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Physical and Psycho-Social Predictors of Adolescents' Suicide Behaviors

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Abstract The current study examined the relationship between suicidal behaviors and physical and psycho-social predictors including body image, weight control behaviors, and risky sexual behaviors among Asian, African American, Caucasian, and Hispanic adolescents. This study used the 2007 Youth Risk Behavior Survey (YRBS). The target populations were 11,134 adolescents (5,636 female and 5,498 male) in 9th–12th grade who completed the survey. A linear regression was conducted to examine the correlation between predictors and suicidal behaviors. The results showed that gender, grade, depression, substance use, body image, weight control behaviors, and risky sexual behaviors were significant predictors of adolescents' suicidal behaviors, while race/ethnicity was not a good predictor. Also, there were significant gender and grade differences in suicidal behaviors. Based on the results, practice implications for suicide prevention were discussed.

Keywords Suicide · Body image · Sexual behavior · Depression · Substance use · Weight control behavior · YRBS

Introduction

Suicide has been regarded as a critical and increasing problem among adolescents. In 2006 in the U.S., 1,270 adolescents committed suicide among 12–18 year olds, making suicide the third leading cause of death among adolescents (CDC 2009b). According to recent data, in 2009, 13.8% of high school students reported that they had seriously considered attempting suicide during the last 12 months; 6.3% of students reported that they had actually attempted suicide one or more times during

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the same time frame (CDC 2009a). Also, for every completed suicide among 15–24 year-olds, there are approximately 100–200 attempts (Goldsmith et al. 2003). It is apparent from the data that suicide among adolescents is a major public health issue that needs to be addressed. This phenomenon has encouraged many researchers to examine suicide among adolescents. Unfortunately, although there has been plenty of research on suicide among adolescents, few predictors of suicidal behavior have been clearly identified (Fitzpatrick 2005; Joiner et al. 2005). To address this gap in knowledge, this study aimed to examine the association between physical and psycho-social variables (i.e., depression, substance use, body image, weight control behaviors, and risky sexual behaviors) and suicidal behaviors among adolescents. The results of this study may be the empirical basis for creating effective social work interventions and suicide prevention programs for adolescents to reduce suicide rates.

Literature Review

Depression and Suicide

One of the most prevalent mental health problems in adolescents is depression (Hamrin and Pachler 2005). Untreated depression is a serious risk factor for anxiety disorders (Ferdinand et al. 2005), mental health problems (Steinhause et al. 2006; Wilcox and Anthony 2004), obesity in adulthood (Ferdinand et al. 2005), and suicidal behavior in both adolescents and adults (Kisch et al. 2005; Thompson et al. 2005).

Numerous studies have asserted that depression is clearly associated with suicide. In fact, it is one of the leading causes of suicide (Brausch 2008). According to the National Institute of Mental Health (2003), over 90% of the people who commit suicide have depression. It is also clear that there are significant gender differences for depression. Best (2008) reported that females experience depression at twice the rate of males. That is, females are more likely to attempt suicide than males, even though males have higher rates of suicide completion.

Substance Use and Suicide

It has been proven by several studies that there is a significant correlation between substance use and suicide among adolescents (Conason et al. 2005; Mehlenbeck et al. 2003). Studies have consistently demonstrated that suicidal behaviors are more likely to occur among adolescents who abuse alcohol (Bae et al. 2005; Shaffer and Pfeffer 2001) or use illicit drugs (Gould et al. 2003; King et al. 2001).

Alcohol and substance abuse may increase the inclination for suicidal behaviors by affecting the emotional and cognitive development (Brent 1995; Shaffer et al. 1996). It has been discovered that long-term substance use or abuse may damage judgment (Brent 1995; Huffard 2001; Windle 2004) and cause cognitive disturbances and emotional instability, thereby producing thoughts and feelings that may not be rational (Light et al. 2003; Stoelb and Chiriboga 1998). Because of

these cognitive damages, substance abusers may lose their social relationships and social support, which in turn may cause suicidal ideation and attempts (Light et al. 2003).

