Alcohol and cigarette use among Warsaw adolescents: Factors associated with risk and resilience

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Abstract

Background—Youth in Poland are at notable risk for substance use. Guided by resiliency theory, we examine if developmental risk and promotive factors are associated with substance abuse risk.

Objectives—We examined the association between adolescent cigarette and alcohol use and related risk and promotive factors including maternal support, neighbours' informal social control, friends' acceptance of substance use, and alcohol and cigarette use by nonparental adults.

Method—Data were collected from a random sample of 13–14-year old students attending Warsaw middle schools (N=3029). We used hierarchical regression models and examined compensatory and protective models of resilience, controlling for sociodemograhic factors.

Results—Our results indicated that friends' acceptance of substance use and perceived drug use among nonparental adults was associated with increased risk cigarette and alcohol use among youth. We found that maternal support moderated the relationship between friends' acceptance of substance use and cigarette use (protective model of resilience). Thus, maternal support buffered the negative effects of friends' acceptance of use on youths' cigarette use. Neighbor's informal social control and maternal support were associated with reduced risk of alcohol use (compensatory model of resilience).

Conclusion—Collectively, results of the study support compensatory and protective models of resilience in a large representative sample of Warsaw adolescents.

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Keywords

resilience; adolescents; substance use; risk/promotive factors

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Introduction

Political and economic changes in Poland in the last 25 years, especially the transition from socialism to capitalism (from centrally planned economy toward a market economy), have brought many benefits to Polish society, but have also had negative consequences. One of the consequences of a market economy was a rapid increase of the availability of alcohol and cigarettes, (Moskalewicz & Simpura, 2000) and the concomitant consumption of these products. These changes affected the entire Polish society, but especially youth. Shortly before transition in 1988, approximately 30% of 15-year olds from Warsaw reported alcohol use and 7.5% reported becoming drunk in the last 30 days. Eight years later, after the political changes in Poland, over 50% of 15-years old students confirmed alcohol consumption and 20% reported becoming drunk in the last 30 days (Ostaszewski & Pisarska, 2008). During this period, cigarette smoking also increased among adolescents. In 1988 approximately 7% of 15-year olds reported regular cigarette smoking, but in 1996 almost 14% reported every day smoking (Ostaszewski & Pisarska, 2008). Fortunately, cigarette smoking decreased in the last decade among 15-year-olds to 10% in 2012, but remains higher than pre-transformation levels (Ostaszewski et al., 2013). Prevalence of substance use among adolescents younger than 15-years is lower than older adolescents, however, data collected in Poland in 2010 for the Health Behaviour in School-aged Children study indicated that in 2010 approximately 6% of 13–14-year old students (7% of boys and about 5% of girls) reported smoking cigarettes every day, and 25% got drunk at least once in their life (30% of boys and 20.5% of girls) (Mazur et al., 2011). Moreover, data collected among 15-year-old respondents indicated that 30% of boys and 20% of girls began smoking at age 13 or younger, and 14% of boys and 5.5% of girls reported that the were first drunk at the age of 13 or before (Mazur et al., 2011; Currie et al., 2012). Unfortunately, the rapid growth of substance use among adolescents was not accompanied with equally dynamic development of theoretically and empirically-informed prevention programs. A promising approach to effective substance use prevention is based on adolescent resilience research underscoring the importance of promotive factors in reducing risk (Masten, 2004, Fergus & Zimmerman, 2005, Werner, 2005, Zimmerman et al. 2013). While resiliency theory has been extensively studied in the United States, only recently has it been applied in Poland (Mazur & Tabak, 2008, Ostaszewski & Pisarska (in press). Adolescent resilience may be partly culturally determined, therefore tests of the theory in non-U.S. samples are necessary to understand youth positive development in different cultures (Ungar, 2011). Our research contributes to the evidence base for resilience-focused approaches to substance use prevention by examining relationship between social promotive factors and youth alcohol and cigarette use among adolescents in Warsaw.

Resiliency Theory

Researchers interested in adolescent substance use have traditionally focused on risks, but more recently they have begun to focus on positive factors that may help youth overcome

risks (e.g., Wills, Vaccaro, & McNamara, 1992; Hawkins, Catalano, & Miller, 1992; Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1995; Resnick et al. 1997; Zimmerman, Salem, & Notaro, 2000; Bryant & Zimmerman, 2002; Griffin, Botvin, Scheier, Doyle, & Williams, 2003; Kegler et al., 2005; Theokas & Lerner, 2006; Lerner, Von Eye, Lerner, Lewin-Bizan, & Bowers 2010). This shift towards strength-based approaches is evidenced by the burgeoning research on resiliency theory (e.g., Kumpfer, 1999; Fraser, Richman, & Galinsky, 1999; Luthar, 2006; Fergus & Zimmerman, 2005; Werner, 2005; Hurd, Zimmerman, & Xue, 2009).

Resiliency theory provides a framework for understanding why some children and adolescents who are exposed to a number of risk factors do not develop negative health and social outcomes. In other words, resiliency theory focuses on those factors that help children and youth avoid the negative consequences of risk exposure (Garmezy, 1985; Rutter, 1987; Rutter, 1993; Luthar & Zigler, 1991, Masten, 2001; Luthar, 2006). In their review of adolescent resiliency research, Fergus and Zimmerman (2005) described the term "promotive factors" originally proposed by Sameroff (Sameroff A., Gutman L., & Peck S., 2003) to discuss positive factors in youths' lives that may help reduce the effects of risk. Promotive factors may reside within individuals (assets - e.g., skills or competence) or external to them (resources - e.g., social support).

