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Cognitive Precursors to Adolescents' Reproductive Health: Exploring the Role of School-based Health Services

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Abstract

The goal of this study was to examine associations between the number of school-based health services (SBHS) provided and the cognitive precursors to adolescents' reproductive health, including birth control self-efficacy, motivation to use birth control, attitudes toward birth control, and contraception knowledge. Further, this study examined whether these associations varied by adolescents' age, gender, socioeconomic status (SES), and race/ethnicity. Data were drawn from two waves of Add Health, a longitudinal survey of a nationally representative sample of U.S. adolescents (1994–96). Results from hierarchical linear regression models indicated that the number of SBHS interacted with adolescents' age to predict birth control self-efficacy, such that a greater number of SBHS were associated with greater birth control self-efficacy among 15-year-old adolescents. Findings also indicated that a greater number of SBHS were associated with lower reported birth control motivation. Although access to a greater number of health services in school settings had some effect, study findings suggest that simply increasing the number or range of health services provided may not be the most effective method for supporting diverse adolescents' reproductive health. This information is important for schools as it highlights the need for SBHS to be health outcome specific and can be used to inform initiatives related to adolescents' reproductive health.

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Conflicts of Interests

The authors declare no conflicts of interest.

Keywords

School-based Health Services; Adolescent; Reproductive Health; Contraception

Introduction

Reducing unintended pregnancies and increasing the proportion of adolescents' who receive formal instruction on contraceptives as national objectives for improving population health (Office of Disease Prevention and Health Promotion, 2014). Providing health services in school settings may be one way to support these initiatives as schools are uniquely positioned to reach diverse groups of adolescents in convenient settings. The provision of school-based health services (SBHS) has steadily increased over the last the few decades (Love et al., n.d.). These services include, but are not limited to, acute, primary, preventative, and referral services and are designed to be easily accessible for students. Indeed, studies suggest that providing adolescents with access to SBHS has positive implications for reproductive health (Bersamin, Paschall, & Fisher, 2017a; Kirby, 2002; Ricketts & Guernsey, 2006).

School-based approaches also may impact adolescents' health knowledge base and the cognitive precursors that inform behavior. Social cognitive theory perspectives highlight the importance of knowledge, motivation, attitudes, intentions, and self-efficacy for health promotion (Bandura, 1998). These factors or cognitive precursors are drivers of reproductive health behaviors. Adolescents' knowledge about contraceptives and their belief in their ability to use contraceptives (i.e., contraceptive self-efficacy) are associated with their sexual behaviors and contraceptive use (Chen, Thompson, & Morrison-Beedy, 2010; Longmore, Manning, Giordano, & Rudolph, 2003; Ryan, Franzetta, & Manlove, 2007). Further, research shows that ambivalent attitudes toward pregnancy are associated with a reduced likelihood of contraception use (Bruckner, Martin, & Bearman, 2004). Although limited, some research demonstrates that SBHS may impact the cognitive precursors that inform and promote adolescents' reproductive health behaviors. Weeks (1995) found that school-based education programs addressing sexual and reproductive health support young adolescents' self-efficacy to buy contraceptive from stores, obtain contraceptive from clinics, and their intentions to use contraceptives. Similarly, Mesheriakova and Tebb (2017) demonstrated the efficacy of an iPad-based intervention delivered through school-based health centers for improving adolescents' sexual health knowledge and their intentions to use contraceptives.

Although research indicates that availability of reproductive services can have a positive effect on adolescents' cognitive precursors to reproductive health, no prior studies have investigated whether access to a greater number of SBHS also may have such a beneficial effect. It is possible that having access to a greater number of SBHS will benefit adolescents through multiple both direct and indirect mechanisms. Given health domains often overlap, adolescents' cognitive precursors to reproductive health may be directly informed through interactions with health care providers for services other than family planning. For example, accessing emotional counseling or primary care services may inform adolescents' knowledge about available reproductive health resources or expectations about sexual

behaviors through discussions with school health care providers. Great numbers of health services in school settings also may indirectly benefit adolescents' through (a) observation of their peers' interactions with health services or (b) through health marketing materials which advertise available services, information, and resources about health practices, and reinforce normative messages regarding family planning behaviors and practices. Through these mechanisms it is hypothesized that a greater number of SBHS services could positively impact diverse health outcomes, including reproductive health behaviors.

