

Determinants of Sexual Awareness among High School Students in Tokyo, Japan

—Post-Interventional Comparison Analysis in Relation to Social Capital

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Abstract

Purpose: This study was to clarify the association of sexual awareness of high school students with cognitive social capital (SC) in Tokyo, Japan. **Method:** In September 2017, we conducted a survey of 1073 third-grade high school students who were the same students who had participated in the same questionnaire survey at the prior academic year when they were second-grade students. A total of 1073 students were surveyed and 956 students responded. From six to eight weeks prior to this September 2017 survey, we implemented an educational intervention in the students. Then we compared the results of this survey with the previous survey of February 2017. We used logistic regression to assess sexual awareness and sex knowledge, sexually experienced surrounding peers and Self-Esteem score. The study was approved by the Ethical Review Board. **Result/Discussion:** Sexual awareness of high school students was significantly associated with SC both before and after the intervention. The higher SC one had, the higher sexual awareness was shown and the greater the sexual caution among both boys and girls was indicated. The study clarified the Determinants of Sexual Awareness of High School Students in Tokyo before and after the educational intervention. **Conclusion:** SC was found to be significantly associated with sexual awareness. SC should be emphasized in promoting adolescent reproductive health for the future.

Keywords

Sexual Awareness, Social Capital, Self-Esteem, Sex Knowledge, High School Students, Japan

1. Introduction

Adolescent sex behavior is at higher risk of causing unwanted pregnancy and

sexually transmitted diseases in comparison with adult sexual behavior. It has been known to be a high-risk factor for future health issues such as infertility (UNFPA 2013, WHO 2011) [1] [2]. Previous studies have clarified that immature sexual awareness, insufficient sex knowledge and low self-esteem scale score which reflects the level of an individual's self-respect were factors for likely engaging in sexual behavior in adolescence (Goodson, P. *et al.* 2006) [3]. On the other hand, the impact of relationships with the local community and neighborhood on adolescent's mental health and daily activities recently has been reported as important social capital and has attracted attention in developed countries including Japan (McPherson, K. *et al.* 2013) [4]. Many studies about factors that influence adolescent sexual awareness and behavior have been conducted up-to-now, and the importance of raising self-esteem in sex education has been emphasized by a number of domestic and international researchers from 1980's to 2002 (Goodman, P. *et al.* 2006) [3]. This philosophy has been assimilated into the Japanese education. It was recently noted that social capital such as "sense of community belonging" and "neighborhood relationship" is influential to an individual's behavior even among young people (Kawachi I, *et al.* 2001) [5]. Therefore, we hypothesized that social factors such as social capital were associated with adolescent sexual awareness and behavior compared to previously recognized individual factors including sex sufficient knowledge and high self-esteem, and we have reported verification of the association of sexual awareness and self-consciousness of social capital (cognitive social capital) based on the results of the questionnaire survey of the eleventh-grade high school students in Hanoi, the capital city of Vietnam where social changes and changes in young people's lifestyles are drastic (Watanabe. *et al.* 2014) [6] [7] [8] [9]. Concerning the verification of determinants of sexual awareness and behavior, we used previously unreported verification method of multiple factors tested simultaneously and we found that social capital rather than sex knowledge and self-esteem was associated deeply with sexual awareness, higher cognitive social capital, and safer and more socially desired sexual awareness. We also conducted the same survey in Ho Chi Min City of Southern Vietnam that is far away and culturally and historically different from the capital Hanoi and we acquired similar results (Watanabe *et al.* 2014) [6] [7] [8] [9]. Since we acquired virtually the same results from two culturally and historically different areas in Vietnam, we made a hypothesis that we may get the same results in Japan. We conducted in Japan the same survey as in Vietnam with some modifications for Japanese culture to second-grade high school students in Tokyo. The Tokyo results, same as the results in Vietnam, showed sexual awareness was deeply associated with social capital rather than sex knowledge and self-esteem.

Accordingly, in this study we conducted longitudinal research on the same students now in their third grade who had participated in the survey an academic year earlier while at their second grade to confirm the presence or absence of changes in sexual awareness. These now third-grade students were administered the same survey. Eight-to-ten weeks before the third-grade survey, an interven-

tion (described in Method (2), below) was made. The main purpose was to enhance social capital. The collective results of the intervention, the third-grade survey and the posteriori second-grade survey aimed to clarify unreported and undefined parts of the determinants of adolescent sexual awareness and behavior in Japan, and aimed to develop interventional measures for adolescent youth.

