

The stability and predictors of peer group deviance in university students

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Abstract

Background Peer group deviance (PGD) is strongly associated with current and future externalizing behaviors. Debate remains about the degree to which this association arises from social selection. The first year of university constitutes a social experiment in which most individuals leave their home environment and recreate for themselves a new peer group.

Methods PGD was measured in newly arrived university students and then 6 and 18 months later. Other personality and family traits were also assessed.

Results PGD reported for high school friends at the start of university and university friends 6 months later were substantially correlated (+0.60). This correlation was only slightly diminished if restricted to students whose home was greater than 50 miles from the university. PGD was strongly predicted across three cohorts by male sex (+),

extraversion (+), conscientiousness (–), a family history of alcohol use disorders (+) and depression (+), and religiosity (–). These predictors of PGD had a relatively stable impact over 18 months and, aside from sex, differed only modestly in males and females.

Conclusions As individuals change social groups from high school to university, the level of PGD remains relatively stable, suggesting that individuals play a strong role in selecting peer groups with consistent characteristics. PGD is also predicted cross-sectionally and longitudinally by personality, family background and religiosity. Our results suggest that the association between personal and peer deviance is due at least in part to the effects of social selection.

Keywords Peer deviance · Development · Personality · Family history · College

Peers influence many aspects of human behavior [1]. In childhood and adolescence, high levels of peer group deviance (PGD) are strongly associated with a range of future externalizing behaviors [2–4]. Consequently, many developmental models for antisocial behavior include PGD as a key variable (e.g., [5–7]). Understanding the predictors of association with deviant peers will be important in elucidating the developmental processes leading to externalizing behaviors.

While early models of person–environment interaction typically assumed that the individual was a passive recipient of environmental influences, (i.e., environment → person), more recent studies of PGD have commonly suggested bidirectional effects (environment ↔ person) (e.g., [8–11]). While social pressures to conform can make adolescents' behaviors resemble those of their peers (via social influence), adolescents can also actively seek out

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like-minded friends who share their own proclivities (via social selection).

This paper follows up on two lines of research that evaluate the role of social selection in PGD. First, when individuals move, do they recreate their social environments including the level of PGD? We found two relevant past reports. First, a study of Japanese exchange students going to Australia, where they were randomly assigned to families, found that the quality of social support measured before and during their exchange program correlated $+0.43$ [12]. Second, Stappenbeck et al. [13] found that an aggregate measure of friend alcohol consumption was moderately stable ($r = +0.41$) for students followed from their last year of high school into their first year in college. Both these reports suggest that, to a considerable degree, when changing locations, individuals recreate for themselves similar social environments [12].

Going to university in most Western countries is characterized by several important transitions. Individuals typically live independently from their parents often for the first time, have increased freedom and responsibility, and build new social networks [14–16]. This represents a natural social experiment of which to take advantage. We have examined PGD in high school from 3 independent cohorts of freshman assessed at the start of their freshman semester at university and then asked them about PGD in their university friends 6 months later in the middle of the spring semester. What level of correlation would we observe between these two assessments of PGD? Do students recreate their social environments and level of PGD from high school when they are at university?

Second, a range of prior studies have found that individual and family characteristics in childhood predict peer group characteristics in adolescence [17–20]. We explore the degree to which we can predict current and subsequent PGD in our three cohorts of students from measures of demographic factors, personality, religiosity, and family history of psychopathology.

Methods

As described elsewhere [21], the “Spit for Science” project attempted to enroll all incoming freshman, who were 18 years of age or older, at Virginia Commonwealth University (VCU), a diverse, urban US public university. Study data were collected and managed using REDCap electronic data capture tools hosted at VCU [22]. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for

seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.

The study design involves multiple waves of data collection including two in the freshman year, the first initiated as the freshman prepare to arrive on campus in the fall and in the second in the middle of the spring semester. Further waves of data collection then occur yearly in the spring. The study is on-going and the present paper utilizes results from the first cohort at waves 1, 2 and 3, the second cohort at waves 1 and 2, and the third cohort only at wave 1. DNA collection is part of the protocol, but not involved in the present analyses.

