Ecological Influence on Early Sex Experience among Taiwanese University Students: A Study of a University in Mid-Taiwan

Ya-Chien Wang

Abstract

Prior research suggests that early sex experience is related to substance abuse and negative health and social outcomes. However, little is known about ecological predictors of early sex experience among Taiwanese university students. This study utilized Bronfenbrenner's ecological systems theory to examine predictors of early sex experience among university students in Taiwan. Ecological system factors selected for this study included micro-system (individual), meso-system (family, school, and peer), and macro-system (socioeconomic status) factors.

Data were derived from a cross-sectional study, conducted between 2011 and 2012, on sexual behavior of students in a medical university in mid-Taiwan. Students completed a self-administered, structured questionnaire. The analytic sample consisted of 302 students with a mean age of 21, 52.9% being males, and

Assistant Professor, Department of Medical Sociology and Social Work, Chung Shan Medical University, Email: taiwantous@gmail.com

21% having sex before age 20. Multiple logistic regression was conducted for each sex.

The results of multiple logistic regression analysis showed that male smokers were more likely to have early sex experience than male nonsmokers (OR = 9.27, 95% CI: 2.39-35.97). Males with better class adjustment were more likely to have early sex experience (OR = 1.65, 95% CI: 1.20-2.26), but those with parent's more liberal attitude towards premarital sex were less likely to have early sex experience (OR = 0.6, 95% CI: 0.45-0.78). For females, those who had dated via the internet were more likely to have early sex experience than were the others who had not done so (OR = 4.25, 95% CI: 1.39-12.97). Those females with stronger family bonds were less likely to have early sex experience than were the others (OR = 0.25, 95% CI: 0.09-0.69).

These findings suggest the necessity of integrative and gender-specific interventions, addressing risk factors across different system levels. Future research may investigate social meaning of early sex experience among male peer culture and ways to change the social meaning of early sex experience.

Background

Attainment of sexual maturity is an integral aspect of developmental transition from youth to adulthood. The percentage of Taiwanese college students who have had a sexual experience has increased from less than 10% in 1979 to 36% in 2007 (Yen, Liu, & Cheng, 2009). Prior research suggests that adolescents' early sex debut is associated with negative mental health symptoms (Hallfors et al., 2004) and health consequences, such as sexually transmitted diseases and unexpected adolescent pregnancy (Ma et al., 2009; Madkour, Farhat, Halpern, Godeau, & Gabhainn, 2010; Smith, 1997). Other studies have documented strong associations between early sex debut and other deviant behaviors such as substance use, prompting suggestions that early sexual debut is an indicator of an underlying problem behavior syndrome (Madkour et al., 2010; Whitbeck, Yoder, Hoyt, & Conger, 1999). A cohort study of over 2000 Taiwanese adolescents showed that adolescent smoking was significantly associated with premarital sexual activity among males (Chiao, Yi, & Ksobiech, 2012). Therefore, an understanding of risk predictors of early sex experience among Taiwanese adolescents is essential for the prevention of consequential health and social problems.

Previous studies have identified numerous correlates of adolescent early sex onset, most of which have focused on one or two social systems, such as family (Longmore, Manning, & Giordano, 2001), school (Whitbeck et al., 1999), peer (Killoren, Updegraff, Christopher, & Umaña-Taylor, 2011), or neighborhood factors (Browning, Leventhal, & Brooks-Gun, 2005). A broader theoretical model, which simultaneously examines risk factors at all levels of social systems, will likely improve the predictability of timing of first intercourse (Crockett, Bingham, Chopak, & Vicary, 1996). In this regard, Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979) provides a broad framework by which one may

comprehend the dynamic of influences from different social systems.

According to Bronfenbrenner's ecological systems theory, the ecology of human development involves four system levels which may influence human behavior (Bronfenbrenner, 1979). The first is the micro-system involving an individual's characteristics and roles in any setting (such as family). Micro-system factors often included age, mood and behavioral disorder, risk-seeking attitudes, or substance use (Corcoran, 1999; Voisin, DiClemente, Salazar, Crosby, & Yarber, 2006). The second is the meso-system involving variables related to peers, family, school, and community which provide the social context for direct interaction with others (Corcoran, 1999; Voisin et al., 2006). The third is the exo-system, the settings within which the individual does not interact directly but that, however, may have an effect on the individual's development, such as parent's workplace. Factors at the exo-system system level are, however, usually unspecified in prior adolescent sex studies. The final system is the macro-system, which include factors such as race, socioeconomic status, or gender norms (Chen, 2005; Corcoran, 1999; Van Horne, Wiemann, Berenson, Horwitz, & Volk, 2009; Voisin et al., 2006).