Importantly, providing health services in school settings may be particularly important for socio-demographic subgroups who experience barriers to and deficits in their cognitive precursors to reproductive health. Girls, older adolescents, and those with mothers who completed high school reported higher contraceptive self-efficacy than boys, younger adolescents, and those mothers did not complete high school (Longmore et al., 2003). Similarly, studies have shown that whereas greater condom knowledge is associated with greater likelihood of ever using contraception among boys, reproductive health knowledge is associated with greater likelihood of ever using contraception among girls (Ryan et al., 2007). Differences across racial/ethnic groups have also been observed. Adolescent and young adult Latino/Hispanic women have been shown to be misinformed about contraceptive use, risks, and benefits (Gilliam, Warden, Goldstein, & Tapia, 2004) and report lower general knowledge about contraception (Garcés-Palacio, Altarac, & Scarinci, 2008). Similarly, adolescent and young adult Black and Hispanic men report lower knowledge about the capabilities and range of available contraceptives (Borrero, Farkas, Dehlendorf, & Rocca, 2013). However, research exploring how SBHS differentially impact diverse socio-demographic subgroups' reproductive health knowledge base and their beliefs is lacking.

Therefore, the goal of the current study was twofold. First, we extend previous research by examining longitudinal associations between SBHS and cognitive precursors to adolescents' reproductive health. Based on previous literature and the principles of social cognitive theory, the following cognitive precursors were explored: birth control self-efficacy, motivation for birth control, attitudes toward birth control, and contraception knowledge. Second, we investigated whether these associations varied by adolescents' age, gender, socioeconomic status (SES), and race/ethnicity. Given previous research, we expect that a greater number of SBHS provided will be associated with greater birth control self-efficacy, motivation, attitudes, and contraception knowledge. Further, given past research on socio-demographic subgroups, we expect that a greater number of SBHS to be more strongly associated with males, younger, racial/ethnic minorities, and low SES adolescents' cognitive precursors.

Methods

Sampling and Data Collection

Add Health is a longitudinal survey of a nationally representative sample of U.S adolescents who were in grades 7–12 at Wave 1 (1994–1995). To date there have been four waves of data collection following adolescents into young adulthood (ages 24–32 at Wave 4). However, the current study draws from Wave 1 and Wave 2.

First, adolescents' demographic characteristics and cognitive precursors were obtained from in-home and parental interviews conducted at Wave 1 (1994–1995; Age range: 12–21) and Wave 2 (1996; Age range: 13–22). Second, information about proportion of college-educated parents, proportion of non-Hispanic White students, and the total number of students at the school-level was obtained from surveys administered in schools at Wave 1. Finally, the Wave 1 school administrator survey was used to retrieve information about SBHS. For more details on the sampling strategy as well as data collection methods see Harris et al. (2009). The current study's two Waves data were based on youth from 77 public high schools that offered grade 12.

Measures

Number of school-based health services.—At Wave 1, school administrators indicated if the following nine health services were provided on school premises: athletic physical, non-athletic physical, treatment for minor illnesses and injuries, diagnostic screenings, treatment for STDs, immunizations, family planning services, pre-natal/post-partum health care, and emotional counseling. We created a count variable tallying the total number of SBHS provided, such that greater scores indicated greater services provided.

Birth control self-efficacy.—At Waves 1 and 2 participants were asked three questions about their birth control self-efficacy: “If you wanted to use birth control, how sure are you that you could stop yourself and use birth control once you were highly aroused or turned on?”; “How sure are you that you could plan ahead to have some form of birth control available?”; and “How sure are you that you could resist sexual intercourse if your partner did not want to use some form of birth control?”. Responses ranged from (1) very sure to (5) very unsure. Responses were reverse-coded and an overall scale score was created by averaging all three item scores at both Wave 1 ($\alpha = .63$) and Wave 2 ($\alpha = .68$), with higher scores indicating higher self-efficacy. These items have been used to assess birth control self-efficacy in previous studies (Garfield et al., 2016; Longmore et al., 2003).