Body Image and Suicide

Rosenbaum (1993) defined body image as "a plastic, constantly changing concept, continually modified by bodily growth, trauma, or decline, and significantly influenced by the ever-changing interaction with the social environment" (p. 63). A positive body image means experiencing a realistic self-perception, while a negative body image means having an unrealistic self-perception (Body Image & Your Health 2004). A realistic body image exists when self-perceived body weight is consistent with current body weight, and an unrealistic body image exists when self-perceived body weight differs from current body weight. The influence of unrealistic body image may lead to eating disorders, emotional problems, unhealthy weight concerns, anxiety, low self-esteem, and depression (Body Image 2004; Body Image & Your Health 2004; Shepherd and Ricciardelli 1998). An unrealistic body image may also lead to engaging in suicidal behaviors. Many studies have reported that adolescents who commit suicide have different body attitudes than adolescents who have no experience of suicidal behaviors (Orbach et al. 2001). According to previous studies, suicidal adolescents have more negative attitudes and feelings about their body than adolescents who are not suicidal (Brausch 2008; Orbach et al. 2001).

Weight Control Behaviors and Suicide

Diet for weight control or weight loss is a common phenomenon among adolescents, especially females (Pesa and Turner 2001). Also, studies have reported that there is a significant gender difference in the prevalence rates of weight control behaviors. Overall, female adolescents (59.4%) were considerably more likely to try to lose weight than male adolescents (26.1%) (CDC 2000). This considerable gender difference is also identified across all racial and ethnic groups.

The relationship between weight control behaviors and suicidal behaviors has lacked adequate research and evaluation. However, a few studies shed light on the correlation between weight control behaviors and suicidal behaviors. Fresco (1998) insisted that adolescents who have non-traditional weight loss habits (vomiting, using diet pills and laxatives) are four times more likely to have suicidal ideation and seven times more likely to attempt suicide. Neumark-Sztainer et al. (1998) also reported that moderate weight control behaviors have a noticeably weaker correlation with suicidal ideation and suicidal attempts than extreme weight control behaviors. That is, extreme weight control behaviors may have a stronger correlation with suicidal behaviors.

Risky Sexual Behaviors and Suicide

Risky sexual behaviors are one of the most significant health problems among adolescent in the U.S. Those who have a history of sexual abuse as a

child—including rape and sexual coercion—are more likely to attempt suicide compared to those who have no such history (Joiner et al. 2007; Segal 2009). Although many individuals who have a history of sexual abuse never attempt suicide, they still have a higher risk of attempting suicide (Segal 2009). According to Joiner et al. (2007), the impact of risky sexual experiences on lifetime suicide is stronger than those resulting from verbal abuse and molestation. Moreover, sexual victimization affects the development of adaptive coping skills in a negative way (Gall 2006). However, there is a lack of researchers who examined the relationship between various risky sexual behaviors and suicide of adolescents.

Demographic Variables and Suicide

Unfortunately, almost all studies have only focused on Caucasian, African Americans, or Hispanic groups. They failed to include diverse minority ethnic groups, often because their sample size was too small, causing them to, at times, combine minority ethnic groups (Ensminger 1990; Rafiroiu et al. 2003). According to previous literature, suicide rates are higher in Caucasian adolescents when compared to African American adolescents (CDC 2008; Fresco 1998; Purselle et al. 2009; Shields et al. 2006) and rates in both categories have significantly increased in the recent few decades (Fresco 1998). Although, the suicide rate among adolescents has been the highest among Caucasians, the gap between African Americans and Caucasians has been narrowed significantly (Portner 1998).

In America, male adolescents have reported a higher rate of suicide completion than female adolescents (Joe 2006), though female adolescents are more likely to attempt suicide than male adolescents (Bae et al. 2005). The higher rate of suicide attempts in females is associated with less lethal methods of suicide, including jumping from heights or overdosing on a treatable amount of drugs. Males generally choose more lethal and violent methods (firearms or hanging) than females when they attempt suicide, resulting in higher rates of suicide completion (Marttunen et al. 1995).

Suicide becomes more common with the onset of puberty. According to previous studies, there is no agreement about the difference in suicidal behaviors among specific ages during adolescence. Some researchers reported that suicide rates increase throughout the teenage years and peak at around 20–24 years of age (Gould et al. 1990; Shaffer and Fisher 1981). However, other researchers insisted that the suicide rates decrease after age 14 (Matsumoto et al. 2008). Although there is no agreement about differences in suicidal behaviors among specific ages, researchers generally agree that the suicide rates of adolescents are higher than those of children under 12 years old, while the rates of adolescents are lower than those of people 65 years old and older. More importantly, when the number of suicides is calculated as a percentage, adolescents are reported as the group with the highest percentage of suicides (Shaffer and Fisher 1981).