Reviews of the studies on adolescent sexual activity in general suggest that antecedents of adolescents' sex initiation are distributed across multi-levels of social systems, including individual, family, school, peer, and neighborhood factors (Corcoran, 1999; Kirby, 2002; Kotchick, Shaffer, Miller, & Forehand, 2001; Markham et al., 2010; Zimmer-Gembeck & Helfand, 2008). However, very few empirical studies have examined simultaneous effects of multi-level social systems on adolescent sexual activity. Moreover, much less is known about racial and gender differences in these processes (Zimmer-Gembeck & Helfand, 2008).

The lifecourse developmental perspective suggests that the social meaning of sexual initiation may be contingent upon racial/ethnic culture, gender-specific norms, and sex attitude of members in the adolescents' proximal social environments, including family, school, and peer networks (Whitbeck et al., 1999).

Adolescents from diverse racial/ethnic backgrounds may attribute dissimilar affective meanings to parental controlling or coercive behavior (Perkins, Luster, Villarruel, & Small, 1998; Zimmer-Gembeck & Helfand, 2008). Small and Luster (1994) also pointed out that the risk factors for early sex initiation among males and females may be different given their genetic constitutions and typically different life experience. From a social control perspective (Hirschi, 1969), social bonds to conventional society may serve to deter individuals from transgressing social norms. However, studies have found that social controls (bonds to conventional persons and institutions) play a far more significant role in delaying sexual initiation among girls than among boys (Crockett et al., 1996; Small & Luster, 1994).

The focus of the present research is to examine gender differences in ecological risk factors for university students' early sex experience in Taiwan. Taiwanese university students are targeted by this study because of several reasons. First of all, definition of adolescence may be considered from the point of view of country law or social culture. A legal adult in Taiwan is a person who has attained the age of 20, two years later than that in the West. Secondly, with respect to culture, adulthood could be denoted by role transitions (Kail & Cavanaugh, 2015). Most of Taiwanese university students are not economic independent and are expected to focus on education especially by middle-class parents. Therefore, they represent the subpopulation of late adolescents in Taiwan. In terms of sex experience, Taiwanese college students tended to initiate sex experience at an older age than Western adolescents, who on average had sex debut at the age of 16.4 (Haydon, Herring, Prinstein, & Halpern, 2012). According to a national health survey conducted in 2000, it was found that about 86% to 90% of Taiwanese youths under age of 20 had not ever had sex experience (Hwang, Lee, & Chao, 2010). In general, those having sex experience before age of 20 were comparatively earlier than were the average Taiwanese youths. Therefore, this study defines early

sex experience as sex experience which takes place under the age of 20.

To date, the ecological system theory has been tested primarily with samples from populations of Western younger adolescents. Taiwan provides a particular cultural background, which values collectivistic orientation (Lieber, Yang, & Lin, 2000). Adolescents situated in this cultural context are exposed to higher degrees of influence from social institutions (Chiao et al., 2012; Yi, Wu, Chang, & Chang, 2009). Given this particular cultural exposure, the dynamic of social influences from different social systems in Taiwanese adolescents' sexual behavior would be divergent from their Western counterparts.

Moreover, as suggested by the ecological system theory, gender norms may be one of the macro-system factors. In Taiwanese traditional culture, men and women are expected to have distinct social roles (Gao et al., 2012). More specifically, the Confucian concept of model womanhood encourages submissiveness as a gender-appropriate behavior. A virtuous woman is expected to be subordinate to her father before marriage, to her husband after marriage, or to her son in widowhood (Gao et al., 2012). In sexuality women are supposed to be submissive and less sexually aggressively than men (Tang, Wong, & Lee, 2001). With the divergent cultural expectations by sex, risk factors of having early sex experience are expected to be different for males and females in Taiwan. Therefore, this study will adopt a gender-specific approach to examine ecological predictors in different social systems for early sex experience. However, because exo-system factors in the ecological system theory are the settings within which the individual does not interact directly, university students might not have sufficient or reliable information to respond to an inquiry about exo-system factors. Therefore, this study examines only factors at the micro-, meso-, and macro-system levels, using self-reported data provided by the respondents.

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Methods

The Institutional Review Board at a hospital in Taiwan reviewed and approved the study protocol in 2011 prior to implementation.

Sample

This study used G*power software to calculate sample size (Erdfelder, Faul, Buchner, & Lang, 2009). For power equal to .8 (α = .05) with R square set at a medium size of .13 (Cohen, 1988), the sample size required was 132 for a regression analysis with 13 predictors or less. Data were derived from a cross-sectional survey on sexual behavior among students of a medical university located in mid-Taiwan. The survey was conducted between November 2011 and January 2012 to collect data on sexual behavior and their predictors among junior and senior students of the university. The students were eligible if they were 20 years old or older. In order to represent students in different colleges of the university, the researcher randomly selected one junior or senior class members from each of the four colleges in the university and distributed anonymous questionnaires in the classrooms. Of the 403 students invited to participate in the survey, 302 students (142 males and 160 females) completed a self-administered, structured questionnaire. The response rate is 75%.

