Korean adolescents, considering potential covariate variables. All details of the data collection procedure were described by the Ministry of Education, Ministry of Health and Welfare, Korea Centers for Disease Control and Prevention.¹¹ Informed consent was obtained from all participants and the survey was conducted with the approval of the research ethics committees of Korea Centers for Disease Control and Prevention; the approval number is 2014-06EXP-02-P-A.

The students were assigned unique ID-numbers by classroom teachers. They accessed the survey web page using those numbers and were asked if they were willing to participate. The students who chose to join the study completed the questionnaire anonymously at their school. The response rate was 96.7%; 68,043 of 70,362 students participated in KYRBWS-XI projects. However, only 628 of these 68,043 participants provided sufficient information about their romantic and sexual behaviour to be categorized as gay or bisexual boys ($n = 430$) and lesbian or bisexual girls ($n = 198$). The participants had no previous psychiatric history and were not receiving medical treatment. The characteristics of the participants are shown in Table 1.

Categorization of Lesbian, Gay, and Bisexual

Categorization of participants into homosexual (gay or lesbian) and bisexual boys and girls, respectively, was determined using the following single question

TABLE 1 The Characteristics of Participants

Variables		Gay or bisexual boy (<i>n</i> = 430)	Lesbian or bisexual girl (<i>n</i> = 198)
Age (years)		15.33 ± 1.72	15.41 ± 1.87
Height (cm)		171.29 ± 8.29	160.76 ± 6.78
Weight (kg)		60.79 ± 11.61	52.38 ± 9.76
Body mass index (kg/m ²)		20.66 ± 3.33	20.19 ± 3.13
Economic status of the family	Very rich	112 (26.0)	47 (23.7)
	Rich	84 (19.5)	34 (17.2)
	Average	120 (27.9)	50 (25.3)
	Poor	53 (12.3)	31 (15.7)
	Very poor	61 (14.2)	36 (18.2)
Mental stress	Very high	88 (20.5)	33 (16.7)
	High	87 (20.2)	41 (20.7)
	Average	152 (35.3)	76 (38.4)
	Low	61 (14.2)	28 (14.1)
	Very low	42 (9.8)	20 (10.1)
Frequency of smoking	No smoking	280 (65.1)	120 (60.6)
	1–2 day(s) per month	15 (3.5)	5 (2.5)
	3–5 days per month	7 (1.6)	9 (4.5)
	6–9 days per month	19 (4.4)	5 (2.5)
	10–19 days per month	12 (2.8)	10 (5.1)
	20–29 days per month	14 (3.3)	8 (4.0)
	Every day	83 (19.3)	41 (20.7)
Frequency of drinking	No drinking	268 (62.3)	115 (58.1)
	1–2 day(s) per month	49 (11.4)	20 (10.1)
	3–5 days per month	30 (7.0)	15 (7.6)
	6–9 days per month	16 (3.7)	18 (9.1)
	10–19 days per month	12 (2.8)	6 (3.0)
	20–29 days per month	3 (0.7)	5 (2.5)
	Every day	52 (12.1)	19 (9.6)
Frequency of vigorous physical activity per week	None	68 (15.8)	37 (18.7)
	1–2 days	128 (29.8)	70 (35.4)
	3–4 days	114 (26.5)	50 (25.3)
	Over 5 days	120 (27.9)	41 (20.7)
Frequency of light physical activity (walking) per week	None	56 (13.0)	26 (13.1)
	1–2 days	47 (10.9)	21 (10.6)
	3–4 days	61 (14.2)	29 (14.6)
	Over 5 days	266 (61.9)	122 (61.6)
Frequency of muscle-strengthening exercises per week	None	122 (28.4)	74 (37.4)
	1–2 days	144 (33.5)	66 (33.3)
	3–4 days	83 (19.3)	25 (12.6)
	Over 5 days	81 (18.8)	33 (16.7)
Suicide: seriously considered	No	295 (68.6)	117 (59.1)
	Yes	135 (31.4)	81 (40.9)