Promotive factors may operate in several ways and two models of resiliency described originally by Garmezy, Masten & Tellegen (1984) are particularly relevant for the present study. The compensatory model implies that promotive factors can neutralize or counteract the effects of risk factors, and therefore have an opposite and independent effect from risks on the outcome of interest. In this case, risk and promotive factors do not interact but have direct effects on behaviour (Zimmerman & Arunkumar 1994). This model may be tested by investigating unique, direct effects in multiple regression or with structural equation modeling (SEM) (Fergus & Zimmerman, 2005). The protective model refers to the instances when promotive factors buffer or moderate the negative influence of exposure to risk. Within this model, promotive factors interact with risks and lessen or modify their negative effect on outcome of interest. This model can be tested with an interaction term in regression, entered after main effects (Masten, 2001; Fergus & Zimmerman, 2005). Both models indicate that the process of resiliency involves a complex interplay among an individual's constellation of risks, assets and resources on outcomes. Researchers have found that adolescents' social network including their family, peers, and nonparental adults are particularly relevant to our understanding of adolescent substance use (Griffin et al., 2003; Mayberry, Espelage, & Koenig 2009; Ennett et al., 2008; Hurd et. al., 2009; Brenner, Bauermeister & Zimmerman, 2011). These findings are consistent with socio-ecological theory, suggesting that adolescent development and behaviour are shaped by reciprocal influences across multiple contexts (e.g., home, school and community) (Bronfenbrenner, 1994). Thus, family, peers and community adults may have significant influence on adolescent behaviours such as substance use.

Promotive factors for adolescent substance use

Resiliency theory highlights the importance of supportive parental relationships as one of the most robust predictors of child's positive adaptation (Luthar, 2006). Findings from the U.S. Rochester Child Resilience Project with 9- to 12-years-old children and its replication with a younger age group (7–9 year olds) indicated that children of emotionally responsive parents were more likely to demonstrate resilient development (Wyman, Cowen, Work, Hoyt-Meyers, Magnus, & Fagen, 1999). Fergus & Zimmerman (2005) noted that "parental factors seem to be particularly vital in helping youth to be resilient" (p. 410). Several researchers have documented the promotive role that parents can play to help youth overcome the negative effects of risks associated with alcohol use and misuse, and cigarette use (Brenner et al., 2011; Gottfredson & Hussong, 2011; Springer, Parcel, Baumler, & Ross, 2006; Ennett et al., 2008; Simons-Morton, 2007). Parental support can help to build prosocial attitudes and beliefs that foster adolescents' resistance to negative influence and facilitate building coping skills (Wills et al., 1992). Thus, adolescents with support may be less likely to engage in substance use. The study among Warsaw students indicated, however, that in positive parental practices mothers play a leading role (Ostaszewski & Pisarska, in press). Despite intensive changes in women social position in recent years, traditional socializing roles that mothers play in Polish society seems to be resistant. The father's lower engagement in positive parenting practices is culturally embedded in Polish society, and a consequence of poor emotional support of fathers who are not living with their children (approximately 17% of youth) (Ostaszewski & Pisarska, in press). As a result, adolescents more often talk with their mothers about school, relationships with friends, interests and everyday life events (Tabak & Mazur, 2008).

Researchers have also documented the role of community or neighborhood characteristics for promoting positive youth development in the face of risk. The presence of informal social control within youths' environment, such as neighbours' willingness to monitor youths' behaviour and intervene when they act against socially accepted norms, can play important roles in protecting adolescents from engaging in problem behaviours (Sampson, Raudenbush, & Earls, 1997; Leventhal & Brooks-Gunn, 2000). The positive influence and support of nonparental adults (i.e., natural mentors) can also be helpful for reducing risk of negative outcomes and promoting the healthy development of youth (Werner & Smith, 1992; Greenberger, Chen & Beam, 1998; Zimmerman, Bingenheimer & Notaro 2002; Hurd et al., 2009). Hurd and Zimmerman (2010) found that having a mentor was associated with reduced risk of depressive symptoms, sexual risk behaviors and substance use among U.S. adolescents. Thus, having a mentor may be an important promotive factor to reduce risk of substance use among youth.

Risk factors for adolescent substance use

Negative social influences for substance use can have deleterious effects on adolescent behaviours. "Nonparental adults may also exact costs to adolescent' development, as when they model deviant behaviour" (Greenberger et al., 1998, p. 322). Until recently, little attention has been given to possible negative influences of nonparental adults on adolescents in the research literature (Hurd et al., 2009). Recent research suggests that nonparental adults can increase risk of adolescent substance use (Hurd et al., 2009). This may be due to

nonparental adults in young people's lives modeling alcohol and drug use, which, in turn, increased risk of adolescents' use (Lambert, Brown, Philips, & Ialongo, 2004; Parry, Morojele, Saban, & Flisher, 2004). Thus, nonparental adult substance use may be a risk factor for adolescent substance use.

Adolescents are more likely to use drugs if they believe that many of their peers also use such substances and approve drug use (Borsari & Carey, 2001; 2003; Berkowitz, 2004). These social influences are based on what adolescents think their peers approve or do as opposed to their peers' actual beliefs and behaviours (Ajzen & Fishbein, 1980; Berkowitz, 2004). In general, the role of peers in youth drug use is considered in terms of their negative rather than positive influences; many studies have documented that having peers who approve drug use is a risk factor for adolescent alcohol use and alcohol related problems (Borsari & Carey, 2001; LaBrie, Hummer, Neighbors, & Larimer, 2010) and cigarette use (Andrews, Hampson, & Barcley, 2002). Taken together, these results suggest that risk and promotive factors across important contexts for adolescents, including family, peers, and community may be important influences on risk of substance use.