Measures

Measures used for each variable were summarized in Table 1. Cronbach α of the measures ranged from .6 to .91.

The outcome variable

Early sex experience was assessed by asking the respondents' ages at first

Table 1

Summary of Measures (N = 302)

Variable (no. items)	Scale Range	α	Sample question
Outcome variable			
Age of sex initiation (1)	13-24	-	At what age did you first have sexual intercourse?
Micro-system			
Individual factor			
Age (1)	19-29	-	Self-reported age
Sex (1)	0-1	-	Self-reported biological sex
Smoking (1)	0-1	-	Do you smoke? (0)never (1)smoking at present or ever smoked
Dating friends via internet (1)	0-1	-	Did you ever date someone you met on the internet? (no/yes)
Meso-system			
Family factors			
Family structure (1)	1-5	-	What is the status of your parents' marriage? (1)two parent family, (2)separate, (3)divorced, (4)widow, (5)widower
Family bonds (4)	4-16	.60	Do you like living with parents and other close relatives? (1) strongly agree to (4) strongly disagree.
Parents' attitude towards premarital sex (2)	2-10	.76	What is your father's attitude towards premarital sex? (1) absolute approval to (5) absolute disapproval.
Communication about relationships and sex with parents (6)	6-18	.84	Did you ever discuss with parents about how to avoid pregnancy? (1) detailed discussion, (2) general discussion, (3) almost no discussion

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Table 1   (continued)

Variable (no. items)	Scale Range	α	Sample question
School factors			
Teacher support (3)	3-12	.70	You often obtain praise from the teachers. (1) strongly agree to (4) strongly disagree.
Class adjustment (4)	4-16	.91	How well do you get along with classmates? (1) very well to (4) very bad
Satisfaction with academic performance (3)	3-12	.76	You feel satisfied with academic performance at school. (1) strongly agree to (4) strongly disagree.
Peer influence			
Perception of good friends having multiple sex partners (1)	0-1	-	Do you think that your good friends have multiple sex partners? (no/yes)
Macro-system			
Father's education (1)	6-25	-	Years of father's education
Mother's education (1)	6-25	-	Years of mother's education

sexual intercourse. The responses were recoded into the outcome variable of having early sex experience, with 0 indicating those who did not have sex experience before the age of 20, and 1, those who ever had sex experience under the age of 20.

Explanatory variables

Micro-system predictors: individual characteristics. Individual characteristics included age, smoking, and dating friends via the internet.

Meso-system predictors: family, school, and peer factors. The measurements for family factors included family structure, family bonds (Wu, Chong, Cheng,

& Chen, 2007), parents' attitude toward premarital sex (Chen, 2005), and communication about relationships and sex with parents (Chen, 2005). The responses to family structure were recorded into (1) single parent households or (0) two parent households. Family bond was measured by four questions, such as "Do you like living with parents and other close relatives?" and "Do you enjoy staying at home?" Each question was rated on a 1 to 4 scale ranging from strongly agree to strongly disagree, with the total score being a sum of ratings. Perception of parents' attitude toward premarital sex was measured by a self-evaluation of father's and mother's attitude on premarital sex, respectively. It was rated on a 1-5 scale, ranging from absolute approval to absolute disapproval. In addition, communication about relationships and sex with parents was assessed by a 6-item scale, in which the respondents evaluated to what extent they had discussions with their parents on six topics, including getting along with heterosexual friends, preventing pregnancy, biology of reproduction, sexually transmitted diseases and AIDS, falling in love, and choosing partners. The variable was rated on a 1-3 scale, ranging from detailed discussion to almost no discussion.

The measurements for school predictors included variables of teacher support, class adjustment, and satisfaction with academic performance at school (Wu et al., 2007). Teacher support was measured by the sum of scores from three items, such as "You often obtain praise from the teachers." These items were rated on a 1-4 scale ranging from strongly agree to strongly disagree. Class adjustment was measured by the sum of scores from four items, for example, "how well do you get along with classmates." Each question was rated on a 1-4 scale ranging from very well to very bad. Satisfaction with academic performance at school was assessed from the point of view of both respondents themselves and their fathers and mothers. The example question is "You feel satisfied with academic performance at school." Each question was rated on a 1-4 scale ranging from strongly agree to strongly disagree.

Peer influence was assessed by the variable of the perception that their friends had multiple sex partners. The variable was rated on a binominal scale (no/yes).

Macro-system predictors: Socioeconomic status. Socioeconomic status was conceptualized as the father's and mother's education. It was measured by the number of cumulative years of education that the father and mother had received, respectively. The responses were recoded into (1) more than 12 years (beyond high school degree), or (0) 12 years or less (high school degree or less).

Statistical analysis

Some variables were recoded so that in all variables a higher value indicated a more liberal attitude, stronger likelihood of agreement or more discussion. Missing values were replaced with means of the variables. Because data were collected from class members, distributions of variables between classes were compared. No significant differences of variable distribution were found between classes. Therefore, the data from each class were pooled together in bivariate and multiple logistic regression analyses.