(Continued)

TABLE 1 (Continued)

Variables		Gay or bisexual boy (<i>n</i> = 430)	Lesbian or bisexual girl (<i>n</i> = 198)
Suicide: planned	No	340 (79.1)	141 (71.2)
	Yes	90 (20.9)	57 (28.8)
Suicide: attempted	No	364 (84.7)	154 (77.8)
	Yes	66 (15.3)	44 (22.2)

Note. Data are expressed as mean \pm standard deviation or as *n* (%)

of the KYRBWS-XI: “Select each of these that you have experienced?” The available responses were classified into three groups: (1) none of these, (2) sexual intercourse with someone of the opposite sex, (3) sexual intercourse with someone of the same sex. Based on their responses, participants were divided into 2 groups: (A) a gay or bisexual boy group consisting of boys who responded with “yes” to group 3 or “yes” to both groups 2 and 3; (B) a lesbian or bisexual girl group consisting of girls who responded with “yes” to group 3 or “yes” to both groups 2 and 3.

Dependent Variables

Suicidal behaviour was categorized into seriously considered, planned, and attempted using the following three questions: (1) “In the last twelve months, have you ever seriously considered suicide?” (2) “In the last twelve months, have you made a concrete plan to commit suicide?” and (3) “Did you attempt suicide during the last twelve months?” The available responses were “no” (reference group) and “yes.”

Independent Variables

Physical activities were evaluated using the following three questions: (1) “On how many days out of the last seven did you perform vigorous physical activity wherein you were breathing hard or sweating for more than twenty minutes?” (2) “On how many of the last seven days did you walk for more than 10 minutes?” (light) and (3) “In the last seven days, on how many days did you do resistance exercises (muscle-strengthening) such as push-ups, sit-ups, weightlifting, working out with dumbbells, chin-ups, and parallel bars?” The available responses were (1) none in the last seven days, (2) one day, (3) two days, (4) three days, (5) four days, (6) five days, (7) six days, and (8) every day. Based on their responses, participants

were divided into 4 groups: (A) none, (B) 1–2 days, (C) 3–4 days, and (D) over 5 days.

Covariate variables

(1) Economic status of the family: the possible responses ranged from 1 (very rich) to 5 (very poor).

(2) Mental stress: the possible responses ranged from 1 (very high) to 5 (none).

(3) Frequency of smoking: the possible responses ranged from 1 (no) to 7 (every day).

(4) Frequency of drinking: the possible responses ranged from 1 (no) to 7 (every day).

Statistical Analysis

All results from this study are presented in terms of mean \pm standard deviation or *n* (number) (%). Multivariate logistic regression analyses were conducted to determine whether the suicidal behaviour categories (seriously considered, planned, and attempted) were related to physical activities after adjusting for covariate variables such as economic status of the family, mental stress, frequency of smoking, and frequency of drinking. Statistical significance was set at $p < 0.05$, and all analyses were performed using SPSS Complex Sample™ version 18.0 (Chicago, IL, USA).

RESULTS

The results of the multivariate logistic regression analyses for suicidal behaviour in relation to physical activities in gay, lesbian, and bisexual Korean adolescents are shown in Table 2.

There were no significant relationships between muscle-strengthening exercises and the suicidal behaviour categories of seriously considered, planned, and attempted in both gay or bisexual boys and lesbian or bisexual girls. Additionally, there were no significant relationships between vigorous physical

TABLE 2 The Results for Suicide in Relation to Physical Activities in Gay, Lesbian, and Bisexual Korean Adolescents