It has been established through numerous empirical studies that suicide is a serious problem among adolescents. Many studies have been conducted to examine risk factors for adolescent suicide. Most adolescent risk models for suicide contain "traditional" risk factors such as depression or substance use (Docksai 2009;

Landheim et al. 2006; Méan et al. 2005). However, other possible factors such as body dissatisfaction or risky sexual behaviors have lacked adequate research and evaluation in general, even though these factors have been prevalent among adolescents and associated with risk factors for suicide (Barker and Galambos 2003; Goode 2001). Also, the target population in past studies that investigate suicide risk among adolescents has been mainly focused on Caucasians, African Americans, or Hispanics and failed to include various racial and ethnic groups such as Asians who have high rates of suicide (WHO 2008).

Based on these gaps of past studies on suicide among adolescents, this study will provide pertinent information on what factors may affect suicidal behaviors among adolescents through the analysis of data gathered nationwide from the target population. This study will help to improve the understanding of the relationship between suicide risk and physical/mental factors such as depression, substance use, body image, weight control behaviors, and risky sexual behaviors. It is hoped that the results of this study could be used as a foundation for social workers to understand and help adolescents at risk for suicide, not based on assumptions but based on empirically tested findings. Also, understanding the predictors of suicide among adolescents will unquestionably help social workers to make more effective and appropriate intervention strategies when working with those clients. Furthermore, the findings of the current study may be a valuable resource in planning social work services and interventions and establishing social policies for adolescents.

Theoretical Frameworks

The Beck's Cognitive Theory of Depression

Slaby and Garfinkel (1996) argued that individuals with depression may begin to perceive life in a negative and distorted way. This phenomenon coincides with Brown and Beck's (2002) assertion that the "cognitive triad" contributes to an individual's depression. Beck's cognitive theory of depression is the most broadly known theory on depression and suicide (Beck et al. 1987). The theory follows a developmental perspective by assuming that negative perceptions in one's early age can predispose an individual to suicide-related behaviors through activation by negative life events. In this theory, suicide is triggered by three cognitive features called "cognitive triads": individual's negative thoughts about the self, the world, and the future (Dusablon 2009). For example, adolescents who are in stressful situations may think that they are worthless ("the self"), the world/environment is unfair ("the world"), and their future is hopeless ("the future"). Triggered by this negative cognitive triad, adolescents who have depressive disorder may commit suicide to end their symptoms.

The Gateway Theory of Substance Use

The gateway theory of substance use indicates that the use of certain drugs by adolescents, such as cigarettes or alcohol that are legal for adults, creates a gateway

through which adolescents begin more severe and varied use of additional illicit drugs (Dupont 1984). Although there are several "gateway theories" that are similar and related to one another, the gateway theory of substance use is appropriate to explain the relationship between substance use and suicidal behaviors among adolescents for the following reasons: (1) the specific order of substance use may differ by theory and culture; and (2) the majority of studies focusing on the gateway phenomenon have supported the finding that the use of a particular substance, such as alcohol or cigarettes, precedes more severe drug use, such as heroine or crack (Kandel et al. 1992). Studies have consistently demonstrated that suicidal behaviors are more likely to occur among adolescents who abuse illicit drugs (Gould et al. 2003; King et al. 2001). Therefore, adolescents who use substances, such as alcohol or cigarettes, open the gateway to use more severe substances and illegal drugs. As a result, they are placed at more serious risk of suicidal behaviors.

The Stress-Diathesis Model of Suicide-Related Behavior

Mann et al. (1999) have introduced an explanatory model for suicide-related behavior based on a stress-diathesis model. This model assumes that an individual has a predisposition for suicidal behaviors. This predisposition (or diathesis) is marked by characteristics of the individual including hopelessness, impulsivity, and aggression. If an individual is faced with a severe stressor, those with the underlying diathesis are more likely to engage in suicidal behaviors compared to persons without the diathesis (Dusablon 2009). Especially for female adolescents, body image (Forman 2002; Marshall 2006) and weight control behaviors (CDC 2000; Pearman et al. 2000; Pesa and Turner 2001) are significant stressors and are related to suicidal behaviors (Brausch 2008; Crow et al. 2008; Fresco 1998; Orbach et al. 2001). Negative body image and weight control behaviors have a possibility to trigger a pre-existing diathesis for suicidal behaviors.

