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“The Relationship Between Cognitive Ability and Experiences of Vaginal, Oral, and Anal Sex in the United States”

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Abstract

Few studies have investigated the sexual development of populations with low cognitive abilities in the United States (U.S.). This paper examines the relationship between cognitive ability and various sexual experiences from adolescence (12–18) to early adulthood (28–34). Data were from 13,845 respondents interviewed at Waves I and IV of the National Longitudinal Study of Adolescent to Adult Health (Add Health), a probability sample of adolescents in the U.S. followed from adolescence to adulthood. Adjusted logistic regression models were used to study relationships between cognitive ability, approximated by the Add Health Picture Vocabulary Test (AHPVT), and experiences of vaginal, oral, and anal sex. After controlling for biological sex, age, race/ethnicity, and socioeconomic status, individuals in the lowest cognitive ability group had significantly lower odds of experiencing each type of sex than those in the average ability group. Although individuals in the highest cognitive ability group had significantly lower odds of experiencing vaginal intercourse than those in the average ability group, this association did not remain significant when analyses were stratified by biological sex. These differences in experiences have implications for future health and warrant further study to understand policy implications for sexual health services and education.

Keywords

Adolescence; special populations/disabled; normative sexual behavior; quantitative/statistical/survey

Introduction

To date, few studies have been conducted on the sexual development of adolescents with low cognitive abilities. Of the existing studies on sexual activity in this population, the majority have relied on cross-sectional or convenience samples, which has generated conflicting findings. Specifically, these studies suggest that people of low cognitive ability may be sexually active, but perhaps not to the same extent as their peers of higher ability (Chamberlain, Rauh, Passer, McGrath, & Burket, 1984; McCabe & Cummins, 1996). Recent

studies using the National Longitudinal Study of Adolescent to Adult Health (Add Health), a probability sample of adolescents in the United States followed from adolescence to early adulthood, have shown a curvilinear association between cognitive ability and vaginal intercourse among adolescents, such that those at the lowest and highest cognitive ability levels are less likely to have experienced vaginal sex than their peers (Halpern, Joyner, Udry, & Suchindran, 2000). In a later paper using the genetic sample in Add Health, Harden and Mendle (2011) concluded that cognitive ability (measured by the Add Health Picture Vocabulary Test [AHPVT]) and academic achievement (grade point average), while each related to delay of first vaginal sex, operate through distinct and indirect pathways. In behavioral genetic analyses, they found that same-sex adolescent twin pairs with different cognitive abilities who were raised in the same family did not differ in age of first vaginal intercourse. The authors attribute this pattern entirely to unmeasured environmental differences between families, suggesting that ability is a proxy for a variety of social and environmental variables that distinguish families. In contrast, analyses indicated that academic achievement is linked to sexual delay via genetic pathways, suggesting that genetic factors independent of cognitive ability impact delayed onset of vaginal intercourse. However, research to date has focused exclusively on vaginal intercourse and has not considered other aspects of sexual development in the transition from adolescence into early adulthood.

Current Research

Accordingly, the present paper addresses this gap in the literature by examining the relationship between cognitive ability and the experiences of vaginal, oral, and anal sex among individuals living in the United States as they transition from adolescence to early adulthood. We hypothesize that respondents in the lowest cognitive ability group will be less likely to have experienced each type of sex by early adulthood than their peers in the average cognitive ability group. Based on the results of previous research, we also predict that those in the highest cognitive ability group will show a lower likelihood of experiencing each type of sexual intercourse than those in the average cognitive ability group.

Methods

Sample

Data are from Add Health, a nationally representative sample of more than 20,745 adolescents in 7th-12th grade during the 1994–1995 school year (Wave I). The Add Health study used a complex, school-based sampling design which included 132 schools that were stratified by region, urbanicity, school type, ethnic mix, and size from 80 communities in the U.S. (Chen & Chantala, 2014). Since then, four waves of data have been collected with the original Add Health sample, which has provided detailed information regarding health and well-being from adolescence to adulthood. At Wave IV, interviews were conducted with 15,701 of the original respondents, representing 80.3% of those eligible (Kathleen Mullan Harris, Udry, & Bearman, 2013). The in-home surveys were conducted by interviewers using laptop computers, and sensitive questions, such as those regarding sexual experiences, were self-administered using an audio computer-assisted self-interview (ACASI) system at Waves I and II, and a computer-assisted self interview (CASI) system at later waves. Greater

detail regarding the Add Health study design has been described elsewhere (K.M. Harris et al., 2009).