Bivariate relationships were assessed by using Pearson's r, t-test, or chi-square test. Because the dependent variable of having early sex experience was dichotomous, odds of having early sex experience before the age of 20 was modeled with multiple logistic regression analysis in which those who had not had sex experience before the age of 20 were the reference group. In order to compare relative effects of different social systems in early sex experience, I computed 5 different models using various combinations of risk factors[1], using SPSS 22.0 Model 1 included individual factors. Model 2 was a combination of individual and family factors. Model 3 added school factors. Model 4 added peer factors. Model 5 included a complete set of predictors. Significance of bivariate and multiple logistic

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[1] This method is also called "sequential logistic regression analysis."

regression analysis was defined by an alpha level of 0.05 or less. Multiple logistic regression analyses were done separately for each sex in order to examine gender differences in predictors of having early sex experience.

Results

Descriptive findings

The results of descriptive statistics (Table 2) showed that the mean age of the respondents was 21.1 (SD = 1.19) with 52.9% being males. About 21% of the respondents had sex before age 20. In general, the respondents had good social support, as suggested by moderate to strong family bonds and teacher support, and a positive evaluation of class adjustment.

Table 2

Sample Descriptive Statistics

Variable	Total (N = 302)		Male (N = 160)		Female (N = 142)		χ^2/t	p
	n(%)	Mean(SD) of total score	n(%)	Mean (SD) of total score	n(%)	Mean (SD) of total score		
Outcome variable								
Having sex initiation before age 20	63(20.9)		34(21.3)		29(20.4)		0.03	.86
Micro-system								
Individual factor								
Age		21.10(1.19)		21.25(1.41)		20.94(0.85)	−2.37*	.02
Smoking(yes)	30(9.9)		20(12.5)		10(7)		2.5	.11
Dating friends via internet(yes)	51(16.9)		26(16.3)		25(17.6)		0.1	.75
Meso-system								
Family factors								
Single parent household(yes)	26(8.6)		14(8.8)		12(8.5)		0.001	.97
Family bonds	12.11(1.92)		11.85(2.1)		12.4(1.65)		2.55*	.01
Parents' attitude/premarital sex	5.62(2.15)		5.83(1.78)		5.39(2.49)		−1.71	.09
Communication/relationships/sex	9.64(2.75)		9.38(2.8)		9.93(2.68)		1.75	.08

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Table 2   (continued)

Variable	Total ($N = 302$)		Male ($N = 160$)		Female ($N = 142$)		χ^2/t	p
	n (%)	Mean(SD) of total score	n (%)	Mean (SD) of total score	n (%)	Mean (SD) of total score		
School factors								
Teacher support	8.39(1.34)		8.56(1.45)		8.19(1.17)		−2.43*	.02
Class adjustment	12.32(1.52)		12.23(1.65)		12.44(1.36)		1.21	.23
Satisfaction/academic performance	4.96(1.23)		4.70(1.32)		5.25(1.05)		4.05**	.00
Peer influence								
Perception/friends having multiple sex partners(yes)	30(9.9)		22(13.8)		8(5.6)		5.54*	.02
Macro-system								
Father's education beyond high school	185(61.3)		112(70)		73(51.4)		10.96**	.00
Mother's education beyond high school	119(39.4)		94(58.8)		25(17.6)		53.34**	.00

* $p < .05$. ** $p < .005$

This study found no significant gender differences in timing of sex debut ($t = 0.03$, $p = .86$). However, significant gender differences were identified in several independent variables ($p < .05$). For example, males tended to have more teacher support and were more likely to perceive that their friends had more than one sex partner. Females had stronger family bonds and a higher level of satisfaction with academic performance.

Bivariate analysis

The results of bivariate analysis (Table 3) showed that different factors were associated with early sex experience between sexes. For instance, the factors correlated with early sex experience for males included smoking ($\chi^2 = 11.29$, $p = .001$), more conservative parental attitude towards premarital sex ($t = 2.45$, $p =$

.018), better class adjustment ($t = -3.18$, $p = .002$), and lower level of mother's education ($\chi^2 = 5.5$, $p = .02$). These factors, however, did not significantly covary with female early sex experience. The factors associated with early sex experience for females were dating friends via internet ($\chi^2 = 10.38$, $p = .001$), weaker family bonds ($t = 3.08$, $p = .003$), and lower level of satisfaction with academic performance ($t = 2.5$, $p = .01$).

