

The Pennsylvania State University  
The Graduate School  
College of Health and Human Development

**CHANGE IN COLLEGE STUDENTS' PERCEIVED PARENTAL PERMISSIBILITY OF  
ALCOHOL USE AND ITS RELATION TO COLLEGE DRINKING OUTCOMES**

A Thesis in  
Human Development and Family Studies  
by  
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Submitted in Partial Fulfillment  
of the Requirements  
for the Degree of  
Master of Science

May 2016

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## ABSTRACT

Perceived parental permissibility of alcohol use has been consistently linked with college drinking outcomes. That is, students who report that their parents deem it appropriate for them to consume more drinks on a given night report consuming a greater number of drinks, engaging in binge drinking more frequently, and experiencing a greater number of negative consequences of alcohol use. However, few studies have assessed permissibility as an outcome, measured permissibility on more than one occasion, or focused on the later college years. Data from 687 college students in a large university in the Northeast United States were used to assess whether perceived parental permissibility of alcohol use changed across college and whether permissibility predicted binge drinking frequency, peak drinking, and negative consequences of alcohol use. Results showed permissibility increased across college, and that the rate of change was faster for males than females. Generalized linear mixed models showed that between-person differences in mean permissibility were linked with all three drinking outcomes across college, such that individuals who reported higher mean permissibility also reported more frequent binge drinking occasions, higher levels of peak drinking, and more negative consequences of alcohol use. However, within-person differences in permissibility across years of college were only associated with peak drinking, such that in years when students reported higher permissibility they also reported higher peak drinking levels. The greater prevalence of between-person findings suggested the need for an approach focused on different profiles or groups of permissibility change across college. Four clusters of differential patterns of permissibility change were then identified using k-means cluster analysis: a *low permissibility* cluster, whose permissibility was consistently low; an *age 21 permissibility* cluster, whose permissibility rose

sharply upon nearing the minimum legal drinking age of 21 years of age, a *college permissibility* cluster, whose permissibility rose sharply upon matriculating to college, and a *high permissibility* cluster, whose permissibility was consistently high. Membership in these clusters predicted binge drinking frequency and peak drinking, such that students in the *low permissibility* cluster reported fewer binge drinking occasions and fewer drinks consumed on their heaviest drinking occasions in comparison to each of the other three clusters. The results suggest that aspects of the parent-child relationship are linked with the risk behaviors their late adolescent children engage in during college. Intervention implications include the potential value of continuing intervention programs past the first year of college as both drinking behaviors and perceived parental permissibility of alcohol use increased across the first four years of college.

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## **ACKNOWLEDGEMENTS**

Data from this master's thesis came from The University Life Study, which was funded by NIAAA R01-AA019606 to J. Maggs.

## INTRODUCTION

Over the last few decades, rates of binge drinking and negative consequences of alcohol use among college students have remained high despite some fluctuations (Hingson, Zha, & Weitzman, 2009; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2013). As a result, there is an ongoing public debate about how parents and society at large should address underage drinking and binge drinking in college (Asimov, 2008; Cloud, 2008; Foley, 2004; Peele, 2007; Steinberg, 2015). Some journalists, academics, and college presidents in the United States advocate for more leniency by suggesting that the minimum legal drinking age of 21 years be lowered (Amethyst Initiative, 2008; Steinberg, 2015) or that parents should allow their late adolescent children to drink at home to teach them how to drink responsibly (Asimov, 2008; Cloud, 2008; Foley, 2004; Peele, 2007). Conversely, other social and public health scientists argue that the minimum legal drinking age is effective at reducing alcohol consumption and traffic crashes (Wagenaar & Toomey, 2002), and that parents should not allow their late adolescent children to drink in the home or condone alcohol use outside of the home (Abar, Abar, & Turrisi, 2009; Livingston, Testa, Hoffman, & Windle, 2010; Walls, Fairlie, & Wood, 2009). This thesis aims to extend the literature on the association of perceived parental permissibility of alcohol use with drinking behaviors and consequences among college students, and thus to inform this debate.

Despite earlier beliefs that parents played a minimal role in the behaviors and development of late adolescents after the end of high school (Borsari & Carey, 2001; Ham & Hope, 2003; Windle, 2000), more recent research suggests that parents remain important influences in the lives of their children as they begin transitioning into adulthood (Arnett, 2007a; Turrisi, Wiersma, & Hughes, 2000; Wood, Read, Mitchell, & Brand, 2004). More specifically, a

host of parenting characteristics and behaviors including parent-teen communication, parental modeling of alcohol use, and parental monitoring are associated with college drinking (Abar et al., 2009; Small, Morgan, Abar, & Maggs, 2011; Turrisi & Ray, 2010). Perceived parental permissibility of alcohol use, or students' perceptions of the extent to which their parents think it is acceptable for them to drink, is one such aspect of parenting that has been shown to be associated with the number of drinks college students tend to consume, the likelihood that they engage in binge drinking, and the negative consequences of alcohol use that they experience (Abar et al., 2009; Abar, Morgan, Small, & Maggs, 2012; Walls et al., 2009).

The following sections begin with an overview of heavy drinking among college students as well as an overview of the process of transitioning to adulthood. Next, Baumrind's (1991) theory of parenting styles is presented, along with an argument for its relevance to parenting through college and the transition to adulthood. Finally, empirical support for the relation between perceived parental permissibility of alcohol use and college drinking is reviewed. Throughout, this thesis distinguishes between adolescents, who will be considered those in secondary school, and college students, who will be considered those who are enrolled at a four-year college or university and are under the age of 25.

### *Heavy Drinking in College*

Heavy drinking – historically defined as consuming 4+/5+ drinks on an occasion for women/men (Hingson et al., 2009; Wechsler, Dowdall, Davenport, & Rimm, 1995) – is of great concern to both parents of college students and to college administrators due to its high prevalence and serious negative consequences (Ham & Hope, 2003; Perkins, 2002; Wechsler & Nelson, 2006). Even though during high school college-bound students tend to drink less than their peers who are not college-bound, after matriculation, college students tend to drink more

than their non-college peers (Johnston et al., 2013; Schulenberg et al., 2001). Nationally representative studies have shown that over 35% of U.S. college students report having engaged in heavy drinking in the past two weeks (Johnston et al., 2013; Wechsler et al., 2002) or in the past 30 days (Hingson et al., 2009). Perhaps the most important negative consequences of heavy drinking among college students are alcohol-related injuries and deaths. There were an estimated 1,825 alcohol-related college student deaths in 2005, with 1,357 of these resulting from automobile accidents and 468 from other unintentional injuries, such as falling or poisoning (Hingson et al., 2009). Further, in 2001, there were an estimated 599,000 college students who were injured as a result of drinking, 646,000 students who were physically assaulted by another student who had been drinking, and 97,000 students who were sexually assaulted by another student under the influence of alcohol (Hingson et al., 2009).

In addition to having a negative impact on students' physical health, heavy drinking is also associated with negative consequences in students' academic performance, social relationships, and sexual behaviors (Engs, Diebold, & Hanson, 1996; Perkins, 2002; Wechsler & Nelson, 2008). Heavy drinkers tend to achieve less academically, as evidenced by missing class more often, falling behind on course work, and having lower grade point averages (Engs et al., 1996; Presley, Meilman, Cashin, & Lyerla, 1996; Wechsler et al., 2002). Alcohol use is also linked to risky sexual behaviors, including unplanned sexual activity and sex without using protection, in both between-person (Wechsler et al., 2000) and within-person (Patrick & Maggs, 2009) designs. Lastly, heavy drinkers are more likely to get arrested or vandalize property (Wechsler et al., 2002).

Not only does heavy drinking have negative consequences for the individual consuming the alcohol, but it also negatively affects other students and people in the surrounding

environment (Perkins, 2002; Wechsler & Nelson, 2008). For example, binge drinking rates on college campuses have been associated with such “secondhand” effects as disruptions to the sleep and/or studying of other students, property damage, and verbal violence (Wechsler et al., 1995). An estimated 29% of college students reported having been verbally assaulted by another student under the influence of alcohol (Wechsler et al., 2002). Thus, heavy drinking among college students remains an important ongoing problem facing parents, administrators, policymakers, and students, as it is quite prevalent on college campuses and is associated with an array of negative consequences to the students consuming alcohol as well as to their peers.

### *The Transition to Adulthood*

Over the last half-century, the process of transitioning from adolescence to adulthood has begun to look increasingly different as a result of changing economic and social conditions. The economic shift towards a post-industrial economy based on information and technology has led a greater percentage of people than ever before to pursue post-secondary education (Côté & Bynner, 2008; Spain & Bianchi, 1996). In 2012, approximately 66% of recent high school graduates were enrolled in college in October of that year, and roughly 60% of recent high school graduates were attending four-year institutions (U.S. Bureau of Labor Statistics, 2013). Many of those in higher education postpone marriage and childbirth, two traditional markers of adulthood, until after they have completed their degrees and found stable employment (Arnett, 2000; Settersten & Ray, 2010). The changing economic climate has also resulted in lower wages and statuses for many young working individuals, making it more difficult to attain financial independence and perhaps discouraging them from starting families of their own until their economic situation improves (Arnett, 2000; Côté & Bynner, 2008). In addition, social changes, such as the invention of the birth control pill and the second wave of the feminist movement,

have led to changes in the markers of adulthood as well as their sequencing (Amato et al., 2008; Arnett, 2000; Settersten & Ray, 2010). For example, even though marriage and parenthood were viewed as markers of adulthood that most often occurred in sequence in the mid-1950s, young people in the early 21<sup>st</sup> century tend to view these markers as options as opposed to requirements and parenthood often precedes marriage for young people today (Settersten & Ray, 2010). Further, other markers of adulthood, such as finishing school, obtaining full-time employment, and establishing an independent household, are viewed as less relevant as indicators of adulthood than they were in the middle of the 20<sup>th</sup> century (Côté & Bynner, 2008; Settersten & Ray, 2010). These markers of adulthood are also more likely to occur in an array of various sequences due to a diminishing of social norms and a weakening of the effectiveness of social institutions (i.e., community colleges, service learning programs, and the military) that once helped young people effectively transition to adulthood (Côté & Bynner, 2008; Settersten & Ray, 2010).

As a result of changing economic and social climates, a new phase of development known as emerging adulthood (Arnett, 2000; Arnett, 2007b), or alternatively, the transition to adulthood (Amato et al., 2008; Côté & Bynner, 2008; Settersten & Ray, 2010), has been described. This transitory phase typically lasts from the end of secondary school (~18 years of age) until the mid- to late-twenties and is characterized by instability, heterogeneity, and identity exploration (Arnett, 2000; Arnett, 2007b; Settersten & Ray, 2010). Additionally, these are the years when many types of risk behaviors, such as substance use and abuse, typically peak (Johnston et al., 2013; Substance Abuse and Mental Health Services Administration [SAMHSA], 2003).

As the lengthening process of transitioning into an adult has led some scholars to call this period of the lifespan a “prolonged adolescence” (Blatterer, 2007; Erikson, 1968; Furstenberg,

2000), there may be reason to believe that the role of parents during these years is becoming increasingly important, especially for college students. For example, college students often seek help and emotional support from their parents when under stress, and overall, college students appear to value the support and assistance their parents provide (Chen & Kat, 2009; Kenny, 1987; Trice, 2002). Mobile phones and the internet have also made parent-student communication cheaper, easier, and more immediate, and many college students, especially those in their first year, communicate with their parents every day (Abar, Abar, Turrisi, & Belden, 2013; Chen & Kat, 2009; Small et al., 2009). In addition to warmth and emotional support, many parents provide substantial financial support to their children during college and in the subsequent years as the road to financial independence is now much longer than it once was (Arnett, 1994; Côté & Bynner, 2008). Further, aspects of the parent-child relationship during college have been shown to be associated with the extent that college students engage in risk behaviors, such as alcohol use. For example, lower levels of perceived parental permissibility of alcohol use (Abar et al., 2009; Varvil-Weld et al., 2014; Walls et al., 2009) and greater amounts of parent-student communication (Small et al., 2011; Turrisi et al., 2000) have been associated with lower levels of college drinking. Therefore, as the transition to adulthood continues to lengthen, parents are playing more pronounced roles in the lives of their college student children.