The present analysis sample is restricted to the 13,845 respondents who were subsequently interviewed approximately 14 years later at ages 24–34 (Wave IV, 2008–2009) and who had complete data on all variables of interest. Specifically, respondents were excluded from analyses if they did not have valid sampling weights ($n=901$), or if they had missing data for demographic variables ($n=246$), cognitive ability ($n=670$), and experiences of vaginal intercourse, oral sex, or anal sex ($n=39$). All Add Health study procedures were approved by the Institutional Review Board for the Protection of Human Subjects at the University of North Carolina at Chapel Hill. Present analyses were deemed exempt.

Measures

Cognitive Ability.—As a proxy for cognitive ability, we used the 87-item Add Health Picture Vocabulary Test (AHPVT) from Wave I (Carolina Population Center, 1998). The AHPVT is an abridged version of the Peabody Picture Vocabulary Test (PPVT), which is moderately correlated with other measures of intelligence, including the Stanford-Binet Intelligence Scale and the Wechsler Intelligence Scale for Children (Becker, 2003; Dunn & Dunn, 1981; Wechsler, 2004). To administer the AHPVT, the interviewer read a word aloud to the respondent, who then selected one of four illustrations on a computer screen that best fit its meaning. Scores were standardized to take on an intelligence quotient (IQ) metric with a mean of 100 and a standard deviation of 15, and were then categorized as Low (<85), Low/Average (85–99), Average/High (100–114), and High (>114 ; Carolina Population Center, 2003). Past research comparing scores generated from standard administration of the entire PPVT instrument and those from the abridged AHPVT has shown that the two measures are highly correlated at 0.96 (Halpern et al., 2000).

Since the AHPVT does not require reading comprehension skills, it is considered to be a particularly appropriate cognitive ability measure for those with scores on the lower end of the cognitive distribution (Cheng & Udry, 2005). However, our use of the terms such as “low cognitive ability” or “high cognitive ability” in this paper mean nothing more and nothing less than “low AHPVT” or “high AHPVT.”

Sexual Experience.—Sexual experience was assessed with questions from the Wave IV interview about vaginal intercourse, oral sex, and anal sex in the respondent’s lifetime. Specifically, respondents were asked to answer “No,” “Yes,” or “Don’t Know” to the following questions:

- “Have you ever had vaginal intercourse? (Vaginal intercourse is when a man inserts his penis into a woman’s vagina.)”
- “Have you ever had oral sex? That is, has a partner ever put his/her mouth on your sex organs or you put your mouth on his/her sex organs?”
- “Have you ever had anal intercourse? (By anal intercourse, we mean when a man inserts his penis into his partner’s anus or butt hole.)”

Analysis

First, bivariate cross-tabulations of 1) demographic variables (biological sex, age at Wave IV, race/ethnicity, socioeconomic status [SES; measured using highest education attained by either parent]) and 2) the types of sexual experiences with the cognitive ability categories were conducted. Next, biological sex-, age- race/ethnicity-, and SES-adjusted logistic regressions were then used to determine associations between cognitive ability and the odds of experiencing vaginal intercourse, oral sex, and anal sex. The reference groups for these analyses were selected based on the mean (cognitive ability, age) or the majority group (biological sex, race/ethnicity, SES). Finally, regression analyses were run again after stratifying by biological sex. All analyses used sampling weights and adjusted variance estimates for the Add Health complex survey design, and were completed using Stata version 14.1 (StataCorp, 2015).

