

Fall 12-16-2017

Measuring Responses to Negative Peer Pressure Using Virtual Reality

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MEASURING RESPONSES TO NEGATIVE PEER PRESSURE
USING VIRTUAL REALITY

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MEASURING RESPONSES TO NEGATIVE PEER PRESSURE
USING VIRTUAL REALITY

A Thesis Presented to the Graduate Faculty of

Dedman College

Southern Methodist University

in

Partial Fulfillment of the Requirements

for the degree of

Master of Arts

with a

Major in Clinical Psychology

by

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December 16, 2017

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ACKNOWLEDGEMENTS

This work could not have been accomplished by the wisdom of my advisors and committee faculty, Drs. Ernest Jouriles, Renee McDonald, & Mike Chmielewski. I am also immensely grateful to my family for their encouragement and support throughout my graduate studies.

Sargent, Kelli S. B.A., Psychology and Music, Southern Methodist University, Dallas, 2014

Measuring Responses to Negative Peer Pressure
Using Virtual Reality

Advisor: Professor Ernest Jouriles

Master of Arts conferred December 16, 2017

Thesis completed September 22, 2017

Adolescent susceptibility to negative peer pressure consistently relates to maladaptive adolescent adjustment. However, measurement of this construct typically involves a mono-method, self-report approach. The current study uses virtual reality to create an observational assessment procedure for measuring adolescent responses to negative peer pressure. Participants ($n = 264$) completed a lab assessment, including self-reports of susceptibility to peer pressure, antisocial behavior, dating violence perpetration, and depressive symptoms. Participants also engaged in 9 virtual reality simulations (4 involving peer pressure), which were coded for resistance to peer pressure. Control participants repeated the virtual reality simulations at a 2-month follow-up. Resistance scores evidenced item-level convergent validity with each other and discriminant validity with bystander behavior, coded from 5 separate virtual reality simulations. When peer pressure scores were summed and treated as a scale, they evidenced acceptable internal consistency, stability over a 2-month period, convergent validity with self-reports of susceptibility to peer pressure, and criterion validity with self-reports of antisocial behavior and dating violence perpetration. The latter two associations held after accounting for self-reports of susceptibility to peer pressure and participant sex. Results provide initial evidence for the utility of a virtual reality procedure for assessing adolescent resistance to negative peer pressure.

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INTRODUCTION

Peer pressure is broadly defined as peer attempts to compel or coerce an individual to engage in specified behaviors (Sim & Koh, 2003). Negative peer pressure occurs when individuals are compelled or coerced to participate in risky and antisocial behaviors, such as unprotected sex, substance use, and theft. Adolescents are theorized to be especially vulnerable to negative peer pressure (Steinberg & Monahan, 2007), due to general increases in antisocial behavior during this developmental period (Moffitt, 1993) and neurocognitive changes in risk-reward systems (Albert & Steinberg, 2011).

How adolescents respond to negative peer pressure is theorized to be significant in the development of autonomy and self-identity (Erikson, 1968; Steinberg & Silverberg, 1986). As such, behavioral responses to negative peer pressure are thought to be important to adolescent adjustment and development because they help facilitate or hinder the successful navigation of competing developmental needs for social belonging and increasing autonomy (Steinberg & Silverberg, 1986). Consistent with such theory, measures of adolescent responses to negative peer pressure are associated with a variety of adjustment difficulties and important developmental outcomes. For example, submitting to negative peer pressure is positively related to general antisocial behavior (Erickson, Crosnoe, & Dornbusch, 2000; Monahan, Steinberg, & Cauffman, 2009), as well as specific types of antisocial behavior, such as substance abuse (Allen, Porter, & McFarland, 2006; Borsari & Carey, 2001; Santor, Messervey, & Kusumakar, 2000) and the perpetration of dating violence (Schad, Szwedo, Antonishak, Hare, & Allen, 2008). It is also associated with depressive symptoms (Allen et al., 2006), risky sexual decisions (Crockett, Raffaelli, & Shen, 2006), and poor academic performance (Santor et al., 2000). Conversely, resisting negative peer pressure is positively related to self-esteem, self-reliance, and self-

efficacy (Bámaca & Umaña-Taylor, 2006; Fletcher, Darling, Steinberg, & Dornbusch, 1995).

Given the potential significance of adolescents' responses to negative peer pressure, there is a clear need to measure these responses soundly. To date, the assessment of adolescents' responses to negative peer pressure, or how an individual resists or engages in peer-directed antisocial behavior, has largely relied on rationally created self-report measures. These measures are generally internally consistent and correlate with adolescent adjustment, but additional psychometric data are limited or equivocal in the literature. Additionally, assessment of actual behavioral responses to negative peer pressure is necessary. Multimethod assessment is needed to gain a more comprehensive understanding of this construct (Kazdin, 2003; Urbina, 2014).

Review of self-report measures

Existing self-report measures include iterations of Berndt's (1979) conformity questionnaire. On this measure, adolescents respond to hypothetical situations by choosing whether they would engage in or refuse the specified behavior (e.g., "You and a couple of your best friends are fooling around in an empty lot next to a house and accidentally break one of the windows of the house. Your friends want to take off and not tell anybody in the house, and you don't think that's right, but they tell you to hurry up and come. What would you really do?"). Scores on this measure consistently demonstrate adequate internal consistency (i.e., $\alpha = .73$ to $.76$) and correlate weakly (i.e., $r = .24$ to $.32$) with theoretically related constructs, such as parental supervision and self-esteem (Bámaca & Umaña-Taylor, 2006; Erickson et al., 2000; Sim & Koh, 2003; Steinberg & Silverberg, 1986). However, such items essentially ask adolescents to indicate which response most closely corresponds to how they believe they would behave in the situation. This is not quite the same as asking them to describe how they would actually respond, or to report past responses, and research is needed to examine how well this corresponds to

actual resistance to lived experiences of negative peer pressure (Baumeister, Vohs, & Funder, 2007).

Additionally, self-report measures often do not cover a wide range of possible responses. For example, from the conformity questionnaire: “One day after supper, you and a couple of your best friends meet at the school. No one is around and your friends decide that you should all write on the school walls. You don’t think that it’s a good idea, but your friends do it anyway. What would you really do?” Participants are offered “Not write on the school walls,” or “Write on the school walls,” and rate their degree of agreement with each statement (Berndt, 1979). In this example, an adolescent who merely pretends to, or only very minimally, writes on the school walls scores identically to an adolescent who enthusiastically does so. Similarly, one who initially resists but eventually gives in scores identically to an adolescent who gives in immediately. The measure itself is confounded by an adolescents’ ultimate decision, which may better assess antisocial behaviors than how adolescents wrestle with negative peer pressure. Yet, the initial reluctance or resistance may be particularly informative, as it hints at adolescents’ decision-making processes, risk perceptions, and in turn, assertion of autonomy. In short, the restricted response format of existing self-reports potentially misses theoretically important aspects of adolescents’ responses relevant to adolescent adjustment variables, such as self-reliance and delinquency.

Other self-report measures present statement pairs and ask participants to select which sentence best describes them (e.g., “Some people go along with their friends just to keep their friends happy, BUT Other people refuse to go along with what their friend want to do, even though they know it will make their friends unhappy.”) (Steinberg & Monahan, 2007).

Researchers offer several indicators of construct validity for this scale, including discriminant

validity with impulsivity ($r = -.22$), criterion validity in the prediction of changes in adolescent antisocial behaviors ($\beta = .29$), and appropriate coefficient alpha across diverse samples (i.e., .70 to .76) (Steinberg & Monahan, 2007). Nevertheless, the double-barreled nature of this format imposes motivations or social consequences for adolescent responses, and may mistakenly confound peer reactions (i.e., degree of happiness) with adolescents' responses to peer pressure. It also appears to assess the extent to which adolescents perceive themselves to be easily influenced by peers (in both neutral and antisocial situations), which is not equivalent to the extent to which adolescents actually resist negative peer pressure when it occurs.

Another commonly used measure, the Peer Pressure Inventory (Claesen, Brown & Eicher, 1986), asks adolescents to indicate the degree and direction of perceived peer pressure for 53 peer-directed activities on a 7-point scale from "No pressure" to "A lot [of pressure]". This measure shows evidence of internal consistency ($\alpha = .50$ to $.89$ across subscales), and robust associations with self-reported misconduct ($r = .51$ to $.56$). Although this instrument adds to our knowledge of adolescents' perceptions of the experience of being pressured, it does not assess *responses* to such pressure.