Table 3

Bivariate Correlation Between Independent Variables and Timing of Sex Initiation

Variable	Male ($N = 160$)					Female ($N = 142$)				
	Late		Early		χ^2	Late		Early		χ^2
	n	(%)	n	(%)		n	(%)	n	(%)	
Smoking(yes)	10	7.9	10	29.4	11.29**	6	5.3	4	13.8	2.54
Dating friends via internet(yes)	18	14.3	8	23.5	1.68	14	12.4	11	37.9	10.38**
Single parent household(yes)	12	9.5	2	5.9	0.45	7	6.4	5	17.2	3.44
Perception/friends having multiple sex partners(yes)	14	11.1	8	23.5	3.48	6	5.3	2	6.9	0.11
Father's education beyond high school(yes)	92	73.0	20	58.8	2.57	58	51.3	15	51.7	0.001
Mother's education beyond high school(yes)	80	63.5	14	41.2	5.5**	19	16.8	6	20.7	0.24

	Late		Early			Late		Early		
	Mean/ total score	(SD)	Mean/ total score	(SD)	t	Mean/ total score	(SD)	Mean/ total score	(SD)	t
Age	21.17	1.08	21.53	2.23	−0.90	20.91	0.86	21.03	0.82	−0.69
Family bonds	11.78	2.22	12.12	1.63	−0.84	12.61	1.58	11.59	1.68	3.08**
Parents' attitude/premarital sex	6.03	1.61	5.06	2.16	2.45*	5.37	2.49	5.48	2.52	−0.21
Communication with parents/ relationships/sex	9.33	2.76	9.53	2.00	−0.36	9.90	2.56	10.03	3.16	−0.24
Teacher support	8.62	1.40	8.35	1.63	0.95	8.27	1.16	7.86	1.19	1.70
Class adjustment	12.02	1.63	13.00	1.48	−3.18**	12.48	1.40	12.28	1.19	0.72
Satisfaction/academic performance	4.67	1.33	4.82	1.27	−0.61	5.36	1.04	4.83	0.97	2.50*

$*p < .05$. $**p < .01$

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This study found many important correlations among factors in each system level or cross system levels (not shown), while the correlations were not always identical between different sexes. For example, for both sexes, stronger family bonds were significantly associated with better class adjustment (male, $r = .27$, $p < .0005$; female, $r = .31$, $p < .0005$). On the other hand, dating via the internet for males was associated with less satisfaction with academic performance ($r = -.23$, $p = .003$) and better class adjustment ($r = .16$, $p = .048$), while for females, it was associated with weaker family bonds ($r = -.18$, $p = .031$).

Multiple logistic regression

The results of multiple logistic regression for males (Table 4) showed that the significant associations between the independent and dependent variable were consistent in all models with varying level of magnitude. For males, adding school factors to Model 3 contributed the most increase in χ^2 ($\Delta\chi^2 = 16.22$, $\Delta p = .001$). Pseudo R square of Model 3 for males stood between 21% (Cox and Snell's R^2) and 33% (Nagelkerke's R^2). The result of a post hoc power analysis on Model 3 showed minimal chances of a Type II error with the power being .99. Thus, Model 3 could detect statistically significant differences in the observed data.

In addition, in Model 5 for males with a complete set of predictors, it was found that male smokers were more likely to have early sex experience than male nonsmokers (OR = 9.27, 95% CI = 2.39-35.97, $p < .01$). Controlling for other variables, males with better class adjustment were more likely to have early sex experience than were the others (OR = 1.65, 95% CI = 1.2-2.26, $p < .01$). In contrast, adjusting for other variables, males with parents' more liberal attitude towards premarital sex were less likely to have early sex experience (OR = 0.6, 95% CI = 0.45-0.78, $p < .01$).

Pseudo R square of Model 5 for males stood between 23% (Cox and Snell's R^2) and 36% (Nagelkerke's R^2), larger than that of Model 3, suggesting that Model