Suicide	Seriously considered		Planned		Attempted	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Gay or bisexual boy (n = 430)						
Frequency of vigorous physical activity per week						
Over 5 days	1.000 (Reference)		1.000 (Reference)		1.000 (Reference)	
3-4 days	0.694 (0.271-1.774)	0.445	0.649 (0.228-1.847)	0.418	0.796 (0.240-2.644)	0.710
1-2 days	0.823 (0.406-1.668)	0.589	0.611 (0.267-1.400)	0.244	1.211 (0.470-3.121)	0.692
None	0.849 (0.423-1.704)	0.646	0.676 (0.301-1.519)	0.343	1.003 (0.396-2.543)	0.995
Frequency of light physical activity (walking) per week						
Over 5 days	1.000 (Reference)		1.000 (Reference)		1.000 (Reference)	
3-4 days	1.626 (0.759-3.484)	0.211	2.438 (1.061-5.603)	0.036*	2.263 (0.895-5.724)	0.084
1-2 days	1.032 (0.443-2.403)	0.942	1.846 (0.709-4.804)	0.209	1.302 (0.424-4.002)	0.645
None	2.266 (1.157-4.441)	0.017*	2.608 (1.199-5.672)	0.016*	2.079 (0.905-4.775)	0.085
Frequency of muscle-strengthening exercises per week						
Over 5 days	1.000 (Reference)		1.000 (Reference)		1.000 (Reference)	
3-4 days	0.554 (0.242-1.269)	0.163	0.679 (0.263-1.755)	0.425	0.575 (0.196-1.687)	0.313
1-2 days	0.619 (0.288-1.329)	0.218	0.594 (0.244-1.445)	0.251	0.541 (0.196-1.499)	0.238
None	0.944 (0.419-2.127)	0.890	0.846 (0.326-2.198)	0.731	1.156 (0.399-3.353)	0.790
Lesbian or bisexual girl (n = 198)						
Frequency of vigorous physical activity per week						
Over 5 days	1.000 (Reference)		1.000 (Reference)		1.000 (Reference)	
3-4 days	1.371 (0.297-6.332)	0.686	2.776 (0.485-15.885)	0.251	1.385 (0.124-15.517)	0.791
1-2 days	1.608 (0.440-5.874)	0.472	2.530 (0.592-10.810)	0.210	2.665 (0.482-14.723)	0.261
None	3.262 (0.842-12.632)	0.087	6.470 (1.456-28.743)	0.014*	7.152 (1.273-40.164)	0.025*

(Continued)

TABLE 2 (Continued)

Suicide	Seriously considered		Planned		Attempted	
	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
Physical activities						
Frequency of light physical activity (walking) per week						
Over 5 days	1.000 (Reference)		1.000 (Reference)		1.000 (Reference)	
3–4 days	1.625 (0.540–4.888)	0.388	3.005 (0.972–9.296)	0.056	6.186 (1.516–25.247)	0.011*
1–2 days	0.280 (0.072–1.089)	0.066	1.133 (0.283–4.532)	0.860	0.127 (0.008–2.041)	0.145
None	1.536 (0.563–4.192)	0.402	1.459 (0.460–4.633)	0.522	2.652 (0.581–12.106)	0.208
Frequency of muscle-strengthening exercises per week						
Over 5 days	1.000 (Reference)		1.000 (Reference)		1.000 (Reference)	
3–4 days	1.688 (0.436–6.537)	0.448	0.462 (0.102–2.085)	0.315	0.277 (0.044–1.756)	0.173
1–2 days	2.816 (0.763–10.403)	0.120	0.630 (0.148–2.691)	0.533	0.893 (0.164–4.852)	0.896
None	1.677 (0.394–7.134)	0.484	0.978 (0.224–4.274)	0.977	1.757 (0.330–9.363)	0.509
OR = odds ratio, CI = confidence interval						

* $p < 0.05$; tested by multivariable logistic regression analysis after adjustment for economic status of the family, mental stress, frequency of smoking, and frequency of drinking

activity and any of the suicidal behaviour categories in gay or bisexual boys.

However, gay or bisexual boys who performed no light physical activity had a 2.266 higher odds ratio (OR), 95% confidence interval (CI) = 1.157–4.441 ($p = 0.017$), of having seriously considered suicide than boys who performed over 5 days of light physical activity. Boys who performed no light physical activity had a 2.608 higher OR, 95% CI = 1.199–5.672 ($p = 0.016$), and boys who performed 3–4 days of light physical activity had a 2.438 higher OR, 95% CI = 1.061–5.603 ($p = 0.036$), of having planned suicide compared with boys who performed over 5 days of light physical activity.