Although the relation between aspects of parenting and college drinking continues to become more clearly established, it is less clear whether parenting behaviors and characteristics are related to alcohol use change across college. For example, although perceived parental permissibility of alcohol use is positively associated with college drinking and its negative consequences, the majority of the work demonstrating this relation focuses on the transition to

university and the first year of college (Abar et al., 2009; Wood et al., 2004). Further, most studies that assess the link between perceived parental permissibility of alcohol use and college drinking only measure permissibility on a single occasion (Abar et al., 2012; Walls et al., 2009). Therefore, it is still unclear whether there is change in the extent to which parents condone college drinking across years of college. Since the transition to adulthood is typically a period in which autonomy and independence increase (Arnett, 2000), parents may become more permissive of alcohol use across college as students approach and reach the minimum legal drinking age of 21 years. However, more research is needed to determine if perceived parental permissibility of alcohol use and other aspects of parenting are related to college drinking change across the college years.

#### *Applying Baumrind's Theory of Parenting Styles to College Drinking*

Baumrind's (1991) theory of parenting styles proposes that the ideal style of parenting, known as authoritative parenting, is one in which parents express high levels of warmth to children (often termed responsiveness) and set high expectations and clear boundaries (often called demandingness). Authoritative parenting is theorized to promote healthy development by building psychosocial competencies and resilience and by helping strengthen the parent-child relationship (Baumrind, 1987; Bell, Forthun, & Sun, 2000). Using social control theory, sociologists have further noted that poor parent-child relationships and adolescents over relying on their peers for social support are both risk factors for antisocial behavior (Hawkins, Catalano, & Miller, 1992; Hirschi, 1969). The literature on adolescent risk behaviors, meaning those that occur during secondary school (approximately ages 11-18), provides support for the application of Baumrind's theory to adolescence. For example, an authoritative parenting style is protective against alcohol use in adolescence (Koning, van den Eijnden, Verdurmen, Engels, & Vollebergh,

2012; Laghi, Lonigro, Baiocco, & Baumgartner, 2012; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994). More specifically, parental monitoring is associated with less alcohol use in adolescence (Barnes & Farrell, 1992; Clark, Donnellan, Robins, & Conger, 2015; McCann, Higgins, Perra, McCartan, & McLaughlin, 2013) and a reduced likelihood of transitioning to heavy drinking (Reifman, Barnes, Dintcheff, Farrell, & Uhteg, 1998).

An important caveat is that although parental monitoring is often defined conceptually as a set of parental behaviors attempting to discern where children are, what they are doing, and who they are with (Dishion & McMahon, 1998), Stattin and Kerr (2000) note that measures of parental monitoring typically ask about parental knowledge of children's activities as opposed to behaviors aimed at obtaining this information. Stattin and Kerr (2000) also demonstrate that knowledge of children's activities is more often a result of child disclosure than it is of parenting behaviors such as solicitation of information or parental control. Additionally, child disclosure, or the lack thereof, is the source of information that explains the most variance in adolescent delinquency (Stattin & Kerr, 2000). Therefore, when discussing the link between parental monitoring and drinking behaviors in adolescents, it is important to differentiate between actual parental monitoring and parental knowledge. In both a descriptive and prescriptive sense, it seems most fitting to conclude that there is an inverse relationship between parental knowledge of adolescents' activities and adolescents' drinking behaviors.

Even though less empirical research exists on the role parenting styles play in the risk behaviors of college students, some researchers have suggested that the application of Baumrind's (1991) theory can be extended to the transition to adulthood, and more specifically, to drinking among traditional-aged college students (Abar & Turrisi, 2008; Walls et al., 2009; Wood et al., 2004). For example, parenting behaviors, such as parental disapproval of alcohol

use, seem to align with Baumrind's dimension of demandingness in that disapproval may communicate clear expectations for behavior (Walls et al., 2009). Such parenting behaviors have been shown to be negatively associated with college drinking (Abar & Turrisi, 2008; White et al., 2006; Wood et al., 2004). Further, characteristics of parents and of parent-student relationships that appear to be consistent with Baumrind's dimension of responsiveness, such as parent-student communication and parental bonds, have also been shown to be negatively linked to college drinking behaviors (Small et al., 2011; Patock-Peckham & Morgan-Lopez, 2007; Turrisi et al., 2000). More broadly, several studies of college drinking have found associations between Baumrind's (1991) parenting styles and alcohol use and correlates of alcohol use among college students (Mallett et al., 2011; Patock-Peckham, Cheong, Balhorn, & Nagoshi, 2006; Patock-Peckham & Morgan-Lopez, 2006, 2007). For example, Mallett et al. (2011) found that students whose parents utilized an authoritarian parenting style reported higher levels of peak drinking in their first year of college than students whose parents utilized authoritative, permissive, or indifferent parenting styles (Mallett et al., 2011). Therefore, there does appear to be some evidence that Baumrind's (1991) theory of parenting styles can be applied to college student risk behaviors, or more specifically, to alcohol use among traditional-aged college students.

#### *Parent-Student Communication and College Drinking*

Direct parent-student communication is negatively associated with college drinking and its negative consequences in college samples (e.g., Turrisi, Wiersma, & Hughes, 2000), including the present dataset (e.g., Abar, Morgan, Small, & Maggs, 2012; Small et al., 2011). Specifically, college students who report talking with their mothers about alcohol more frequently tend to have less positive beliefs about drinking, and in turn are less likely to engage

in heavy episodic drinking (Turrise et al., 2000). Previous analyses of the current dataset showed that on weekend days that first-year students spent 30 or more minutes communicating with their parents, they consumed fewer alcoholic drinks, were less likely to engage in heavy episodic drinking, and experienced fewer alcohol-related negative consequences, compared to weekend days they spent less than 30 minutes communicating with their parents (Small et al., 2011).

Parents also communicate with their children through such indirect forms as the extent to which they approve of or allow their children to consume alcohol, often referred to as parental permissibility. An ongoing public debate concerns how parents should approach underage drinking and heavy drinking among college students. Some journalists have argued that parents should allow their children to drink at home in order to demystify alcohol as a “forbidden fruit” and to teach them how to drink responsibly (Asimov, 2008; Cloud, 2008). However, empirically, college students’ perceived parental permissibility of alcohol use is associated with *greater* drinking and alcohol-related negative consequences (Abar et al., 2009; Abar et al., 2012; Livingston et al. 2010, Walls et al., 2009; Wood et al., 2004). These findings have led some researchers to conclude that a zero-tolerance approach may be the best strategy for parents (e.g., Abar et al., 2012), especially as late adolescents transition to the university setting. Perceived parental permissibility of alcohol use in adolescents’ senior year of high school is predictive of greater drinking behaviors in students’ first year of college, such as the number of drinks students consume, the likelihood of engaging in heavy episodic drinking, and students’ peak drinking in the last 30 days (Abar et al., 2009; Walls et al., 2009; Wood et al., 2004).

Although there are multiple studies showing positive associations of perceived parental permissibility of alcohol use with drinking behaviors and consequences among college students, there are several gaps in this empirical literature. First, to the author’s knowledge, there are no

studies that examine college students' perceived parental permissibility of alcohol use as an *outcome* variable. Including permissibility as an *outcome* variable would allow researchers to explore whether other variables, such as gender, predict different levels of permissibility, which would increase understanding of how aspects of the parent-child relationship are associated with drinking behaviors during college. Second, since most of the existing studies have measured perceived parental permissibility only on a single occasion, typically in students' senior year of high school or their first year of college, there is a lack of longitudinal research on *change* in college students' perceived parental permissibility. It is important to examine this variable longitudinally as there is substantial instability in behaviors, relationships, and adjustment associated with transitioning to university and because this construct may change developmentally across the later college years as students approach and reach the minimum legal drinking age of 21 years of age. Third, there has not been a focus on *gender differences* in perceived parental permissibility of alcohol use among college students, so it is unknown whether male and female students differ in levels of perceived parental permissibility at the start of college or if there are gender differences in the change trajectories of permissibility across college.

Gender is of interest due to known gender differences in similar constructs. First, certain aspects of parent-college student relationships (e.g., amount of parent-student communication) differ by gender. For example, female college students communicate with their parents more frequently and across more modes of communication than do male college students (Abar, Abar, Turrisi, & Belden, 2013; Small et al., 2011). Second, there are gender differences in risk-taking and attitudes towards risk behaviors, with males being more likely to take risks and being more permissive of risk-taking behaviors (Byrnes, Miller, & Schafer, 1999; Oliver & Hyde, 1993;

Turner & McClure, 2003). Lastly, although gender differences in college drinking are narrowing (Ham & Hope, 2003; Johnston et al., 2013), male college students have traditionally reported drinking more frequently and in greater amounts (O'Malley & Johnston, 2002; Read et al., 2002; Wechsler et al., 1995), as well as experiencing more negative consequences of alcohol use (Read et al., 2002), than female college students. Further, females have slower rates of alcohol metabolism than males meaning that females can obtain levels of blood alcohol concentration equal to males after drinking less alcohol (Perkins et al., 2002). Therefore, even if gender differences in college drinking are now minimal, it seems reasonable that parents might set alcohol use limits differentially depending on their college student child's gender.

Fourth, there is a lack of studies examining whether the perceived parental permissibility of alcohol use and college drinking *relation changes over time* as most studies that have assessed this association have been cross-sectional and have focused on the early college years. Given historically lengthening transitions to adulthood, increasing years to completion of degrees, and growing financial dependence on parents (Côté & Bynner, 2008; Settersten & Ray, 2010; Shanahan, 2000), as well as high prevalence of heavy drinking across all years of college (Hingson et al., 2009; Wechsler et al., 2002), the later college years may also be important for parental influence. That is, parents may be able to help limit their children's drinking behaviors and consequences by how permissive they are of college student drinking.

#### *Present Study*

The present study seeks to determine the extent to which perceived parental permissibility of alcohol use predicts binge drinking, peak drinking, and negative alcohol-related consequences in a sample of undergraduate students followed across college. Specifically, the study aims to answer the following research questions: (1a) Does college students' perceived

parental permissibility of alcohol use change as a function of time from students' first year of high school through their third year of college? (1b) Are there gender differences in the initial status and/or rate of change of college students' perceived parental permissibility of alcohol use? (2a) Is college students' perceived parental permissibility of alcohol use associated with heavy drinking, peak drinking, and negative alcohol-related consequences? (2b) Does the association of perceived parental permissibility of alcohol use with college students' alcohol use and consequences change across college and differ by gender? (3) Are there distinct latent groups of students with different patterns of change in their perceived parental permissibility of alcohol use responses? (4) Is membership in these latent permissibility groups differentially associated with binge drinking, peak drinking, and negative consequences of alcohol use across college?

## METHODS

### *Participants*

Data used in the current study came from the University Life Study (ULS), a longitudinal study looking at the daily lives and risk behaviors of college students in a Northeast US state university (Abar et al., 2012; Greene & Maggs, 2014; Howard, Patrick, & Maggs, 2014; Patrick, Maggs, & Lefkowitz, 2015). The ULS used a longitudinal measurement-burst design in which participants completed a longer, web-based survey followed by 14 consecutive daily web-based surveys in each of seven semesters. The ULS was granted approval from the university's Institutional Review Board (IRB) and was protected by a federal Certificate of Confidentiality from the National Institutes of Health. In the first wave, eligible participants were first-year, first-time, full-time students who were under 21 years of age, were United States citizens or permanent residents, and lived within 25 miles of the university's main campus. Participants were recruited using a stratified, random sampling procedure aiming to recruit similar numbers of males and females in each of the four largest racial/ethnic groups in the US. The resulting sample was diverse in regards to race and ethnicity but was not representative of the university's overall student body, which includes many more students who are White.