2. Method

1) Subjects

From September to November 2017, we administered the survey to 1073 third-grade high school students in six high schools in the Tokyo metropolitan area who participated in our questionnaire survey last academic year when they were at the second-grade (collected responses 956, collection rate 89.1%). After excluding invalid responses with unspecified age or gender, the final analysis subjects were 476 boys (51.2%), 471 girls (48.8%), a total of 947 students (88.3%). To acquire the average data of high school students in Tokyo, all six high schools were public, fulltime, comprehensive and coed with almost equal ratio of boys/girls.

2) Contents of Intervention

Eight-to-ten weeks prior to the survey described in (1), above, an educational intervention was performed on a class-by-class basis. The number of students in a class was 30 - 40 and one class-based-teacher was assigned in each class. The educational intervention was conducted in the manner of lecture for approximately 30 minutes (questions and answers time not included) by each class teacher and researchers as leaders with support of a nursing teacher and vice-principal with whom we discussed the intervention protocol beforehand. The intervention pamphlet which was based on survey results from their second year of high school was used. The pamphlet is four-pages in size of B4, and contents are as follows; a) disclosure about survey results of the second grade high school students (only tabulation of all participants and undisclosed name of person and school), b) the necessity of learning sex for high school students and responsibility for living as a member of society, c) types of contraceptive methods and specific usage of them, d) types, symptoms and incubation periods of sexually transmitted diseases, e) appropriate usage of condom and reasons for encouraging use of condom.

3) Survey Contents

We examined the level of self-esteem using the Japanese version (Yamamoto, *et al.* 1965) [10] of the Rosenberg Self-Esteem Scale [11], sex knowledge, sexual awareness (acceptance of premarital sex, acceptance of premarital sex with love, existence of sexually experienced surrounding peers of the same generation), cognitive social capital (sense of community belonging, willingness of social contribution, reliability to surrounding people), structural social capital (existence of events in school and community and participating situations, involvement with family) in addition to basic attributes.

We translated the questionnaire from English into Vietnamese and used it for surveys in Vietnam in 2012 and 2014. We then translated the English version of the questionnaire into Japanese and modified it consistent with Japanese culture and climate after discussions with representatives and persons in charge of subject high schools (head of year, homeroom teacher, nursing or *Yogo*-teacher) and making further adjustments in 2016. A “*Yogo* teacher” is a special licensed educator in Japan who supports children’s growth and development through health education and health services on the basis of principles of health promotion in all areas of educational activities in school. We completed this questionnaire through a pilot study of 560 high school students in Tokyo and used it for this study. In this process we used the words and terms of the textbooks of high school health and physical education and homemaking courses approved by the Japan Ministry of Education, Culture, Sports, Science and Technology.

To verify sexual awareness of the subjects, we categorized their responses of four choices of “strongly think so”, “think so”, “strongly don’t think so”, and “don’t think so” into two groups and tabulated them; “think so” group for “strongly think so” and “think so”, “don’t think so” group for “strongly don’t think so”, and “don’t think so”.

4) Analysis Method

After simple tabulation, we performed multivariate analysis assigning true or false answers to questions on: timing to wear condom for “sex knowledge”; acceptable or unacceptable premarital sex of high school students for “sexual awareness”; sense of community belonging for “social capital”; presence or absence of sex experienced peers; and Rosenberg Self-Esteem Scale score (binarized with the mean value). Then, we performed multiple logistic regression analysis assigning sexual awareness for dependent variable and sex knowledge, sexually experienced surrounding peers and Self-Esteem score for independent (explanatory) variable [model 1], and included social capital for independent variable [model 2].

5) Ethical Consideration

This study was approved by the Ethical Review Board of the National Center for Global Health and medicine (Approval number: NCGM-G-002071-00). We had the cooperation of the high schools and obtained written informed consent from the participating students before conducting this survey.

3. Results

1) Background of Subjects

Of the analysis subjects, 99.6% were 16 or 17 year olds and 77.6% were from nuclear families. **Table 1** shows the physical development status of subjects tabulated by genders. The subjects overall were the average Japanese high school students from the perspective of physical development, and there was not a meaningful change from the second-grade times to the third-grade times (White Paper on Children and Young People 2017) [12]. Therefore the subjects of this

Table 1. Physical development.