Cooperation at the first wave ranged from 57 to 60 % across the first three cohorts. Retention rates were 80 % in cohort 1, and 76 % in cohort 2 at wave 2, and 59 % in cohort 1 at wave 3. Cohort 1 (typical for the other cohorts) was 60.3 % female with a mean age (SD) of 18.5 (0.5) with the following ethnic self-identifications: American Indian/Native Alaskan ($n = 10$, 0.5 %), Asian ($n = 311$, 15.1 %), Black/African American ($n = 395$, 19.2 %), Hispanics/Latino ($n = 120$, 5.8 %), Native Hawaiian/Pacific Islander ($n = 17$, 0.8 %), White ($n = 1,056$, 51.4 %), and more than one race ($n = 109$, 5.3 %).

At wave 1 in cohort 1, PGD was assessed by 12 items obtained from two validated instruments [23, 24] that assessed the proportion of the respondent’s friends, who engaged in specific behaviors. Friends were defined as “people who you would have seen regularly and spent time with in school and outside of school.” The five response options were on a 1–5 scale: none, a few, some, most, and all. These items were: (1) “smoked cigarettes”, (2) “drunk alcohol”, (3) “got drunk”, (4) “had problems with alcohol”, (5) “skipped or cut school a lot”, (6) “cheated on school tests”, (7) “stole anything or damaged property on purpose”, (8) “been in trouble with the law”, (9) “smoked marijuana”, (10) “used inhalants”, (11) “used other drugs like cocaine, downers or LSD”, and (12) “sold or gave drugs to other kids”. For subsequent waves, because of concerns expressed by students over the length of our questionnaire, we shortened our PGD scale, using part-whole regressions, to six items: (1), (2), (3), (4), (8), and (9). In this article, we called these two scales the “long” and “short” PGD assessment. PGD was scored as the average of the endorsed items on the 1–5 scale. The Pearson product-moment correlation of the long- and short-form scores for wave 1 in cohorts 1 was $+0.93$. Unless otherwise noted, all the analyses reported here were done using the PGD short form.

When these questions were first asked of incoming freshman, the introductory wording to the PGD section was: “Please answer for your friends that you spent time with during high school (before starting VCU)”. When

these questions we re-asked later in the freshman year, the wording had changed as follows: “Please answer for your friends that you spend time with since starting school at VCU”.

Personality was assessed by the big five inventory (BFI) [25] and religiosity was measured using items originally derived from the National Comorbidity Survey, a Gallup poll, and the religiousness scale of Strayhorn and colleagues [26]. Cronbach’s alpha [27] for the shortened personality scales and our religiosity measure were as follows: extroversion +0.79, agreeableness +0.60, conscientiousness +0.71, neuroticism +0.69, openness 0.64 and religiosity +0.85.

For family history, we asked questions separately for four groups of relatives: (1) mothers, (2) fathers, (3) siblings, and (4) aunts, uncles, or grandparents. For each group of relatives, we asked separately whether they had ever experienced problems with (1) alcohol, (2) other drugs, or (3) depression/anxiety. Questions for each phenotype were averaged over the 4 groups of relatives. To explore the degree to which the individual groups of relatives were predictive, we picked one example and saw that independently, PGD was highly significantly predicted ($p < 0.0001$) by a history of alcohol problems in each of the four relative groups. When they were examined together in a multiple regression, three groups remained significantly predictive in the following order of effect sizes: aunts, uncles, or grandparents, mother and father.

Parental education was coded on a seven-point scale (from no formal education to post-graduate professional training) and averaged across parents. The three digit zip code of the student’s home address was available to us. With this information, we could divide the students into those whose home was near the university (within a radius of approximately 50 miles) and those whose home was not. For all analyses, missingness was quite modest. We analyzed the mean response for all individuals who answered ≥ 30 % of the items. All continuous scales were then z-transformed for ease of interpretation.