Before the start of their first semester (Fall 2007), students who were selected to participate were mailed an informational letter describing the study as well as a pen and a \$5 cash pre-incentive. Five days later, an email was sent to students' university email addresses inviting them to participate in an initial web-based, baseline survey. Upon completion of the baseline survey, participants were sent another email with a link inviting them to begin 14 consecutive brief web-based daily surveys. Students were given four weeks to complete the baseline surveys and start completing the daily surveys. Reminder emails were sent to those who

did not respond to the initial email. This process of completing a longer survey followed by 14 consecutive daily surveys was repeated twice per year (fall and spring) through the fall of the students' seventh semester (Fall 2010). Students were required to fill out an online consent form prior to beginning the baseline survey in their first semester. Participants received monetary incentives for participating in the study each semester. In the first two semesters, students received \$20 for completing the longer web survey, \$3 for completing each daily survey, a \$4 bonus for completing 13 of the 14 daily surveys, and an \$8 bonus if they completed all 14 of the daily surveys. Thus, students were able to earn a maximum of \$70 in each of their first two semesters for completing all of the surveys that semester. The monetary incentives given to students for completing the longer survey at the beginning of each semester increased to \$30 for semesters 3 and 4 and to \$40 for semesters 5, 6, and 7. Throughout the duration of the study, students were given \$3 for completion of each daily survey. The bonus for completing 13 of the 14 daily surveys increased from \$4 in semesters 1 and 2, to \$7 in semesters 3 and 4, and to \$9 in semesters 5, 6, and 7. Similarly, the bonuses given to students for completing all of the daily surveys increased from \$8 in semesters 1 and 2, to \$13 in semesters 3 and 4, and to \$18 in semesters 5, 6, and 7. The maximum amount of money students were able to earn in the seventh semester was \$100.

Data collected in the first through seventh semesters were used in the present analyses. The initial sample included 744 participants. The mean age of participants in the fall of their first year of college was 18.45 years ( $SD = 0.43$  years), and 50.8 % of the participants were female. The sample was racially and ethnically diverse as 25.1 % of the participants were Hispanic or Latino American, 27.4% were European American Non-Hispanic or Latino (NHL),

23.3% were Asian American NHL, 15.7% were African American NHL, and 8.5% were multiracial NHL (see Table 1).

### *Measures*

*Perceived Parental Permissibility of Alcohol Use.* In the spring of their second year of college, students were asked about the amount of alcohol they perceived that their parents would deem as an upper limit for them to consume on a given occasion (Abar et al., 2009; Walls et al., 2009). Single items referred to three time periods: The current year, the first year of college, and the last year of high school. For example, students were asked “During your sophomore (second) year of college, how many drinks would your parents consider the maximum number for you to consume on any given occasion?” Students were also asked this question in the spring of their third year in reference to the current year. Responses to these items were “no amount would be ok” (0), “1 drink” (1), “2 drinks” (2), “3 drinks” (3), “4 drinks” (4), “5 drinks” (5), “6-12 drinks” (6), and “there was no upper limit” (7). Of the four perceived parental permissibility of alcohol use items, two were reported retrospectively and two were reported concurrently (see Table 2).

*Alcohol Use.* Students’ alcohol use was assessed during the fall of their first four years of college using two items that asked about the maximum number of drinks consumed in a given night and the frequency of binge drinking, which was defined as 4+/5+ drinks for women/men in a two-hour period (NIAAA, 2004). These alcohol use items came from the NIAAA’s Task Force on College Drinking (2002), which recommends asking about alcohol use over a 12-month time frame. The items in the current study were modified to assess drinking behaviors over the last 30 days. One drink was defined on the surveys as one 12-ounce can or bottle of beer, one 5-

ounce glass of wine, or one drink containing one shot of liquor (International Center for Alcohol Policies, 1998).

*30-day binge drinking frequency* was measured in the fall semester of students' first four years of college by asking students "During the last 30 days (one month), how often did you have 4/5 or more drinks containing any kind of alcohol within a two-hour period?" Male participants were asked to indicate how often they had consumed five or more drinks in a two-hour period over the last 30 days, whereas female students were asked to report how frequently they had consumed four or more drinks in a two-hour period over the last 30 days (NIAAA, 2004; Wechsler et al., 1995). The use of gender-specific binge drinking thresholds is warranted as females metabolize alcohol at a slower rate than males (Wechsler et al., 1995). Further, the 4+/5+ thresholds for women/men predict a similar likelihood of each gender experiencing negative consequences of alcohol use (Wechsler et al., 1995). Respondents indicated their frequency of binge drinking using an 8-point scale. Responses to these items were "*I never had 4/5 or more drinks within a two-hour period in the last 30 days*" (0), "*Once*" (1), "*2 to 3 times*" (2), "*Once a week*" (3), "*Two times a week*" (4), "*3 to 4 times a week*" (5), "*5 to 6 times a week*" (6), and "*Everyday*" (7).

*30-day peak drinking* was assessed in the fall semester of students' first four years of college by asking "During the last 30 days (one month), what is the maximum number of drinks containing alcohol that you drank within a 24-hour period?" Participants responded by entering the maximum number of drinks they had consumed on a single occasion over the last month. On the first measurement occasion, in students' first year of college, there was no upper limit to the number of drinks students could report consuming on their heaviest drinking occasion in the past 30 days. However, any responses above 25 drinks were both outliers and considered unrealistic

and were recoded as 25 drinks. For the remaining measurement occasions, in students' second, third, and fourth years of college, this item had a maximum allowable number of drinks set at 25.

*Negative Consequences of Alcohol Use.* Negative consequences of alcohol use were assessed in the fall semester of students' first four years of college using a modified version of the 23-item Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989). The RAPI assesses various problems associated with adolescent drinking such as "passed out or fainted suddenly" and "had a fight, argument, or bad feelings with a friend." It had an internal consistency of .92 in the original sample (White & LaBouvie, 1989) and .90 in the ULS in the first year of college. High one month, six month, and one year test-retest reliability ( $r > .89$ ) has been reported (Miller et al., 2002). The RAPI has face validity as all its items were drawn from other measures of alcohol problems, and it has convergent validity as demonstrated by moderate correlations with alcohol use ( $r = .20 - .57$ ; White & LaBouvie, 1989). Students were asked about lifetime consequences of drinking during their freshman year and about consequences experienced in the past 12 months during their sophomore, junior, and senior years. Students reported how many times they had experienced each consequence on a 4-point scale consisting of "None" (0), "1-2 times" (1), "3-5 times" (2), and "More than 5 times" (3). Scores for the modified version of the RAPI were calculated by computing the mean of all 23 items for each individual in each year.

*Gender.* Students were asked to report their gender during the fall of their freshman year of college. Participants were asked, "What is your gender?" Students had the option of selecting either "Female" (0) or "Male" (1).

*Plan of Analysis*

*Conditional Growth Model of Permissibility.* A conditional growth model for perceived parental permissibility of alcohol use across four occasions was estimated using the PROC GLIMMIX statement in SAS 9.0. Since permissibility was a count variable and its distribution was positively skewed and somewhat platykurtic, a generalized linear mixed model was used and a Poisson distribution was specified (Coxe, West, & Aiken, 2009; Hayat & Higgins, 2014; Raudenbush & Bryk, 2002). Estimation of this model answered both parts of research question one, which addressed whether perceived parental permissibility of alcohol use changed across college and differed by gender. The equation for this conditional growth model was:

$$\begin{aligned} \text{Level-1: } & \ln(\text{PERMISSIBILITY}_{ij}) = \pi_{0i} + \pi_{1i}\text{TIME}_{ij} + \varepsilon_{ij} \\ \text{Level-2: } & \pi_{0i} = \gamma_{00} + \gamma_{01}\text{MALE GENDER}_i + u_{0i} \\ & \pi_{1i} = \gamma_{10} + \gamma_{11}\text{MALE GENDER}_i \end{aligned}$$

Conditional growth models were also estimated for each of the three drinking outcomes, and as with the model for permissibility, generalized linear mixed models were used and Poisson distributions were specified as all three drinking outcome variables were composed of positively skewed count data. The equations for these conditional growth models were identical to the equation for the permissibility conditional growth model, except for the substitution of the outcome variable (PERMISSIBILITY).

*Aggregate Generalized Linear Mixed Models of Drinking Outcomes.* Three generalized linear mixed models, estimated using the PROC GLIMMIX statement in SAS 9.0, were used to predict binge drinking, peak drinking, and negative consequences of alcohol use in the whole sample. Due to skew in all three outcome variables that included a large number of zeroes, each was modeled using a Poisson distribution (Coxe et al., 2009; Raudenbush & Bryk, 2002). Estimation of these three models answered the two parts of research question two, which asked whether the association between perceived parental permissibility of alcohol use and drinking

outcomes changed across college and if these associations differed by gender. The equation for the generalized linear mixed model for the binge drinking outcome was:

$$\begin{aligned} \text{Level-1: } & \ln(\text{BINGE}_{ij}) = \pi_{0i} + \pi_{1i}\text{TIME}_{ij} + \pi_{2i}(\text{PERM}_{ij} - \text{MEAN PERM}) + \varepsilon_{ij} \\ \text{Level-2: } & \pi_{0i} = \gamma_{00} + \gamma_{01}\text{GENDER}_i + \gamma_{02}\text{MEAN PERM}_i + u_{0i} \\ & \pi_{1i} = \gamma_{10} + \gamma_{11}\text{GENDER}_i \\ & \pi_{2i} = \gamma_{20} + \gamma_{21}\text{GENDER}_i \end{aligned}$$

The equations for the peak drinking and negative consequences of alcohol use outcomes were identical, except for the substitution of the outcome variable (BINGE).

*Cluster Analyses.* K-means cluster analyses were conducted in SPSS 22 with two, three, four, and five clusters. Practical considerations were used to identify the most appropriate number of permissibility clusters. These analyses answered the third research question of whether there were distinct groups of students with differing patterns of change in their perceived parental permissibility of alcohol use responses.

*Generalized Linear Mixed Models of Drinking Outcomes Using Permissibility Clusters.*

Three generalized linear mixed models, estimated using the PROC GLIMMIX statement in SAS 9.0, were used to predict the three drinking outcomes using permissibility cluster membership as a predictor variable. As with the aggregate models, a Poisson distribution was specified for each of the three models as each outcome variable was composed of count data (Coxe et al., 2009; Raudenbush & Bryk, 2002). Estimation of these three models answered research question four, which asked whether permissibility cluster membership predicted differences in each of the three drinking outcomes. The equation for the generalized linear mixed model for the 30-day binge drinking outcome was:

$$\begin{aligned} \text{Level-1: } & \ln(\text{BINGE}_{ij}) = \pi_{0i} + \pi_{1i}\text{TIME}_{ij} + \varepsilon_{ij} \\ \text{Level-2: } & \pi_{0i} = \gamma_{00} + \gamma_{01}\text{GENDER}_i + \gamma_{02}\text{AGE } 21_i + \gamma_{03}\text{COLLEGE}_i + \gamma_{04}\text{HIGH}_i + u_{0i} \\ & \pi_{1i} = \gamma_{10} + \gamma_{11}\text{GENDER}_i + \gamma_{12}\text{AGE } 21_i + \gamma_{13}\text{COLLEGE}_i + \gamma_{14}\text{HIGH}_i \end{aligned}$$

The equations for the peak drinking and negative consequences of alcohol use outcomes were identical, except for the substitution of the outcome variable (BINGE).

## RESULTS

### *Descriptives*

Means and standard deviations of perceived parental permissibility of alcohol use for the whole sample, as well as for males and females separately, are shown in Table 3. The mean perceived parental permissibility of alcohol use across all individuals and occasions was 2.34 ( $SD = 2.45$ ). In other words, averaged across the four years of college, the average student reported that their parents would approve of them drinking between two and three drinks on a given occasion. The median for permissibility was 2.00, meaning that half of the responses for permissibility were equal to or below 2.00 drinks and half of the responses were equal to or above 2.00 drinks. The mode for permissibility was 0.00, meaning that the most common response across all four years of college was that no drinks would be acceptable on a given occasion. The fact that the median and the mode were both lower than the mean indicated that the permissibility variable was positively skewed.