Still other self-report measures asks participants to describe how they respond to peer pressure in general, using items such as "I've skipped classes, when others have urged me to." (Santor et al., 2000). This arguably provides a better indicator of behavioral resistance to negative peer pressure, and unsurprisingly shows consistent associations with a variety of adolescent adjustment indices, including sexual attitudes ($r = .42$), depressive symptoms ($r = .29$), theft ($r = .31$), and substance use ($r = .28$ to $.44$) (Santor et al. 2000). However, structural analyses indicate that responses to such items correlate as strongly with popularity as they do with peer pressure. Subscale scores on this measure for peer pressure and popularity correlate at

$r = .91$, suggesting substantial redundancy (Santor et al., 2000). Thus, it is unclear the extent to which this scale assesses resistance to peer pressure, and not other theoretically related constructs.

Additionally, self-reports are vulnerable to recall errors, particularly when assessing negative events (Jouriles, McDonald, Garrido, Rosenfield, & Brown, 2005; Rubin & Berntsen, 2003). In some cases, the negative or distressing experience of negative peer pressure may similarly lead to recall errors with regard to adolescents' responses on retrospective reports. Despite these limitations, self-report measures provide strong evidence that negative peer pressure, and adolescent perceptions of how they experience and respond to it, are associated with psychological adjustment. Given these self-reported associations, a multimethod approach, including observational assessment of actual behavioral responses, is warranted to better understand these links.

Review of observational measures

Observational measures can help mitigate some of the limitations of the self-report measures described above, as well as some limitations of self-report measures in general. Existing observational measures include modifications of the "desert island" task (Strodtbeck, 1951), in which two peers are instructed to decide which fictional individuals should be kicked off a deserted island. Decisions are made separately, then peers discuss together to come to a final agreement. Past research has coded the discussions to yield ratings of experienced peer pressure (Allen, et al., 2006; Schad et al., 2008). Higher scores using this procedure have been related to lower friendship quality ($r = -.21$) and lower attachment security among peers ($r = -.17$) (Schad et al., 2008). Similarly, role plays depicting risky peer pressure situations involving

participants, peers, and research confederates have been utilized and coded for resistance tactics in a sample of high school students (Wolfe, Crooks, Chiodo, Hughes, & Ellis, 2012).

These observational paradigms allow for coding of multiple aspects of responses to peer pressure (e.g., specific negotiation tactics or degree of assertiveness), and coupling peer behavior with behavioral responses to it. On the other hand, observational approaches carry their own limitations. Specifically, research has largely relied on single observational situations, which limits generalizability of adolescent responses to the range of antisocial situations adolescent face in real life. Furthermore, use of fantasy situations that do not involve actual pressure to engage in risky or antisocial behavior may not correspond well to adolescents' responses to real-life negative peer pressure. Existing observational tasks also require the presence of a peer, adding logistical and social influence considerations to the research. In these cases, responses may reflect specific relationship dynamics with the peer in question, and conflate friendship stability and quality with ratings of peer pressure. That is, adolescents may have established patterns of responding to specific peers or particular acts that cannot be comprehensively assessed with one peer or a single situation.

Virtual reality as an observational measurement tool

Virtual reality (VR) technology offers an alternative observational approach that can help circumvent some of the issues that characterize existing self-report and observational measures, and build a more comprehensive picture of adolescent behavior when used together. VR is an immersive paradigm in which participants experience virtual environments and engage in real-time dynamic interactions with avatars. Thus, VR simulations facilitate the temporary suspension of reality so that participants encounter lifelike experiences in a controlled fashion. The immersive experience of VR may help mitigate potential Hawthorne effects, as participants

temporarily immerse themselves while in the VR environment (Bombari, Mast, Canadas, & Bachmann, 2015). That is, participants who become immersed in the VR environment forget they are being observed and thus offer more genuine responses (Holmes, 2011). The degree to which participants feel as though the virtual environment is plausible is theorized to facilitate real-life responses (Bombari et al., 2015). However, theory cautions against highly elevated levels of realism, citing an uncanny valley, or dip in degree of suspended disbelief, as virtual characters reach total human likeness (Mori, 1970). Past research shows VR simulations can achieve the desired moderate levels of participant-rated realism as rated by adolescents (Jouriles et al., 2016). VR simulations also have the potential to mimic real-life experiences of negative peer pressure in an ecologically valid manner, and research suggests that individuals respond realistically toward avatars in virtual environments (Gillath, McCall, Shaver, Blascovich, 2008; Hoyt, Blascovich, & Swinth, 2003). By interacting with a virtual peer, participant responses are not vulnerable to recall errors, and confounds inherent in involving real-life peers are mitigated.

VR also allows for multiple avatars and peer situations, so that responses to negative peer pressure across a number of situations and peer characteristics can be assessed. This lends a more complete picture of how adolescents respond to negative peer pressure in general, as well as to specific antisocial pressures. For example, research on pressure to use illicit substances suggests that the effectiveness of resistance strategies differs depending on the type of substance being offered (Kulis, Marsiglia, Castillo, Becerra, & Nieri, 2008). This raises the possibility that response strategies, and their effectiveness, may differ across situations depending on the nature of the pressured behavior (Wolfe et al., 2012; Wright, Nichols, Graber, Brooks-Gunn, & Botvin, 2004). To date, few studies have examined situational and individual influences on resistance to negative peer pressure, and it remains unclear the extent to which individuals would be expected

to respond similarly across negative peer pressure situations. A valid, thorough measure of resistance to negative peer pressure should thus sample multiple situations involving a variety of antisocial behaviors.

Assessment of responses to peer pressure using VR allows for coding of the content of adolescents' responses to negative peer pressure, so that dimensions such as degree of resistance can be examined. This allows investigation of *the extent to which* adolescents resist negative peer pressure, rather than how certain they are or how likely it would be that they would act in specific ways. Lastly, all participants can experience identical stimuli using a standardized protocol that can control for potential differences in peer coercion tactics, social status of the pressuring peer, and frequency and persistence of pressuring statements.

Researchers have begun to use VR to assess a number of behaviors related to this topic. For example, VR has been used to assess social competence among adolescents encouraged by an avatar to engage in risky behaviors, from which the authors coded for response characteristics such as negotiation, emotional control, and provocation (Paschall, Fishbein, Hubal, & Eldreth, 2004). VR has also been used to assess responses to a variety of social stimuli, including how adolescents and young adults respond to potentially dangerous situations involving peers (Jouriles et al., 2016; Jouriles, Rosenfield, Yule, Sargent, & McDonald, 2016), how female college students respond to sexual threat (Jouriles, Rowe, McDonald, Platt, & Gomez, 2011), and how community adults respond to ambiguous social cues in a virtual subway train to assess paranoia symptoms (Freeman et al., 2008).

Convergent validity

A good measure of resistance to negative peer pressure should be associated with other measures of the same construct as evidence of convergent validity (Campbell & Fiske, 1959;

Clark & Watson, 1995). However, given that existing self-reports of responses to peer pressure may not be assessing adolescents' *resistance* to peer pressure, convergent associations with available measures of peer pressure resistance may be reduced. In addition, the degree of convergent validity, or the magnitude of associations with other measures of peer pressure, is likely affected by several sources of error, including the method of data collection. Specifically, cross-method associations are likely to be lower than same-method associations due to method variance (Podsakoff, MacKenzie, Lee, & Podsakof, 2003). For example, research examining the utility of VR observational paradigms against self-reports of behavior show report cross-method associations of .24 (Jouriles, Kleinsasser, Rosenfield, & McDonald, 2016). Thus, we suggest a sound VR assessment of resistance to negative peer pressure should evidence correlations of approximately .20 or greater with self-reports of responses to peer pressure. Given that the construct of interest is *resistance* to negative peer pressure, associations with existing self-reports of *susceptibility* to peer pressure should be negative.