Results

Bivariate frequencies

The analysis sample was almost evenly split by biological sex, with 50.6% males and 49.4% females. The average age of respondents at Wave IV was 28 years. Approximately 13.6% of the sample was in the Low, 33.3% in the Low/Average, 35.6% in the Average/High, and 17.5% in the High cognitive ability categories. The majority of respondents (66.0%) identified as Non-Hispanic White, with an additional 15.8% identifying as Non-Hispanic Black, 11.8% as Hispanic, and 6.4% as Non-Hispanic Other Race. Approximately 60% of parents had attended some college or had a college degree or more. Overall, 93.0% of respondents reported experiencing vaginal intercourse, 91.8% oral sex, and 43.6% anal sex. It is also important to note that for each type of sexual intercourse, a higher proportion of respondents in the lowest cognitive ability category indicated not knowing if they had ever engaged in the behavior than those in the other three ability groups, even with the provided descriptions. Table 1 outlines the bivariate cross-tabulations of the demographic variables and types of sexual intercourse by the four cognitive ability categories.

Adjusted logistic regression models of sexual experience

In adjusted models with “don’t know” responses recoded to missing (see Table 2), respondents in the Low cognitive ability category had approximately five times lower odds of having experienced vaginal intercourse (aOR = 0.23, 95% CI: 0.13–0.41) and oral sex (aOR = 0.17, 95% CI: 0.11–0.27), and approximately two times lower odds of having experienced anal sex (aOR=0.52, 95% CI: 0.44–0.62) than those in the Average/High category by early adulthood (28–34). These results were similar among males and females (See Table 3). In addition, those in the Low/Average category had lesser odds of having experienced vaginal intercourse (aOR = 0.70, 95% CI: 0.50–0.98), oral sex (aOR = 0.63, 95% CI: 0.47–0.85), and anal sex (aOR = 0.84, 95% CI: 0.76–0.94) compared to those in the Average/High category; however, stratified analyses indicated that the patterns for vaginal and anal sex were driven by the male respondents. Finally, those in the High cognitive category had lesser odds of having experienced vaginal intercourse than peers in the Average/High category (aOR = 0.66, 95% CI: 0.48–0.90), though this relationship did not

remain significant after stratification by biological sex, and such associations did not appear for oral or anal sex.

Discussion

The results of this study indicate significant differences in experiences of first vaginal intercourse, oral sex, and anal sex among four different cognitive ability categories. Specifically, respondents in the Low cognitive ability category during adolescence had lower odds of having experienced each type of sexual behavior by early adulthood compared to their peers of Average/High cognitive ability group, which supported our first hypothesis. At the other end of the distribution, respondents in the High cognitive ability category also had significantly lower odds of vaginal intercourse by early adulthood, a pattern that shows a continuing association from adolescence (Halpern et al., 2000). These results are consistent with previous analyses using the genetic sample in Add Health, which demonstrated positive associations between low and high AHPVT scores and young adult inexperience with vaginal intercourse (Harden & Mendle, 2011). However, our analyses indicate that the lower and higher end categories of AHPVT diverge in terms of associations with other types of sexual behavior, such that the curvilinear pattern found for vaginal intercourse was not replicated in models of oral and anal sex. That is, by early adulthood, respondents in the High ability category were just as likely to have experienced oral and anal sex as respondents in the Average/High ability category. Furthermore, the association we found for vaginal intercourse was no longer significant after stratification by biological sex. Although these results only partially support our second hypothesis, this divergence suggests that different processes may underlie these associations for individuals at the extremes of the cognitive ability distribution (Halpern & Haydon, 2012; Halpern et al., 2000; Haydon, Cheng, Herring, McRee, & Halpern, 2014). In previous research investigators interpreted the delay of vaginal sex among the highest ability group as possibly reflecting a commitment to educational goals and avoidance of a “slippery slope” that will lead to more risky behavior (Halpern et al., 2000). Present findings are consistent with this interpretation for vaginal sex if oral and anal sex are perceived to introduce fewer risks to educational and professional achievement since they cannot result in pregnancy (Halpern-Felsher, Cornell, Kropp, & Tschann, 2005). Other research with a more contemporary cohort of adolescents has suggested that the majority of youth are more willing to consider broader sexual repertoires that include non-coital practices like oral sex as a way of “working up” to vaginal intercourse (Lewis, Marston, & Wellings, 2013). Further research dedicated to understanding attitudes towards various sexual acts among members of different cognitive ability groups and how these attitudes may have changed over time among different adolescent cohorts could provide greater insight into these differences.