Results

Descriptive statistics and the stability of peer deviance

The Cronbach coefficient alpha [27] for the PGD long form, assessed only in cohort 1 wave 1 was 0.90. The coefficient alphas for the short form were as follows: cohort 1—0.89, 0.88 and 0.87 in waves 1, 2 and 3; cohort 2—0.89 and 0.87 in waves 1 and 2; and in cohort 3—0.88 in wave 1.

In the PGD short form, in cohort 1, the mean (SD) of PGD was 2.40 (0.88) at wave 1, 2.54 (0.87) at wave 2 and

2.48 (0.82) at wave 3. In cohort 2, the mean score was 2.40 (0.87) and 2.44 (0.86) at waves 1 and 2. In cohort 3, the mean PGD score at wave 1 was 2.36 (0.85). Thus, across all waves, the average response from VCU students was that between “a few” and “some” of their friends were engaged in the assessed deviant behaviors.

For cohort 1, the Pearson correlation between waves 1 and 2 (~6 months) was +0.60 ($n = 2,133$). The parallel figure between waves 1 and 3 (~18 months) was +0.50 ($n = 1,293$), and waves 2 and 3 (~12 months) was +0.56 ($n = 1,198$). For cohort 2, the correlation between waves 1 and 2 was +0.60 ($n = 1,879$).

Since a proportion of VCU students lived close to the university before they enrolled, they could have maintained some of their same peer group between high school and university, biasing upward our estimate of PGD stability. In cohorts 1 and 2, 22.7 and 19.6 % of the students lived within ~50 miles of the university. In cohort 1, the correlation of PGD score between waves 1 and 2 was identical in students who did versus did not live near the university (both +0.60). In cohort 2, PGD was modestly more stable in those who lived near the university (+0.67) than those who did not (+0.58).

Predictors of peer deviance

We began by comparing in cohort 1 wave 1 our prediction of PGD as assessed using the short and long forms from our demographic factors, personality, religiosity, and family history variables (Table 1). Surprisingly, the proportion of variance predicted was higher with the short form than the long form of PGD (14.1 vs. 11.9 %). The performance for nearly all predictors was quite similar with the largest changes seen for extraversion that was modestly stronger at predicting short-form versus long-form PGD.

All the subsequent analyses reported here examined the PGD short form. We next examined the cross-sectional prediction of PGD from our demographic factors, personality, religiosity and family history in the first wave of cohorts 1, 2 and 3 (Table 2). By examining multiple cohorts, we could explore the reproducibility of the predictors of PGD. The proportion of variance in PGD predicted was relatively stable over the three cohorts ranging from 14.1 to 16.2 %. Seven variables were consistently significant predictors of PGD across all three cohorts: sex (male+), extraversion (+), openness (+), religiosity (–), and a family history of alcohol problems (+), drug problems (+), and depression (+). Of these, sex, extraversion, religiosity, and a family history of alcohol problems were the strongest predictors. Agreeableness (–) and parental education (+) both significantly predicted PGD in two of the three cohorts. Of the variables examined, only age, conscientiousness and neuroticism were unrelated to the level of PGD.

Table 1 Prediction of peer group deviance as assessed by our short and long form from demographic factors, personality, religiosity and family history in the first wave of cohort ($n = 2,440$)

	Short form		Long form	
	β	SE	β	SE
Age	-0.02	0.02	-0.03	0.02
Sex	0.19 [#]	0.04	0.20 [#]	0.04
Parental education	0.07 [#]	0.02	0.06 [†]	0.02
Extraversion	0.16 [#]	0.02	0.12 [#]	0.02
Agreeableness	-0.01	0.02	-0.03	0.02
Conscientiousness	-0.02	0.02	-0.04	0.02
Neuroticism	0.03	0.02	0.02	0.02
Openness	0.05 [*]	0.02	0.05 [*]	0.02
Religiosity	-0.14 [#]	0.02	-0.12 [#]	0.02
FH-alcohol problems	0.13 [#]	0.02	0.12 [#]	0.02
FH-drug problems	0.06 [‡]	0.02	0.07 [†]	0.02
FH-depression/anxiety	0.12 [#]	0.03	0.12 [#]	0.02
Total r^2	0.141		0.119	