Criterion validity

Despite varied approaches to assessing adolescent responses to negative peer pressure, theory and data point to consistent associations with related adjustment variables. Theory suggests that adolescents' responses to negative peer pressure should be associated with antisocial behavior. Teens who submit to negative peer pressure, in most cases, by definition engage in antisocial behavior. Involvement with deviant peers is a consistent, robust predictor of adolescent antisocial behavior (see e.g., Ary, Duncan, Duncan, & Hops, 1999; Capaldi, Dishion, Stoolmiller & Yoerger, 2001; Henry, Tolan, & Gorman-Smith, 2001). This link may be attributable, at least in part, to negative peer pressure from deviant peers, as suggested by findings that responses to negative peer pressure are linked to antisocial behavior (Monahan, et

al., 2009). As a point of reference, existing self-reports of responses to negative peer pressure show correlations from .28 to .49 with self-report measures of antisocial behavior (Erickson et al., 2000; Santor et al., 2000).

Theory and research also links responses to negative peer pressure with dating violence perpetration in adolescent relationships. For example, negative pressure from peers is theorized to undermine one's sense of autonomy, which in turn increases compensatory efforts to assert autonomy and control over one's romantic partner through aggression (Schad et al., 2008). Consistent with such theorizing, adolescents who report experiencing peer pressure from a best friend or larger peer group are more likely to self-report being relationally aggressive to a dating partner, a finding replicated with partner reports of relational victimization ($r = .24$ to $.26$) (Schad et al., 2008). As such, measures of adolescent responses to negative peer pressure would be expected to be modestly related to one's own dating violence perpetration behaviors.

Theory also suggests that responses to negative peer pressure should be related to adolescent depression. One conceptualization of this link is that difficulty resisting peer pressure results in doubt about one's ability to establish autonomy in important relationships (Allen et al., 2006), which is particularly distressing in the adolescent context of increasingly complex social landscapes, and can lead to depressive symptoms. Depressed adolescents are also less liked by their peers (Zimmer-Gembeck, Waters, & Kindermann, 2009), which may render them more susceptible to peer pressure in efforts to fit in. Depressive symptoms may also emerge indirectly as a result of enacting peer-directed antisocial behaviors, such as dating violence or substance use (Allen et al., 2006; Allen et al., 2012; Fergusson, Wanner, Vitaro, Horwood, & Swain-Campbell, 2003; Schad et al., 2008). Consistent with this reasoning, adolescent responses to

negative peer pressure have been found to be related to self-reports of depressive symptoms, with associations ranging from .10 to .29 (Allen et al., 2006; Santor et al., 2000).

Internal consistency

Existing self-report measures of resistance to peer influence, including neutral influence, report adequate internal consistency. These measures also demonstrate small average inter-item correlations (AIC) of approximately .20 (Monahan, Steinberg, & Cauffman, 2009), suggesting a relatively broad construct (Watson & Clark, 1995). Surprisingly, studies examining resistance to antisocial peer pressure specifically also report a similar AIC (Bámaca & Umaña-Taylor, 2006). However, weaknesses of these existing measures may be unintentionally muddying the construct and creating false breadth. For example, peer pressure items on the Peer Pressure, Popularity, Conformity, and Peer Conformity Scale (Santor et al., 2000) tap both the experience of negative peer pressure (e.g., “I’ve felt pressured to get drunk at parties.”) as well as hypothetical behavioral intentions (e.g., “When at school, if a group of people asked me to do something, it would be hard to say no.”). Thus, responses to some items may not correspond strongly with responses to others. As such, a sound measure of resistance to antisocial peer pressure would be expected to demonstrate a moderate AIC, indicating neither an overly narrow construct or highly specific preference, nor a construct as broad as higher-order personality traits.

Research regarding situational and individual influences on resistance to peer pressure is sparse. There is some evidence that adolescents alter their responses across different pressured behaviors, suggesting strong situational effects on behavior (Kulis et al., 2008; Wolfe et al., 2012; Wright et al., 2004). However, self-reports of responses to negative peer pressure demonstrate internal consistency across a variety of antisocial items, which may indicate a more consistent style of responding across situations. Taken together, resistance to negative peer

pressure may be subject to situational influences *and* consistent interpersonal styles, such as individual differences in agreeableness or assertiveness. We theorize that resistance to negative peer pressure may be subject to situational influences *and* consistent interpersonal styles; adolescents may exhibit individual fluctuations in degree of resistance or strategies used across situations, with rank-order stability of mean levels of resistance across individuals.

Consistency over time

Limited information is provided in the literature on the stability of adolescents' resistance to negative peer pressure. Developmentally, resistance to peer influence increases linearly across adolescence, with little evidence of continued growth past age 18 (Steinberg & Monahan, 2007). Responses to peer pressure may follow a similar trajectory: variability during early adolescence that diminishes with approaching adulthood. Thus, scores from measures of resistance to negative peer pressure should be stable over relatively brief time periods. Instability that emerges from longer assessment intervals is more likely to reflect true developmental change (Watson, 2004), whereas very short time frames may capture transient measurement error or, in the case of VR assessments, practice effects from recent exposure to the VR paradigm. Stability correlations for observed behaviors in VR paradigms with adolescent samples have been documented as high as .75 over a 6-month period (Jouriles, Rosenfield, Yule, Sargent, & McDonald, 2016). Given the lack of research on the stability of existing measures of responses to peer pressure, more information is necessary to better understand its developmental trajectory.

Present study

The current study describes the development and initial evaluation of an observational measure that uses VR simulations to assess late adolescents' responses to negative peer pressure. We consider the measure's convergent and discriminant validity, and perceived realism of

adolescents' responses during the individual VR simulations that make up the measure. We then evaluate the convergent validity of scores derived from the VR protocol with self-report measures of responses to peer pressure, the criterion validity with self-reports of antisocial behavior, dating violence perpetration, and depressive symptoms and the stability of these scores over a 2-month period. We hypothesized that 1) observed resistance to negative peer pressure in VR simulations would show weak-to-moderate, negative correlations with self-reported responses to negative peer pressure. Given the use of different assessment methods (self-report vs. observational), we did not anticipate exceptionally strong correlations ($r \approx -.2$ to $-.4$). We also hypothesized that 2) observed resistance to negative peer pressure will evidence weak-to-moderate negative concurrent associations with antisocial behavior, dating violence perpetration, and depressive symptoms ($r \approx -.1$ to $-.3$). We also expected 3) VR scores to remain stable over a 2-month period ($r \approx .6$ to $.8$).

The value of a new measure of adolescent responses to negative peer pressure lies in its ability to meaningfully contribute to knowledge and prediction beyond existing measures (Haynes & Lench, 2003; Sechrest, 1963). A multi-method approach, using observational together with self-report methods may aid in the prediction of relevant outcomes. Thus, the current study examines the incremental utility of observed responses to negative peer pressure in VR simulations compared to an existing self-report measure, in the prediction of theorized adjustment correlates. Given its ability to provide data on the quality and nature of responses to negative peer pressure, we hypothesized that 4) the VR measure would be associated with antisocial behavior, dating violence perpetration, and depressive symptoms, after accounting for the effect of self-report responses to negative peer pressure.

Method

Participants

Participants ($n = 264$) were recruited from first year required Wellness courses at a mid-size four-year university in the southwest United States. Students were offered course credit for participating, and those who chose not to participate were offered alternative assignments. The mean age of the sample (46% male) was 18.17 years ($SD = 0.56$), and was predominantly White ($n = 215, 81\%$). However, Asian ($n = 19, 7\%$), Black or African American ($n = 9, 3\%$), and students who identified as “More than one race,” ($n = 15, 6\%$) or “Unknown” ($n = 7, 3\%$) also participated. In a separate question about ethnicity, 33 students (13%) identified as Hispanic or Latino/a.

Procedures

The data for the present study were collected as part of a larger randomized controlled trial evaluating the effectiveness of an online bystander program. Students visited the research lab for a baseline assessment and returned approximately 2 months later to complete a follow-up assessment. Baseline data from the full sample of participants were used to test hypotheses 1, 2, and 4, whereas data from participants assigned to the control condition were used to test hypothesis 3. At each assessment, participants completed questionnaires and participated in VR simulations (described below). Of the 131 students who completed the baseline assessment and were assigned to the control condition, 124 completed the follow-up assessment (95% retention). One week before the follow-up assessment was due, students were sent email reminders about their scheduled assessment; the emails were sent weekly until the assessment was completed or the semester ended.