Table 4

Multiple Logistic Regression on Early Sex Initiation for Males (N = 142)ᵃ

Variable/reference group	Model 1 Individual		Model 2 Family		Model 3 School		Model 4 Peer		Model 5 Macro	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
1. Age	1.00	(0.76-1.31)	0.99	(0.74-1.33)	0.95	(0.70-1.30)	0.97	(0.72-1.31)	0.97	(0.7-1.34)
Smoking/ref=0 (no)	4.54**	(1.51-13.68)	6.74**	(2.05-22.14)	9.93**	(2.61-37.84)	9.92**	(2.63-37.44)	9.27**	(2.39-35.97)
Dating via internet/ref=0 (no)	1.29	(0.47-3.59)	1.63	(0.56-4.80)	1.88	(0.58-6.10)	1.82	(0.56-5.87)	1.69	(0.52-5.53)
2. Single parent household/ref=0 (no)			0.82	(0.144-4.75)	1.72	(0.26-11.44)	1.92	(0.3-12.51)	1.52	(0.23-9.96)
Family bonds			1.16	(0.49-2.78)	1.10	(0.43-2.84)	1.28	(0.48-3.41)	1.17	(0.43-3.2)
Parents' attitude/premarital sex			0.70**	(0.56-0.88)	0.6**	(0.46-0.77)	0.59**	(0.45-0.77)	0.60**	(0.45-0.78)
Communication with parents/relationships/sex			1.05	(0.9-1.23)	1.02	(0.87-1.19)	1.02	(0.87-1.19)	1.03	(0.88-1.21)
3. Teacher support					1.22	(0.42-3.58)	1.39	(0.46-4.21)	1.26	(0.41-3.87)
Class adjustment					1.72**	(1.26-2.34)	1.69**	(1.24-2.31)	1.65**	(1.2-2.26)
Satisfaction/academic performance					1.11	(0.72-1.71)	1.12	(0.73-1.72)	1.09	(0.7-1.69)
4. Perception/friends having multiple sex partners/ref=0 (no)							3.04	(0.89-10.46)	2.88	(0.82-10.06)
5. Father's education beyond high school/ref=0 (no)									0.84	(0.2-3.53)
Mother's education beyond high school/ref=0 (no)									0.65	(0.17-2.47)
χ^2	9.75*		21.46**		37.68**		40.72**		42.08**	
R^2_{cs}	0.06		0.13		0.21		0.23		0.23	
R^2_n	0.09		0.20		0.33		0.35		0.36	
p	0.02		0.003		<0.0005		<0.0005		<0.0005	
$\Delta\chi^2$	9.75*		11.71*		16.22**		3.04		1.35	
Δp	0.02		0.02		0.001		0.08		0.51	
Power	0.89		0.99		0.99		0.99		0.99	

Note. ᵃThe value of 1 refers to those who had sex experience before age of 20; the value of 0 denotes the reference group who did not have sex experience before age of 20.

*p < .05. **p < .01.

Table 5

Multiple Logistic Regression on Early Sex Initiation for Females (N = 160)[a]

Variable/reference group	Model 1 Individual		Model 2 Family		Model 3 School		Model 4 Peer		Model 5 Macro	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
1. Age	0.96	(0.58-1.58)	0.89	(0.53-1.50)	0.86	(0.51-1.47)	0.86	(0.51-1.48)	0.86	(0.5-1.47)
Smoking/ref=0 (no)	2.91	(0.71-11.92)	2.06	(0.45-9.38)	1.68	(0.34-8.39)	1.66	(0.29-9.49)	1.71	(0.29-10.03)
Dating via internet/ref=0 (no)	4.73**	(1.75-12.79)	4.05*	(1.37-12.01)	4.16*	(1.38-12.59)	4.17*	(1.38-12.6)	4.25*	(1.39-12.97)
2. Single parent household/ref=0 (no)			3.65	(0.87-15.26)	3.08	(0.72-13.08)	3.08	(0.72-13.14)	2.99	(0.68-13.11)
Family bonds			0.22**	(0.08-0.56)	0.25**	(0.09-0.68)	0.25**	(0.09-0.68)	0.25**	(0.09-0.69)
Parents' attitude/premarital sex			1.08	(0.90-1.30)	1.12	(0.91-1.37)	1.12	(0.91-1.38)	1.12	(0.91-1.38)
Communication with parents/relationships/sex			1.10	(0.92-1.30)	1.10	(0.92-1.32)	1.10	(0.92-1.32)	1.10	(0.92-1.33)
3. Teacher support					0.60	(0.22-1.59)	0.60	(0.22-1.59)	0.60	(0.23-1.61)
Class adjustment					0.94	(0.63-1.40)	0.94	(0.63-1.4)	0.93	(0.62-1.4)
Satisfaction/academic performance					0.79	(0.48-1.32)	0.79	(0.47-1.32)	0.79	(0.48-1.32)
4. Perception/friends having multiple sex partners/ref=0 (no)							1.03	(0.14-7.39)	0.95	(0.12-7.27)
5. Father's education beyond high school/ref=0 (no)									0.87	(0.32-2.35)
Mother's education beyond high school/ref=0 (no)									1.18	(0.33-4.23)
χ^2	11.56**		24.05**		26.64**		26.64**		26.74**	
R^2_{cs}	0.08		0.16		0.17		0.17		0.18	
R^2_{n}	0.12		0.25		0.27		0.27		0.27	
p	0.009		0.001		0.003		0.005		0.013	
$\Delta\chi^2$	11.56**		12.49*		2.59		0.001		0.108	
Δp	0.009		0.014		0.46		0.98		0.947	
Power	0.98		0.99		0.99		0.99		0.99	

Note. [a]The value of 1 refers to those who had sex experience before age of 20; the value of 0 denotes the reference group who did not have sex experience before age of 20.

*p < .05. **p < .01.

5 better predicted odds of early sex experience than did Model 3. In addition, Model 5 had an adequate level of a post hoc power being 0.99.