Responses were observed across the full range of perceived parental permissibility of alcohol use scores (from 0 indicating no amount of alcohol would be acceptable to 7 indicating there was no upper limit), however there was a large number of zeroes in each of the four time periods resulting in this variable having a non-normal distribution. For example, in regards to permissibility during their last year of high school, over half the sample ( $n = 398$ ) responded with zeroes indicating that their parents deemed no amount of alcohol acceptable for them to consume. Even in students' third year of college, roughly 20% of respondents ( $n = 122$ ) gave a response of zero. Thus, the distribution of permissibility scores was positively skewed and somewhat platykurtic at each of the four time periods. Therefore, the normality assumption associated with ordinary least squares models (i.e., the general linear model and the general

linear mixed model) was violated (Coxe et al., 2009). When a count variable with a relatively low mean (less than 10) is used as an outcome variable in an ordinary least squares (OLS) model, the results may produce biased standard errors and significance tests (Coxe et al., 2009). As a result, a generalized linear mixed model approach was chosen for the conditional growth model testing whether or not perceived parental permissibility of alcohol use changed across college as generalized linear models do not assume a continuous normal distribution (Coxe et al., 2009).

Means and standard deviations of 30-day binge drinking, 30-day peak drinking, and negative consequences of alcohol use across all four occasions are shown in Table 4. The mean binge drinking frequency score across all individuals and time points was 1.54 ( $SD = 1.72$ ), indicating that, averaged across the four years of college, the typical student engaged in binge drinking between once and two to three times in the 30 days prior to being surveyed. The mean number of drinks the average student consumed on his or her heaviest drinking occasion in the past 30 days across all individuals and time points was 5.74 ( $SD = 5.56$ ), indicating that, averaged across the four years of college, the typical student consumed between five and six drinks on their heaviest drinking occasion in the 30 days prior to being surveyed. The mean negative consequences of alcohol use score across all individuals and occasions was .22 ( $SD = .33$ ). This indicates that, averaged across the four measurement occasions, students reported having experienced approximately five negative consequences of alcohol use one or two times.

To reflect the count data assessed by these three outcome variables, a Poisson distribution was specified because it inherently consists of only positive integers (including zero), whereas a normal distribution assumes that the variable can take on positive or negative values as well as whole numbers or fractions of whole numbers (Coxe et al., 2009). Thus, since students' reports

of binge drinking, peak drinking, and negative consequences of alcohol use in this study were also limited to values that were discrete and non-negative, a Poisson distribution was selected.

#### *Does Perceived Parental Permissibility of Alcohol Use Change across College?*

Results of the conditional growth model testing whether students' perceived parental permissibility of alcohol use changed across college, as well as gender differences in the rate of change, are shown in Table 5. In students' last year of high school, the average permissibility for females,  $\gamma_{00}$ , was .97, indicating that the average female reported that her parents would deem it appropriate for her to consume about 1 drink on a given night during her last year of high school. Predicted permissibility scores for males during their last year of high school did not differ from those of females,  $\gamma_{01}$ . Predicted permissibility scores increased by an average of 31% each year across college for females,  $\gamma_{10}$ , and there was a trend level ( $p < .10$ ) Gender  $\times$  Time interaction such that permissibility increased for males at a faster rate than it did for females,  $\gamma_{11}$ . Figure 1 illustrates these results.

#### *Do Binge Drinking Frequency, Peak Drinking, and Negative Consequences of Alcohol Use Change across College?*

The results of three conditional growth models assessing change in each of the three drinking outcomes are shown in Table 6. In their first year of college, the predicted binge drinking frequency score for females was .86,  $\gamma_{00}$ . Males reported binge drinking more frequently,  $\gamma_{01}$ , with a predicted score of 1.13. In other words, on average, females reported engaging in binge drinking slightly less than once in the 30 days prior to being surveyed in their first year of college, and males reported binge drinking slightly more than once during the same time period. The rate of binge drinking for females increased by an average of 8% each year across college,  $\gamma_{10}$  (Figure 2). Put another way, the predicted binge drinking score for females

increased from .86 in their first year of college to 1.09 during their fourth year of college. This corresponds to a change of less than one binge drinking occasion in 30 days. Males did not differ from females in this rate of change,  $\gamma_{11}$ .

The results of the conditional growth model for peak drinking showed that females consumed an average of 2.61 drinks on their heaviest drinking occasion in their first year of college,  $\gamma_{00}$ . Males consumed more drinks on their heaviest drinking occasion,  $\gamma_{01}$ , that is, an average of 4.18 drinks. Peak drinking increased at an average rate of 12% per year for females,  $\gamma_{10}$  (Figure 3). In other words, the average number of drinks females consumed on their heaviest drinking occasion increased from 2.61 drinks in their first year of college to 3.65 drinks in their fourth year of college. There was a statistically significant Gender  $\times$  Time interaction such that the rate of increase in peak drinking for males was less than that for females,  $\gamma_{11}$ . The number of drinks males consumed on their heaviest drinking occasion in the past 30 days increased from 4.18 drinks in their first year of college to 5.17 drinks in their fourth year of college.

The results of the conditional growth model for negative consequences of alcohol use showed that in females' first year of college, their average negative consequences score was .20,  $\gamma_{00}$ , indicating that the average female student reported having experienced approximately 5 of the possible 23 assessed negative consequences of alcohol use once or twice in her lifetime. Males did not differ from females in the average number of negative consequences they initially reported having experienced,  $\gamma_{01}$ . There was no significant change across college in the number of negative consequences of alcohol use experienced by females,  $\gamma_{10}$ , or males,  $\gamma_{11}$ .

*Is Perceived Parental Permissibility of Alcohol Use Associated with Drinking Behaviors across College?*

The results of three generalized linear mixed models testing whether perceived parental permissibility of alcohol use was associated with binge drinking, peak drinking, and negative consequences of alcohol use are shown in Table 7. These models were extensions of the conditional growth models presented in Table 6 as they added two permissibility predictor variables: Students' person-mean permissibility score was added as a between-person predictor and the fluctuation from that mean in a given year was added as a within-person predictor.

In students' first of year of college, the predicted binge drinking score for females was .90,  $\gamma_{00}$ . Males reported more frequent binge drinking,  $\gamma_{01}$ , with a predicted binge drinking score of 1.10. In other words, the predicted frequency of binge drinking occasions in the 30 days prior to being surveyed was slightly less than 1 for females and slightly greater than 1 for males. The frequency with which females engaged in binge drinking increased by an average of 8% each year across college,  $\gamma_{10}$ , and males did not differ from females in their rate of change in binge drinking,  $\gamma_{11}$ . Each one-unit difference in students' mean perceived parental permissibility of alcohol use was associated with a 27% difference in the number of binge drinking occasions in the past 30 days,  $\gamma_{02}$ . Put another way, females who had a mean permissibility score one unit above the grand mean had a predicted binge drinking score that was .24 higher than the average female. This difference corresponds to between 0 and 1 binge drinking occasions in a 30-day period. There was no significant association between fluctuations in perceived parental permissibility of alcohol use in the previous year and binge drinking frequency for females,  $\gamma_{20}$ , or males,  $\gamma_{21}$ .

The results of the model predicting peak drinking showed that, in students' first of year of college, the average female consumed 2.92 drinks on her heaviest drinking occasion in the past 30 days,  $\gamma_{00}$ ; the average male consumed more,  $\gamma_{01}$ , with a predicted average of 4.13 drinks on

his heaviest drinking occasion in the past 30 days. Peak drinking for females increased by an average of 10% per year across college,  $\gamma_{10}$ . In other words, the average number of drinks females consumed on their heaviest drinking occasion increased from 2.92 drinks in their first year of college to 3.86 drinks in their fourth year of college. There was a trend level ( $p < .10$ ) Gender  $\times$  Time interaction such that peak drinking increased more slowly for males than it did for females,  $\gamma_{11}$ . The average number of drinks males consumed on their heaviest drinking occasion increased from 4.13 drinks in their first year of college to 4.91 drinks in their fourth year of college. Each one-unit difference in students' mean perceived parental permissibility of alcohol use was associated with a 27% difference in the number of drinks they consumed on their heaviest drinking occasion in the past 30 days,  $\gamma_{02}$ . Put another way, females who had a mean permissibility score one unit above the grand mean reported consuming an estimated .80 more drinks on their heaviest drinking occasion in their first year of college than the average female. Each one unit difference in females' perceived parental permissibility of alcohol use in the prior year was associated with a 3% greater number of drinks consumed,  $\gamma_{20}$ . This indicates that females who reported permissibility scores for their senior year of high school that were one unit above their mean permissibility score consumed an estimated .10 more drinks on their heaviest drinking occasion in their first year of college than the average female. There was no significant Gender  $\times$  Permissibility interaction,  $\gamma_{21}$ .

The results of the model predicting negative consequences of alcohol use showed that, in students' first of year of college, females had a mean negative consequences of alcohol use score of .19,  $\gamma_{00}$ . Males did not differ from females in the mean number of negative consequences they had experienced,  $\gamma_{01}$ . This indicates that the average student of either gender reported having experienced approximately four negative consequences of alcohol use once or twice in their

lifetime at the first measurement occasion during their first year of college. Negative consequences of alcohol use did not change over time for females,  $\gamma_{10}$ , or males,  $\gamma_{11}$ . Each one-unit difference in students' mean perceived parental permissibility of alcohol use was associated with a 9% greater score of mean negative consequences of alcohol use,  $\gamma_{02}$ . Put another way, females who had a mean permissibility score one unit above the grand mean had a negative consequences score that was an estimated .02 higher than the average female in their first year of college. This corresponded to having experienced slightly less than one more negative consequence of alcohol use. Negative consequences of alcohol use did not fluctuate with perceived parental permissibility of alcohol use in the year prior for females,  $\gamma_{20}$ , or males,  $\gamma_{21}$ .

### *Cluster Analyses*

Turning to the question of whether there were distinct groups of students with differing patterns of change in permissibility, results of k-means cluster analyses are presented in Table 8. As noted previously, k-means cluster analyses were conducted in SPSS 22 with two, three, four, and five clusters. After comparing the clusters provided by each set of analyses, the four cluster solution was selected as the most appropriate as this included both high and low permissibility groups as well as two intermediate groups that exhibited marked changes in permissibility in synchrony with clear life transitions. The first group ( $n = 224$ ) was named the *low permissibility* cluster as students in this group had permissibility scores that were consistently low across the four occasions. Students in the *low permissibility* cluster had a mean permissibility score of .22 during their last year of high school and a mean of .90 during their third year of college (see Figure 4). The second group ( $n = 173$ ) was named the *age 21 permissibility* cluster, because their permissibility scores started low ( $M = .66$ ) but rose sharply in their third year of college ( $M = 4.64$ ), corresponding to when students neared the minimum legal drinking age of 21 years old.

The third group ( $n = 117$ ) was named the *college permissibility* cluster as these students' permissibility scores were somewhat low during their last year of high school ( $M = .99$ ) but rose dramatically upon matriculation to college ( $M = 4.93$ ). Lastly, the fourth group ( $n = 75$ ) was named the *high permissibility* group due to these students having high permissibility scores during all four time periods. Students in the *high permissibility* cluster had a mean permissibility score of 5.39 during their last year of high school and a mean of 4.65 during their third year of college. Of the 679 students in the analytic sample for the aggregate generalized linear mixed models predicting each of the three drinking outcomes, 90 students were not assigned to a cluster. Subsequent analyses focus on the 589 cases who were assigned to one of the four clusters.

#### *Is Permissibility Cluster Membership Associated with Drinking Behaviors?*

Results of question four, which asked whether permissibility cluster membership was associated with binge drinking, peak drinking, and negative consequences of alcohol use, are shown in Table 9. In a series of generalized linear mixed models predicting each of the three alcohol use outcomes, time was included as a within-person predictor, and permissibility cluster membership and gender were included as between-person predictors. Permissibility cluster membership was designated as an indicator variable in the CLASS statement in SAS 9.0 such that the *age 21 permissibility* cluster, the *college permissibility* cluster, and the *high permissibility* cluster were contrasted with the *low permissibility* cluster, which served as the reference group.

As in the aggregate level results reported in Table 7, during the first year of college males engaged in binge drinking more frequently in the past 30 days than did females,  $\gamma_{01}$ . Further, time was a significant predictor indicating that students tended to binge drink more frequently

across the college years,  $\gamma_{10}$ . However, in this permissibility cluster model, there was a trend-level ( $p < .10$ ) Gender  $\times$  Time interaction indicating that the number of times students reported binge drinking in the previous 30 days increased across college more slowly for males than females,  $\gamma_{11}$ . Results contrasting the four clusters showed that, during the first year of college, students in the *age 21 permissibility* cluster, *college permissibility* cluster, and *high permissibility* cluster reported more binge drinking occasions in the prior 30 days than students in the *low permissibility* cluster,  $\gamma_{02}$ . However, there were no differences among clusters in change in the number of binge drinking episodes over time,  $\gamma_{12}$ .