The Strain Theory of Suicide

The strain theory of suicide was developed by Zhang in 2005 to explain socio-psychological mechanisms prior to suicidal behavior (Zhang and Lester 2008). The strain theory of suicide assumes that, because it is so insufferable to the victim, strain resulting from psychological suffering due to competing pressures and conflicts between one's behaviors and social values may lead to engagement in suicidal behavior as a solution to reduce or stop the strain (Zhang and Song 2006). Adolescents who have multiple sexual partners may experience strain because there is an inconsistency between their aspiration and moral standard. History of sexual abuse is also considered a serious risky sexual behavior as well as a life crisis.

Sexual victimization causes physical and psychosocial damages and affects the development of adaptive coping skills in a negative way (Gall 2006; Steel et al. 2004). According to the strain theory of suicide, if an adolescent experiences sexual abuse without the ability to cope with it, the person may experience coping strain. These strains may cause mental disorders including alcohol and substance abuse and may precede other abnormal behaviors such as personal assaults and property

crimes (Merton 1957). In the relationship between strain and suicide, mental disorders may be an intermediation increasing the association between strain and suicide (Zhang and Lester 2008).

The following hypotheses are rooted in the above literature and theoretical frameworks:

(1) Higher depression is significantly correlated with higher suicidal behaviors.
(2) Higher substance use is significantly correlated with higher suicidal behaviors.
(3) Unrealistic body image is significantly correlated with suicidal behaviors.
(4) More weight control behaviors are significantly correlated with suicidal behaviors.
(5) More risky sexual behaviors are significantly correlated with suicidal behaviors.

Methodology

Study Sample

In this study, "Adolescents" are defined as those males and females who are in grades 9 through 12. There were a total of 14,041 students (7,036 female, 6,992 male, and 13 missing data) who completed the 2007 Youth Risk Behavior Survey (YRBS). By selecting specific racial/ethnic groups including Asian, African American, Caucasian, and Hispanic, and excluding other races and ethnicities, 11,134 adolescents were chosen as a target of analysis.

All regular public, Catholic, and other private school students, in grades 9 through 12, in the 50 states and the District of Columbia were included in the sampling frame. Puerto Rico, the trust territories, and the Virgin Islands were excluded from the frame. Schools were selected systematically with probability proportional to enrollment in grades 9 through 12 using a random start. One hundred and ninety-five schools were sampled. All classes in a required subject or all classes meeting during a particular period of the day, depending on the school, were included in the sampling frame. Systematic equal probability sampling with a random start was used to select classes from each school that participated in the survey. Items for the current study were selected based on literature review. Construct validities of selected variables are as follows: (1) suicidal behavior was demonstrated by statistically significant results with a Rhode Island public high school students sample (Jiang et al. 2010); (2) substance use was demonstrated by statistically significant results with an U.S. and Australian adolescent sample (Pirkis et al. 2003); (3) body image was demonstrated by statistically significant results with a female students sample who completed the Dallas YRBS (Marshall 2006); (4) weight control behaviors were demonstrated by statistically significant results with a normal weight students sample who completed the YRBS (Talamayan et al. 2006); and (5) risky sexual behaviors were demonstrated by statistically significant results with an Asian American and Pacific Islander adolescent sample (Hollander 2010).

Dependent Variable Measures

Suicidal Behavior

To assess suicidal behaviors, the following two questions were used: "During the past 12 months, did you ever seriously consider attempting suicide?"; "During the past 12 months, did you make a plan about how you would attempt suicide?" In the 2007 YRBS, each question has a corresponding dichotomous variable. The response categories were "yes" and "no." For convenient analysis, the responses from risky suicidal behavior questions were reversed (0: No, 1: Yes) and the items were computed. Cronbach's Alpha internal consistency reliabilities were calculated for the variables administrated. According to Nunnally (1978), consistency reliabilities (Cronbach's Alpha) should be higher than ".70" for internal research purposes. The Cronbach's Alpha of suicidal behaviors was .75.

Independent Variable Measures

Depression

To verify depressed mood of participants, the question "During the past 12 months, did you ever feel sad or hopeless almost every day for 2 weeks or more in a row that you stopped doing some usual activities?" was used. The response categories were 1: "Yes" and 2: "No." For convenient analysis, the responses of this item were reversed (0: No, 1: Yes).