Current study

This cross-sectional study focuses on risk and promotive factors that may influence substance use among Warsaw adolescents. Specifically, we examined the positive social influences that may help Polish youth avoid drug-related behaviours (e.g., maternal support, neighbours' informal control over students behaviours, having a mentor) and the negative social influences on youth drug-related behaviours (e.g., approval of drug use among peers and alcohol/nicotine use among nonparental adults). Middle school students constitute unique sample of the first generation of Polish youth growing under the new democratic rule. They were born at the beginning of transformation and grew up during the time of deep political and social changes that affected families, peers, schools, communities. The opening of borders and the resulting influence of westernized culture created and reinforced alcohol consumption and other substances among youth (Wojtyniak et. al. 2005, Anderson and Baumberg, 2006). New economic rules and free market created expanded employment opportunities and many parents shifted more of their time to work. This has resulted, however, in more time unsupervised for youth than in previous generations (Kurz pa, 2008). Moreover, during this period, economic turmoil has resulted in insufficient funding for services that traditionally offered out-of-school support for children and youth at risk (e.g. childcare facilities, youth organizations, leisure time activities). Consequently, alcohol and other psychoactive substances became a source of entertainment for youth as they had few other outlets in their free time.

In the presented study we hypothesized that exposure to negative adult and peer influences would be associated with increased adolescent cigarette and alcohol use. We also hypothesized that for youth who were exposed to such negative influences, maternal support, neighbours' informal social control and having a mentor would contribute to more positive outcomes (compensatory effect) and buffer youth negative outcomes (protective effect). Thus, we test both compensatory and protective models of resilience.

Method

Sampling and data collection procedures

The original representative sample of Warsaw schools consisted of 150 classes randomly selected from the sample frame of 600 seventh grade classes from all public and non-public Warsaw middle schools. Classroom was the unit of randomization. The target population consisted of approximately 3900 students from 99 Warsaw middle schools.

Following the selection of classes, school principals were informed by a member of the research team that their schools (and particular classes) had been selected for a study of adolescent risky behaviours and lifestyles. Four schools principals did not agree to participate in the study, therefore 8 selected classes (191 students) did not participate in the study. According to our knowledge, these four schools did not differ significantly from other participating middle schools. In schools whose principals agreed to participate, parents were asked for their consent. Due to parents' refusals, 203 students (among them students from 3 whole classes) did not participate in the survey. Finally, 139 classes participated in the study (123 classes from public and 16 from non-public schools).

Data were collected during the first semester of the school year 2006/2007. The students answered the self-administered questionnaire during school lessons. They were asked by trained data collectors to participate in the study and informed about the voluntary and anonymous nature of their involvement. About 10% of the students consented into the study were absent during the data collection days. A final sample of 3089 students completed the questionnaire. This constitutes about 82% of the original sample. Due to incomplete data or answers indicating the youth did not take a study seriously (e.g., jokes, drawings and inconsistent responses) data of 62 students were removed from the sample. Thus, our final sample for analysis was 3027. Their mean age was 13.5 years (SD=.329) and females constituted 51% of the final sample.

The research was approved by the Human Subject Committee for the Institute of Psychiatry and Neurology in Warsaw, Poland, and by the Human Subject Protection Office at the Fogarty International Center, National Institutes of Health, USA.

Measures

Most of the measures used in the study were adapted for Polish youth from the Flint Adolescent Study done in the USA (Zimmerman & Schmeelk-Cone, 2003). Other sources of items are mentioned below.

Dependent variables—Our dependent variables are cigarette and alcohol use, because alcohol and nicotine are the most prevalent substances among Warsaw middle school students. Our measures are the same as those used in the Monitoring the Future study (Johnston, O'Malley, & Bachman, 1993), and applied in other youth studies in Poland (Sierosławski, 2011).

Cigarette use: Cigarette use was measured by combining a measure of lifetime and last month cigarette use. Frequency of lifetime use was assessed on 5-point Likert scale (1 =

never, 5 = currently I smoke regularly), while last month use - on 7-point Likert scale (1 = not at all, 7 = 2 packs or more per day). The correlation between lifetime and last month cigarette use was .62. We created a cigarette use index by summing standardized scores from these two self-report items (mean = − .01; range: −0.78 −11.63; SD = 1.78; skewness = 3.34). There were two reasons why we created cigarette use index instead of single item use. First, the use of combining measure allowing for greater precision in assessing a student stage of cigarette use involvement. Second, this index used as a continuous variable would allow for greater precision in regression analysis.

Alcohol use: Alcohol use was measured by a scale including life time use (with a clarifying instruction for seven graders on the questionnaire that one, two or three sips do not count), last year use and last month use. Frequency of use was assessed on 7-point Likert scale (1 = 0 times, 7 = 40 or more times). We created an alcohol use scale by summing scores from these three self-report items (mean = 5.36; range: 3 – 21; SD = 3.42; skewness= 1.86). The alcohol use scale had high internal consistency (alpha coefficient .88) with equal value for male and female subgroups. The use of a scale to measure teenage alcohol use has several potential benefits. This scale used as a continuous variable may allow for greater precision in regression analysis. As the three alcohol items were related temporally, the scoring method (adding the points for each individual item) resulted in higher scores for more recent alcohol use. This method gives attention to more recent users who may be more likely to be regular alcohol consumers (Williams et al. 1995). This is consistent with how these items are used as single item measures (e.g. alcohol use in the last week or the last month).

Promotive factors

Maternal support: Perceived support from mothers was assessed using a shortened version of Procidano's and Heller's (1983) social support scale. The shortened scale of mother support in daily lives of students includes 5 items. For example: *My mother enjoys hearing about what I think.* The scale uses the 5-point Likert format (1 = not true, 5 = very true). The mother support scale was the mean of these five items and had the Cronbach alpha coefficient of .89. Higher scores indicated more support.[1]

Neighbours' informal control: Neighbours' control was measured by 8 items related to perceived neighbours' reaction to problem behaviour, including drug use by the students, for example: *Indicate how often the following statements are true for you: If I were to get drunk and a neighbour were to see, they would probably tell my parents* (5-point Likert scale, 1= definitely no, 5= definitely yes). We used the mean of these eight items for the scale, which had a Cronbach alpha coefficient of 93. Higher scores indicated more neighbour control.