Gender	Second Grade Times						Third Grade Times									
	Boy			Girl			Boy			Girl						
	Number of Subjects	Minimum	Maximum	Mean ± Standard Deviate	Number of Subjects	Minimum	Maximum	Mean ± Standard Deviate	Number of Subjects	Minimum	Maximum	Mean ± Standard Deviate				
Height	515	152.0	191.0	171.0 ± 6.4	479	143	181	157.9 ± 5.3	217	156.0	192.0	171.0 ± 6.7	206	144.0	181.0	157.9 ± 5.6
Weight	510	38.0	126.0	61.1 ± 10.6	437	38.0	85.0	50.9 ± 6.8	218	40.0	130.0	62.5 ± 13.0	191	37.0	89.0	51.9 ± 7.9

study can be considered as the average Japanese high school student population.

2) Ownership Status of Personal Use Items

Table 2 shows responses on items owned for personal use. As responses could be multiple answers, counts of selectors and percentages were shown in the table. Almost all subjects answered that they owned a mobile phone or smart phone for personal usage and there was no difference in their grade in school. About 70% of the subjects were allocated a private room and there was no difference in their grade in school. To sum it up, they seem to be living relatively endowed with a privacy right that adolescents desire.

3) Reality of Social Capital

Table 3 and **Table 4** show answers to questions composed of “structural social capital” and “cognitive social capital” divided by the characteristics of social capital.

As for structural social capital, although more than 70% of the subjects in both genders responded that there were events they could participate in at their place of residence, only less than 25% of them answered that they actually participated

Table 2. Ownership of personal use items.

Item	Boy 2 nd Grade (%) n = 518	Boy 3 rd Grade (%) n = 476	Girl 2 nd Grade (%) n = 493	Girl 3 rd Grade (%) n = 493
Private Room at Home	378 (73.0)	357 (75.0)	337 (68.4)	324 (70.4)
Mobile Phone, Smart Phone	505 (97.5)	452 (95.0)	488 (99.0)	446 (97.0)
Personal Computer	143 (27.6)	145 (30.5)	91 (18.5)	89 (19.3)
Communication Devices other than Mobile and Smart Phone	90 (17.4)	72 (15.1)	34 (6.9)	33 (7.2)
Bicycle	464 (89.6)	395 (83.0)	441 (89.5)	385 (83.7)
Motor Bike	36 (6.9)	45 (9.5)	20 (5.1)	38 (8.3)
Automobile other than Bike	4 (0.8)	8 (1.7)	2 (0.4)	8 (1.7)

Table 3. Structural social capital.

Gender	Boy 2 nd Grade n = 518		Boy 3 rd Grade n = 474		MacNemar	Girl 2 nd Grade n = 493		Girl 3 rd Grade n = 458		McNemar
	Yes (%)	No (%)	Yes (%)	No (%)		Yes (%)	No (%)	Yes (%)	No (%)	
1) Events for Residents in Community	392 (76.0)	124 (24.0)	362 (76.4)	112 (23.6)	n.s.	355 (72.3)	136 (27.7)	338 (73.8)	120 (26.2)	n.s.
2) Participating in 1)	125 (24.2)	391 (75.8)	142 (29.9)	333 (70.1)	*	122 (24.8)	370 (75.2)	113 (24.7)	345 (75.3)	n.s.
3) Interfamilial Communion such as eating out	281 (54.5)	235 (45.5)	264 (55.6)	211 (44.4)	n.s.	316 (64.2)	176 (35.8)	293 (64.0)	165 (36.0)	n.s.
4) Father's Meddling in Behavior	169 (32.9)	345 (67.1)	142 (30.0)	331 (70.0)	n.s.	141 (29.2)	342 (70.8)	117 (26.0)	333 (74.0)	n.s.
5) Mother's Meddling in Behavior	272 (52.8)	243 (47.2)	239 (50.3)	236 (49.7)	n.s.	259 (52.9)	231 (47.1)	241 (52.9)	215 (47.1)	n.s.

*: $p < 0.05$, n.s.: $p \geq 0.05$.

Table 4. Reality of cognitive social capital.