Sex: 0 female, 1 male, FH family history

* <0.05

† <0.01

‡ <0.001

0.0001

To maximize power, we then combined the wave 1 data from cohorts 1, 2 and 3 together and examined whether the effect of our predictors on PGD differed by sex. Of the twelve predictors examined, two had significant interactions with sex. Extraversion was a considerably stronger predictor of PGD in women ($b = +0.19$, $SE = 0.01$) than in men ($b = +0.08$, $SE = 0.02$; $p < 0.0001$ for the

interaction), while the opposite was seen for openness ($b = +0.15$, $SE = 0.02$ in men and $+0.07$, $SE = 0.02$ in females, $p = 0.002$ for the interaction).

Next, we examined the temporal stability of the predictors of PGD in cohort 1 by comparing the ability of these predictors—assessed at wave 1—to predict PGD at waves 1, 2 and 3 (Table 3). The total variance predicted declined modestly from wave 1 (14.1 %) to wave 2 (12.1 %), but then increased again at wave 3 (14.4 %). The performance of the individual predictors was broadly similar across waves, although a few changes were noteworthy. Sex and religiosity declined modestly in their association with PGD over time, while conscientiousness and parental education became somewhat more strongly associated.

Finally, to determine how much the prediction of PGD in waves 2 and 3 were mediated through levels of PGD in wave 1, we repeated these multiple regressions, but now included level of PGD in wave 1. As seen in Table 4, controlling for wave 1 PGD, parental education, extraversion, and openness continued to predict consistently PGD at the later waves controlling for prior PGD. The additional predictors' conscientiousness, religiosity and FH for alcohol problems were significant for one of these two further waves.

Discussion

The goal of these analyses was to first determine the stability of PGD as late adolescents moved from their home of rearing to a university environment. Second, we sought to clarify the degree to which PGD could be predicted by

Table 2 Prediction of peer group deviance from demographic factors, personality, religiosity and family history in the first wave of cohorts 1, 2 and 3

Variable	Cohort 1		Cohort 2		Cohort 3	
	$n = 2,440$		$n = 2,268$		$n = 1,931$	
	β	SE	β	SE	β	SE
Age	-0.02	0.02	-0.02	0.02	-0.03	0.03
Sex	0.19 [#]	0.04	0.18 [#]	0.04	0.12 [*]	0.05
Parental education	0.07 [#]	0.02	0.02	0.02	0.05 [*]	0.02
Extraversion	0.16 [#]	0.02	0.17 [#]	0.02	0.13 [#]	0.02
Agreeableness	-0.01	0.02	-0.08 [#]	0.02	-0.07 [†]	0.02
Conscientiousness	-0.02	0.02	-0.01	0.02	-0.03	0.02
Neuroticism	0.03	0.02	0.02	0.02	-0.01	0.02
Openness	0.05 [*]	0.02	0.04 [*]	0.02	0.06 [†]	0.02
Religiosity	-0.14 [#]	0.02	-0.14 [#]	0.02	-0.14 [#]	0.02
FH-alcohol problems	0.13 [#]	0.02	0.12 [#]	0.02	0.10 [#]	0.03
FH-drug problems	0.06 [‡]	0.02	0.09 [‡]	0.02	0.10 [#]	0.03
FH-depression/anxiety	0.12 [#]	0.03	0.13 [#]	0.02	0.12 [#]	0.03
Total r^2	0.141		0.162		0.145	

Sex: 0 female, 1 male, FH family history

* <0.05

† <0.01

‡ <0.001

0.0001

Table 3 Prediction of peer group deviance in waves 1, 2 and 3 in cohort 1 from demographic factors, personality, religiosity and family history assessed in wave 1