Substance Use

Five items were selected to analyze substance use among participants: "During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?" with the following response categories: (1: "I did not smoke cigarettes during the past 30 days"; 2: "Less than 1 cigarette per day"; 3: "1 cigarette per day"; 4: "2–5 cigarettes per day"; 5: "6–10 cigarettes per day"; 6: "11–20 cigarettes per day"; 7: "More than 20 cigarettes per day"); "During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip, such as Redman, Levi Garrett, Beechnut, Skoal Bandits, or Copenhagen?" with the following response categories: (1: "0 days"; 2: "1 or 2 days"; 3: "3–5 days"; 4: "6–9 days"; 5: "10–19 days"; 6: "20–29 days"; 7: "All 30 days"); "During your life, on how many days have you had at least one drink of alcohol?" with the following response categories: (1: "0 days"; 2: "1–2 days"; 3: "3–9 days"; 4: "10–19 days"; 5: "20–39 days"; 6: "40–99 days"; 7: "100 or more days"); "During your life, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?" with the following response categories: (1: "0 days"; 2: "1–2 days"; 3: "3–9 days"; 4: "10–19 days"; 5: "20–39 days"; 6: "40 or more times"); "During your life, how many times have you taken steroid pills or shots without a doctor's prescription?" with the following response categories: (1: "0 days"; 2: "1–2 days"; 3: "3–9 days"; 4: "10–19 days"; 5:

"20–39 days"; 6: "40 or more times"). For convenient analysis, all of these items were computed. The Cronbach's Alpha of substance use was .61.

Body Image

The question, "How much do you weigh?" was used to assess respondent's actual body weight. In this study, participants' actual body weights were re-coded into three categories: underweight, normal weight, and overweight. The mean of participants' body weight was 68.5 kg with standard deviation of 16.9. Underweight is ranged from minimum body weight (34.47) to one standard deviation (SD) below of the average (51.6), normal weight is ranged from one SD below of the average (51.6) to one SD above of the average (85.4), and the range of overweight is from one SD above of the average (85.4) to maximum body weight (180.99).

The question, "How do you describe your weight?" was used to assess respondents' perceived body weight with the following choices: very underweight, slightly underweight, about the right weight, slightly overweight, or very overweight. For the consistent analysis with actual body weight, perceived body weight was categorized into three categories; underweight, normal weight, and overweight. The responses "very underweight" and "slightly underweight" are re-coded as underweight, "about the right weight" is re-coded as normal weight, and "slightly overweight" and "very overweight" are re-coded as overweight.

Body image was categorized as realistic and unrealistic by comparing participants' actual body weight with their perceived body weight. If a participant's body weight (under, normal, or overweight) matched his/her perceived body weight (under, normal, or overweight), the participant was regarded as an individual who has a realistic body image. On the contrary, if an individual's body weight and perceived body weight did not match, the individual was regarded as a person who has an unrealistic body image.

Weight Control Behaviors

To assess participants' weight control behaviors, the responses to five items were used. This included exercising (Q67), eating less food, fewer calories, or foods low in fat (Q68), going without eating for 24 h or more (fasting) (Q69), taking any diet pills, powders, or liquids without a doctor's advice (Q70), and vomiting or taking laxatives (Q71). The possible responses for each question were "yes" and "no." All the responses from these questions were reversed (0: No, 1: Yes) and all questions were computed for convenient analysis. The Cronbach's Alpha of weight control behaviors was .57.

Risky Sexual Behaviors

Seven items were used to assess risky sexual behaviors: forced sex (Q22) (from 1: "Yes" to 2: "No"); age at first sexual intercourse (Q59) with the following response categories: (1: "I have never had sexual intercourse"; 2: "11 years old or younger"; 3: "12 years old"; 4: "13 years old"; 5: "14 years old"; 6: "15 years old"; 7:

"16 years old"; 8: "17 years old or older"); the number of sexual partner during life time (Q60) with the following response categories: (1: "I have never had sexual intercourse"; 2: "1 person"; 3: "2 people"; 4: "3 people"; 5: "4 people"; 6: "5 people"; 7: "6 or more people"); the number of sexual partner during the past 3 months (Q61) with the following response categories: (1: "I have never had sexual intercourse"; 2: "I have had sexual intercourse, but not during the past 3 months"; 3: "1 person"; 4: "2 people"; 5: "3 people"; 6: "4 people"; 7: "5 people"; 8: "6 or more people"); substance use before sexual intercourse in the last time (Q62) (1: "I have never had sexual intercourse," 2: "Yes," and 3: "No"); condom use in the last sexual intercourse (Q63) (1: "I have never had sexual intercourse," 2: "Yes," and 3: "No"); method of birth control in the last sexual intercourse (Q64) with the following response categories: (1: "I have never had sexual intercourse"; 2: "No method was used to prevent pregnancy"; 3: "Birth control pills"; 4: "Condoms"; 5: "Depo-Provera"; 6: "Withdrawal"; 7: "Some other method"; 8: "Not sure"). The answers of Q22 were reversed for analysis (0: "No" and 1: "Yes") and all items were computed. The Cronbach's Alpha of risky sexual was .87.

Demographics

Among demographic variables of 2007 YRBS, sex, race/ethnicity, and grade level were used. The questions "What is your sex?" (Q2), "Race/Ethnicity" (RaceEth), and "In what grade are you?" (Q3) were used for these respective items. One of the responses to Q3 (5: Ungraded or other grade) was coded as missing data.

Results

A linear regression was conducted to examine the correlation between predictors and suicidal behaviors. For the possible predictors, depression, substance use, body image, weight control behaviors, risky sexual behaviors, and demographic variables were used. The entire model predicted 19.6% of the variance in suicidal behaviors, and the overall relationship was statistically significant ($F = 256.14$, $p < .001$). Depression ($\beta = .34$, $t = 32.92$, $p < .001$), substance use ($\beta = .15$, $t = 13.08$, $p < .001$), body image ($\beta = .04$, $t = 4.24$, $p < .001$), weight control behavior ($\beta = .08$, $t = 7.33$, $p < .001$), and risky sexual behaviors ($\beta = .04$, $t = 3.71$, $p < .001$) were significant predictors and positively correlated with suicidal behaviors. On the contrary, race/ethnicity ($\beta = -.01$, $t = -.46$, $p > .05$) was not a significant predictor of suicidal behaviors (Table 1).

Gender was a significant predictor and negatively correlated with suicidal behaviors. ($\beta = -.05$, $t = -5.11$, $p < .001$). As a result, females' suicidal behaviors were clearly higher than those of males. Regarding grade-level, the findings showed that grade ($\beta = -.05$, $t = -4.94$, $p < .001$) was a significant predictor and negatively correlated with suicidal behaviors. However, the correlation between grade and suicidal behaviors lacked consistency. Therefore, it may be hard to report a negative correlation between those two variables. Although the

Table 1 Multiple regression model predicting suicidal behaviors

Variables	*B*	SE	*β*
Gender	−.062	.012	−.053***
Race/ethnicity	−.002	.005	−.005
Grade	−.027	.005	−.051***
Depression	.445	.014	.339***
SU	.024	.002	.148***
BI	.051	.012	.042***
WCB	.041	.006	.076***
RSB	.003	.001	.042***

SU substance use, *BI* body image, *WCB* weight control behaviors, *RSB* risky sexual behaviors

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

direction of correlation was unclear, the results of the study proved that there was a significant grade difference. For this reason, additional research was examined to identify the correlation between grade-level and the study variables. The results of additional research showed that depression, substance use, and weight control behaviors were significant predictors of suicidal behaviors in all grade-levels (9th to 12th). Risky sexual behaviors decreased as the participants aged (Table 2).

Discussion and Implications for Social Work Practice

The goal of this research is to attain a better understanding of what physical and psycho-social predictors are significantly correlated with adolescents' suicidal behaviors. The results of the current study concluded that gender, grade, depression, substance use, body image, weight control behaviors, and risky sexual behaviors are considered meaningful predictors of adolescents' suicidal behaviors.

According to previous studies, there is no agreement about differences in suicidal behaviors among specific ages in adolescence. Some researchers reported that suicide rates increase during each year of adolescence and peak at around age 20–24 years (Gould et al. 1990; Shaffer and Fisher 1981). However, other researchers insisted that suicide rates decrease after 14 years of age (Matsumoto et al. 2008). The findings of the preliminary analysis showed that grade-level ($\beta = -.05$, $t = -4.94$, $p < .001$) was a significant predictor and negatively correlated with suicidal behaviors. However, the correlation between grade-level and suicidal behaviors lacked consistency. For this reason, it may be difficult to report a negative correlation between those two variables. One possible explanation for this result is that missing data or the low validity of the measure might cause this inconsistent result. Nevertheless, the findings of this correlation and the additional study examining the grade differences in study variables provide important insights into differences in suicidal behaviors among adolescents in different grade-levels.