Few studies have considered the sexual development of adolescents and young adults with intellectual disabilities in the United States, which refers to individuals with an IQ below 70. This gap exists for various reasons, including historical restrictions on individuals’ sexual behaviors for eugenic purposes and unfounded assumptions about asexuality or hypersexuality (Brodwin & Frederick, 2010; Esmail, Darry, Walter, & Knupp, 2010; Kempton & Kahn, 1991). Past research has shown that adolescents with intellectual disabilities have less sexual knowledge, are at increased risk for pregnancy and sexually

transmitted infections (STI), and are more vulnerable to physical and sexual abuse than their peers without disabilities (Cheng & Udry, 2005; McCabe & Cummins, 1996; Murphy & Elias, 2006). However, the literature lacks sufficient information regarding sexual behavior and relationships in this population, which is critically important to inform more developmentally appropriate sexuality education to these populations (Halpern, 2010; Schalet et al., 2014). The results of our study provide an important step towards understanding sexual behavior among people on the lower end of the cognitive ability spectrum, and future research with the Add Health sample should focus more specifically on those respondents with AHPVT scores below 70 in order to identify specific needs for this population.

Different developmental processes are also implied in the greater percentages of “don’t know” responses among respondents in the Low cognitive ability category. These patterns echo results of past studies regarding sexual knowledge among people with low cognitive ability (McCabe & Cummins, 1996; Murphy & Elias, 2006). Such patterns indicate a distinct need for further research with populations with lower cognitive abilities and intellectual disabilities in order to gauge their understanding of various sexual acts, and thus identify their specific sexual education needs. Given the increased risk for STIs, sexual abuse, and other negative outcomes associated with sexual activity in this population, such research could help to further illustrate the critical need for targeted, developmentally appropriate sexual health education to these groups.

Strengths and Limitations

Our analyses have the strength of using a large, nationally representative sample of youth in the United States. Furthermore, to our knowledge, our study is the first to examine the relationship between cognitive ability and timing of oral and anal sex, not just vaginal intercourse. However, these results have limitations and should thus be interpreted with caution. Though correlated with other measures of cognitive ability in the United States, one limitation of this research is the use of a narrow measure of cognitive ability (AHPVT). The specific focus on vocabulary skills does not account for the various dimensions of cognitive ability, which may introduce bias towards those who excel in verbal tasks. Similarly, the AHPVT may favor those of higher socioeconomic status who are likely to have access to better education that both enhances vocabulary and includes lessons on sexual health.

It is also important to address the strengths and limitations of the Add Health survey methodology, particularly regarding responses to sensitive questions and the response reliability of participants with potential intellectual disabilities. Respondents were only excluded from the analytical sample if they did not have complete data on all variables of interest, and relatively few were missing data about sexual experiences (n=39). Given this and the past research citing the strengths of using computer-based survey technology to generate truthful responses to questions regarding sexual behavior, we feel confident in both the accuracy of responses to the sexual experience variables and the specificity of our analyses (Gribble, Miller, Rogers, & Turner, 1999; Turner et al., 1998). For those respondents with lower cognitive abilities, it is also critical to consider issues of inclusion and measurement, as these represent important barriers to research participation by

populations with disabilities. Various researchers and disability advocates have discussed the best ways to involve special populations in survey research, including recruitment and survey methods (Barnartt & Altman, 2001). Add Health's unique sampling design in schools, including those designated as special schools for students with disabilities, as well as the follow-up procedures for contacting original members of the sample in advance of the Wave IV in-home interview provide greater inclusion and retention of populations with disabilities in the sample (Kathleen Mullan Harris et al., 2013; Parsons, Baum, Johnson, & Hendershot, 2001). In addition, Add Health's use of in-home surveys and computer technologies for interviewing respondents are considered best practices when conducting survey research among populations with disabilities (Mitchell, Ciemnecki, Cybulski, & Markesich, 2006; Oschwald et al., 2014; Parsons et al., 2001). Thus, the thoughtful design of the Add Health study represents an important strength for our current work, which includes both sensitive questions and populations with disabilities.