Variable	Year 1 fall		Year 1 spring		Year 2 spring	
	<i>n</i> = 2,440		<i>n</i> = 1,978		<i>n</i> = 1,196	
	β	SE	β	SE	β	SE
Age	-0.02	0.02	-0.03	0.02	-0.03	0.03
Sex	0.19 [#]	0.04	0.15 [†]	0.05	0.15 [*]	0.06
Parental education	0.07 [#]	0.02	0.11 [#]	0.02	0.10 [‡]	0.03
Extraversion	0.16 [#]	0.02	0.15 [#]	0.02	0.15 [#]	0.03
Agreeableness	-0.01	0.02	-0.02	0.02	-0.04	0.03
Conscientiousness	-0.02	0.02	-0.04	0.02	-0.09 [†]	0.03
Neuroticism	0.03	0.02	0.00	0.02	0.00	0.03
Openness	0.05 [*]	0.02	0.05 [*]	0.02	0.07 [*]	0.03
Religiosity	-0.14 [#]	0.02	-0.14 [#]	0.02	-0.09 [‡]	0.03
FH-alcohol problems	0.13 [#]	0.02	0.12 [#]	0.03	0.12 [‡]	0.03
FH-drug problems	0.06 [‡]	0.02	-0.02	0.03	0.07 [*]	0.03
FH-depression/anxiety	0.12 [#]	0.03	0.10 [#]	0.03	0.10 [‡]	0.03
Total <i>r</i> ²	0.141		0.121		0.144	

Sex: 0 female, 1 male, *FH* family history

* <0.05

† <0.01

‡ <0.001

0.0001

Table 4 Prediction of peer group deviance in waves 2 and 3 in cohort 1 from demographic factors, personality, religiosity, family history and peer group deviance assessed in wave 1

Variable	Year 1 spring		Year 2 spring	
	<i>n</i> = 1,975		<i>n</i> = 1,193	
	β	SE	β	SE
Age	-0.01	0.02	-0.01	0.03
Sex	0.03	0.04	0.09	0.06
Parental education	0.07 [‡]	0.02	0.07 [†]	0.02
Extraversion	0.06 [†]	0.02	0.08 [†]	0.02
Agreeableness	-0.03	0.02	-0.05 [*]	0.03
Conscientiousness	-0.03	0.02	-0.08 [†]	0.03
Neuroticism	0.00	0.02	-0.02	0.03
Openness	0.04 [*]	0.02	0.06 [*]	0.02
Religiosity	-0.08 [#]	0.02	-0.04	0.03
FH-alcohol problems	0.05 [*]	0.02	0.05	0.03
FH-drug problems	-0.01	0.02	0.05	0.03
FH-depression/anxiety	0.02	0.02	0.05	0.03
Wave 1 peer group deviance	0.56 [#]	0.02	0.42 [#]	0.03
Total <i>r</i> ²	0.3869		0.2972	

Sex: 0 female, 1 male, *FH* family history

* <0.05

† <0.01

‡ <0.001

0.0001

individual and family characteristics. Both of these results should help us gain insight into the nature of the relationship between PGD and externalizing outcomes.

Across two cohorts, PGD as reported by incoming students about their prior high school friends correlated

strongly (+0.60) with ratings obtained 6 months later describing the peers they acquired since coming to university. These results changed little if we restricted the students to those whose home was at least 50 miles distant from the university, thereby increasing the likelihood that most of their university friends would be new. These correlations were modestly higher than previously observed for the quality of social support for the Japanese exchange students prior to and during a year abroad in Australia [12], and for peer alcohol use from senior year in high school to first year in college [13]. The stability of peer deviance we observed was also higher than those reported for “peer delinquency” from waves 2 to 3 (+0.45) and from waves 3 to 4 (+0.38) in the Rochester Youth Development Study studies between 9th and 11th grade [28], but similar in magnitude to correlations in peer substance use found from 8th to 9th grade (+0.57) reported by Wills and Cleary [11]. Our results are broadly consistent with the prior literature in suggesting that as individuals change social environments, they tend to seek out friends with similar levels of peer deviance. In support of the social selection model of PGD, individuals appear to play an active role in creating the level of deviancy in members of their social environment. Our findings add to our understanding of the nature of the transition to college [16] and can help to identify those at high risk of adverse externalizing behaviors.