Having a mentor: Support from nonparental adults was measured by a single question: *Is there an adult who you consider to be your mentor? That is, someone you can go for support and guidance or if you need to make an important decision, or who inspires you to do your*

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[1]The shortened scale of father support was also used. Due to high percentage of missing data we decided not to use this scale in analysis. It is worth to note that there is strong correlation between mother and father support (r=0.56).

best? (yes or no answer) (Zimmerman, Bingenheimer, & Notaro, 2002). Answers were classified as *having a mentor* (46.5% of valid answers) or *do not having a mentor* (53.5%).

Risk factors

Friends' acceptance of substance use: Friends' acceptance of substance use was measured by a three item scale related to alcohol, cigarette and illegal drug use, for example: *Would your friends think it was cool or uncool if you drank beer, wine or vodka?* The items used a 5-point Likert scale (1 = uncool, 5 = very cool). We calculated the scale as the mean of these three items, and the scale had a Cronbach alpha of .83.

Drinking/smoking among nonparental adults: The student's perception of alcohol/cigarette use among nonparental adults in the students' life was measured by three items that assessed how many adults (excluding parents or adults living with respondent) they know who: *drink alcohol at least once a week, who get drunk once a week and who use cigarettes or other tobacco products.* These items used a 5-point Likert scale (1 = none, 5 = all). This scale had a Cronbach alpha of .71.

Control variables: Demographic information, such as gender, family composition, parental education level and family budget situation were obtained. Family composition was assessed by a single question *Mainly, with whom do you live?* This variable was recoded to have binary values: (1 = single - or step-parent family 2 = two-parent family). About 80% of the students lived with both parents while 20% students came from single or step-parent families. Parental education was assessed by two separate questions on mother and father education: *What is the level of schooling your parents completed?* (1 = completed elementary school, 4 = completed college or university). We took the highest reported education between the mother and the father in the analyses. The majority of the students (62%) had a least one parent with college or university degree, which generally reflects the average level of education among adults who live in Warsaw. Family budget situation was assessed by single question: *How would you describe financial situation of your family?* (5-pt Likert, 1 = much above average, 5 = much below average). The vast majority of the students (93%) assessed their family income as above average or average.

Data analytic approach

We performed analyses for the current study using Stata 12 (StataCorp). First, we evaluated descriptive statistics for all measures included in the study, including medians, means, mode, and skewness (where appropriate). We evaluated study variables for violations to statistical assumptions as indicated (e.g., multivariate normality for continuous outcome variables). Our results suggested that both dependent variables (alcohol use scale and cigarette index) demonstrated notable departure from normality. As a result, we log transformed both alcohol and cigarette use variables (cigarette use was rescaled such that mean = 1) for use in regression models. Next, we evaluated missing data on all study variables. We handled missing data on independent variables using multiple imputation (MI) technique. Statisticians suggest that MI may result in less biased estimates of associations than using techniques such as complete case analyses and mean imputation (Raghunathan, 2004; Schenker et al., 2006). Using MI, missing data for a participant is imputed using information

from a participant's other known characteristics (Donders, van der Heijden, Stijnen, & Moons, 2006). We did not use MI on dependent variables because of potential bias introduced in our results. We instead examined participants who had missing data on each outcome versus non-missing on all sociodemographic variables to examine possible differences using t-tests for comparisons with continuous variables and X^2 tests for comparisons with categorical variables. In accordance with study hypotheses, our analyses included statistical interaction terms. We followed the procedure for statistical interactions as discussed by Hayes (2013) and Jose (2013). For continuous by continuous variable interactions we computed the interaction term using mean centered values for the purposes of interpretation. For continuous by categorical, the same procedure applied, except the (dichotomous) categorical variables in the interaction were recoded to 0 and 1. Following a significant interaction finding, we then investigated details of the moderation effect through graphing and examination of simple slopes. For all interactions with imputed variables, we completed this procedure for each of the imputed datasets. Next, we accounted for survey design. Participants in the study were students within classrooms and thus their responses may be correlated. In order to account for possible correlations, we performed regression analyses using survey commands in Stata and clustered by classroom (primary sampling unit).

We used hierarchical regression models to assess the relationship among our outcome variables of interest and our independent variables. In hierarchical regression, variables are entered in stages to examine the relationship between variables of interest and the outcome after controlling for the effects of previously entered variables (Cohen et al., 2003). Keeping with the resilience approaches (Fergus & Zimmerman, 2005; Garmezy, Masten, & Tellegen, 1984), the first step included four demographic variables entered as a block (gender, family composition, family financial situation and parent's education), the risk factors were entered as block in the second step, the promotive factors in the third (test of compensatory model of resiliency). Following the sociodemographics, risk and promotive factors, we included each interaction term in the model to test for a significant moderating effect (protective model of resiliency) between negative peer or nonparental adults' behaviour and positive social influences for a total of six risk by promotive interactions. Finally, we exponentiated the model coefficients to aid in interpretation of independent and dependent variable relationships.

Due to our procedure of testing multiple interactions following the addition of socidemographic, risk and promotive variable blocks, we controlled for the false discovery rate (FDR) using the technique described by Benjamini and Hochberg (1995). This technique uses a Benjamini-Hochberg critical value (i/m)Q, determined by p-value rank (i), the number of tests (m) and determined false discovery rate (Q) to assess the significance of predictors in the model. Using this approach, the largest P<(i/m)Q is significant and all those smaller are also significant (McDonald, 2014).