Measures

Observed responses to negative peer pressure in VR simulations. Students participated in nine VR simulations at both assessment points. Simulations were administered using a custom VR application and Oculus Rift VR goggles, through which students experienced themselves as seated in the passenger seat of a parked car, with a peer (avatar) in the driver's seat. During the simulations, a trained actor controlled the avatar's speech and movements in real time via computer. Participants were instructed to "just be yourself," and to interact with the avatar as they normally would with a friend.

The VR simulations involved interactions that included one of two themes: four included peer pressure to engage in antisocial or risky behavior, the primary variable used for the present research; the remaining five involved situations of actual or potential relationship aggression as a measure of discriminant validity. The simulations are described by theme below (see Tables 1 and 2 for simulation scripts). Each simulation was approximately two minutes long, in order to allow time for a sense of immersion in the virtual environment without unduly burdening participants with a lengthy assessment. In the simulations, actors engaged participants in a conversation and were provided with 5 to 6 scripted statements to use in each simulation.

Avatars in peer pressure simulations were matched to the gender of the participant for all peer pressure scenarios except "Sexual Assault," in which a male avatar was used for all participants. At least two of the scripted statements in each peer pressure simulation directly pressured the participant to engage in or facilitate antisocial behavior. Research assistants coded actor adherence to the script during the simulations, reported separately for each simulation below. Simulations were created based on consultation with experts in the field of adolescent behavior, as well as feedback from university students.

Theft. The avatar begins the simulation by telling the participant they do not have enough money for parking, and suggests taking money from their roommate's desk. The avatar informs the participant that the roommate is not around today, and "it's not a big deal," to steal the money because "it's not like they are strapped for cash. Actors used all of the scripted statements for 93.5% and 100% of participants at baseline and 2-month follow-up, respectively.

Cheating. The avatar opens with, "This math class is so hard, and we are both not doing that great, don't you think?" The avatar then tells the participant that when the avatar visited the professor for office hours, the professor left the room for a moment and left the answer key to the final exam on her desk. The avatar took pictures of the answer key, and suggests "we can use it to study," arguing that "her tests are never fair, this will make it fair for us." Actors used all of the scripted statements for 99.6% and 100% of participants at baseline and 2-month follow-up, respectively.

Substance use. The avatar begins the simulation with, "So excited about the party tonight, aren't you?" The avatar goes on to describe a party that "not that many freshmen even get invited to," taking place at the "abandoned house no one has been living in for a while." The avatar asks the participant if they can stop on the way to the party, explaining "My friend has some weed and I said we'd bring it." The avatar says "I know it's not your thing, but it's no fun getting high alone," and concludes with "We'll go check out the party, drink a little, and see what happens." Actors said all of the scripted statements for 98.9% and 99.6% of participants at baseline and 2-month follow-up, respectively.

Sexual assault. The avatar begins by asking the participant "Did you see that girl Erica in there?" and explains that it was too loud inside the party, but that "I really want to hook up with her," and asks if they can go back into the party "to see if I have potential with her." The avatar

says “she’s really drunk, so I definitely think I can make this happen,” and concludes by saying, “I’m going to go back inside and get her alone.” Actors said all of the scripted statements for 98.5% and 99.2% of participants at baseline and 2-month follow-up, respectively.

Coding of peer pressure simulations. The simulations were audio recorded and coded for participant degree of resistance to negative peer pressure. Codes were made for each simulation on a 4-point scale from 0 = *Non-resistant* to 3 = *Very resistant*. Ratings considered the content (resistance or submission), frequency, and assertiveness (hesitation/reluctance or confidence) of participants’ statements. For instance, participants who expressed agreement, encouragement, or provided no contest to engaging in the specified antisocial behavior received a score of 0. Participants who responded hesitantly when making resistant statements, as evidenced by infrequent, inconsistent, noncommittal or vague resistant statements, or participants whose statements went back and forth between resistant and agreeable statements, received a score of 1. Participants who responded with consistent resistant statements with moderate confidence received a score of 2, and those that consistently, assertively expressed resistance with clarity and confident explanation received a score of 3. Simulations were coded by a primary coder who coded 100% of the simulations and a reliability checker who coded over 35% of them. Intraclass correlation coefficients (ICC) ranged from .90 to .92 at baseline in the full sample, and .90 to .93 at 2-month follow-up in the control group.

Self-reported responses to negative peer pressure. Students reported their susceptibility to peer pressure using the peer pressure subscale of the Peer Pressure, Popularity, Conformity, and Peer Conformity Scale (Santor et al., 2000). Students rated how well each of eleven statements described them “in general” on a 4-point scale, ranging from 0 (*Not at all like me*) to 3 (*Very much like me*). Sample items include “At times I’ve broken rules because others

have urged me to,” and “I often feel pressured to do things I wouldn’t normally do.” See Appendix A for full measure content. Scores were derived by summing responses, with higher scores reflecting greater susceptibility to negative peer pressure. Scores on this subscale have been found to be negatively associated with school performance, and positively associated with depressed mood and substance use (Santor et al., 2000). Coefficient alpha in the current sample was .86 at baseline assessment. Retest reliability was .82 over the 2-month follow-up period in the control group.

Observed bystander responses in VR simulations. Utilizing the same VR procedure described above, four separate simulations were administered depicting risky situations involving relationship violence, in which the participant had opportunity to respond with effective bystander intervention (e.g., stepping in to defuse the situation, offering support to a victim of violence). Simulations covered the following topics: seeing two intoxicated friends head to a back bedroom at a party (*One drunk night*), witnessing a heated argument among friends involving hitting and yelling (*Physical dating violence*), listening to a friend describe ongoing stalking by an ex-boyfriend (*Stalking*), discovering a friend engaged in intoxicated sexual activity at a party the night before (*Morning after*), and a listening to a friend describe controlling and threatening behavior by her boyfriend (*Coercive relationship*). Although bystander simulations involved avatar reluctance to perform prosocial behaviors, no negative peer pressure was imposed. For the purposes of the bystander simulations, the avatar’s sex was the same across all participants, and based on the content of the individual simulations. Actors said all of the scripted statements at least 98.5% of the time across all simulations.

Coding of bystander simulations. The simulations were audio recorded and coded for effectiveness of participants’ bystander intervention. Codes were made for each simulation on a

4-point scale from 0 = *Ineffective* or *No intervention* to 3 = *Highly effective intervention*. Ratings considered the immediacy, safety, and completeness of bystander interventions. Simulations were coded independently by a primary coder and three reliability checkers; the primary coder rated all simulations, while the reliability coders each rated 1/6 of the simulations (equally 50% of all simulations). ICC ranged from .67 to .86 across simulations at baseline assessment.

VR immersion and realism. After each VR simulation, a research assistant asked participants two questions to assess immersion and perceived realism of their own behavior in the simulations: “How much did you feel as though you were actually in the situation?” and “How much did you respond as you normally would in real life?”. Participants responded verbally on a 5-point scale that ranged from 1 = *Not at all* to 5 = *Very Much*.

Antisocial behavior. Students completed the 9-item Honest Conduct Scale (HCS; Hamby, Grych, & Banyard, 2013), indicating whether they had engaged in a variety of delinquent behaviors (0 = *No*, 1 = *Yes*) over the past 2 months. Sample items include: “Have you ever hit, slapped or pushed other people or gotten into a physical fight with them?” “Have you ever written things or spray painted on walls or sidewalks or cars, where you were not supposed to do that?” As done in past research (Monahan, Steinberg, Cauffman, & Mulvey, 2008; Sargent, Krauss, Jouriles, McDonald, 2016), a variety score was created by summing responses, with higher scores indicating greater variety of antisocial behavior. Coefficient alpha in the current sample was .55. at baseline assessment. Scores on this measure have been found to be negatively associated with honesty and broad-spectrum mental health indices (Hamby, Grych, & Banyard, 2013).