Lesbian or bisexual girls who performed no vigorous physical activity had a 6.470 higher OR, 95% CI = 1.456–28.743 ($p = 0.014$), of having planned suicide compared with girls who performed over 5 days of vigorous physical activity. Girls who performed no vigorous physical activity had a 7.152 higher OR, 95% CI = 1.273–40.164 ($p = 0.025$), of having attempted suicide compared with girls who performed over 5 days of vigorous physical activity. Girls who performed 3–4 days of light physical activity had a 6.186 higher OR, 95% CI = 1.516–25.247 ($p = 0.011$), of having attempted suicide compared with girls who performed over 5 days of light physical activity.

DISCUSSION

This study examined the relationship between physical activities and suicidal behaviours in gay, lesbian, and bisexual Korean adolescents.

The prevalence of having seriously considered, planned, or attempted suicide was very high in both gay or bisexual boys (31.4%, 20.9%, and 15.3%, respectively) and lesbian or bisexual girls (40.9%, 28.8%, and 22.2%, respectively) in this study. Furthermore, these rates are much higher than the corresponding prevalence for adolescents in the United States and for their Latina peers in 2016.^{12,13} We believe that government or schools in Korea should encourage more social and public attention to and caution about preventing suicidal behaviours in gay, lesbian, and bisexual Korean adolescents.

This study found that there were no significant relationships between muscle-strengthening exercises

and suicide in both gay or bisexual boys and lesbian or bisexual girls. Additionally, there were no significant relationships between vigorous physical activity and suicide in gay or bisexual boys. The adolescent period is a phase of psychological change, culminating in sexual maturity, rapid physical growth, and the highest hormone levels compared to the rest of one's lifetime.¹⁴ For this reason, because adolescents are already in good physical condition, especially in terms of muscle mass and function, compared to the remainder of their lifetime, vigorous physical activity, including muscle-strengthening exercises, may not affect suicidal behaviours.

Nevertheless, there were significant relationships between light physical activity and suicidal behaviours in both gay or bisexual boys and lesbian or bisexual girls. Light physical activity such as walking usually affects the blood circulation system.¹⁵ Thus, light physical activity stimulates the brain via increased blood circulation to the whole body, and this has positive effects on psychological factors such as positive mental well-being, lower psychophysiological reactivity to mental stress, anxiety, mood, and happiness.^{16,17} For this reason, we believe that light physical activity reduces the risks of suicidal behaviours.¹⁸ In the future, well-designed studies are necessary to test this hypothesis.

This study has several limitations. First, even though sexuality trends in adolescence may affect the rest of the life span, it is well known that sexual orientation in children and adolescents is considerably different to what may emerge in adulthood. Therefore, this study's findings cannot be generalized to the adult population in Korea. Second, we would suggest that because they are at such a young age and have so little sexual experience, it may be that the sexual experiences reported by participants do not reflect their true sexual orientations. Third, in the covariate variables, economic status of the family was not reported by parents, but by the adolescent participants, so, it might be inaccurate. Fourth, because the KYRBWS-XI was a cross-sectional retrospective cohort study, cause and effect relationships cannot be assessed, hence only the interrelationships between variables were examined. Fifth, since only 628 participants took part in the KYRBWS-XI, it is not possible to generalize

the study findings to the whole population of Korean adolescents. However, we believe that this study will stimulate other researchers to explore social and public health problem of LGB adolescents in Korea.

CONCLUSION

We concluded that, for gay or bisexual boys, light physical activity might be associated with a reduced risk of suicidal behaviours. However, vigorous physical activity and muscle-strengthening exercises were not associated with suicidal behaviours. For lesbian or bisexual girls, vigorous physical activity might be associated with a reduced risk of suicidal behaviours. However, muscle-strengthening exercises had no association with suicidal behaviours.

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The authors declare that there is no conflict of interest.

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