For females, family factors in Model 2 contributed the most increase in χ^2 ($\Delta\chi^2 = 12.49$, $\Delta P = 0.014$) (Table 5). Pseudo R square of Model 2 for females stood between 16% (Cox and Snell's R^2) and 25% (Nagelkerke's R^2) with a post hoc power being 0.99. In Model 5, adjusting for other variables, female students who dated via the internet were more likely to have early sex experience than were the others who did not do so (OR = 4.25, 95% CI = 1.39-12.97, $p < .05$). In addition, controlling for other variables, the females with stronger family bonds were less likely to have early sex experience than were the others (OR = 0.25, 95% CI = 0.09-0.69, $p < .01$). Pseudo R square of Model 5 for females stood between 18% (Cox and Snell's R^2) and 27% (Nagelkerke's R^2), larger than that of Model 2, suggesting that Model 5 was a better model than Model 2. Model 5 also had an adequate level of a post hoc power being 0.99 and thus was able to detect statistically significant differences in the observed data.

Discussion

Micro-system predictors

The findings support the previous studies (Chiao et al., 2012; Madkour et al., 2010) that male's early sex experience is likely to be an indicator of problem behavior syndrome, as this study found that male smokers were more likely to have early sex experience than male nonsmokers. On the other hand, girls who had engaged in internet dating were more likely to have early sex experience than the others who had not done so. This may be possibly due to the fact that Taiwanese gender norms imposes a higher moral standard upon girls' sexual behavior than on boys. Consequently, internet dating may offer an important opportunity for girls

to find sex partners and slip out of adults' and peer's monitoring in the proximal environment.

Meso-system predictors

This study found that for both sexes, a single-parent household was not predictive of early sex initiation; instead, quality of social connection was more important. Prior studies (Markham et al., 2010) have suggested that social connection was related to timing of sex initiation. Although this study found that teacher support was not significantly related to odds of early sex initiation for both sexes, for females family bonds was significantly associated with having early sex experience in both bivariate and multiple logistic regression analysis.

For males, social connection with peers (as exemplified by class adjustment) mattered; odds of early sex experience for those with better class adjustment was greater than the others. In the Taiwanese traditional sex culture, males are expected to take an initiating role in sex; therefore, better social connections with peers might function to facilitate males' motivation of acting upon a culturally scripted role. For males, early sex initiation may symbolize masculinity or adequate social capacity among their male peers.

In addition, past studies provided inconsistent findings about the relationship between early sex experience and communication with parents about relationships and sex (Zimmer-Gembeck & Helfand, 2008). Some studies found sex communication with parents to be protective of early sex experience (Karofsky, Zeng, & Kosorok, 2001; Whitaker & Miller, 2000), while others found it a risk factor (Bersamin et al., 2008). This study did not find a significant association between communication with parents about relationships and sex and early sex experience for both sexes.

Moreover, this study found that males with more liberal parental attitude towards premarital sex were less likely to have early sex experience than were the

other males, while such an effect was not found among the female respondents. This finding conflicts with suggestions of previous studies. For example, in Dittus and Jaccard's prospective study based on a nationally representative school-based sample (Dittus & Jaccard, 2000), they found that the more disapproving adolescents perceived their mothers' attitudes toward their engaging in sexual intercourse, the less likely the adolescents were to initiate sexual activity. McNeely et al. (2002) yielded the similar conclusion. They found that for females, mother's strong disapproval of her daughter having sex was associated with later sexual debut. However, such an effect was not found among sons. Similarly, another study found that mother's liberal attitude towards sex was associated with a higher number of the adolescents' sex partners (Fingerson, 2005).

The conflicting finding of this study about parents' attitude towards premarital sex might be related to very limited sex communication between the respondents and their parents. In traditional Taiwanese culture, sex is not a topic for open discussion. Therefore, adolescents in Taiwan might have a vague perception about their parents' attitude towards premarital sex. As shown on Table 2, sex communication between the respondents and their parents were on average very limited (male mean=9.38, female mean=9.93 out of the range between 6 and 18). Future study may explore dimensions of adolescents' perception about parents' attitude towards premarital sex, such as approval, clarity, and accuracy of the perception. Furthermore, this study combined father's and mother's attitudes towards premarital sex into the variable of parents' attitudes toward premarital sex. However, father's and mother's attitudes might have different impacts upon their daughter or son. Future study may investigate influence of father's and mother's attitudes on their son or daughter separately.

Finally, prior Western studies indicated that less involvement with academic work or lower academic aspiration was associated with early sex onset for girls (Smith, 1997; Whitbeck et al., 1999). This study found that early female sex

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initiators tended to have a lower level of satisfaction with academic performance, but this association disappeared in multiple logistic analysis. This suggests that the association between satisfaction with academic performance and female early sex debut was either spurious or indirect and mediated by other factors.