Dating violence perpetration. Students completed the 25-item Conflict in Adolescent Dating Relationships Inventory – Revised perpetration subscale (CADRI; Wolfe et al., 2001),

reporting the frequency of dating violence perpetration to a romantic partner over the past 2 months. Behaviors were reported on a scale from 0 (*never*) to 4 (*four or more times*). Sample items included “I pushed, shoved, or shook them” and “I tried to turn their friends against them.” Scores on each item were summed, with higher scores indicating greater frequency of perpetration in the last 2 months. Internal consistency was $\alpha = .85$ at baseline assessment. Prior research indicates that perpetration scores on the CADRI correlate with theorized risk factors for dating violence perpetration, such as hostility (Wolfe et al., 2003).

Depressive symptoms. Students reported on their own depressive symptoms using the 20-item Center for Epidemiological Studies – Depression Scale (CES-D; Radloff, 1977). Students indicated how often they experienced symptoms over the past week on a 4-point scale ranging from 0 (*Rarely or none of the time*) to 3 (*Most or all of the time*). Sample items include: “I was bothered by things that don’t usually bother me” and “I had trouble keeping my mind on what I was doing.” See Appendix B for full measure content. Scores were derived by summing the item responses, with higher scores indicating greater depressive symptoms. Coefficient alpha was .90 at baseline assessment. CES-D scores correlate with other self-report measures of depression (Radloff, 1977).

Results

VR responses to peer pressure scale creation

Four simulations were tested to assess responses to peer pressure. To determine which of the four simulations should be included in the final measure, each were examined on the basis of 1) level of participant-rated immersion and realism, 2) inter-item correlations with other peer pressure simulations, and 3) inter-item correlations with bystander VR scores. To be included in the final measure, we required moderate-to-strong mean ratings for responses to both the

immersion (“How much did you feel as though you were actually in the situation?”) and realism (“How much did you respond as you normally would in real life?”) questions. We also required a pattern of moderate-to-strong inter-item correlations with other peer pressure simulations, but week-to-moderate correlations with the bystander VR scores. Descriptive characteristics for individual peer pressure simulations are presented in Table 3.

Simulation immersion and realism were assessed via two items for each simulation. On average, participants rated simulations as moderately immersive on a scale where 1 = *Not at all immersive* to 5 = *Very immersive* ($M = 3.36$ across all 4 simulations, $SD = 0.98$). Immersion did not differ by simulation, $F(3, 1048) = 1.24, p = .29$. On average, response realism was rated as moderately to highly realistic ($M = 4.33, SD = 0.79$). Response realism, or the extent to which participants reported they acted as they normally would in similar real-world situations, differed by simulation, $F(3, 1048) = 3.40, p = .02$. Specifically, *Theft* was significantly more realistic than all other simulations, $ps < .03$. Overall, participant ratings of immersion and realism of each of the four simulations were judged as acceptable to be included in additional analyses.

Next, inter-item correlations were examined among peer pressure simulations and bystander simulations (See Table 4). All peer pressure inter-item correlations were significant at $p < .01$, and were moderate in magnitude ($r = .32$ to $.53$), suggesting neither redundancy nor distinct constructs emerged across simulations. Peer pressure simulations were also moderately correlated with one another, whereas associations with bystander VR simulations were mostly weak in magnitude ($r = .03$ to $.36$, with only 3/20 correlations reaching a magnitude of $.30$ or higher) and statistically non-significant, suggesting evidence of discriminant validity from related peer constructs assessed using VR.

Thus, all four peer pressure simulation scores were summed to create a final VR measure. Coefficient alpha for the final scale was .74 at baseline, which meets established guidelines (Clark & Watson, 1995). AIC for the final scale was .42 at baseline, which is within the recommended range (i.e., .15 to .50, Clark & Watson, 1995).

Convergent validity

Bivariate correlations were conducted between observed peer pressure VR responses and a self-report measure of responses to peer pressure (hypothesis 1). As expected, self-reported peer pressure was negatively associated with VR resistance scores ($r = -.28$), which is consistent with correlations reported in previous work examining cross-method associations using observations of behavior in VR simulations and self-reports (Jouriles et al., 2016).

Criterion validity

Bivariate correlations were conducted between observed VR peer pressure resistance and antisocial behavior, dating violence perpetration, and depressive symptoms, respectively (hypothesis 3). Associations are summarized in Table 5. As expected, VR peer pressure resistance was negatively associated with antisocial behaviors ($r = -.34$), consistent in magnitude with documented associations relating self-reports of these constructs (Erickson et al., 2000; Santor et al., 2000). Also consistent with our hypotheses, dating violence perpetration was modestly related to VR peer pressure resistance ($r = -.15$). Contrary to our hypotheses, observed VR peer pressure resistance was not related to depressive symptoms at baseline assessment.

Stability

To assess the stability of observed VR responses to negative peer pressure across time, baseline and 2-month follow-up scores were correlated with one another (hypothesis 4). The magnitude of the stability coefficient indicates the rank-order test-retest reliability of scores. VR

resistance to peer pressure evidenced stability over the 2-month follow-up period ($r = .64$), which is consistent with documented stability coefficients using VR measurement paradigms with adolescent samples ($r = .75$ for observations of bystander behavior across a 6-month period; Jouriles et al., 2016).

Incremental criterion validity

To assess the incremental criterion validity of scores derived from VR simulations over self-report responses (hypothesis 4), separate regressions were conducted predicting each criterion variable at the baseline assessment. Participant sex was entered as a covariate in all analyses.

Antisocial behavior was skewed at baseline (skewness = 2.58), and evidenced a zero-inflated distribution, thus a Poisson log linear distribution was assumed using generalized linear modeling. VR peer pressure and self-report peer pressure responses were entered predicting baseline antisocial behaviors. Participant sex did not predict antisocial behaviors, $p = .23$, and was thus dropped from analyses. VR peer pressure resistance was associated with antisocial behaviors, $b = -0.15$, $p = .001$, R^2 increase = .06, after accounting for the contributions of baseline self-reports, $b = .09$, $p < .001$, R^2 increase = .06.

Dating violence perpetration was skewed at baseline (skewness = 1.86), and evidenced a zero-inflated distribution, thus a Poisson log linear distribution was assumed using generalized linear modeling. VR peer pressure and self-report peer pressure variables were entered predicting dating violence perpetration. VR peer pressure resistance predicted dating violence perpetration, $b = -.09$, $p = .005$, R^2 increase = .02, after accounting for self-report peer pressure, $b = .04$, $p = .008$, R^2 increase = .03, and participant sex, $b = -.56$, $p = .002$, R^2 increase = .03.

Depressive symptoms were slightly skewed (skewness = 1.18), and thus this variable was log transformed for analyses. A hierarchical linear regression was conducted predicting baseline depressive symptoms; self-report responses to negative peer pressure were entered as the first step, and observed VR responses to negative peer pressure entered as the second step. VR peer pressure did not predict depressive symptoms, $b = -0.28$, $p = .22$, after accounting for self-report peer pressure, $b = 0.32$, $p = .003$, R^2 increase = .04, and participant sex, $b = 3.73$, $p = .002$, R^2 increase = .04.

Discussion

The current study presents the development and preliminary validation of an observational VR protocol designed to assess adolescents' responses to negative peer pressure. We sought to capture adolescents' degree of resistance to negative peer pressure under standardized conditions. The measure we created requires adolescents to participate in four brief VR simulations in which a peer avatar verbally pressures participants to engage in a variety of antisocial behaviors. Each simulation was coded for participants' degree of resistance to negative peer pressure. The individual simulations were judged to be appropriately immersive and realistic, and the coded resistance scores were moderately correlated with one another and weakly associated with bystander VR codes, as evidence of item-level discriminant validity. Resistance scores from the four simulations were summed to create an index of adolescents' degree of resistance to negative peer pressure, which was internally consistent, stable over a 2-month period, and correlated in the expected direction with self-report measures of responses to peer pressure, antisocial behavior and dating violence perpetration. The latter two associations held, even after accounting for the predictive contributions of self-reported responses to negative peer pressure and effects of participant sex. In sum, the results of the current study provide initial

evidence for the validity of a VR measure in the assessment of adolescent resistance to negative peer pressure.

The presented VR measure emphasizes adolescent *resistance* to negative peer pressure, which differs from existing self-reports that ask about conformity dispositions or behavioral intentions. Such a VR protocol thus offers important additional observational information on adolescents' actual behavioral responses to simulated pressure from peers in real-time. Given the immersive quality of VR experiences, ecologically valid samples of adolescent behavior can be obtained across a range of true-to-life situations, and provide rich data on the nature of adolescent responses. Furthermore, the described VR protocol presents standardized peer pressure stimuli, and includes multiple situations addressing a variety of antisocial acts. Notably, a VR measurement approach is not vulnerable to recall errors of existing self-reports or relationship confounds of observational paradigms using real-life peers.