Results

Descriptive statistics

Descriptive data on cigarette and alcohol use among students are presented in the table 1.

Approximately 30% of students had an experience with cigarettes in their lifetime, almost 8% reported current smoking (i.e. during the last 30 days). More than half of the participants drank alcohol at least 1–2 times in the lifetime, approximately 20% were current drinkers. Drunkenness in the past 12 months were reported by 12% of students. The only gender differences were found in the lifetime substance use, more boys than girls reported life time cigarette (p<0,05) and alcohol use (p<0,01).

Table 2 reports the correlation matrix for all study variables which, though small, were all in the expected direction.

Missing Data on Outcome Variables

We found differences among participants with and without missing data on cigarette use. Participants with missing data on cigarette use reported higher levels of parent education (mean difference=0.10, t=−2.90, p<0.01). Participants with missing data on cigarette use were also more likely to report their family financial situation was much above or some above average compared to average or below (X^2=21.01, p<0.001), more likely to be male (X^2=99.65, p<0.001) and more likely to come from a two parent family (X^2=24.65, p<0.001).

Participants with data missing on alcohol use reported higher levels of parent education (mean difference= 0.09, t=−3.6183, p<0.001). We also found differences by family financial situation. We had a greater number missing among those who reported their family financial situation was much above or above average and fewer missing among those who reported average or below (X^2=20.58, p<0.001). Moreover, we found differences by sex and family composition. Males were more likely to be missing alcohol use data (X^2=83.77, p<0.001) and youth from one parent families (X^2=66.31, p<0.001).

Regression Analyses

Cigarette use—Table 3 reports hierarchical regression model results for adolescent cigarette use.

In Model one, living with both parents (versus living with a single parent family) was associated with reduced risk of adolescent cigarette use. In Model two, our results indicated that the risk factors representing negative social influences (friends' acceptance of substance use and substance use among nonparental adults) were associated with increased risk of cigarette use. Model three included two promotive factors in the model representing positive social influences (maternal support and neighbours' informal control). Maternal support and neighbours' informal control reduced risk of cigarette use. For Model three, a one-unit increase in friends' acceptance of use was associated with a 34% increase in cigarette use, controlling for other factors. Every one-unit increase in nonparental adult substance use was associated with a 27% increase in cigarette use, ceteris paribus. For every one-unit increase in maternal support, we expect to see a 10% decrease in cigarette use. Model four included a risk/promotive interaction (maternal support x friends' acceptance of substance use) that tested a protective model of resilience for cigarette use. Our results indicated that maternal support buffers the negative impact of friends' acceptance of substance use on cigarette use.

Models 5–9 tested additional risk by promotive interactions, including friends' acceptance of substance use by having a mentor, friends' acceptance of substance use by neighbours' control, substance use of non-parental adults by neighbours' control, substance use of non-parental adult by having a mentor, and substance use of non-parental adult by maternal support. We corrected for these multiple comparisons using the technique described by Benjamini and Hochberg (1995), with a FDR of 0.15. Using these criteria, our results suggest that the significant predictors in model 4 remain significant even after the correction.

Figure 1 depicts the interaction effects. The graph illustrates the relationship between a risk factor (friends' acceptance of use) and cigarette use for the low, medium and high levels of maternal support (using non-exponentiated values). Simple slopes for each level of maternal support, low (slope=0.33, SE=0.03), medium (slope=0.28, SE=0.02) and high (slope=0.23, SE=0.03) were significantly different from zero, but these results indicate that relationship between friends' acceptance of use and cigarette use is weakest among youth who reported the highest levels of maternal support. In an environment containing a high level of negative peer influences, greater maternal support reduced the likelihood the adolescent would smoke cigarettes as compared to youth who had lower maternal support.

Alcohol use—Table 4 reports hierarchical regression results for alcohol use.

In Model one, living with both parents (versus living with a single parent family) and sex were significant predictors of adolescent alcohol use. Living in a two parent household was associated with less alcohol use; males were more likely to engage in alcohol use. In Model two, our results indicated that the risk factors representing negative social influences (friends' acceptance of substance use and substance use among nonparental adults) were associated with increased risk of alcohol use. Model three included two promotive factors in the model representing positive social influences (maternal support and neighbours' informal control). Maternal support and neighbours' informal control reduced risk of alcohol use. For every one-unit increase in friends' acceptance of substance use we expect to see a 16% increase in alcohol use, controlling for all other factors. A one-unit increase in nonparental adult substance use was associated with a 17% increase in alcohol use, ceteris paribus. A one-unit increase in maternal support was associated with a 6% decrease in alcohol use, ceteris paribus and a one-unit increase in neighbors' informal social control was associated with a 4% decrease in alcohol use. We found no risk/promotive interactions related to adolescent alcohol use (Models 4–9, not shown).

Discussion

In part due to a rapid increase of the availability of alcohol and cigarettes in Poland following the transition from socialism to capitalism, Polish youth have reported an increase in alcohol and cigarette use over the last several decades (Moskalewicz & Simpura, 2000). Consequently, it is critical to identify both risk and promotive factors for substance use among Polish adolescents. Using a resilience framework, we investigated important risk and promotive factors for substance use across ecological levels, including peers, family and community. The results of our study suggest that risk and promotive factors across ecological levels may influence adolescent substance use. We found that peers, nonparental/

community adults, and families may exacerbate or ameliorate risk of substance use among Warsaw adolescents. Our results support both the compensatory and protective models of resilience in the relationship between risk factors and substance use.