Birth control motivations.—In Waves 1 and 2 participants who were 15 years or older or who already had sexual intercourse were asked about their endorsement on five statements about their motivations to use birth control: birth control (1) “is too much of a hassle to use”, (2) “is too expensive to buy”, (3) “takes too much planning ahead of time”, (4) “is too hard to get a {girl/boy} to use with you” and (5) “interferes/would interfere with sexual enjoyment”. Responses ranged from (1) strongly agree to (5) strongly disagree. An overall scale score was calculated by averaging all five item scores at both Wave 1 ($\alpha = .83$) and Wave 2 ($\alpha = .86$). Higher scores indicated greater motivation to use birth control. Previous studies have used these items to create a similar index of birth control motivations (Ryan et al., 2007).

Attitudes towards birth control.—At Waves 1 and 2 participants who were at least 15 years old or who already had sexual intercourse were asked if they endorse that “Using BC is morally wrong” and “If you used birth control, your friends might think that you were looking for sex”. Responses ranged from (1) strongly agree to (5) strongly disagree. A mean

score was derived by averaging the two item scores at both Wave 1 ($r = .35$) and Wave 2 ($r = .41$). Greater scores indicated more positive attitudes towards birth control.

Knowledge about contraception.—At Waves 1 and 2 participants who were at least 15 years old were asked ten true-false questions about contraception. Sample questions include “When a woman has sexual intercourse, almost all sperm die inside her body after about six hours” or “The most likely time for a woman to get pregnant is right before her period starts.” An overall score was created by summing up the number of correct answers to these questions. Higher scores indicated more knowledge about contraception. This measure was similar to other studies examining knowledge about contraception (Ryan et al., 2007).

Ever had sexual intercourse.—At Wave 1 participants were asked, “Have you ever had sexual intercourse? When we say sexual intercourse, we mean when a male inserts his penis into a female’s vagina.” Responses were dichotomous and coded yes (1) no (0).

Demographic characteristics.—Participants also reported their age, gender, race/ethnicity (i.e., White, Hispanic, African-American, Asian, and Native American), and mother’s education level as a proxy for socioeconomic status (Schoen, Landale, Daniels & Cheng, 2009). Four dummy race/ethnicity variables were generated: Hispanic (“Hispanic”), non-Hispanic African American (“African American”), non-Hispanic Asian (“Asian”), and non-Hispanic Other (including Native American and missing cases; “Other”), with non-Hispanic White (“White”) as the referent group (e.g., 0 = White, 1 = Asian). Followed Schoen et al.’s (2009) approach we used the Wave 1 parental questionnaire to obtain mother’s education information. If it was not available, we used the Wave 1 in-home questionnaire. Mother’s education level in both surveys ranged from (1) eighth grade or less to (9) professional training beyond a 4-year college. The option of reporting (10) never went to school also was provided. A dummy variable was created with 1 = some college or more and 0 = high school or less.

School-level control variables.—The proportion of youth who identified as White at each school was calculated using the Wave 1 in-school survey data. Youth were also asked to indicate the highest level of education that their mother or father achieved, which was used to calculate the proportion of parents with college-level education at each school. The number of students who took the in-school surveys was used as a proxy for school size.

Analytic Strategy

To account for nesting of adolescents within schools, we used hierarchical linear regression models (HLM) to test study hypotheses (Raudenbush & Bryk, 2002). Analyses were conducted in SAS using unweighted data as we intended to assess associations rather than produce nationally representative estimates to make inferences to the national adolescent population (Dunn, Richmond, Milliren, & Subramanian, 2015). The outcome measures came from Wave 2 data and their corresponding Wave 1 measures served as control variables. Wave 1 reports of ever having sexual intercourse also were controlled. Models for the independent variables included individual-level variables (age, sex, race/ethnicity, parent education) and school-level variables, including the number of SBHS, proportion of non-

Hispanic White students, proportion of students with college educated parents, and school size. Unconditional models were conducted first, and individual-level variables were then added to examine the effects of individual characteristics on the outcomes. Building upon these models, school-level predictors were incorporated to reduce unexplained variability observed at individual level. Finally, cross-level interaction terms between school-level SBHS and individual-level demographic variables were included to assess possible subgroup differences in SBHS effects. Specifically, the following interactions were tested: SBHS by age, SBHS by gender, SBHS by each race/ethnicity category (i.e., Hispanic, African American, Asian and Other vs White), and SBHS by mother's education. Across the four outcomes, each interaction term was assessed separately and remained in the final model if statistically significant ($p < .05$). Predicted probabilities of significant interactions were examined and graphical plots were created to illustrate differential SBHS effects.