Despite these strengths, use of the proposed measure may be more burdensome to administer than existing self-report measures. Furthermore, the self-report peer pressure measure utilized in this study performed quite well, particularly on indices of criterion validity. Thus, the described VR protocol may function as an important supplement, rather than replacement, to existing measurement tools.

The current study adds to research documenting relations among adolescent experiences of negative peer pressure and antisocial behavior (Erickson et al., 2000, Monahan et al., 2009; Santor et al., 2000). Notably, this study also replicates limited research reporting associations between negative peer pressure and dating violence perpetration (Schad et al., 2008), and expands this finding to include not only relational aggression, but physical dating violence, as well. This finding is consistent with theory and research implicating that negative peer pressure

functions to encourage or maintain dating violence broadly (Capaldi et al., 2001; DeKeserdy & Schwartz, 2013). This link may also develop as a function of other activities, such that teens more resistant to negative peer pressure engage in fewer behaviors known to increase risk for dating violence perpetration and victimization, such as alcohol use and risky sexual activities (Vagi et al., 2013). Future research is necessary to elucidate how experiences of negative peer pressure, and adolescents' responses to such pressure, contribute to the development and maintenance of adolescent relationship and sexual violence.

Contrary to hypotheses, associations between observed VR peer pressure resistance and depressive symptoms failed to emerge. Though unexpected, we offer a few possible explanations for this result: previous research links negative peer pressure to depressive symptoms by way of dating violence experiences (Schad et al., 2008), and across lengthy follow-up periods designed to capture developmental change. Indeed, in a study by Allen and colleagues (2006), susceptibility to peer influence was not related to depressive symptoms concurrently; this relation only emerged across a 1-year follow-up. Thus, it is possible that relations among these constructs develop over time, and through secondary mechanisms of violence, trauma, and other antisocial behaviors (Schad et al., 2008). The present sample also included older adolescents with subclinical levels of self-reported depressive symptoms; associations among these constructs may be particularly relevant for younger adolescents or those with clinically significant symptoms of depression.

The present research has important implications for clinical research. VR adds a unique assessment tool to aid in intervention evaluation and examination of developmental differences in adolescent responding. How adolescents *approach* the decision to engage in pressured behaviors is particularly relevant for deriving effective, theoretically-informed interventions.

Multimethod assessment of adolescent responses to peer pressure is thus especially useful should resistance to negative peer pressure be conceptualized as a primary behavioral target of intervention, or theorized as a key predictor of adolescent adjustment.

VR's ability to approximate reality offers important information about adolescents' interactions with peers, and together with self-reported perceptions can provide a rich picture of adolescent behavior. To this end, VR protocols offer information not only the frequency of resistant responses, or self-reported changes in adolescents' resistance strategies, but on the quality and effectiveness of such responses. By capturing the nature of adolescents' resistance through multimethod assessment, a greater clinical understanding of the phenomenon is achieved; observational data provide different insights than self-report, and can help illuminate targeted cognitive and emotional intervention targets.

Furthermore, the ability to rigorously control the stimuli presented can strengthen research design, such that a variety of risky hypothetical situations can be applied without violating ethical boundaries or compromising the safety of participants. The ability to manipulate and standardize peer stimuli lends itself to innovative research on theoretically important moderators of resistance, like the effects social status or perceived attractiveness of the pressuring peer (i.e., avatar), and how same-sex versus opposite sex friendships operate within this context.

Although this study has several strengths, a few limitations should also be noted. It is unclear if four presented simulations provide the best, most appropriate sampling of adolescent behavior, and raises the possibility that including additional and/or different simulations might strengthen our VR measure. Additionally, this research was conducted with a sample of late adolescent college students, who reported low offending rates of both antisocial behaviors and

dating violence perpetration. As such, it remains unknown the extent to which findings would replicate with younger or more delinquent samples. We emphasize that measure validation is an iterative process; future research with larger, more diverse samples is warranted to replicate and expand upon these results, as additional evidence of construct validity. The current study investigated criterion validity with a limited number of criterion variables. Thus, future research is warranted to establish similar criterion associations between this VR assessment protocol and other theorized correlates, such as risky sexual activities and substance use (Allen et al., 2006; Bosari & Carey, 2001; Santor et al., 2000), as well as measures of positive identity formation, such as self-reliance and self-esteem among adolescents (Bámaca & Umaña-Taylor, 2006; Fletcher et al., 1995).

Future research should also consider the extent to which measures of negative peer pressure are simply proxy assessments of antisocial proclivities. Associations between antisocial variety scores and responses to negative peer pressure indicate discriminant constructs, however, more research is warranted to disentangle *preferences* toward antisocial behavior from lack of *ability* to resist. Interpreting adolescents' responses to negative peer pressure thus requires consideration of the nature of the act and the persuasive tactics of the peer. To date, research largely considers these dimensions together, conceptualized as a broad susceptibility to peer influence. Use of VR can be advantageous in manipulating these aspects separately in future research.

This study presents an initial evaluation of a new method to assess adolescent responses to negative peer pressure. The findings provide preliminary support for the validity of VR simulations for this purpose, and lay the groundwork for future research and VR scale development in the area of adolescent risk behaviors and social interactions. We believe such

methods can arm researchers with a valuable addition to existing self-report measures of adolescent peer influence, and potentially provide clinicians a novel training tool to increase adolescents' resistance to negative peer pressure.

Table 1

VR negative peer pressure simulation scripts

| <i>Simulation</i> | <i>Actor statements</i> |
|----------------------|--|
| <i>Theft</i> | <p>Introduction: Shoot, I don't think I have enough cash for parking.</p> <ol style="list-style-type: none"> 1. Let's just run back inside, I'll grab some cash from my roommate's desk. 2. Yeah, they're not around today, so it'll be fine. 3. Yeah, s/he won't even notice, he/she's always leaving money laying around. 4. It's not like s/he's strapped for cash, I mean his/her family is loaded. It's not a big deal. 5. If s/he notices, we'll just say we were planning to pay it back. |
| <i>Cheating</i> | <p>Introduction: This math class is so hard and we're both not doing that great, don't you think?</p> <ol style="list-style-type: none"> 1. Well I should tell you something. I was in office hours today for my midterm and the professor left the room. I thought she left the answer key to the midterm on her desk, but it wasn't. 2. It was actually the final, I took pictures of it while she was gone. This can help us study. 3. Her tests are never fair, she owes us; this will make it fair. 4. Think about it like a study sheet. You just know what to focus on now. 5. I haven't told anyone else about this, it's just for us. I mean c'mon we have to do this to pass. |
| <i>Substance use</i> | <p>Introduction: So excited for the party tonight, aren't you?</p> <ol style="list-style-type: none"> 1. The buzz about this party is crazy. I heard not a lot of freshmen even get invited. 2. Yeah, it's supposed to be at that big house that no one's been living in for a while. 3. Let's stop by my friend's place on the way. He's got some weed and I said we'd bring it. 4. I know this isn't really your thing, but it's no fun getting high alone. 5. Just come check out the party, drink a little, and see what happens. It'll be fun. |

Sexual assault

Introduction: Did you see that girl Erica in there?

1. I wanted to tell you something inside but it was too loud. I'm really interested in her.
 2. She's so hot. Do you mind going back into the party for a little bit so I can see if she's into me?
 3. I really want to hook up with her. Did you see the way she kissed me? I think she really likes me.
 4. She's really drunk, so I definitely think I can make this happen.
 5. I'm a little drunk but I still know what's going on.
 6. I'm going to go back in and get her alone.
-

Table 2

VR bystander simulation scripts

| <i>Simulation</i> | <i>Actor statements</i> |
|---------------------------------|--|
| <i>One drunk night</i> | <p>Introduction: Wow! That was some crazy party, huh?!</p> <ol style="list-style-type: none"> 1. Marcus and Katie were so drunk tonight. Did you notice? 2. She looked like she was having a good time. She was hanging all over him. 3. Did you see him carrying her? He just carried her into a back bedroom. 4. She's really drunk; she probably has no idea where she is right now. 5. It's a party – we should just leave it alone and not ruin their fun. |
| <i>Physical dating violence</i> | <p>Introduction: Wow, do you see Matt and Alicia arguing?</p> <ol style="list-style-type: none"> 1. Did you see her slap him? That was crazy! 2. I've just never seen them act like THAT before. Most of the time they just yell. 3. Matt has been telling me they've been having problems. He says they fight a lot. Have you heard anything from Alicia? 4. Every relationship has its ups and downs – it's pretty normal. 5. Do you really think it's any of our business? |

Stalking

Introduction: Remember I told you my boyfriend had been acting all jealous? And he started yelling about all these guys he thought I'd been with that I've never met? I'm thinking about breaking up with him.