Gender	Boy 2 nd Grade n = 518		Boy 3 rd Grade n = 475		MacNemar	Girl 2 nd Grade n = 493		Girl 3 rd Grade n = 458		MacNemar
Choices	Strongly think so/Think so (%)	Strongly don't think so/Don't think so (%)	Strongly think so/Think so (%)	Strongly don't think so/Don't think so (%)		Strongly think so/Think so (%)	Strongly don't think so/Don't think so (%)	Strongly think so/Think so (%)	Strongly don't think so/Don't think so (%)	
I have Sense of Community Belonging	393 (76.0)	124 (24.0)	346 (72.8)	129 (27.2)	*	372 (75.8)	119 (24.2)	334 (72.9)	124 (27.1)	*
I'd like to Contribute to Society in the Future	407 (78.9)	109 (22.1)	382 (80.4)	93 (19.5)	n.s.	422 (85.9)	69 (14.1)	406 (88.6)	52 (11.4)	n.s.
I can Trust Surrounding People	409 (79.6)	105 (20.4)	380 (80.0)	95 (20.0)	n.s.	370 (75.2)	122 (24.8)	362 (79.2)	95 (20.8)	*

*: p < 0.05, n.s.: p ≥ 0.05.

in those events except the third-grade boys. In boys, ones who participate in such community events increased from the second-grade times to the third-grade times. We included factors of family and parents in structural social capital considering that students require parental support financially and for daily living activities. Among the subjects who responded that they had interfamilial communion such as going out to eat, the number of girls was slightly higher than boys regardless of the grades in school. Also, as to parental meddling into sexual behavior of children, many responses stated that mother interfered more than father did regardless of the grades in school.

As for cognitive social capital, regardless of the grades in school, more than 75% of the subjects in both genders responded that they had a sense of community belonging, and more than 78% of them responded they would like to contribute to the society in the future. Also, more than 75% of the subjects responded they could trust people generally.

4) Situation of Self-Esteem (Rosenberg Self-Esteem Scale Score)

To measure the level of self-esteem which reflects an individual's overall subjective emotional evaluation of his or her own worth, we employed Rosenberg Self-Esteem Scale (Rosenberg M, U.S.A. Maryland Univ., the Japanese version by Yamamoto, *et al.* 1965) [10] [11]. The score range is from 0 to 30, and the average score of Japanese is 21.

The average score of the subjects of boys was 24.0 ± 3.2 and girls was 24.4 ± 2.7 in the second-grade times and boys 23.4 ± 4.0 and girls 24.0 ± 2.6 in the third-grade times that were higher than the average score of Japanese in both genders and both grades. Also, no difference between the grades was seen in girls but in boys the score of the third-grade times was lower than the second-grade times ($p = 0.04$).

5) Reality of sexual awareness

Table 5 shows responses to questions on sexual awareness of the subjects. Although in comparison to boys more girls had a sense of intolerance to sexual behavior of high school students, the subjects with the sense of intolerance to sexual behavior of high school student at the third-grade times were less than at the second-grade times. Also, in comparison to girls more boys showed tolerance to sexual behavior of high school students if love exists and it was higher at the third-grade times than the second-grade times. Among the subjects who responded that there were many peers around with sexual experience, the number of boys was higher than girls and it was significantly higher at the third-grade times than the second-grade times.

6) Reality of Sex Knowledge

Tables 6-8 show the reality of sex knowledge of the subjects. Regarding questions on sexually transmitted diseases and contraceptive methods with which respondents were acquainted, responses were multiple choices and the count of selectors and percentages were shown. We requested respondents to select only

Table 5. Reality of sexual awareness.

Gender	Boy 2 nd Grade n = 516		Boy 3 rd Grade (%) n = 475		McNemar	Girl 2 nd Grade (%) n = 493		Girl 3 rd Grade (%) n = 455		McNemar
	Choices	I think so (%)	I don't think so (%)	I think so (%)		I don't think so (%)	I think so (%)	I don't think so (%)	I think so (%)	
High school students should not conduct sexual behavior	329 (63.8)	187 (36.2)	290 (61.1)	185 (38.9)	n.s.	342 (69.9)	147 (30.1)	310 (68.0)	146 (32.0)	n.s.
High school students may conduct sexual behavior if love exists	435 (84.5)	80 (15.5)	415 (87.4)	60 (12.6)	n.s.	378 (77.3)	111 (22.7)	365 (80.2)	90 (19.8)	n.s.
I can refuse undesired sexual behavior	493 (95.7)	22 (4.3)	459 (96.6)	16 (3.4)	n.s.	463 (95.3)	23 (4.7)	433 (96.4)	16 (3.6)	n.s.
If I have a sex during high school time, I will do contraceptive	499 (97.5)	13 (2.5)	462 (97.3)	13 (2.7)	n.s.	472 (96.9)	15 (3.1)	446 (98.0)	9 (2.0)	n.s.
Man is responsible for contraceptive	491 (95.7)	22 (4.3)	442 (93.1)	33 (6.9)	n.s.	442 (88.9)	54 (11.1)	402 (88.5)	52 (11.5)	n.s.
Many peers surrounding me have sexual experience	364 (71.0)	149 (29.0)	365 (77.3)	107 (22.7)	*	323 (66.1)	166 (33.9)	325 (71.4)	130 (28.6)	*