Results

The sample and school characteristics across Wave 1 and 2 were very similar (Table 1). Table 2 details the percentage of schools and number of schools that provide each of the nine health services at Wave 1. Athletic physical and treatment for minor illnesses and injuries were the mostly commonly provided services at Wave 1. The range of SBHS was 0 to 7 with schools providing about 2 SBHS on average ($M = 2.26$, $SD = 1.58$). Over half of the schools (55.84%) provided between 2 to 4 services.

Findings from the multi-level linear regression analyses with student- and school-level covariates and cross-level interaction terms are provided in Table 3. Generally, older students reported higher birth control self-efficacy and positive attitudes towards birth control use. Compared to girls, boys had lower scores on all four cognitive precursor measures. A similar pattern was observed among minority groups. Compared to White students, Hispanic, African American and Asian students tended to report significantly lower scores on birth control attitudes and contraception knowledge. Hispanic, Asian and Other students also scored significantly lower than White students on birth control self-efficacy. However, African American students showed significantly higher birth control self-efficacy than Whites. Asian students had markedly lower birth control motivation than white students. Students with mothers that had at least some college education had higher scores on these cognitive precursors.

The findings further indicated that the number of SBHS at Wave 1 was positively though marginally associated with adolescents' birth control self-efficacy at Wave 2 ($\beta = 0.19$, $p = .06$), suggesting that more SBHS were associated with greater birth control self-efficacy. Significant interactions between the number of SBHS and age was found for birth control self-efficacy ($\beta = -0.01$, $p = .05$). Exploring this interaction with simple slope analyses indicated that there was a positive relationship between the number of SBHS and birth control self-efficacy for 15-year-old adolescents ($\beta = 0.03$, $p = 0.05$), while there were no associations between number of SBHS and birth control self-efficacy among older adolescents. The number of SBHS at Wave 1 also was negatively associated with adolescents' motivation of using birth control at Wave 2 ($\beta = -0.02$, $p < .05$). No significant

interaction terms with the socio-demographic variables were found for motivations for birth control, attitudes towards birth control or knowledges about contraception.

Discussion

Providing health services in school settings has been shown to positively impact adolescents' reproductive health (Bersamin et al., 2017a). Further, studies suggest that school-based health programs specifically addressing reproductive health support the cognitive precursors that inform adolescents' reproductive health behaviors (Mesheriakova & Tebb, 2017). However, research has yet to explore whether a greater number of health services are associated with adolescents' cognitive precursors to these health behaviors. Further, studies have generally relied on small and demographically homogenous samples. Therefore, the goals of this study were to (a) examine longitudinal relationships between the number of SBHS and adolescents' cognitive precursors to reproductive health and (b) explore whether adolescents' socio-demographic characteristics moderated these associations in a national sample of U.S. adolescents.

Findings indicated that the number of SBHS interacted with age to predict adolescents' birth control self-efficacy. As hypothesized, a greater number of health services provided was associated with the youngest adolescents (i.e., 15-year-olds) reporting greater birth control self-efficacy one year later. Providing health services in school settings has been shown to reduce barriers to care (Allison et al., 2007; Patel et al., 2016) and increase knowledge about reproductive health (Mesheriakova & Tebb, 2017). Provision of a range of SBHS is particularly important for younger adolescents as studies suggest that these youth have greater knowledge deficits about reproductive health than older adolescents (e.g., Carey, Chiappetta, Tremont, Murray, & Gold, 2007). Access to a greater number of services may afford young adolescents opportunities to increase their reproductive health knowledge and inform the cognitive precursors that promote healthy behavior. Specifically, by reducing these knowledge barriers, SBHS may support younger adolescents' contraceptive self-efficacy, which ultimately may have a beneficial effect on their reproductive health.