1. He's been just texting me non-stop. I mean, he's even texting my friends and spreading rumors that I cheated on him.
2. Now he's like spying on me and constantly checking in. This seems kind of over the top.
3. Like last night, he called me over and over again asking who I was with. He threatened to show up at my place if I didn't tell him where I was.
4. I mean, it's kind of annoying that he checks up on me, but I think he just really cares about me.
5. I don't know, I don't think I'm going to break up with him. I'll just wait for this to pass.

Morning after

Introduction: That was a wild party last night, I'm so hung over.

1. I don't even remember most of it, except for talking with Sam a lot.
2. Yeah I'm not sure what happened, we were both pretty wasted.
3. All I remember is bringing him back to my place. We must have had a fun night. When I woke up this morning he was gone but my clothes were all over the floor.
4. I guess he'll text me later.
5. People get drunk and hook up all the time. It's fine.

Coercive relationship

Introduction: Did you see my girlfriend talking to that guy over there?

1. That's her ex! I can't believe she's talking to him.
 2. It looks like they're really into each other. That guy is such a jerk.
 3. She makes me so mad sometimes. I told her can't talk to him, or any other guys, but she still does.
 4. I think she might be cheating on me. I asked her if she was, and she said no, but she's probably lying.
 5. I made her show me her phone the other day, to see if she's been talking with him.
 6. I'm going over there to put an end to this.
-

Table 3

Descriptive characteristics of VR peer pressure simulations at baseline assessment

| <i>Simulation</i> | <i>Observed resistance M (SD)</i> | <i>Immersion M (SD)</i> | <i>Response realism M (SD)</i> |
|-------------------|---------------------------------------|-----------------------------|------------------------------------|
| Cheating | 2.20 (0.95) | 3.32 (0.97) | 4.25 (0.84) |
| Substance use | 1.21 (0.96) | 3.43 (1.01) | 4.31 (0.82) |
| Theft | 2.40 (0.82) | 3.39 (1.00) | 4.46 (0.74) |
| Sexual assault | 2.07 (0.94) | 3.29 (0.95) | 4.31 (0.75) |

Note. ($n = 264$). Observed resistance scores could range from 0-4. Immersion was assessed by asking “How much did you feel as though you were actually in the situation?” with scores ranging from 1-5. Response realism was assessed by asking “How much did you respond as you normally would in real life?” with scores ranging from 1-5.

Table 4

Inter-item correlations among peer pressure and bystander VR simulations

| <i>Simulation</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. Cheating | .53** | .38** | .50** | .28** | .24** | .17** | .17** | .26** |
| 2. Theft | -- | .32** | .44** | .30** | .27** | .10 | .15* | .15* |
| 3. Substance use | | -- | .43** | .24** | .27** | .23** | -.03 | .28** |
| 4. Sexual assault | | | -- | .36** | .28** | .31** | .12* | .28** |
| 5. One drunk night | | | | -- | .37** | .21** | .11 | .26** |
| 6. Phys dating violence | | | | | -- | .32** | .25** | .18** |
| 7. Stalking | | | | | | -- | .09 | .33** |
| 8. Morning after | | | | | | | -- | .14* |
| 9. Coercive relationship | | | | | | | | -- |

Note. Simulations 1 through 4 are peer pressure simulations; simulations 5 through 9 are bystander simulations. All correlations were conducted with the full sample ($n = 264$).

* $p < .05$

** $p < .01$

Table 5

Correlations, means, and standard deviations of study variables at baseline assessment

| <i>Variable</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>M</i> <i>(SD)</i> |
|------------------------------------|----------|----------|----------|----------|-------------------------|
| 1. VR peer pressure resistance | -.28** | -.34** | -.15* | -.08 | 7.85 (2.75) |
| 2. Self-report peer pressure | -- | .35** | .21** | .20** | 8.78 (5.70) |
| 3. Antisocial behaviors | | -- | .30** | .15* | 0.57 (0.98) |
| 4. Dating violence perpetration | | | -- | .25** | 5.12 (7.20) |
| 5. Depressive symptoms | | | | -- | 13.20 (9.60) |

Note. ($n = 264$). For all variables, higher scores indicated greater levels of the variable. VR peer pressure resistance scores range from 0-12; self-report peer pressure range from 0-33; depressive symptoms range from 0-60; antisocial behaviors range from 0-9; dating violence perpetration scores range from 0-100.

* $p < .05$

** $p < .01$

REFERENCES

- Albert, D., & Steinberg, L. (2011). Judgment and decision making in adolescence. *Journal of Research on Adolescence, 21*, 211-224.
- Allen, J. P., Chango, J., Szwedo, D., Schad, M., & Marston, E. (2012). Predictors of susceptibility to peer influence regarding substance use in adolescence. *Child Development, 83*, 337-350.
- Allen, J. P., Porter, M. R., & McFarland, F. C. (2006). Leaders and followers in adolescent close friendships: Susceptibility to peer influence as a predictor of risky behavior, friendship instability, and depression. *Development and Psychopathology, 18*, 155-172.
- Ary, D. V., Duncan, T. E., Duncan, S. C., & Hops, H. (1999). Adolescent problem behavior: The influence of parents and peers. *Behaviour Research and Therapy, 37*, 217-230.
- Bámaca, M. Y., & Umana-Taylor, A. J. (2006). Testing a model of resistance to peer pressure among Mexican-origin adolescents. *Journal of Youth and Adolescence, 35*, 626-640.
- Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior?. *Perspectives on Psychological Science, 2*, 396-403.
- Berndt, T. J. (1979). Developmental changes in conformity to peers and parents. *Developmental Psychology, 15*, 608-616.
- Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13*, 391-424.
- Bombardi, D., Mast, M. S., Canadas, E., & Bachmann, M. (2015). Studying social interactions through immersive virtual environment technology: Virtues, pitfalls, and future challenges. *Frontiers in Psychology, 6*(869), 1-11.

- Capaldi, D. M., Dishion, T. J., Stoolmiller, M., & Yoerger, K. (2001). Aggression toward female partners by at-risk young men: The contribution of male adolescent friendships. *Developmental Psychology, 37*, 61-73.
- Claesen, D. R., Brown, B. B., & Eicher, S. A. (1986). Perceptions of peer pressure, peer conformity dispositions, and self-reported behavior among adolescents. *Developmental Psychology, 22*, 521-530.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment, 7*, 309-319.
- Crockett, L. J., Raffaelli, M., & Shen, Y. L. (2006). Linking self-regulation and risk proneness to risky sexual behavior: Pathways through peer pressure and early substance use. *Journal of Research on Adolescence, 16*, 503-525.
- DeKeseredy, W. S., & Schwartz, M. D. (Eds.). (2013). *Male peer support and violence against women: The history and verification of a theory*. Northeastern University Press.
- Dishion, T. J., Spracklen, K. M., Andrews, D. W., & Patterson, G. R. (1996). Deviancy training in male adolescent friendships. *Behavior Therapy, 27*, 373-390.
- Erikson, E. (1968). *Youth: Identity and crisis*. New York, NY: WW.
- Erickson, K. G., Crosnoe, R., & Dornbusch, S. M. (2000). A social process model of adolescent deviance: Combining social control and differential association perspectives. *Journal of Youth and Adolescence, 29*, 395-425.
- Fergusson, D. M., Wanner, B., Vitaro, F., Horwood, L. J., & Swain-Campbell, N. (2003). Deviant peer affiliations and depression: confounding or causation?. *Journal of Abnormal Child Psychology, 31*(6), 605-618.