Table 2 Multiple regression model predicting suicidal behaviors in grade 9th–12th

Variable	Suicidal behaviors (Grade 9th–12th)			
	9th	10th	11th	12th
Gender				
B	−.064	−.057	−.061	−.061
SE	.012	.012	.012	.012
β	−.054***	−.048***	−.052***	−.052***
Race				
B	−.001	−.000	.000	−.002
SE	.005	.005	.005	.005
β	−.003	−.002	.000	−.004
Depression				
B	.449	.450	.456	.451
SE	.013	.013	.013	.013
β	.342***	.341***	.345***	.342***
SU				
B	.024	.024	.023	.025
SE	.002	.002	.002	.002
β	.146***	.147***	.140***	.154***
BI				
B	.047	.053	.052	.049
SE	.012	.012	.012	.012
β	.039***	.043***	.043***	.040***
WCB				
B	.044	.045	.043	.043
SE	.005	.006	.006	.005
β	.080***	.082***	.079***	.078***
RSB				
B	.002	.002	.002	.002
SE	.001	.001	.001	.001
β	.023*	.028**	.030**	.025*

SU substance use, *BI* body image, *WCB* weight control behaviors, *RSB* risky sexual behaviors

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

Regarding depression, the findings indicate that depression had a positive relationship with adolescents' suicidal behaviors. Numerous previous studies have insisted that depression is clearly associated with suicide and is one of the leading causes of suicide (Brausch 2008; Kisch et al. 2005; Thompson et al. 2005). The result of the current study is consistent with prior studies reporting the significant correlation between depression and suicidal behaviors. This result is also supported by Beck's cognitive theory of depression. According to Brown and Beck (2002), negative thought contributes to an individual's depression and the depression may make people believe that suicide is the only option to decrease or end the pain that has become unremitting (Slaby and Garfinkel 1996). Adolescents may have many stressful situations including their studies, relationships, and physical changes. These may cause negative thoughts that are related to depression

and suicide. According to the study results, female participants are more likely to be depressed (34.4%) than male participants (20.0%). As already reported, depression and gender are each significantly correlated with suicide. Based on these findings, it was proven that depression, gender, and suicide are significantly correlated one another.

Another major finding of this study is that substance use had a positive relationship with adolescents' suicidal behaviors. This finding is consistent with numerous previous studies that reported a significant correlation between substance use and suicide in adolescents (Conason et al. 2005; Mehlenbeck et al. 2003). This finding is explained by the gateway theory of substance use. Adolescents who use substances, such as alcohol or cigarettes, open the gateway to use more severe substances and illegal drugs. Finally, they are placed at more serious risk for suicidal behaviors. The findings of this study indicated that male adolescents use more substances than female adolescents. Regarding race/ethnicity, Caucasian participants tend to use more substances than other races/ethnicities. Conversely, Asian participants showed the lowest rate of substance use. Asian participants' low rate of substance abuse is consistent with their rate of suicidal ideation and attempt, which was also the lowest in the study. Shaffer et al. (1996) provided a possible explanation for this phenomenon: substance use may affect emotional and cognitive function in a negative way that may increase the inclination for suicidal behaviors. Therefore, Asians' lower rate of substance use may lead to less negative effects on their emotional and cognitive function, resulting in a lower suicide rate.

The correlation between suicidal behaviors and body image and between suicidal behaviors and weight control behaviors are two of the major findings of this study. Previous studies have proven that suicidal adolescents have more negative attitudes and feelings about their bodies than adolescents who are not suicidal (Brausch 2008; Orbach et al. 2001). Regarding weight control behaviors, earlier studies pointed out that high rates of suicidal behaviors are associated with extreme weight control behaviors, including taking diet pills, making oneself vomit, using laxatives, and using diuretics (Crow et al. 2008; Neumark-Sztainer et al. 1998). The findings of the current study are consistent with prior studies reporting that negative body image and weight control behaviors are significantly correlated with suicidal behaviors. Regarding body image, previous studies have reported that unrealistic body image (negative body image) is correlated with suicidal behaviors. More specifically, the results of this study showed that among the participants who had an unrealistic body image, those who perceived their body weight as heavier than their actual weight had more possibility of engaging in suicidal behaviors than the students who perceived their body weight as lighter than their actual weight. Marshall (2006) provided one possible explanation of this phenomenon: adolescents have sensitivity to their appearance and mass media has made an ideal standard of beauty in which "thinner is better." Thus, adolescents who cannot reach the ideal standard of beauty have a higher probability of committing suicidal behaviors.