In the model predicting peak drinking, results of the permissibility cluster model were similar to those of the aggregate level model reported in Table 7 in that male students consumed a greater number of drinks on their heaviest drinking occasion during their first year of college than did females,  $\gamma_{01}$ . Similarly, time was a significant predictor in the model indicating that females tended to consume more drinks on their heaviest drinking occasions in the later (relative to the earlier) college years,  $\gamma_{10}$ . There was a trend-level ( $p < .10$ ) Gender  $\times$  Time interaction indicating that peak drinking increased at a slower rate for males than females,  $\gamma_{11}$ . Results contrasting the four clusters showed that, during the first year of college, the number of drinks students consumed on their heaviest drinking occasion in the past 30 days was greater for students classified in any of the three non-low permissibility clusters than it was for those in the *low permissibility* cluster,  $\gamma_{02}$ . However, there was a statistically significant Permissibility Cluster  $\times$  Time interaction such that the number of drinks students consumed on their heaviest drinking occasions increased at a slower rate for students classified in all three of the non-low permissibility clusters than it did for those in the *low permissibility* cluster,  $\gamma_{12}$ .

The results of the permissibility cluster model predicting negative consequences of alcohol use were also similar to the results of the aggregate model reported in Table 7 as the number of negative consequences that students reported having experienced did not differ by gender,  $\gamma_{01}$ , and did not change over time,  $\gamma_{10}$ . Results contrasting the four permissibility clusters showed two trend-level ( $p < .10$ ) effects for initial status. Students in both the *college permissibility* cluster and the *high permissibility* cluster reported having experienced a greater number of lifetime negative consequences of alcohol use during their first year of college than did students in the *low permissibility* cluster,  $\gamma_{02}$ . However, the *age 21 permissibility* cluster did not differ significantly from the *low permissibility* cluster in reported lifetime negative consequences of alcohol use in the first year of college.

## DISCUSSION

### *Review of Aims and Summary of Findings*

Researchers and prevention scientists have been trying to reduce the prevalence and negative consequences of college drinking for several decades (Straus & Bacon, 1953). Although some journalists have suggested that parents take a more lenient stance towards late adolescent drinking, alcohol use researchers have consistently found that students' perceptions of their parents' permissiveness of alcohol use is positively associated with the number of drinks college students consume, the frequency of their binge drinking occasions, and the negative consequences of alcohol use they experience (Abar et al., 2009; Abar et al., 2012; Varvil-Weld et al., 2014; Walls et al., 2009; Wood et al., 2004). However, much of this work on permissibility and its relation to college drinking only focuses on the early years of college and only assesses permissibility on a single occasion. The current study aimed to extend the literature on perceived parental permissibility of alcohol use among college students by (1) assessing changes in this construct from the last year of high school through the third year of college, (2) constructing clusters of differing permissibility trajectories, and (3) determining whether permissibility was associated with alcohol use behaviors and consequences across the college years.

Findings indicated that students perceived that their parents became more tolerant of alcohol use as they progressed through college. Although there were no gender differences in initial permissibility levels during students' senior year of high school, the rate of change toward increased permissibility was more rapid for males than females resulting in larger discrepancies in permissibility by the third year of college. Generalized linear mixed models showed that students' average level of perceived parental permissibility of alcohol use during college was positively associated with how often students participated in binge drinking, their level of peak

drinking, and the negative consequences of alcohol use they experienced. These models also showed that in students' first year of college males engaged in binge drinking more often and consumed more drinks on their heaviest drinking occasions than females. These two drinking behaviors also increased for both males and females across college, although peak drinking increased at a slower rate for males than for females.

Developmentally-informed practical considerations led to the construction of four latent permissibility clusters, defined by their different patterns of perceived parental permissibility of alcohol use during college. These permissibility clusters were subsequently found to be associated with how frequently students engaged in binge drinking and the number of drinks students consumed on their heaviest drinking occasions. As in the aggregate models, the results of the permissibility cluster models showed that students who reported that their parents were consistently less tolerant of alcohol use engaged in binge drinking less often and consumed fewer drinks on their heaviest drinking occasions. The full pattern of findings extend past work linking perceived parental permissibility of alcohol use and college drinking by showing that permissibility increased across college, that permissibility was positively associated with drinking behaviors across the first four years of college, and that there were distinct patterns of change, as represented by the permissibility clusters, that were also associated with drinking behaviors across the first four years of college.

#### *Limitations of Previous Research on Permissibility and College Drinking*

The main aim of the present study was to corroborate and expound upon the existing literature suggesting that college students' perceived parental permissibility of alcohol use is positively associated with their own drinking behaviors (Abar et al., 2009; Abar et al., 2012; Varvil-Weld et al., 2014; Walls et al., 2009; Wood et al., 2004). Much of this past work on

permissibility only measured permissibility on a single occasion and focused only on the transition to college or the first year of college (Abar et al., 2009; Varvil-Weld et al., 2014; Walls et al., 2009; Wood et al., 2004). These prior designs limit researchers' extant knowledge of how permissibility and college drinking are linked, because some drinking outcomes (Schulenberg et al., 1996; Schulenberg et al., 2001) and permissibility (this study) change across college. The findings of the present study highlight this fact.

Nearly all of the past work focusing on perceived parental permissibility of alcohol use and college drinking has only assessed permissibility on a single occasion, typically in individuals' senior year of high school or first year of college (Abar et al., 2009; Varvil-Weld, 2014; Walls et al., 2004; Wood et al., 2004). This is problematic because it is known that parents relax their behavioral control of their children as they move through adolescence (Barber, Maughan, & Olsen, 2005), and it is well established that drinking increases through late adolescence and peaks in the early twenties (Johnston et al., 1995). Therefore, it is important to know to what extent changes in permissiveness occur and how they are associated with alcohol use across time and within persons.

Further, nearly all of the previous work has been focused on the transition to college or the early college years (Abar et al., 2009; Varvil-Weld, 2014; Wood et al., 2004). Although the transition to college is known to be a risky period for heavy drinking and negative consequences of alcohol use (Arnett, 2005; Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997; Goldman, 2002; White, Labouvie, & Papadaratsakis, 2005), it is important to look at how permissibility and alcohol use are linked throughout the entire college experience. For example, is perceived parental permissibility of alcohol use still linked to college drinking in students'

third and fourth years of college as they begin reaching the minimum legal drinking age of 21 years of age?

*First Major Contribution of the Present Study: Parents Become More Permissive Across College*

The real merit of this study comes from the two new insights it brings to the permissibility and college drinking literature. First, the findings of this study indicate that as students move through college, many report that their parents become more accepting of them consuming a greater number of drinks on a given occasion. Given that perceived parental permissibility of alcohol use is not static, and given that varied patterns of change were identified that predicted differential drinking levels, the timing of measurement of permissibility is likely very important. The findings also show that binge drinking and peak drinking demonstrate slight, positive linear trends across college. Since both permissibility and some aspects of college drinking change over time, perhaps the magnitude of the relation between permissibility and college drinking also changes over time.

While this question cannot be addressed with the findings of the present study, future work with more occasions of measurement spanning adolescence through the transition to adulthood using time-varying effects models (TVEM) may be able to help answer this question (Hastie & Tibshirani, 1993; Hoover, Rice, Wu, & Yang, 1998; Liu, Li, Lanza, Vasilenko, & Piper, 2013). Time-varying effects models estimate the magnitude of the relation between two variables during different time intervals as opposed to assuming the association between two variables is constant, as is common in multi-level modeling (Hastie & Tibshirani, 1993; Liu et al., 2013). Since parents are known to relax their control of their children's behaviors as they move through adolescence (Barber et al., 2005) and adolescents become more autonomous with age (Greenberger, 1984; Steinberg & Silverberg, 1986), it is reasonable to think that the link

between permissibility and drinking may weaken as individuals get older and make the transition to adulthood. If this were the case, time-varying effects models would allow researchers to estimate at which ages changes in the association between permissibility and adolescent or college student drinking occur, whether associations are enhanced or reduced at key transition points, and if, or at which ages, the two variables are no longer linked.

#### *Gender Differences in Students' Perceived Parental Permissibility of Alcohol Use*

The findings also indicate that parents' tolerance of drinking increases more quickly for sons than daughters. This is consistent with prior work suggesting that there are gender differences in the parenting practices parents use for sons and daughters (Raley & Bianchi, 2006; Siegal, 1987). Alternatively, this finding may be due to the fact that female college students have been found to communicate with their parents more frequently than male college students (Abar et al., 2013; Small et al., 2011). Perhaps female college students internalize the attitudes and values of their parents more so than male college students because of this increased frequency of communication. Conversely, this reported gender difference might be due to differences in perceptions between male and female college students concerning how tolerant their parents are of their drinking as a result of differences in gender socialization (Conrade & Ho, 2001; Jacklin, 1989). More research directly obtaining parent reports of their attitudes about sons' and daughters' drinking behaviors as well as male and female college student reports of perceptions of parents' and society's expectations for them could help determine whether there is in fact an actual difference in parents' permissiveness of sons' and daughters' alcohol use and whether there is a gender difference in college students' perceived parental permissibility of alcohol use.

#### *Second Major Contribution of the Present Study: Not All Parents Change the Same Way*

A second major finding of the current study is that there were distinct clusters of college students with differing perceived parental permissibility of alcohol use trajectories and that membership in these clusters was differentially associated with drinking behaviors. This indicates that it may be ideal to measure permissibility on multiple occasions as permissibility changes across college in different ways for students in different clusters. This study extends previous work: To the author's knowledge, it is the first study to assess the permissibility construct longitudinally among college students. Studies that assess permissibility on only one occasion, especially those that measure it in the last year of high school, may provide a distorted view of this construct and its relation to drinking. For example, Figure 2 demonstrates that students in three of the four clusters – *low permissibility*, *age 21 permissibility*, and *college permissibility* – report permissibility scores for their last year of high school that are quite similar. However, by students' second or third year of college, the mean permissibility scores for these groups show marked differences. Thus, although past work has shown a statistically significant relation between perceived parental permissibility in students' last year of high school and drinking behaviors in students' first and second years of college (Abar et al., 2009; Abar et al., 2012; Varvil-Weld et al., 2014; Walls et al., 2009; Wood et al., 2004), there may be more nuances that researchers are failing to capture by using single measurements of permissibility. Taken together, these new insights suggest that permissibility, like other parenting attitudes and behaviors, is a dynamic construct that should be measured on multiple occasions and that creating clusters or latent groups of different patterns of change in permissibility may be a more nuanced approach to studying this aspect of the parent-child relationship and its relation to alcohol use.

#### *Implications of Findings for Interventions*

Recent research has demonstrated the effectiveness of parent-based interventions (PBIs) focused on preventing or reducing college drinking (Cleveland, Lanza, Ray, Turrisi, & Mallett, 2012; Ichiyama et al., 2009; Turrisi et al., 2001; Turrisi et al., 2013). However, much of this work has focused only on drinking across the transition to college and during the first year of college (Cleveland et al., 2012; Ichiyama et al., 2009; Turrisi et al., 2001). Although this is known to be a risk period for alcohol use (Beets et al., 2009; NIAAA, 2002; Sher & Rutledge, 2007), the findings of the current study showed that perceived parental permissibility of alcohol use, binge drinking, and peak drinking increased across the first four years of college. Put another way, this study indicates that as students move through college, they are engaging in risky drinking behaviors to a greater extent and their parents are becoming more tolerant of their drinking. This suggests the need for PBIs to not only be implemented before or during the first year of college, but to continue to be implemented throughout the second, third, or even the fourth year of college. For example, students in the *age 21 permissibility* cluster reported that their parents became much more tolerant of alcohol use in their third year of college as many of them approached the minimum legal drinking age of 21 years of age. Since membership in this group was associated with more frequent binge drinking episodes and greater peak drinking than those in the *low permissibility* group, parent-based interventions implemented in the second or third year of college may be helpful in reducing the extent to which this group of students engages in risky drinking behaviors.