- Fletcher, A. C., Darling, N. E., Steinberg, L., & Dornbusch, S. (1995). The company they keep: Relation of adolescents' adjustment and behavior to their friends' perceptions of authoritative parenting in the social network. *Developmental Psychology, 31*, 300-310.
- Freeman, D., Pugh, K., Antley, A., Slater, M., Bebbington, P., Gittins, M., ... & Garety, P. (2008). Virtual reality study of paranoid thinking in the general population. *The British Journal of Psychiatry, 192*, 258-263.
- Gillath, O., McCall, C., Shaver, P. R., & Blascovich, J. (2008). What can virtual reality teach us about prosocial tendencies in real and virtual environments?. *Media Psychology, 11*, 259-282.
- Graziano, W. G., Jensen-Campbell, L. A., & Hair, E. C. (1996). Perceiving interpersonal conflict and reacting to it: The case for agreeableness. *Journal of Personality and Social Psychology, 70*, 820-835.
- Hamby, S., Grych, J., & Banyard, V. L. (2013). Life paths research measurement packet. *Sewanee, TN: Life Paths Research Program.*
- Haynes, S. N., & Lench, H. C. (2003). Incremental validity of new clinical assessment measures. *Psychological Assessment, 15*, 456-466.
- Henry, D. B., Tolan, P. H., & Gorman-Smith, D. (2001). Longitudinal family and peer group effects on violence and nonviolent delinquency. *Journal of Clinical Child Psychology, 30*, 172-186.
- Holmes, S. Y. (2011). Mitigating the Hawthorne Effect using computer simulation. In L. Annetta and S. C. Bronack, (eds.), *Serious Educational Game Assessment: Practical Methods and Models for Educational Games, Simulations and Virtual Worlds*, 175–187. Sense Publishers.

- Hoyt, C. L., Blascovich, J., & Swinth, K. R. (2003). Social inhibition in immersive virtual environments. *Presence: Teleoperators and Virtual Environments, 12*, 183-195.
- Jouriles, E. N., Kleinsasser, A., Rosenfield, D., & McDonald, R. (2016). Measuring bystander behavior to prevent sexual violence: Moving beyond self reports. *Psychology of Violence, 6*, 73-81.
- Jouriles, E. N., McDonald, R., Garrido, E., Rosenfield, D., & Brown, A. S. (2005). Assessing aggression in adolescent romantic relationships: Can we do it better?. *Psychological Assessment, 17*, 469-475.
- Jouriles, E. N., Rosenfield, D., Yule, K., Sargent, K. S., & McDonald, R. (2016). Predicting high-school students' bystander behavior in simulated dating violence situations. *Journal of Adolescent Health, 58*, 345-351.
- Jouriles, E. N., Rowe, L. S., McDonald, R., Platt, C. G., & Gomez, G. S. (2011). Assessing women's responses to sexual threat: Validity of a virtual role-play procedure. *Behavior Therapy, 42*, 475-484.
- Kazdin, A. E. (2003). *Research design in clinical psychology*. (4th ed). Boston, MA: Allyn & Bacon.
- Klimstra, T. A., Hale III, W. W., Raaijmakers, Q. A., Branje, S. J., & Meeus, W. H. (2009). Maturation of personality in adolescence. *Journal of Personality and Social Psychology, 96*, 898-912.
- Kulis, S., Marsiglia, F. F., Castillo, J., Becerra, D., & Nieri, T. (2008). Drug resistance strategies and substance use among adolescents in Monterrey, Mexico. *The Journal of Primary Prevention, 29*, 167-192.

- Mason, M. J., Mennis, J., Linker, J., Bares, C., & Zaharakis, N. (2014). Peer attitudes effects on adolescent substance use: the moderating role of race and gender. *Prevention Science, 15*, 56-64.
- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 100*, 674-701.
- Monahan, K. C., Steinberg, L., & Cauffman, E. (2009). Affiliation with antisocial peers, susceptibility to peer influence, and antisocial behavior during the transition to adulthood. *Developmental Psychology, 45*, 1520-1530.
- Monahan, K. C., Steinberg, L., Cauffman, E., & Mulvey, E. P. (2009). Trajectories of antisocial behavior and psychosocial maturity from adolescence to young adulthood. *Developmental Psychology, 45*, 1654-1668.
- Mori, M. (1970). The uncanny valley. *Energy, 7*, 33-35.
- Norris, J., Nurius, P. S., & Dimeff, L. A. (1996). Through her eyes: Factors affecting women's perception of and resistance to acquaintance sexual aggression threat. *Psychology of Women Quarterly, 20*, 123-145.
- Paschall, M. J., Fishbein, D. H., Hubal, R. C., & Eldreth, D. (2005). Psychometric properties of virtual reality vignette performance measures: a novel approach for assessing adolescents' social competency skills. *Health Education Research, 20*, 61-70.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385-401.
- Rubin, D. C., & Berntsen, D. (2003). Life scripts help to maintain autobiographical memories of highly positive, but not highly negative, events. *Memory & Cognition, 31*, 1-14.

- Santor, D. A., Messervey, D., & Kusumakar, V. (2000). Measuring peer pressure, popularity, and conformity in adolescent boys and girls: Predicting school performance, sexual attitudes, and substance abuse. *Journal of Youth and Adolescence, 29*, 163-182.
- Sargent, K. S., Krauss, A., Jouriles, E. N., & McDonald, R. (2016). Cyber victimization, psychological intimate partner violence, and problematic mental health outcomes among first-year college students. *Cyberpsychology, Behavior, and Social Networking, 19*, 545-550.
- Schad, M. M., Szwedo, D. E., Antonishak, J., Hare, A., & Allen, J. P. (2008). The broader context of relational aggression in adolescent romantic relationships: Predictions from peer pressure and links to psychosocial functioning. *Journal of Youth and Adolescence, 37*, 346-358.
- Sechrest, L. (1963). Incremental validity: A recommendation. *Educational and Psychological Measurement, 23*, 153-158.
- Sim, T. N., & Koh, F. S. (2003). A domain conceptualization of adolescent susceptibility to peer pressure. *Journal of Research on Adolescence, 13*, 57-80.
- Steinberg, L., & Monahan, K. C. (2007). Age differences in resistance to peer influence. *Developmental Psychology, 43*, 1531-1543.
- Steinberg, L., & Silverberg, S. B. (1986). The vicissitudes of autonomy in early adolescence. *Child Development, 57*, 841-851.
- Strodtbeck, F. L. (1951). Husband-wife interaction over revealed differences. *American Sociological Review, 16*, 468-473.
- Urbina, S. (2014). *Essentials of Psychological Testing*. (2nd ed). A. S. Kaufman & N. L. Kaufman (Eds.). Hoboken, NJ: John Wiley & Sons, Inc..

Watson, D. (2004). Stability versus change, dependability versus error: Issues in the assessment of personality over time. *Journal of Research in Personality, 38*, 319-350.

Wolfe, D. A., Crooks, C. V., Chiodo, D., Hughes, R., & Ellis, W. (2012). Observations of adolescent peer resistance skills following a classroom-based healthy relationship program: A post-intervention comparison. *Prevention Science, 13*, 196-205.

Wolfe, D. A., Scott, K., Reitzel-Jaffe, D., Wekerle, C., Grasley, C., & Straatman, A. L. (2001). Development and validation of the conflict in adolescent dating relationships inventory. *Psychological Assessment, 13*, 277-293.

Wolfe, D. A., Wekerle, C., Scott, K., Straatman, A. L., Grasley, C., & Reitzel-Jaffe, D. (2003). Dating violence prevention with at-risk youth: a controlled outcome evaluation. *Journal of Consulting and Clinical Psychology, 71*, 279-291.

Wright, A. J., Nichols, T. R., Graber, J. A., Brooks-Gunn, J., & Botvin, G. J. (2004). It's not what you say, it's how many different ways you can say it: Links between divergent peer resistance skills and delinquency a year later. *Journal of Adolescent Health, 35*, 380-391.

Zimmer-Gembeck, M. J., Waters, A. M., & Kindermann, T. (2010). A social relations analysis of liking for and by peers: Associations with gender, depression, peer perception, and worry. *Journal of Adolescence, 33*, 69-81.