The fact that "don't know" responses to sexual behavior questions were more common among those in the lowest cognitive ability group does raise important concerns regarding their understanding of the survey instrument. As described by Cheng and Udry (2005), the Add Health survey and interview process was specially devised to provide every assistance to respondents without affecting the wording or interpretation of survey items. It is therefore possible that respondents with low cognitive abilities answered questions they did not actually understand. Unfortunately, it is impossible to distinguish between those who did not understand the questions and those who understood but did not know the answer. However, we feel that this limitation only provides further evidence to support the needs for both specialized survey techniques and targeted, developmentally appropriate education for this group regarding sexual health (Halpern, 2010; Mathiowetz, 2001; Schalet et al., 2014).

Conclusion

This study documents differences in a variety of sexual experiences among populations with different cognitive abilities during adolescence through early adulthood. These different experiences have implications for future health and warrant further study to understand the unique experiences and needs of those with lower cognitive abilities, as well as the related policy implications for both sexual health services and education.

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Table 1

Bivariate Cross-Tabulations at Wave IV by Cognitive Ability Category at Wave I

	Low (<85) (n=2084; 13.6%) n %	Low/Average (85-99) (n=4721; 33.3%) n %	Average/High (100-114) (n=4708; 35.6%) n %	>114 (High) (n=2332; 17.5%) n %	Full Sample (n=13,845) n %
Biological Sex					
Male	899 (47.4)	2057 (47.8)	2346 (53.2)	1156 (52.8)	6458 (50.6)
Female	1185 (52.6)	2664 (52.2)	2362 (46.8)	1176 (47.2)	7387 (49.4)
Age					
24-27	607 (36.3)	1491 (38.3)	1291 (32.9)	821 (40.6)	4212 (36.5)
28-29	733 (31.2)	1689 (33.0)	1800 (34.0)	984 (38.4)	5206 (34.1)
30-34	744 (32.5)	1539 (28.7)	1617 (33.1)	527 (21.0)	4427 (29.4)
Race/Ethnicity					
Hispanic	691 (30.2)	694 (10.2)	605 (9.2)	204 (6.1)	2194 (11.8)
Non-Hispanic Black	742 (33.6)	1337 (21.8)	627 (8.2)	286 (5.9)	2992 (15.8)
Non-Hispanic Other Race	241 (8.3)	362 (5.8)	376 (5.9)	249 (7.0)	1228 (6.4)
Non-Hispanic White	410 (27.9)	2328 (62.3)	3100 (76.7)	1593 (81.0)	7431 (66.0)
Parent Education (SES)					
<HS	669 (34.3)	642 (14.3)	344 (6.4)	88 (2.6)	1743 (12.2)
HS/GED	582 (31.1)	1498 (34.1)	1064 (25.0)	350 (16.8)	3494 (27.4)
Some College	436 (19.0)	1450 (31.0)	1536 (33.4)	630 (28.4)	4052 (29.8)
College Grad	397 (15.6)	1131 (20.6)	1764 (35.2)	1264 (52.2)	4556 (30.6)
Vaginal					
No	212 (14.5)	223 (5.4)	195 (4.0)	155 (6.0)	785 (6.2)
Yes	1847 (82.8)	4480 (94.0)	4504 (95.6)	2173 (93.9)	13004 (93.0)
Don't Know	25 (2.7)	18 (0.6)	9 (0.4)	-(0.1)	56 (0.8)
Oral					
No	359 (22.4)	308 (6.1)	164 (3.3)	102 (3.4)	933 (6.8)
Yes	1663 (74.3)	4342 (92.4)	4517 (96.0)	2223 (96.4)	12745 (91.8)
Don't Know	62 (4.3)	71 (1.5)	27 (0.7)	7 (0.1)	167 (1.4)
Anal					
No	1382 (65.2)	2671 (56.3)	2494 (51.8)	1250 (51.7)	7797 (55.1)

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	Low (<85)	Low/Average (85–99)	Average/High (100–114)	>114 (High)	Full Sample
	(n=2084; 13.6%) n %	(n=4721; 33.3%) n %	(n=4708; 35.6%) n %	(n=2332; 17.5%) n %	(n=13,845) n %
Yes	653 (30.9)	1990 (42.3)	2186 (47.4)	1072 (48.1)	5901 (43.6)
Don't Know	49 (3.9)	60 (1.4)	28 (0.8)	10 (0.2)	147 (1.3)

Notes. All n are unweighted counts.

– indicates cell size <5

Percentages are weighted and reflect column percentages within cognitive ability groups and may not sum to 100 due to rounding.