Macro-system predictors

In Zimmer-Gembeck and Helfand's (2008) review of longitudinal studies on adolescent sexual behavior, it was found that most participants who were nonwhite reported no association between age of a first sexual act and parent educational level. The current study partially confirms this research. It was found that in a multivariate analysis, neither a father's or mother's education predicted odds of early sex initiation for both sexes. However, in bivariate analysis, a mother with less than a high school degree was associated with male early sex debut. Therefore, the relationship between parents' education and male adolescent sex initiation could be either indirect or spurious.

Conclusions

The findings of this study are useful and relevant for the public health community. By understanding gender specific predictors of early sex experience, sex education intervention designers and policymakers can better design gender sensitive interventions. This study found that the system factors work to influence early sex experience in combination with other factors, rather than in isolation. It implied the necessity of integrative intervention contents, addressing risk factors across different system levels and in their respective social settings.

The findings of this study indicate some dissimilarities between different sexes. At the individual system level, interventions must pay attention to a male's substance use behavior, which is predictive of early sex experience. For females,

sex education interventions may design a mechanism to monitor internet dating behavior.

At the meso-system level, this study found that better class adjustment increased odds of early sex experience among males. Investigating social meaning of early sex experience among male peer culture and ways to change the social meaning of early sex experience are areas worthy of further research. More specifically, further study may explore to what extent that gender norms of male dominance over women in sexuality might convey different social meanings of early sex experience for different sexes in their proximal peer subculture. For example, sex discussion with peers might risk social reputation for girls. Therefore, better class adjustment for girls might not work the same as for boys, in terms of facilitating acquisition of sex knowledge or exchange of sexual experience with peers.

This study has several limitations. The first is that the data used in this study were provided by self-report rather than an objective view of the ecological environment. However, reliability reports in this study indicated a moderate to high level of consistency between responses. The second is that the study participants were confined to students in a medical university located in mid-Taiwan. Medical university students may represent a subpopulation with a higher level of educational attainment. Previous study had indicated that higher educational attainment may delay initial intercourse (Zhang et al., 2015). Thus, the respondents of this study are likely to represent those sex delayers. Future research should strive to obtain more nationally representative samples.

Thirdly, this study is limited by its sample size because data analysis was performed separately by sex. However, the results of post hoc power analysis showed an adequate level of power between .89 and .99. Therefore, the multivariate analyses by different sexes were still able to detect statistically significant differences in the observed data.

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In addition, this study is limited by its cross-sectional design. Future work involving a longitudinal design may help establish various and important causal relationships between variables. Furthermore, this study observed many bivariate associations between predictors at each system level and across different system levels. Studies with a focus on examining both direct and indirect pathways of predictors in their relationships to the outcome variable will advance our theoretical understanding of adolescent sex initiation in Taiwan. Special attention may be directed to explore the possibilities of indirect relationships between early sex initiation and satisfaction with performance or parents' education.

Declaration of conflicting interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors' contributions

The author conceived of and designed the study, carried out the collection of data, performed the statistical analysis, and drafted the manuscript. The author read and approved the final manuscript.

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生態因素對於臺灣大學生早發性性行為的影響：以中部一所大學為例

王雅倩

摘要

　　以往研究指出早發性性行為和藥物濫用和負面健康／社會結果相關，但很少研究探討生態因素對臺灣大學生早發性性行為的影響。本研究以Bronfenbrenner的生態系統理論為基礎，選取理論中的微觀（個人）、中間（家庭、學校和同儕）及巨觀（社經地位）因素來檢驗其對臺灣大學生早發性性行為的影響。

　　資料引用一針對中部一所醫學大學學生於2011～2012年進行的性行為調查，調查為橫斷式設計，使用結構型問卷。分析樣本包括302位大學生，平均年齡為21歲，52.9%為男性，21%有早發性性行為（20歲前發生）。本研究對不同性別分別採用多元羅吉斯迴歸分析。

　　分析結果顯示男性吸菸者比男性非吸菸者更傾向於有早發性性行為 (OR = 9.27, 95% CI: 2.39-35.97)。有較佳的班級適應的男性較傾向於有早發性性行為 (OR=1.65, 95% CI: 1.20-2.26)，父母對婚前性行為持開放態度的男性較傾向於有早發性性行為 (OR=0.6, 95% CI: 0.45-0.78)。另一方面，網路交友的女性較其他女性更傾向於發生早發性性行為 (OR = 4.25, 95% CI: 1.39-12.97)。有較強家庭連結的女性則不傾向發生早發性性行為 (OR=0.25, 95% CI: 0.09-0.69)。

中山醫學大學醫學社會暨社會工作學系助理教授，E-mail: taiwantous@gmail.com
通訊地址：臺中市建國北路一段110號，聯絡電話：0918-624-167

　　結果建議跨越不同系統層次的具整合性及針對特定性別的方案之重要性。建議未來研究能探索在男性同儕次文化中對於早發性性行為所建構的社會意涵及改變意涵的方式。

關鍵詞：大學生、生態、家庭、同儕、性行為