#### *The Possibility of Reverse Causality*

One issue with the current findings is the possibility of reverse causality. Even though this study did not try to show that having parents who are more permissive of alcohol use *causes* higher levels of drinking, the study is based on this assumption, and there are at least two

alternative explanations that involve reverse causality. First, it may be that parents are more permissive of alcohol use during college if they know that their child already drinks, especially if their child is already a heavy drinker. That is, parents may simply become resigned to the inevitability of their child drinking, despite having serious concerns or simply not actively approving of it. Despite the fact that this study was designed with measurements of permissibility preceding measurements of drinking by a full year, it is not possible to rule out reverse causality as many of the individuals in the current sample had initiated alcohol use (82.9%) and binge drinking (55.4%) during high school. Second, it is possible that students who drink more frequently or to a greater extent are more likely to perceive that their parents are more accepting of them using alcohol than they actually are. This could potentially be a means of reducing cognitive dissonance between their own behaviors and their parents' values and expectations. Therefore, the current study makes no claims of causation and acknowledges the possibility of reverse causality as the source of the association between perceived parental permissibility of alcohol use and drinking behaviors.

#### *The Importance of Parent-Adolescent Relationships across the Transition to Adulthood*

The findings of this study show that there are differing patterns of change in perceived parental permissibility of alcohol use across college and that these changes are associated with drinking behaviors and consequences. Despite the fact that reverse causality cannot be ruled out, these results are consistent with the argument that parents do matter after high school and that they may continue to play influential roles in their children's lives during college. Past research has shown that aspects of the parent-child relationship, such as parent-student communication, are linked with college students' drinking habits (Small et al., 2011). Previous studies have also shown that today's college students communicate with their parents more

frequently than those of past decades (Abar et al., 2013; Chen & Kat, 2009) and rely on their parents for advice and emotional support in addition to financial assistance (Chen & Kat, 2009; Trice, 2002). Taken together, this body of research indicates that parents do matter in the lives of their college student children. This extended reliance on parents may be part of the lengthening transition from adolescence to adulthood that is characteristic of industrialized nations. As social norms and economic conditions continue to change in today's technological age, so too may developmental processes and transitions as well as parent-child relationships.

The findings of the current study suggest that average permissibility levels across college and permissibility cluster membership were consistently linked with drinking outcomes whereas fluctuations in permissibility were less consistently linked with drinking outcomes the following year. This may suggest that, for parenting and college drinking, parental styles or patterns are more important than specific parenting behaviors on specific occasions. For example, parents who have been consistently tolerant of their adolescent's drinking during high school may have little luck curbing their drinking by simply telling them that they no longer approve of it. However, parents who consistently set limits and communicate that they do not approve of heavy drinking may be more successful in preventing their child from initiating heavy drinking (Mallett et al., 2011).

Similarly, the findings of this study are consistent with Baumrind's (1991) ideal of the authoritative parenting style. Expressing low permissibility can be thought of as an aspect of demandingness in that parents set expectations about how much they think is acceptable for their children to drink (Walls et al., 2009). Therefore, the results of this study support Baumrind's notion that it is better for parents to be more demanding of their children, as is characteristic of the authoritative and authoritarian parenting styles, by setting clear boundaries and expectations

than it is to be less demanding of their children, as is characteristic of the permissive and neglectful parenting styles. However, since warmth, or responsiveness, was not assessed, the results of the current study are not able to address the question of whether the authoritative parenting style is more ideal than the authoritarian parenting style. Rather, the current study simply suggests that students who report that their parents are more demanding in regards to alcohol use tend to binge drink less frequently, consume fewer drinks on their heaviest drinking occasions, and experience fewer negative consequences of drinking.

### *Limitations*

The results should be considered in light of several limitations. First, the sample only included participants from one large, public university in a large town in a rural area in the northeastern United States. Even though the stratified random sampling procedure yielded a sample that was racially and ethnically diverse, the results are not easily generalizable. Future work should aim to replicate the findings of this study using samples from different areas of the United States or other countries, from schools in urban areas, and/or from smaller, private colleges.

Second, perceived parental permissibility of alcohol use was assessed using only student self-report, and although there is evidence that adolescents' reports of parenting practices are more predictive of alcohol and substance use and overlap little with parent reports (Cottrell, Li, Harris, D'Alessandri, Atkins, Richardson, and Stanton, 2003; Goldin, 1969; Latendresse, Rose, Viken, Pulkkinen, Kaprio, & Dick, 2009; Moskowitz & Schwarz, 1982), it would be ideal to have data on parental permissibility of alcohol use from both students and their mothers and/or fathers. Permissibility was also measured using only a single item. Although this is not inherently problematic, incorporating more items assessing permissibility, such as whether or not

it is permissible to “black out” or whether parents deem it acceptable for their children to drive after consuming any alcohol, could provide a more nuanced picture of this construct. For example, Van der Vorst, Engels, Meeus, Dekovic, and Van Leeuwe (2005) used a 10-item measure of parents’ alcohol-specific rules in their study of the impact of socialization on adolescent drinking behaviors. Further, permissibility during students’ last year of high school and first year of college was measured retrospectively during the spring semester of students’ second year of college. Although memory failure seems to be problematic for reports of substance use over longer periods of time (Collins, Graham, Hansen, & Johnson, 1985), retrospective reports of parenting practices may be less prone to error (Arrindell, Emmelkamp, Brillman, & Monsma, 1983). Even though it would have been ideal to have had students report on their perceived parental permissibility of alcohol use concurrently at all four time points, it seems reasonable to expect college students to be able to remember the rules and expectations their parents held regarding drinking during the previous two years, especially since one would imagine that parental permissibility of alcohol use is not a construct that typically fluctuates on daily, weekly, or even monthly intervals.

Third, perceived parental permissibility of alcohol use, binge drinking frequency, and negative consequences of alcohol use were all ordinal measures that were treated as if they approximated interval measures. This limited the study’s ability to accurately report outcomes in discrete units, such as the number of drinks students perceived that their parents would consider it appropriate for them to drink on a given occasion, the number of binge drinking occasions students engaged in within a 30-day period, and the number of negative consequences of alcohol use students reported experiencing.

Fourth, there may be other variables that were not included in these analyses that could explain a substantial amount of variance in drinking behaviors above and beyond perceived parental permissibility of alcohol use or that would help explain permissibility cluster membership. For example, parenting variables, such as parental modeling of alcohol use (Abar et al., 2009; Varvil-Weld et al., 2014), alcohol-specific communication between parents and students (Turrisi et al., 2000; Varvil-Weld et al., 2014), parent-child relationship quality (Varvil-Weld et al., 2014), and age at onset of alcohol use (Varvil-Weld et al., 2014), may explain a significant portion of variance in drinking behaviors above and beyond permissibility and/or may help predict permissibility cluster membership better than students' reports of their parents' permissibility alone. Further, having parents report on permissibility would help clarify the accuracy of students' perceptions.

The relation between permissibility and college drinking may no longer be statistically significant if peer drinking variables were included. For example, incorporating items assessing the number or frequency of direct offers to drink students that students receive or students' perceptions of how much and how often their peers drink may explain substantially more variance in drinking behaviors than parent variables (Borsari & Carey, 2001; Wood et al., 2004). In regard to permissibility itself, the religiosity of students' parents may be a strong predictor of permissibility cluster membership, especially of membership in the *low permissibility* cluster (Burkett, 1993; Foshee & Hollinger, 1996). However, such data were not available for the current analyses. Future studies could include such items to better control for all possible predictors of permissibility cluster membership and drinking behaviors.

Fifth, as mentioned previously, there is still the possibility of reverse causality. It may be that parents are more permissive of college drinking if their children initiate drinking prior to

high school. Or, perhaps college students who drink at higher levels perceive their parents as being more permissive as a means of reducing cognitive dissonance. Regardless, the present study acknowledges this limitation and makes no claims about the causality of the relation between permissibility and drinking behaviors among college students.

Sixth, the statistical analyses performed for this study were generalized linear mixed models that used a Poisson distribution and a log link function, as is appropriate with a dependent variable composed of count data (Coxe et al., 2009; Hayat & Higgins, 2014; Raudenbush & Bryk, 2002). However, there are two common problems of Poisson models that were not addressed in this study: zero-inflation and overdispersion. Zero-inflation occurs when there are more zero responses in the data than would normally be expected by a Poisson distribution (Coxe et al., 2009). Often times, this is because some individuals in the sample never engage in the behavior being measured (Hayat & Higgins, 2014). For example, there may have been some students in this study that never engaged in binge drinking during college, because they are abstainers. Responses such as this are commonly referred to as structural zeroes (Coxe et al., 2009). There are also individuals in the sample that reported a score of zero, but may have responded differently on subsequent measurement occasions. Data with an excess of zeroes are typically accounted for using two-part models. The first part uses logistic regression to estimate the probability of an individual being a structural zero, and therefore, never engaging in the behavior being assessed (Coxe et al., 2009). The second part estimates the Poisson or negative binomial model for cases that are not structural zeroes, or for those individuals in which the behavior actually occurs (Coxe et al., 2009).

Overdispersion, or having a conditional variance that is larger than the conditional mean, may have also been a problem. A Poisson probability distribution is characterized by one

parameter,  $\lambda$ , which is both the mean and the variance (Hayat & Higgins, 2014). However, overdispersion occurs when the variance is larger than the mean (Hayat & Higgins, 2014). This is often accounted for with a second parameter,  $\phi$ , which is multiplied by the mean,  $\lambda$  (Coxe et al., 2009). Negative binomial models can also be used to account for overdispersion (Coxe et al., 2009). When overdispersion is present but not accounted for, estimates of standard errors will be too small, statistical significance will be overestimated, and confidence intervals will be too narrow (Coxe et al., 2009). However, overdispersion was not assessed or accounted for in these models due to practical considerations. Future studies should account for both overdispersion and zero-inflation to ensure optimal statistical accuracy.

### *Strengths*

Despite having a number of limitations, there are several notable strengths and unique features of the current study. First, this is the first study to the author's knowledge that assesses perceived parental permissibility of alcohol use in college students longitudinally.

Consequently, this allowed the current study to be the first to assess whether permissibility changes across college on an aggregate level as well as whether there were different patterns of change in students' perceived parental permissibility of alcohol use. Further, this allowed for the current study to be the first to test whether students' mean perceived parental permissibility as well as fluctuations from this in a given year were linked to drinking behaviors.

Another key strength was the use of two complementary sets of statistical analyses (aggregate generalized linear mixed models and generalized linear mixed models that used permissibility clusters) that produced converging findings. Similarly, the use of three drinking outcomes (binge drinking frequency, peak drinking, and negative consequences of alcohol use) that were all significantly associated with permissibility to varying degrees was also a strength.

Taken together, the converging findings across the two complimentary sets of statistical analyses and the three drinking outcomes add convergent validity to this study's findings.

A final strength of the current study was the focus on the role of parents in college drinking. Even though there is an emerging body of literature exploring how parents are associated with various drinking behaviors during college (Abar et al., 2012; Mallett et al., 2011; Small et al., 2011; Turrisi et al., 2001), there is much more work on this relation in the adolescent literature (Barnes et al., 2000; Barnes & Farrell, 1992; Baumrind, 1991; Cohen, Richardson, & LaBree, 1994; Latendresse et al., 2008). This study contributes to an understudied area that may become more important as our economy and society continue to change and the transition from adolescence to adulthood continues to lengthen and become more complex.