Table 2

Sex-, age-, race/ethnicity-, and SES-adjusted odds ratios (and 95% confidence intervals) from logistic regression between cognitive ability and types of sexual experiences

	Vaginal		Oral		Anal	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Cognitive Ability						
Average/High (100–114; ref)	1.00		1.00		1.00	
Low (<85)	0.23	(0.13–0.41)*	0.17	(0.11–0.27)*	0.52	(0.44–0.62)*
Low/Average (85–99)	0.70	(0.50–0.98)*	0.63	(0.47–0.85)*	0.84	(0.76–0.94)*
High (> 114)	0.66	(0.48–0.90)*	0.87	(0.62–1.20)	1.02	(0.89–1.18)
Biological Sex						
Male (ref)	1.00		1.00		1.00	
Female	1.72	(1.36–2.17)*	0.80	(0.66–0.98)*	0.95	(0.86–1.05)
Age						
28–29 (ref)	1.00		1.00		1.00	
24–27	1.02	(0.80–1.30)	1.04	(0.80–1.36)	0.93	(0.81–1.07)
30–34	0.86	(0.66–1.11)	0.75	(0.60–0.95)*	0.94	(0.84–1.05)
Race/Ethnicity						
Non-Hispanic White (ref)	1.00		1.00		1.00	
Hispanic	0.94	(0.69–1.27)	0.93	(0.69–1.27)	1.34	(1.15–1.56)*
Non-Hispanic Black	0.89	(0.62–1.26)	0.42	(0.31–0.57)*	0.79	(0.66–0.93)*
Non-Hispanic Other Race	0.91	(0.97–1.73)	0.82	(0.49–1.39)	0.93	(0.76–1.14)
Parent Education (SES)						
College Grad (ref)	1.00		1.00		1.00	
<HS	1.24	(0.86–1.80)	0.55	(0.35–0.86)*	1.00	(0.85–1.18)
HS/GED	1.14	(0.90–1.44)	0.86	(0.67–1.12)	1.10	(0.98–1.23)
Some College	1.29	(0.97–1.73)	0.99	(0.73–1.35)	1.04	(0.91–1.19)

Notes.

* <0.05

“Don’t Know” responses coded as missing for these analyses.

Table 3

Age-, race/ethnicity-, and SES-adjusted odds ratios (and 95% confidence intervals) from logistic regression between cognitive ability and types of sexual experiences by biological sex

	Vaginal		Oral		Anal	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Cognitive Ability						
Average/High (100–114; ref)	1.00		1.00		1.00	
Low (<85)	0.21	(0.12–0.36)*	0.26	(0.11–0.61)*	0.16	(0.09–0.28)*
Low/Average (85–99)	0.53	(0.34–0.82)*	1.14	(0.76–1.72)	0.59	(0.37–0.95)*
High (>114)	0.68	(0.46–1.00)	0.63	(0.36–1.09)	0.88	(0.55–1.42)
Age						
28–29 (ref)	1.00		1.00		1.00	
24–27	0.93	(0.68–1.28)	1.12	(0.72–1.75)	1.02	(0.73–1.44)
30–34	0.86	(0.61–1.23)	0.84	(0.55–1.28)	0.83	(0.59–1.17)
Race/Ethnicity						
NH White (ref)	1.00		1.00		1.00	
Hispanic	0.92	(0.62–1.38)	0.98	(0.57–1.69)	1.02	(0.62–1.67)
NH Black	0.85	(0.53–1.37)	0.93	(0.64–1.36)	0.51	(0.31–0.83)*
NH Other Race	0.82	(0.50–1.35)	1.08	(0.55–2.14)	0.64	(0.33–1.25)
Parent Education (SES)						
College Grad (ref)	1.00		1.00		1.00	
<HS	1.00	(0.68–1.46)	1.73	(0.70–4.30)	0.49	(0.29–0.83)*
HS Grad/GED	0.87	(0.63–1.21)	1.69	(1.17–2.45)*	0.82	(0.54–1.26)
Some College	1.13	(0.79–1.62)	1.52	(0.92–2.51)	0.93	(0.59–1.46)

Notes.

* <0.05

“Don’t Know” responses coded as missing for these analyses.