Contrary to study hypotheses, results suggested that a greater number of SBHS was associated with lower motivation for birth control one year later. Further, we did not find associations between the number of SBHS and birth control attitudes or knowledge about conception. This unexpected findings may be the result of messages delivered by the SBHS providers. For example, if schools are distributing messages or curricula around abstinence, this may be associated with lower student reported motivation for birth control. Additional research is needed to examine whether there are indeed opportunities for health providers to share messaging and resources that support reproductive health and to understand what messages might be particularly impactful to inform the cognitive precursors to diverse adolescents' reproductive health behavior.

Results also indicated socio-demographic subgroup differences in adolescents' cognitive precursors to reproductive health. Replicating results from previous research (Longmore et al., 2003), findings generally suggested girls generally had a higher level of cognitive precursors than boys, and older adolescents had greater birth control self-efficacy and more

positive attitudes toward birth control. Further, results generally indicated that racial/ethnic minority adolescents reported lower levels across the cognitive precursors than White adolescents. These findings support past research demonstrating racial/ethnic minority differences in knowledge about reproductive health products and services (Borrero et al., 2013). Although SBHS are often provided in low-income students serving schools (e.g., Allison et al., 2007) and SBHS may be particularly supportive for racial/ethnic minority youths (Bersamin, Paschall, Fisher, 2017b), access to a range of SBHS was not protective for these socio-demographic subgroups in this study. Perhaps there are other important drivers of adolescents' cognitive precursors to reproductive health behaviors, such as conversations with parents or other school programs (e.g., health class) (Malacane & Beckmeyer, 2016). Alternatively, it may be that the number of SBHS does not influence adolescents' reproductive attitudes or knowledge. Rather, services in specific health domains may be needed.

Although this study adds to the literature examining the ways in which school-based health services may support young peoples' reproductive health, findings should be interpreted considering several limitations. First, given this study was designed to assess associations rather than produce nationally representative estimates, findings may not be generalizable to all adolescents. Second, some of the measures used in the current study demonstrated low internal consistency, suggesting more cohesive measures may be needed in future research. Third, a limited number of schools provided all seven SBHS. As such, we may not be able to capture how a wider range of health services were associated with the adolescents cognitive precursors to reproductive health. A more nuanced examination of schools that provide the greatest numbers of services may be valuable for future research. Fourth, this study is subject to social desirability and recall bias due to the self-report survey methodology. Using multiple methods of data collection (e.g., school health records) may result in greater insights. Relatedly, this study is limited by the fact that we cannot assess adolescents' use of specific services. Although it is important to understand how a range of SBHS positively impact adolescents' health, more in-depth research with similarly large and diverse samples is needed to completely understand these associations.

The age of Add Health dataset is a final limitation of this study. Although over 20-years old, exploration of this dataset has been and will continue to be a valuable resource for understanding how experiences with SBHS informs health and behavior. Importantly, the study design employed for the Add Health study allows for examination of diverse racial/ethnic minority adolescents, populations that are often ignored in research. Although the health care landscape is dynamic, data which allow for examination how adolescents' health care access informs their knowledge, motivation, and attitudes toward health behaviors are essential for informing both policy and practice.

Conclusions

Overall, results suggested that a greater number of SBHS were associated with greater birth control self-efficacy one year later for 15-year-old adolescents. However, results also suggest that a greater number of SBHS were associated with adolescents' reporting lower motivation to use birth control one year later. Although access to a greater number of health services in

school settings seem to have some effect, other research provides more definitive evidence that reproductive health specific information/services will likely be more effective in supporting adolescents' reproductive health. This information is important for schools as it highlights the need for SBHS to be health outcome specific and can be used to support the Healthy People 2020 initiatives for supporting adolescents' reproductive health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations.

SBHS -school-based health services

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Highlights

- Number of SBHS and the cognitive precursors to reproductive health were examined
- Subgroup differences in cognitive precursors to reproductive health were observed
- SBHS positively predicted young adolescents' later birth control self-efficacy
- SBHS also negatively predicted adolescents' later birth control motivation
- Limited evidence of the number of SBHS efficacy in influencing cognitive precursors

Table 1.

Mean (SD) or % demographic characteristics among youth by wave.