#### *Future Directions*

Future research could build on the findings of this study in two main ways. First, future work should include more permissibility variables. It would be ideal to have both students and parents report on permissibility. This would help remove any uncertainty relating to how accurately students can report on their parents' attitudes towards alcohol use (Cottrell, Li, Harris, D'Alessandri, Atkins, Richardson, and Stanton, 2003; Latendresse, Rose, Viken, Pulkkinen, Kaprio, and Dick, 2009). Further, it would be ideal to have variables assessing how permissive parents are of their children getting drunk, experiencing negative consequences of alcohol use, and driving under the influence of alcohol (Shope, Waller, Raghunathan, & Patil, 2001; van der Vorst et al., 2005). Second, it would be ideal to include measures of both drinking and permissibility from earlier than the last year of high school (White, Pandina, & Chen, 2002). Many adolescents initiate alcohol use prior to their last year of high school (Johnston, O'Malley,

Bachman, & Schulenberg, 2011). Incorporating measures from as early as elementary or middle school through students' last year of college would allow for more nuanced trajectories of permissibility change and better cross-lagged designs, which would help in establishing a clearer understanding of the link between alcohol use and permissibility and in reducing the likelihood of reverse causality (Kerr & Stattin, 2003).

In a broader sense, in addition to just asking how permissibility changes and to what extent it relates to college drinking, researchers should ask *how* permissibility affects drinking behaviors. For example, do students whose parents are less permissive of drinking engage in fewer drinking behaviors because they are afraid of getting in trouble or disappointing their parents? Or is it because their parents have explained to them the risks of heavy drinking and have modeled responsible drinking behaviors, and students have internalized these attitudes and values? Further, although most researchers would probably agree that having parents who are permissive of heavy drinking is not developmentally healthy, it might be less than optimal to have parents who adopt a zero-tolerance policy towards alcohol use during college as this is not realistic. For example, more than 70% of adolescents have consumed alcohol at least once by their last year of high school and about 40% of high school seniors report consuming alcohol in the past 30 days (Johnston et al., 2011). Further, having parents who take such a strict stance towards college drinking could be harmful to the parent-child relationship and could result in students needing to lie to their parents about their recreational activities. Perhaps instead of just looking at how permissibility relates to drinking behaviors, researchers should assess whether permissibility and drinking are linked to social and emotional health. Research in these areas would help move towards a more complete understanding of college drinking and its health consequences.

## *Conclusion*

The findings of the current study support and extend the growing body of literature linking perceived parental permissibility of alcohol use and drinking behaviors among college students. Specifically, these findings support previous work by showing that college students' perceived parental permissibility of alcohol use was associated with binge drinking, peak drinking, and negative consequences of alcohol use across the first four years of college. Further, these findings extend the literature by showing that permissibility increases across college, that there are distinct clusters of students with differing permissibility trajectories, and that permissibility cluster membership is associated with drinking behaviors and consequences. These findings lend support to parent-based interventions targeting college drinking by suggesting the need to continue implementing PBIs beyond the transition to college and the first year of college as permissibility, binge drinking, and peak drinking increase across college and changes in permissibility in students' third year of college were shown to be linked to increases in risky drinking behaviors. Future work using more items assessing characteristics of the parent-child relationship and more nuanced aspects of parents' attitudes and messages about their children's alcohol use would help strengthen these findings and their interpretations.

**APPENDIX**  
**TABLES AND FIGURES**

Tables 1-9

Figures 1-4

**Table 1**

Demographic Characteristics of the Initial Sample in the  
Fall of the First Year of College

Demographic Characteristic	n	Percent (%)
Gender		
Female	378	50.8
Race/Ethnicity		
Hispanic/Latino	187	25.1
European American NHL	204	27.4
Asian American NHL	173	23.3
African American NHL	117	15.7
Multi-racial NHL	63	8.5

*Note.*  $N = 744$ ; NHL = non-Hispanic/Latino.

**Table 2**

## Schedule of Perceived Parental Permissibility of Alcohol Use Measurement

Time Period Survey Asked About	Year Surveyed	Type of Survey
Senior Year of High School	Second Year of College	Retrospective
First Year of College	Second Year of College	Retrospective
Second Year of College	Second Year of College	Concurrent
Third Year of College	Third Year of College	Concurrent

**Table 3**

Means and Standard Deviations of Perceived Parental Permissibility of Alcohol Use across Four Occasions: Full Sample and by Gender

	Last year of high school	First year of college	Second year of college	Third year of college
Full Sample	1.20 (1.95)	2.33 (2.47)	2.63 (2.54)	3.25 (2.33)
Females	1.09 (1.78)	2.15 (2.37)	2.46 (2.42)	2.87 (2.17)
Males	1.31 (2.11)	2.53 (2.56)	2.81 (2.66)	3.69 (2.43)

*Note.*  $N = 617 - 656$ .

**Table 4**

Means and Standard Deviations of 30-Day Binge Drinking Frequency, 30-Day Peak Drinking, and Negative Consequences of Alcohol Use across Four Years of College: Full Sample and by Gender

	First year of college	Second year of college	Third year of college	Fourth year of college
30-day binge drinking frequency				
Full sample	1.35 (1.74)	1.60 (1.75)	1.54 (1.65)	1.68 (1.72)
Females	1.17 (1.67)	1.48 (1.66)	1.52 (1.62)	1.53 (1.63)
Males	1.54 (1.79)	1.74 (1.84)	1.56 (1.68)	1.86 (1.80)
30-day peak drinking				
Full sample	4.95 (5.32)	5.71 (5.66)	5.99 (5.69)	6.48 (5.49)
Females	3.58 (3.87)	4.63 (4.22)	4.91 (4.36)	5.23 (4.23)
Males	6.38 (6.18)	6.90 (6.72)	7.24 (6.72)	7.93 (6.37)
Negative consequences of alcohol use				
Full sample	.24 (.33)	.20 (.29)	.21 (.34)	.23 (.34)
Females	.22 (.29)	.18 (.26)	.20 (.27)	.21 (.30)
Males	.26 (.36)	.23 (.32)	.24 (.41)	.25 (.38)

*Note.*  $N = 531 - 738$ .

**Table 5**

Conditional Growth Model Estimating Change in Perceived Parental Permissibility of Alcohol Use across College and by Gender

	Rate ratio [95% CI]
Intercept, $\gamma_{00}$	.97 [.85, 1.11]
Male Gender, $\gamma_{01}$	1.15 [.96, 1.38]
Time, $\gamma_{10}$	1.31 [1.26, 1.35]***
Gender $\times$ Time, $\gamma_{11}$	1.04 [.99, 1.09] <sup>+</sup>

*Note.*  $N = 679$ , CI = confidence interval.

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

**Table 6**

Conditional Growth Models Estimating Change in Drinking Behaviors across College and by Gender

	Binge drinking rate ratio [CI]	Peak drinking rate ratio [CI]	Negative cons. rate ratio [CI]
Intercept, $\gamma_{00}$	.86 [.76, .99] *	2.61 [2.32, 2.95] ***	.20 [.17, .25] ***
Male Gender, $\gamma_{01}$	1.31 [1.08, 1.57] **	1.60 [1.35, 1.89] ***	1.22 [.92, 1.63]
Time, $\gamma_{10}$	1.08 [1.04, 1.12] ***	1.12 [1.09, 1.14] ***	.99 [.88, 1.11]
Gender $\times$ Time, $\gamma_{11}$	.98 [.93, 1.04]	.96 [.93, .99] **	1.00 [.86, 1.17]

*Note.*  $N = 679$ .

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

**Table 7**

Fixed Effects of Generalized Linear Mixed Models Predicting Drinking Behavior by Time, Perceived Parental Permissibility of Alcohol Use, and Gender: Aggregate Models

	Binge drinking rate ratio [CI]	Peak drinking rate ratio [CI]	Negative cons. rate ratio [CI]
Average drinking, $\pi_0$			
Intercept, $\gamma_{00}$	.90 [.78, 1.02]***	2.92 [2.61, 3.28]***	.19 [.15, .25]***
Male gender, $\gamma_{01}$	1.22 [1.01, 1.48]*	1.41 [1.20, 1.67]***	1.29 [.93, 1.79]
Mean permissibility, $\gamma_{02}$	1.27 [1.22, 1.32]***	1.27 [1.23, 1.33]***	1.09 [1.04, 1.14]***
Average change over time, $\pi_1$			
Intercept, $\gamma_{10}$	1.08 [1.03, 1.13]**	1.10 [1.07, 1.13]***	1.00 [.87, 1.14]
Male gender, $\gamma_{11}$	.98 [.91, 1.04]	.96 [.93, 1.00] <sup>+</sup>	.98 [.81, 1.18]
Average fluctuations with permissibility, $\pi_2$			
Intercept, $\gamma_{20}$	1.01 [.97, 1.05]	1.03 [1.01, 1.06]**	.99 [.90, 1.10]
Male gender, $\gamma_{21}$	1.00 [.95, 1.05]	.99 [.96, 1.02]	1.02 [.89, 1.16]

Note.  $N = 679$ , CI = 95% confidence interval.

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

**Table 8**

Final Cluster Centers of K-Means Cluster Analysis of Perceived Parental Permissibility of Alcohol Using k = 4 Groups

	n	Last year of high school	First year of college	Second year of college	Third year of college
Clusters					
Low permissibility	224	.22	.46	.57	.90
Age 21 permissibility	173	.66	1.34	1.69	4.64
College permissibility	117	.99	4.93	5.63	4.84
High permissibility	75	5.39	5.99	5.99	4.65

**Table 9**

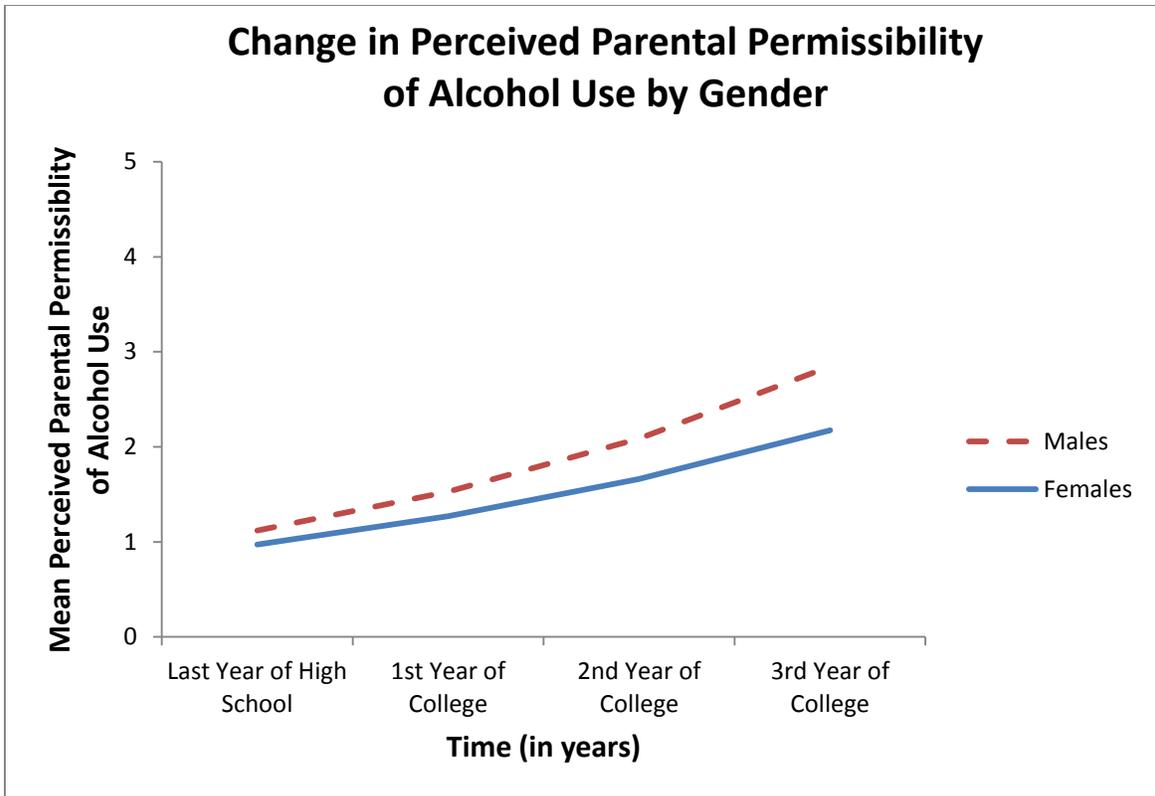
Fixed Effects of Generalized Linear Mixed Models Predicting Drinking Behavior by Time, Perceived Parental Permissibility of Alcohol Use, and Gender: Permissibility Cluster Models