*: p < 0.05, n.s.: p ≥ 0.05.

Table 6. Acquainted sexually transmitted diseases.

	Boy 2 nd Grade n = 518	Boy 3 rd Grade (%) n = 475	Girl 2 nd Grade (%) n = 493	Girl 3 rd Grade (%) n = 459
Chlamydia	261 (50.4)	262 (55.2)	158 (32.0)	157 (34.2)
Gonorrhea	91 (17.6)	106 (22.3)	40 (8.1)	67 (14.6)
Venereal/Syphilis	151 (29.2)	106 (38.5)	8.5 (17.2)	106 (23.1)
HIV (AIDS)	166 (32.0)	181 (38.1)	112 (22.7)	118 (25.7)
Hepatitis B	64 (12.4)	87 (18.4)	68 (13.8)	73 (15.9)
Trichomoniasis	23 (4.4)	49 (10.3)	16 (3.2)	35 (7.6)

Table 7. Acquainted contraceptive methods.

	Boy 2 nd Grade n = 518	Boy 3 rd Grade (%) n = 475	Girl 2 nd Grade (%) n = 493	Girl 3 rd Grade (%) n = 459
Condom	484 (93.4)	445 (93.7)	452 (91.7)	424 (92.4)
Oral Contraceptive Pill	380 (73.4)	360 (75.8)	389 (78.9)	359 (78.2)
Rhythm Method	68 (13.1)	94 (19.8)	39 (7.9)	60 (13.1)
Coitus Interruptus (Pull-Out Method)	260 (50.2)	248 (52.2)	178 (36.1)	164 (35.7)
Intrauterine Contraceptive Device (IUD)	140 (27.0)	143 (30.2)	141 (28.6)	139 (30.3)

Table 8. Correct/incorrect answers to questions on condom usage.

Gender	Boy 2 nd Grade n = 492		Boy 3 rd Grade (%) n = 448		Girl 2 nd Grade (%) n = 449		Girl 3 rd Grade (%) n = 413	
	Correct (%)	Incorrect (%)	Correct (%)	Incorrect (%)	Correct (%)	Incorrect (%)	Correct (%)	Incorrect (%)
Proper Timing to Wear Condom	240 (48.8)	252 (51.2)	209 (46.7)	239 (53.3)	255 (56.8)	194 (43.2)	219 (53.0)	194 (47.0)
Countermeasure When Condom Breakage	148 (31.0)	329 (69.0)	137 (31.6)	297 (68.4)	158 (35.2)	291 (64.8)	126 (30.6)	287 (69.4)

one with which they actually were acquainted and they could explain what it was.

The only sexually transmitted disease that was known by a majority of the subjects was chlamydia infection in boys at both of the second- and third-grade times. The rest of diseases known by them were all less than 40%. Both trichomoniasis, which affected few cases recently, and also Hepatitis B, which affected a certain number of cases, was reported constantly. Other transmission paths besides sexual transmission were known by only less than 20% of the subjects in both genders. However, the subjects who knew both diseases increased by at least 2% from the second- to third-grade times.

Among acquainted contraceptive methods, the only method known by more than 90% of the subjects was condom regardless of the grade in school. The oral

contraceptive pill was known by more than 70% the subjects in both genders.

As to correct or incorrect answers to questions on condom usages, the subjects who answered correctly on either question were less than 60% in both genders. And a huge discrepancy was seen between so-called “acquainted (able to explain what it is)” contraceptive methods and actual knowledge. However, the number who gave correct answers to almost all questions was higher at the third-grade times than the second-grade times.