We found that, among promotive factors, maternal support and neighbours' informal control were associated with less substance use among youth. We found that maternal support moderated the relationship between peer negative influences and adolescent cigarette smoking. Researchers have reported that parents may exert their influence through establishing conditions for their sons' or daughters' affiliation with peers who do not use drugs (Chuang, Ennett, Bauman, & Foshee, 2005). Thus, among youth in this study, maternal influence on peer relationships may be a protective mechanism that reduces risk of cigarette use among Polish adolescents. Maternal support, however, did not moderate the relationship between risk factors and adolescent alcohol use. This may be because alcohol use, even among adolescents, is more accepted in Polish families than cigarette use. We did find that maternal support had an opposite and direct effect on alcohol use, even in the presence of risk factors such as friends' acceptance of substance use and nonparental substance use. These results supported a compensatory model of resilience. Taken together, our results suggest that maternal support is a vital promotive factor for substance use, counteracting the negative effects of risk on substance use. Thus, despite the social and economic upheaval new parenting challenges, maternal support remains an important protective factor.

Our findings also confirmed that neighbours' informal control had a compensatory effect on adolescent alcohol use. Neighbours' informal control had an opposite and direct effect on alcohol use, even in the presence of risk factors such as friends' acceptance of use and substance use of non-familial adults. This is consistent with other researchers who suggest that informal social control, existing in the neighbourhood where residents know each other, helps reduce risks for problem behaviours (Leventhal & Brook-Gunn 2000; Mayberry et al., 2009). Of course, adolescents living in such cohesive neighbourhoods may experiment with substance use or engage in other problem behaviours but the adults living there are likely to notice and take action to address the issue (Nash & Bowen, 1999). These findings suggest that efforts to increase neighbourhood cohesion and social interactions, especially intergenerational connections, may help create supportive environments for positive youth development. Furthermore, creating intergenerational connections may be a promising way to help address risks associated with the relative increase in unsupervised time among Warsaw adolescents.

Contrary to our expectations, we found no relationship between having a mentor and adolescent cigarette smoking or alcohol use. One explanation for this finding is that we did not adequately capture relationships with other significant adults. Mentors in our sample included mostly family members (e.g., grandparents, aunts, cousins) and non-familial mentors were rare. Future research that assesses a more nuanced definition of adolescent mentors is warranted. Taken together, our findings regarding promotive factors are consistent with a substantial body of research has demonstrated that ecological assets in families and neighbourhoods play a crucial role in positive youth development and reducing risk of

problem behaviours among adolescents (Resnick et al., 1997; Fergus & Zimmerman, 2005; Theokas & Lerner, 2006; Lerner et. al., 2010).

We found that among risk factors, friends' acceptance of use and substance use by non-familial adults were associated with substance use during adolescence. Peer groups become a primary focus during adolescence (Muuss, 1996; Youniss & Haynie, 1992). Adolescents actively establish a peer network that can be both a source of emotional support, but also facilitate social opportunities that may include availability of alcohol or cigarettes (Borsari and Carey, 2001). This is consistent with past research indicating that adolescents who perceive that peers approve substance use are more likely to use such substances themselves (Berkowitz, 2004). It is worth to noting, however, that many individual and social factors may moderate the negative influences of peer norms (Borsari & Carey, 2001), including maternal support as we found in the current study.

Substance use by nonparental adults may also increase risk of cigarette and alcohol use among adolescents. Our findings are consistent with other researchers who have found that substance use by nonparental adults is a risk factor for substance use among adolescents (Hurd et al., 2009). Adults may influence an adolescent's behaviour if she/he perceives these adult as important persons in her/his life (Hurd et al., 2009). Yet, even if adolescents do not perceive nonparental familial adults as important, such adults can still have a negative influence, particularly if the adolescents "*are exposed* to *multiple deviant behavior by several adults in their environment*" (Hurd et al. 2009, p. 778). We do not know whether our respondents considered adults who are very important for them when answering questions about drug use among nonparental adults. Nevertheless, adolescents' perceptions of substance use among adults around them were associated with increased risk of substance use.

This study expands our understanding of resiliency theory to a sample of Polish adolescents. Most research on resiliency has focused on U.S., Canadian, or Western European samples. Although Poland is a member of the European Union with a increasingly westernized culture, it has only relatively recently became a democracy with new freedoms after years of authoritarian rule in the former Eastern Bloc. It is possible that resiliency may be somewhat different depending on the socio-political context, especially regarding social and familial support offered by adults to children and youth in unstable social and economical situation. Opportunities for new forms of organized and natural social support may both increase in number and importance for Polish youth as its democracy continues to develop.

Limitations

Although we used a random selection procedure with psychometrically sound measures, several study limitations require attention. First, our analysis was cross-sectional which does not allow determination of temporal order or causal direction of the relationships we tested. In this context, the associations between risk and promotive factors and youth behaviors were analysed rather than "the effects" of risk or promotive factors. Nevertheless, this is one of the first large and multivariate studies of Polish youth, and provides support for further inquiry. Second, our measure of context for this study focused on perceived social environment. Features of the neighbourhood based on census data such as socioeconomic

status (SES) of the neighbourhood provides another approach to understanding contextual influences on youth (Leventhal & Brooks-Gunn, 2000). Although examination of neighbourhood characteristics was beyond the scope of this paper, our results suggested that contextual factors are influential for Polish youth and that future research using more objective measures is warranted. It is possible, for example, that neighbourhood SES may influence social contexts and adolescent perceptions of them. Thus, future research could focus on the mediating effects of subjective assessments for the relationship between more objective measures and adolescent outcomes (e.g., substance use). Third, approximately 10% of students were excluded from the regression analysis due to missing or incomplete data on our dependent variables. Nevertheless, we did have ample variation in our substance use measure, our sample size for our analysis was relatively large, and our results are theoretically consistent. These add to our confidence in the results and diminish concerns that our analysis sample biased our results in a significant way. Fourth, we investigated perceived versus reported problem behaviours of peers. Yet, previous research suggests youths' perceptions of peer behaviours are a significant predictor of youth engaging in problem behaviours themselves (Berkowitz, 2004). Despite these limitations, our study provides useful insight about important risk and promotive factors across ecological levels associated with adolescent substance use.