	Binge drinking rate ratio [CI]	Peak drinking rate ratio [CI]	Neg. consequences rate ratio [CI]
Average drinking, $\pi_0$			
Intercept, $\gamma_{00}$	.44 [.36, .53]***	1.35 [1.15, 1.59]***	.16 [.11, .23]***
Male gender, $\gamma_{01}$	1.24 [1.02, 1.50]*	1.43 [1.21, 1.69]***	1.24 [.90, 1.70]
Permissibility cluster			
Age 21 <sup>a</sup> , $\gamma_{02}$	2.19 [1.71, 2.82]***	2.48 [2.01, 3.06]***	1.15 [.74, 1.77]
College <sup>a</sup> , $\gamma_{03}$	3.53 [2.71, 4.61]***	3.82 [3.04, 4.81]***	1.51 [.97, 2.34] <sup>+</sup>
High <sup>a</sup> , $\gamma_{04}$	4.28 [3.18, 5.77]***	4.20 [3.22, 5.47]***	1.59 [.98, 2.58] <sup>+</sup>
Average change over time, $\pi_1$			
Intercept, $\gamma_{10}$	1.14 [1.06, 1.22]***	1.18 [1.13, 1.22]***	1.01 [.85, 1.21]
Gender, $\gamma_{11}$	.98 [.93, 1.04] <sup>+</sup>	.97 [.94, 1.00] <sup>+</sup>	1.01 [.85, 1.20]
Permissibility cluster			
Age 21 <sup>a</sup> , $\gamma_{12}$	.95 [.87, 1.04]	.95 [.91, 1.00]*	.96 [.76, 1.20]
College <sup>a</sup> , $\gamma_{13}$	.95 [.87, 1.04]	.92 [.88, .97]***	.97 [.77, 1.23]
High <sup>a</sup> , $\gamma_{14}$	.94 [.86, 1.03]	.92 [.88, .97]***	.97 [.75, 1.25]

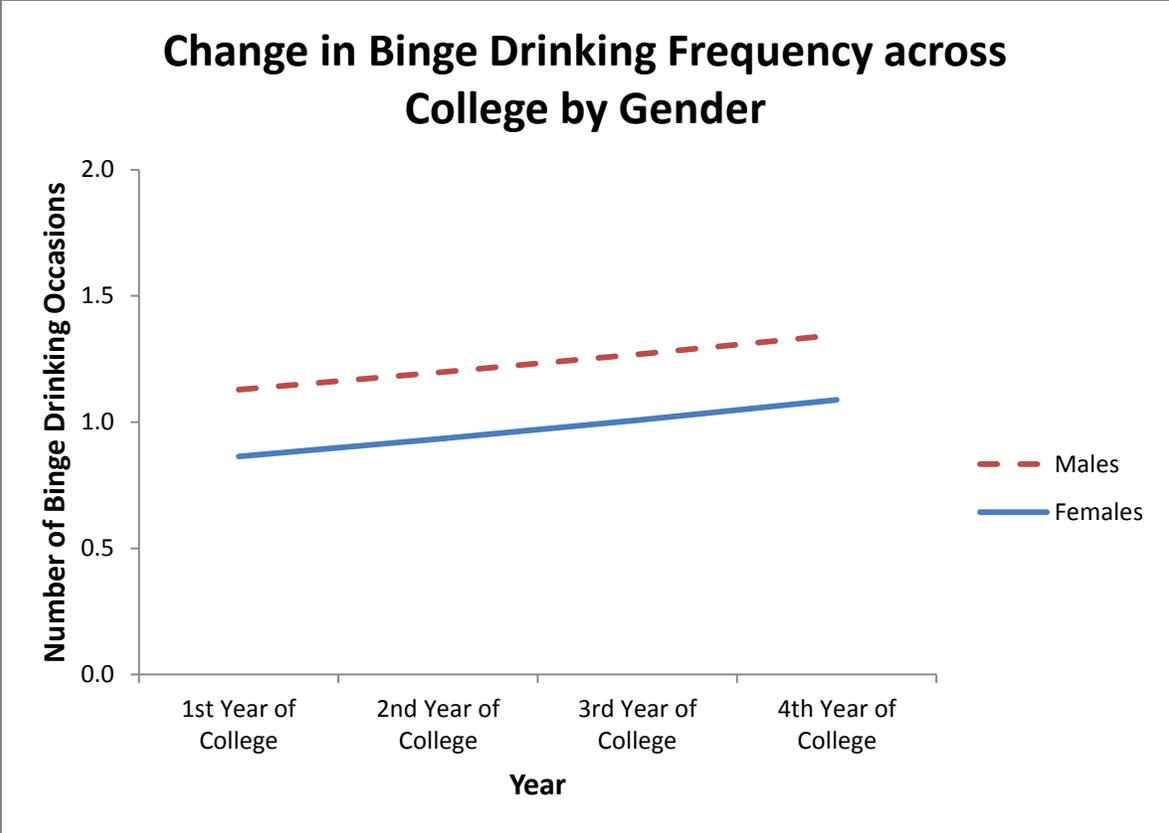
Note.  $N = 589$ , CI = 95% confidence interval.

<sup>a</sup> In comparison to the Low Permissibility cluster (reference).

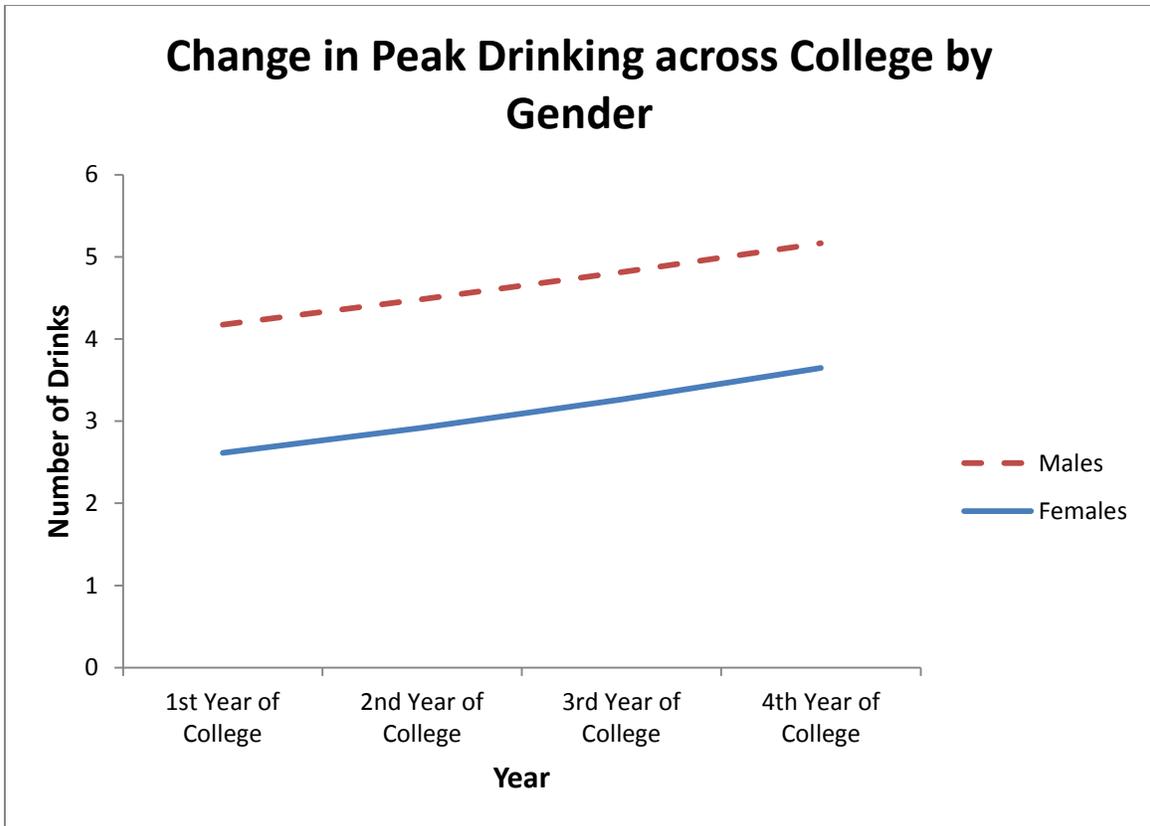
<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .



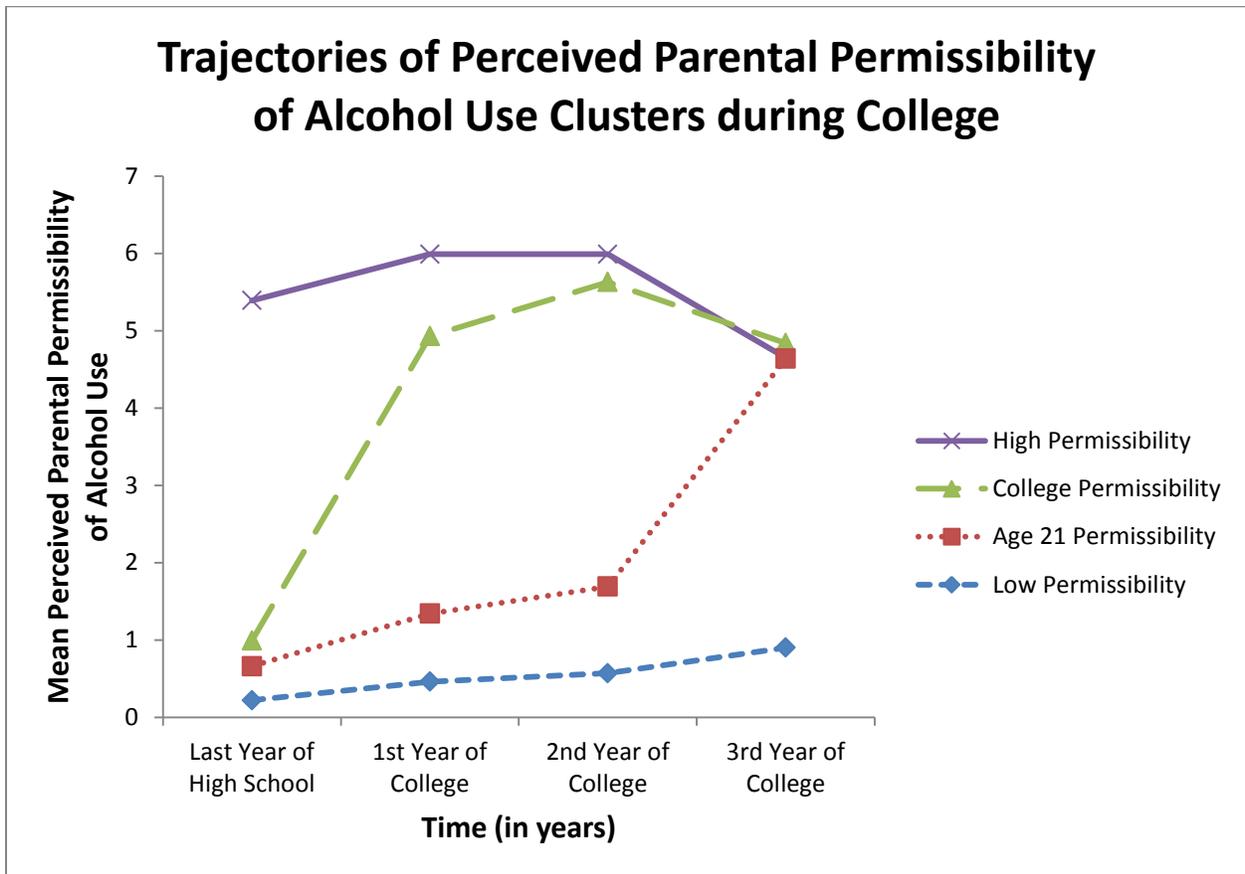
**Figure 1.** Predicted change trajectories of perceived parental permissibility of alcohol use across college by gender.



**Figure 2.** Predicted change in binge drinking frequency in the past 30 days by gender.



**Figure 3.** Predicted change in the number of drinks consumed on students' heaviest drinking occasion in the past 30 days by gender.



**Figure 4.** Change trajectories of perceived parental permissibility of alcohol use clusters sorted by k-means cluster analysis.

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