7) Sexual Problem and Person to Consult, and Sex Education

Table 9 shows the situation of a sexual problem, person to consult, sex education and awareness of sex knowledge.

The subjects who had a sexual problem were less than 25% in both genders and it was lower at the third-grade times than the second-grade times. Also, the subjects who had a person to consult on sexual and physical problems were less in boys in comparison to girls. However, it was higher at the third-grade times than the second-grade times in both genders. Although the subjects who had experienced receiving guidance about sex were more than 65% in both genders, the ones who had confidence in sufficient sex knowledge were less than 40%, particularly lesser in girls, and it was lower at the third-grade times than the second-grade times in both genders, thus showing discrepancy between self-awareness of education and actual acquirement of knowledge.

8) Testing Multiple Determinants of Sexual Awareness Simultaneously

Table 10 shows the results of multiple logistic regression analysis with sexual awareness assigned as dependent variable. In model 1, having sex knowledge in girls and high Self-Esteem score in both genders were associated with a sense of intolerance to sexual behavior of high school students. In model 2, after cognitive social capital was included, influence of sex knowledge and Self-Esteem score disappeared, and having a sense of community belonging was strongly associated with a sense of intolerance to sexual behavior of high school students in both genders [OR (95% CI): boy 9.06 (5.60 - 14.65), girl 26.48 (13.77 - 50.92)].

4. Discussion

The subjects of this study were considered to be the average Japanese high school students from a perspective of the kind of high school in which they were

Table 9. Sexual problem and person to consult, and sex education.

Gender	Boy 2 nd Grade n = 511		Boy 3 rd Grade (%) n = 473		Girl 2 nd Grade (%) n = 486		Girl 3 rd Grade (%) n = 456	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Yes (presence)/No (absence) Answer								
Sexual Problem (Worries)	125 (24.5)	386 (75.5)	105 (22.2)	368 (77.8)	93 (19.1)	393 (80.9)	79 (17.3)	377 (82.7)
Person to Consult on Physical and Sexual Issue	225 (43.9)	287 (56.1)	229 (48.5)	243 (51.5)	293 (60.3)	193 (39.7)	284 (62.7)	169 (37.3)
Experience of Receiving Sex Education	345 (67.4)	167 (32.6)	326 (68.9)	147 (31.1)	361 (74.1)	126 (25.9)	316 (69.3)	140 (30.7)
Self-Confidence on Sex Knowledge	260 (52.2)	238 (47.8)	233(49.3)	240 (50.7)	217 (45.4)	261 (54.6)	181 (40.0)	272 (60.0)

Table 10. Multiple logistic regression analysis on acceptability to sexual behavior of high school students at 3rd grade times.

Variables	Model 1				Model 2			
	Boy		Girl		Boy		Girl	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Answer to Question on Proper Timing to Wear Condom.								
Correct	0.77 (0.55 - 1.09)	0.14	0.85 (0.59 - 1.25)	0.04	0.55 (0.37 - 0.82)	0.30	0.67 (0.43 - 1.06)	0.09
Incorrect	ref		ref		ref		ref	
Are There Many Peers with Sexual Experience Around?								
No	0.9 (0.66 - 1.24)	0.53	0.84 (0.60 - 1.17)	0.30	0.62 (0.44 - 0.89)	0.90	0.45 (0.30 - 0.69)	0.52
Yes	ref		ref		ref		ref	
Rosenberg Self-Esteem Scale Score								
21≤	0.85 (0.60 - 1.21)	0.04	0.59 (0.41 - 0.83)	<0.01	0.56 (0.37 - 0.84)	0.50	0.33 (0.21 - 0.52)	0.75
>21	ref		ref		ref		ref	
I Have Sense of Community Belonging.								
Yes					9.06 (5.60 - 14.65)	<0.01	26.48 (13.77 - 50.92)	<0.01
No					ref		ref	

OR: Odds Ratio; CI: Confidence Interval. Results are based on logistic regression analysis. Model 1 has been adjusted for Rosenberg self-esteem scale score, proper timing to wear condom and most of peer have sexual experience. Model 2 has been adjusted for Rosenberg self-esteem scale score, proper timing to wear condom, community belonging and most of peer have sexual experience.

enrolled, physical development, family structure, living style, etc. Therefore, conducting the survey after intervention, then tabulating and analyzing the results are considered to lead to acquisition of data from the average Japanese high school students. As in the case of social capital of the subjects, the result of their structural social capital was not so high before and after intervention but the result of cognitive capital was high on every item in both genders before and after intervention. Although, in general, structural social capital is supposed to be the base for cognitive social capital and thus to lead to boost cognitive social capital (Kawachi I, *et al.* 2001) [5] resulting in a small difference between structural and cognitive social capital, in the case of the subjects in our study a difference between structural and cognitive social capital was significantly large in both genders before and after intervention. From this result, the subjects were considered to have acquired factors that cultivate cognitive social capital from somewhere other than their community belonging environment, or considered to be boosted by some kind of high internal factors.