Conclusions

These study limitations notwithstanding, our findings support compensatory and protective models of resilience (Fergus & Zimmerman, 2005). Our results suggest that family and neighbourhood resources can be vital for counteracting and protecting against the effects of peers' and nonparental adults' influence on substance use by adolescents. These results are consistent with earlier research (Nash & Bowen, 1999; Hurd et al., 2009), but replicate them in a sample of youth in a social and political context that has not been widely studied. Informal social control can help compensate for risks that increase the probability of problem behaviour among youth (Leventhal & Brooks-Gunn, 2004). Therefore, one strategy for effective prevention would be to strengthen neighbourhood cohesion and monitoring among residents. The results also suggest that efforts to help Polish youth avoid risks for alcohol use or offset their negative effects might focus on interventions to enhance parenting skills and create opportunities for developing supportive relationships between parents and their school children.

Acknowledgments

Glossary

Resiliency theory
Theory that provides a framework for understanding why some children and adolescents who are exposed to a number of risk factors do not develop negative health and social outcomes. Resiliency theory focuses on those factors that help children and youth avoid the

negative consequences of risk exposure (Garmezy, 1985; Rutter, 1987; Rutter, 1993; Luthar & Zigler, 1991, Masten, 2001; Luthar, 2006).

Risk factors

Variables associated with a high probability of onset, greater severity, and longer duration of major health problems (Coie et al., 1993: p. 1013)

Promotive factors

Assets or resources that may help youth reduce or avoid the negative effects of risks and therefore enhance healthy development (Fergus & Zimmerman, 2005).

The compensatory model

The model implies that promotive factors can neutralize or counteract the effects of risk factors, and therefore have an opposite and independent effect from risks on the outcome of interest. In this case, risk and promotive factors do not interact but have direct effects on behaviour (Zimmerman & Arunkumar 1994).

The protective model

The model that refers to the instances when promotive factors buffer or moderate the negative influence of exposure to risk. Within this model, promotive factors interact with risks and lessen or modify their negative effect on outcome of interest. (Masten, 2001; Fergus & Zimmerman, 2005)

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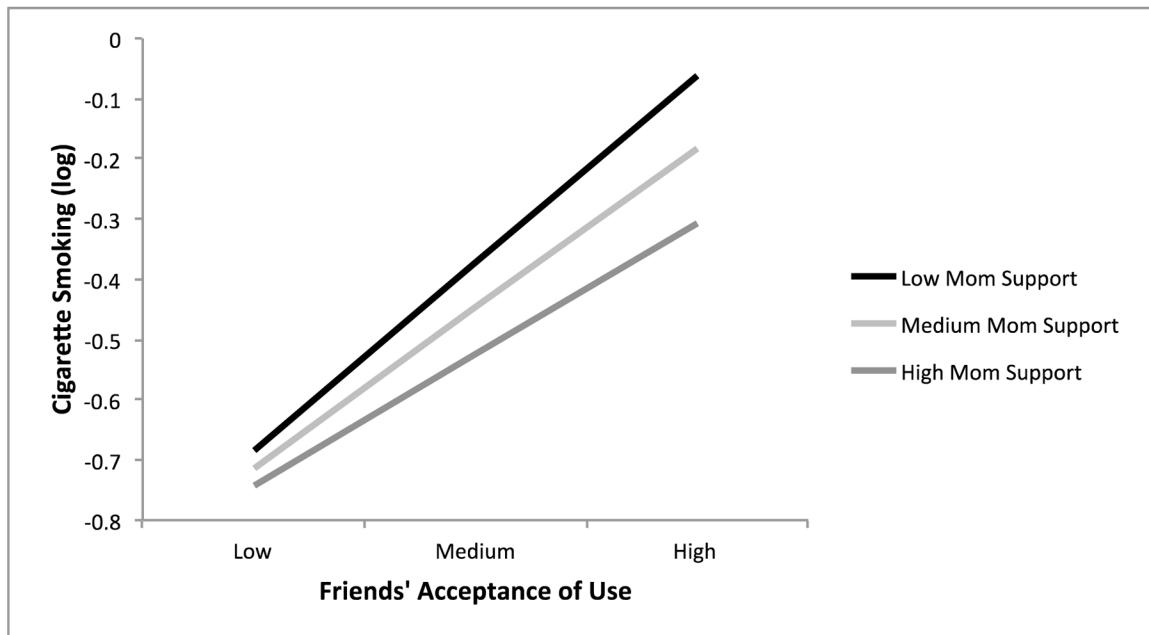Author Manuscript
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Figure 1.
Relationship between friend's acceptance of use and participant's cigarette use for low, medium and high levels of mother support. Low: −1 SD (standard deviation), Medium: Mean, High: +1 SD.

Table 1

Prevalence of cigarette and alcohol use among students

	Boys	**Girls**	**Total**
Cigarette use at last 1–3 times during the lifetime	433 (31.1%)	418 (27.8%) *	855 (29.4%)
Cigarette use at last once during the last 30 days	126 (9.1%)	128 (8.5%)	257 (8.8%)
Alcohol use at last 1–2 times during the lifetime	771 (56%)	771 (51.8%) **	1550 (53.9%)
Alcohol use least 1–2 times during the last 12 months	587 (42.8%)	619 (41.7%)	1210 (42.2%)
Alcohol use at least 1–2 times during the last 30 days	269 (20.1%)	279 (19%)	551 (19.5%)
Drunkenness at least 1–2 times during the last 12 months	156 (11.7%)	174 (11.9%)	332 (11.8%)

*
p<0.05;

**
p<0.01

Table 2

Correlations among study variables for boys (above the diagonal) and girls (below the diagonal)