This study also reported that risky sexual behaviors are correlated with adolescents' suicidal behaviors. Previous studies indicated that those who have a history of sexual abuse as a child including rape and sexual coercion are more likely to attempt suicide compared to those who have no such history (Joiner et al. 2007;

Segal 2009). The results of the current study were consistent with prior studies reporting a correlation between forced sex and suicidal behaviors. Furthermore, the current study also included the following items as risky sexual behaviors: age at first sexual intercourse; multiple sexual partners; substance use before sexual intercourse; and methods to prevent pregnancy. As a result, the correlations between those items and suicidal behaviors were significant. Thus, this study expanded the current knowledge about the relationship between risky sexual behaviors and suicidal behaviors and suggested a stronger model.

To clarify the generalizability or boundary condition of the findings, it is necessary to discuss the methodological limitations. This study has three limitations. First, all data were self-reported so that there was a possibility for participants to under-report or over-report their behaviors in the questionnaire. Although this study assumed that each participant answered the questionnaire correctly and honestly, participants were reluctant to answer some questions related to participants' privacy. The under-reported or over-reported answers may reduce reliability of results. Second, this research used school-based survey data that were gathered from only the adolescents who attend school. Therefore, target populations are not representative of all adolescents in this age group. Third, all independent variables were included into the model as the same level, so no clues of the hierarchical relationships among predictors on suicidal behaviors can be identified. Possibly tobacco use and body image may function as mediation variables between some independent variables (i.e., depression, substance use, weight control behaviors, and risk sexual behaviors) and suicidal behaviors. Further comprehensive study of these areas is needed.

This research suggests more effective ways of working with the adolescents who are at risk of suicide or have potential to commit suicide. First, it is necessary to understand the unique characteristics of adolescents' physical, mental, and socio-psychological features. Adolescence is a period characterized by great physical, emotional, and social change. By understanding adolescents' unique features that may be related to suicidal risks, social workers could work proactively to prevent suicide and make more effective interventions.

Social workers who work with adolescents also need to have substantial information and knowledge about adolescent suicide and its predictors. As examined in this research, depression, substance use, body image, weight control behaviors, and risky sexual behaviors are significant predictors of adolescent suicide. Having these comprehensive understandings will create a foundation from which to broaden social workers' perspectives and coping skills to deal with adolescents' suicidal issues.

With this knowledge about adolescents' suicide and its predictors, social workers need to attempt to educate adolescents as well as stakeholders responsible for the care of adolescents about suicide, in the hopes of prevention. As another way to reduce or prevent suicide among adolescents, support systems, such as a counseling services and peer support groups, may work as valuable resources for adolescents who do not have adaptive coping skills to deal with suicidal behaviors. Professionals who are in various fields should work together to decrease adolescents' suicide with diverse perspectives. Healthcare professionals need to consider screening

adolescents for predictors of adolescents' suicide as part of routine primary care (Jiang et al. 2010). Based on this study's finding of differences in suicidal behaviors among different adolescent grade-levels, it is also necessary to establish suicide prevention curriculums, trainings, or workshops that are suitable for each grade-level of students.

Finally, in order to work more effectively with adolescents at risk of suicide, social workers need to focus their efforts on establishing and changing social policies in a way that supports suicide prevention for adolescents. It is one of the duties of social workers to make efforts to change policies that may affect their clients' lives in negative ways.

This study aimed to attain a better understanding of what physical and psychosocial factors place adolescents at risk for suicidal behavior. The findings of this study indicate that there are several predictors of suicide: depression, substance use, body image, weight control behaviors, and risky sexual behaviors. These are all significantly correlated with adolescents' suicidal behaviors. Also, the relationships between race/ethnicity and each predictor of adolescents' suicidal behaviors were examined and the results showed that there are significant correlations between them. Although this study presented limited insight into the variables affecting adolescents' suicide, the results of this study provide direction for further examination. Further research that focuses on gender differences in this same topic is needed to obtain more detailed knowledge and make more specified interventions for male and female adolescents.

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