Regarding sexual behavior of high school students, more than 60% of the subjects had a sense of unacceptability and it was especially-pronounced in girls. Since it has been known that, in general, sexually experienced high school students increase as their grade in school advanced, we predicted that the third-grade high school students before graduation with permissive attitude toward sexual behavior might increase. In this survey to speculate sexual expe-

rience of high school students, we asked a question on presence or absence of sexually experienced surrounding peers of the same generation (since asking their sexual experience directly was prohibited by high school authority, we did not include such a question). As there was more than a 5% increase of perceived presence of sexually experienced peers from the second grade to the third grade in both genders, we may say that sexually experienced high school students increase as their grade in school advanced even though we may not determine it as to the subjects of this study. However, regarding permissiveness toward sexual behavior there was no significant difference between the second and the third grade, and there were many students having a cautious opinion on sexual behavior. Also, almost all subjects in both the second and third grade were against unwilling sex and they had awareness of using contraceptive in case they engage in sex during school times. This observed awareness strongly suggested the possibility of control over the initiation of sexual behavior and control over risky sexual behavior of high school students.

As to sex knowledge, the result was that the subjects who had correct and sufficient sex knowledge were few in both the second and third grade. Because not having correct sex knowledge may lead to increased risk of sexually transmitted diseases and unwanted pregnancy (Qioqin M, Masako Ono-Kirihara, *et al.* 2009) [13], countermeasures against it will be needed in the future. Although many of the subjects received sex education, only few subjects actually had sufficient sex knowledge. This result suggests acquisition and familiarization of correct sex knowledge may become a future health or social issue. By teaching sex knowledge in an intervention of about 30 minutes time, the number of the subjects who responded that they knew almost all of sexually transmitted diseases and contraceptive methods increased. Also, as for the answers to two questions on condom usage, the number of correct respondents in boys between the second and third grade was almost unchanged but the number of correct respondents in girls increased. From this result we conclude that there was a difference in acquisition of sex knowledge in terms of speed and effectiveness between boys and girls, and that acquisition of sex knowledge relates closer to girls' risk assessment of not only sexually transmitted diseases but also unwanted pregnancy, which only girls bear, rather than characteristic differences in learning between boys and girls.

Through testing two models by multiple logistic regression analysis, before and after intervention, it was indicated that not sufficient sex knowledge and high self-esteem had a deep relationship with adolescent sexual awareness as previously recognized, but social capital had a more significant association with sexual awareness in a manner that persons in both genders with high social capital are likely to have cautious sexual awareness. Particularly, odds ratio (95% CI) of boys at the third grade in model 2 was high with 9.06 (5.60 - 14.65) but odds ratio of girls was even higher with 26.48 (13.77 - 50.92). The association of sexual awareness and cognitive social capital and the effect of intervention had a dif-

ference between boys and girls, and it was more significant among girls. In the future, we suggest teachers and schools increase opportunities to cultivate cognitive social capital of high school students, and introduce cognitive social capital in education at other schools and at homes and communities.

As for analysis method, testing multiple factors simultaneously using multiple logistic regression analysis made us able to review an individually analyzed factor that was previously considered to have a deep association, and to test by a method to find detailed associations.

Some study limitations need to be considered. Mainly, there is a possibility of reporting bias because this is a self-administered questionnaire survey.

5. Conclusion

Even when multiple factors were verified simultaneously, sexual awareness and cognitive social capital of high school students in the Tokyo metropolitan area of Japan were significantly associated. We found that the educational intervention could be a help for the students to improve their sexual knowledge. Cognitive social capital was cultivated by the educational intervention, and it was more effective especially for girls. Thus, this suggests that the concept of cognitive social capital should be emphasized in promoting adolescent reproductive health. Formulating measures to enhance cognitive social capital are needed for the future.

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Conflicts of Interest

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