	1	2	3	4	5	6	7	8	9	10
1. Family composition		-.13**	.08**	-.06*	-.08**	-.04	.07*	.04	-.10**	-.05
2. Family financial situation	-.11**		-.25**	.03	.07*	-.01	-.12**	-.01	.01	-.02
3. Parental education	.09**	-.29**		-.06*	-.09**	-.02	.10**	.03	-.10**	-.04
4. Friends' acceptance of substance use	-.08**	.09**	-.07**		.31**	-.10**	-.18**	-.19**	.37**	.37*
5. Drinking/smoking among nonparental adults	-.08**	.07**	-.12**	.38**		-.04	-.13**	-.17**	.28**	.34**
6. Having mentor	.00	-.06*	.02	-.08**	-.05		.11**	.09**	-.04	-.02
7. Mother support	.07**	-.18**	.09**	-.31**	-.19**	.12**		.17**	-.12**	-.14**
8. Neighbours' control	.02	-.03	.03	-.16**	-.16**	.07*	.16**		-.16**	-.20**
9. Cigarette use index	-.18**	.08**	-.10**	.44**	.36**	-.07**	-.24**	-.11**		.51**
10. Alcohol use scale	-.11**	.03	-.05	.47**	.40**	-.07*	-.25**	-.18**	.52**	

*
p<0.05,

**
p<0.01

Correlations on un-imputed data

Table 3

Hierarchical multiple regression results predicting adolescent cigarette use from demographics and risk and promotive factors

Cigarette Use (Log)	Model 1: Demographics	Model 2: Risk factors	Model 3: Promotive Factors	Model 4: Interaction[§]
Parameter	**Exp(b) (95% CI)**	**Exp(b) (95% CI)**	**Exp(b) (95% CI)**	**Exp(b) (95% CI)**
Intercept	0.83(0.41, 0.82)	0.30(0.25., 0.37)	0.57(0.42, 0.82)	0.60(0.47, 0.80)
Demographics				
Sex[†]	1.08(1.01,1.15) *	1.01(0.94, 1.07)	1.00(0.95, 1.07)	1.01(0.95, 1.07)
Household composition[£]	0.74(0.68, 0.82) **	0.80(0.73, 0.87) **	0.81(0.74, 0.88) **	0.80(0.74, 0.88) **
Financial situation	1.03(0.99, 1.08)	1.00(0.96, 1.04)	0.99(0.95, 1.03)	0.99(0.95, 1.03)
Parent education	0.99(0.95, 1.02)	0.99(0.96, 1.03)	1.00(0.96, 1.03)	1.00(0.96, 1.03)
Risk factors				
Friends' acceptance of substance use		1.38(1.32, 1.44) **	1.34(1.28, 1.40) **	1.33(1.27, 1.39) **
Substance use of nonparental adults		1.29(1.22, 1.36) **	1.27(1.20, 1.34) **	1.27(1.20, 1.33) **
Promotive factors				
Neighbours' control			0.97(0.93, 1.00)	0.97(0.93, 1.00)
Mother support			0.90(0.86, 0.93) **	0.91(0.87, 0.94) **
Having a mentor			1.03(0.97, 1.08)	1.03(0.98, 1.08)
Risk x promotive interaction				
Mother support x Friends' acceptance of substance use				0.95(0.90, 0.99) *

[†] Females are the reference group,

[£] Dichotomous variable: one parent family is reference group.

[§] Variables in the interaction were centered, values in the table represent exponentiated beta coefficients and 95% CI. Our results for significant predictors of cigarette use were unchanged using false discovery rate (FDR) correction as described by Benjamini and Hochberg (1995). We tested a total of nine models: models 4–9 included risk x promotive interactions. The remaining models did not demonstrate a significant risk by promotive interaction (friends' acceptance x mentor, friends' acceptance x neighbourhood control, substance use of non-parental adults x neighbours' control, substance use of non-parental adult x mentor, substance use of non-parental adult x mother support) and are not included in the results table.

*
p<0.05

**
p<0.001

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Table 4

Hierarchical multiple regression results predicting adolescent alcohol use from demographics and risk and promotive factors

Alcohol Use (Log)	Model 1: Demographics	Model 2: risk factors	Model 3: Promotive Factors[§]
Parameter	**Exp(b) (95% CI)**	**Exp(b) (95% CI)**	**Exp(b) (95% CI)**
Intercept	4.93(4.40, 5.53)	2.67(2.39, 2.98)	4.27(3.53, 5.26)
Demographics			
Sex[†]	1.06(1.02, 1.11) [*]	1.02(0.99, 1.06)	1.02(0.99, 1.06)
Household composition[£]	0.90(0.85, 0.95) [**]	0.94(0.89, 0.98) [*]	0.94(0.90, 0.99) [*]
Financial situation	0.99(0.97, 1.02)	0.98(0.96, 1.00) [*]	0.97(0.95, 0.99) [*]
Parent education	1.00(0.98, 1.02)	1.01(0.98, 1.03)	1.01(0.99, 1.03)
Risk factors			
Friends' acceptance of substance use		1.19(1.16, 1.22) [**]	1.16(1.14, 1.20) [**]
Substance use of nonparental adults		1.18(1.15, 1.21) [**]	1.17(1.14, 1.20) [**]
Promotive factors			
Neighbours' control			0.96(0.94, 0.98) [**]
Mother support			0.94(0.92, 0.96) [**]
Having a mentor			1.01(0.97, 1.05)

[†]Females are the reference group,

[£]Dichotomous variable: one parent family is reference group.

[§]Values in the table represent exponentiated beta coefficients and 95% CI. Results from models 4–9 not shown in the table as none of the risk by promotive interactions were significant predictors of alcohol use.

[*]
p<0.05

[**]
p<0.001