The predictors of PGD were diverse and consistent over our three cohorts and included demographic factors (male sex+), personality (extraversion +, openness +, agreeableness -), religiosity (-), and a family history of alcohol or drug problems or depression/anxiety (all +). These

predictors when assessed at the start of school had a relatively stable effect on PGD over the first 18 months of university suggesting that they reflected a relatively enduring set of individual differences. We compared PGD predictors across the sexes and two personality traits emerged with quite significant interactions. Extraversion was substantially more predictive of PGD in females and openness in males.

The effects of our predictors on PGD in later waves could have been mediated entirely through their impact on wave 1 PGD. To examine this, we included wave 1 PGD in our multiple regressions and produced results consistent with only partial mediation. A number of our predictors continued to be significantly associated with PGD in later waves controlling for wave 1 PGD although generally at lower effect sizes. These results suggest that some of our predictors continued to actively impact on PGD levels after the wave 1 measurement.

Our predictors of PGD were, with considerable consistency, also predictors of externalizing behaviors including male sex [29], high extraversion [30], low agreeableness [31], low religiosity [14, 26], and a family history of alcohol or drug problems [32, 33]. These results are consistent with a prior longitudinal study in childhood and adolescence that found that externalizing traits and family dysfunction predicted future PGD [34]. Our results are also congruent with prior evidence for the heritability of PGD [35, 36] and especially with evidence that genetic influences on PGD increase as individuals age and leave home, thereby becoming increasingly able to create their own social environment [37].

Our findings suggest that the association between PGD and externalizing behaviors does not arise solely from social influences (social environment → person). Social selection—where individuals prone to externalizing traits seek out like-minded friends—is also likely to play an important role. However, deviant peers may play a critical mediational role in externalizing trajectories augmenting and mutually reinforcing deviant behavior [38–42]. Indeed, studies in adolescence suggest that high levels of parental monitoring can reduce externalizing outcomes, in part, by reducing the association with deviant peers [43, 44]. The early university years are potentially a high risk time for deviant trajectories in part due to the absence of parental monitoring figures.

It is also of interest to note what predictors were unrelated to PGD. In particular, neuroticism is a robust risk factor for a range of internalizing psychiatric disorders especially major depression and anxiety disorders [45–47]. In our data, level of neuroticism in college students is entirely unrelated to the average deviance of their peers.

Limitations

These results should be interpreted in the context of five potentially important methodological limitations. First, all of our measures of PGD are obtained by self-report, which are subject to reporting bias [10]. A proportion of the stability of PGD across waves seen in this study may result from stable biases on the part of the subject in reporting on their peers. Second, most of our analyses utilized a shortened six-item PGD scale. This would tend to attenuate any of our results due to greater measurement error. Third, we cannot rule out that several friends might have together applied to this university and maintained their friendship over time. Thus, some of the stability of PD from high school to college might not result from selection of similar friendship groups in the two environments. Fourth, cooperation rates were only in the range of 57–60 % at the first wave. However, these results are high for college-based internet surveys. For example, a 2000 meta-analysis identified 68 US web surveys of college populations with a mean response rate of 39.6 % [48]. A 2011 web-survey of 513 data from the National Survey of Student Engagement reported an overall response rate of 34 % [49]. Lastly, our measure of high school PGD was recorded retrospectively. But the elapsed time period was very brief as most participants completed their surveys within the first few weeks of starting college.

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Conflict of interest The authors report no competing interests.

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