Variables	Wave 1 (N = 12,548)	Wave 2 (N = 8,565)
<i>Student level</i>		
Age	16.8 (1.41)	17.3 (1.33)
Gender		
Male	49.8	49.3
Female	50.2	50.7
Ethnicity		
African American	20.3	19.6
White	50.4	51.7
Asian	9.2	9.1
Hispanic	18.9	18.6
Other	1.2	1.1
College Mother	38.5	39.0
<i>School level</i>		
Mean proportion of college-educated parents	0.33 (0.13)	--
Mean proportion of Non-Hispanic White students	0.60 (0.30)	--
Total number of students	839.3 (527.45)	--
<i>Outcome and control variables</i>		
Birth control efficacy	4.17 (0.84)	4.24 (0.82)
Birth control barriers	3.84 (0.87)	3.91 (0.91)
Birth control attitudes	3.78 (0.93)	3.82 (0.94)
Sexual knowledges	6.11 (0.88)	6.26 (1.82)
Ever had sexual intercourse	47.2	52.2

Note. Based in U.S. adolescents in 1994–95 (Wave 1) and 1996 (Wave 2).

Table 2.

School-based Health Services at Wave 1

Wave 1 services	%	Number of schools
Athletic physical	57.1	44
Non-athletic physical	22.1	17
Treatment for minor illnesses & injuries	61.0	47
Diagnostic screenings	10.4	8
Treatment for STD	3.9	3
Family planning service	3.9	3
Prenatal/postpartum health care	5.3	4
Emotional counseling	52.0	40
Immunizations	10.4	8

Note. Based in U.S. adolescents in 1994–95 (Wave 1).

Table 3.

Multi-level regression analyses for cognitive precursor outcomes with interaction terms

Variables	Birth control self-efficacy <i>n</i> = 6,935 β (SE)	Birth control motivation <i>n</i> = 7,142 β (SE)	Birth control attitudes <i>n</i> = 7,137 β (SE)	Contraception knowledge <i>n</i> = 6,966 β (SE)
<i>School level</i>				
Number of services at Wave 1	0.19 (0.10) [†]	−0.02 (0.01) [*]	−0.002 (0.01)	−0.003 (0.01)
Proportion of college parent at school level	0.06 (0.10)	0.13 (0.11)	0.08 (0.12)	0.78 (0.33) [*]
Proportion of Non-Hispanic White in school	0.04 (0.05)	0.13 (0.05)	0.10 (0.06)	0.13 (0.15)
School size	0.00 (0.00002)	0.00 (0.00002)	0.00 (0.00003)	0.00 (0.00008)
<i>Student level</i>				
Age at Wave 2	0.03 (0.01) [*]	−0.01 (0.01)	0.03 (0.01) ^{***}	−0.01 (0.02)
Male (vs. female)	−0.21 (0.02) ^{***}	−0.18 (0.02) ^{***}	−0.25 (0.02) ^{***}	−0.11 (0.04) ^{**}
Race (reference group: White)				
Hispanic	−0.13 (0.03) ^{***}	−0.03 (0.03)	−0.14 (0.04) ^{***}	−0.24 (0.08) ^{**}
African American	0.07 (0.03) [*]	0.03 (0.03)	−0.08 (0.04) [*]	−0.26 (0.07) ^{**}
Asian	−0.31 (0.04) ^{***}	−0.17 (0.04) ^{***}	−0.30 (0.05) ^{***}	−0.23 (0.09) [*]
Other	−0.18 (0.09) [*]	−0.04 (0.10)	−0.11 (0.10)	−0.09 (0.21)
College Mother (vs. non-college mother)	0.02 (0.02)	0.10 (0.02) ^{***}	0.09 (0.02) ^{***}	0.21 (0.04) ^{***}
Cognitive precursor at Wave 1	0.33 (0.01) ^{***}	0.50 (0.01) ^{***}	0.37 (0.01) ^{***}	0.36 (0.01) ^{***}
Ever had sex at Wave 1 (vs. Never had)	−0.02 (0.02)	−0.12 (0.02) ^{***}	0.04 (0.02)	0.27 (0.04) ^{***}
<i>Cross level</i>				
Services [*] Age at wave 2	−0.01 (0.01) [*]			

Note. Based in U.S. adolescents in 1994–95 (Wave 1) and 1996 (Wave 2). In each model, the cognitive precursor measured at Wave 1 was included in the model as a control.

[†]
p .10.

^{*}
p .05.

^{**}
p .01,

^{***}
p .001