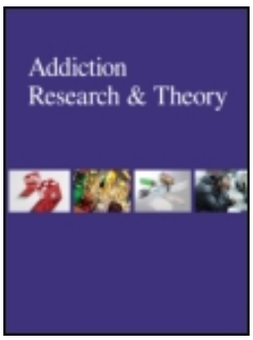

Addiction Research & Theory

ISSN: 1606-6359 (Print) 1476-7392 (Online) Journal homepage: http://www.tandfonline.com/loi/iart20

Nonmedical use of prescription drugs in emerging adulthood: differentiating sex from gender

Robert L. Peralta, Breanna C. Stewart, Jennifer L. Steele & Fernando A. Wagner

To cite this article: Robert L. Peralta, Breanna C. Stewart, Jennifer L. Steele & Fernando A. Wagner (2016) Nonmedical use of prescription drugs in emerging adulthood: differentiating sex from gender, Addiction Research & Theory, 24:5, 389-397, DOI: 10.3109/16066359.2016.1140745

To link to this article: http://dx.doi.org/10.3109/16066359.2016.1140745

Published online: 05 Jun 2016.

ADDICTION RESEARCH & THEORY, 2016
VOL. 24, NO. 5, 389–397
http://dx.doi.org/10.3109/16066359.2016.1140745

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Nonmedical use of prescription drugs in emerging adulthood: differentiating sex from gender

Robert L. Peralta[a], Breanna C. Stewart[a], Jennifer L. Steele[b] and Fernando A. Wagner[c]

[a]Department of Sociology, The University of Akron, Olin Hall, Akron, OH, USA; [b]Department of Sociology/CJ/Professional Studies, Ohio University Lancaster, Lancaster, OH, USA; [c]Prevention Sciences Research Center and School of Community Health and Policy, Morgan State University, Baltimore, MD, USA

ABSTRACT

Male–female variations in health-behavior continue to be of national and international significance with men generally being more likely to be engaged in behaviors that enhance risk across an array of preventable diseases and injuries as well as premature deaths. The literature has identified nonmedical use of prescription drugs (NMUPD) as a developing and particularly dangerous substance use behavior among college students. The literature has reported sex differences (male; female) in NMUPD but has yet to explain how gender orientation (e.g. masculine, feminine) might impact NMUPD. The purpose of this study is to address this gap by examining the influence of gender-orientation on NMUPD. Using survey data collected during the 2013–2014 academic year from a convenience sample of college students at a mid-sized Midwestern university, we examine the association of gender-orientation and NMUPD ($N = 796$). To do this, we separated masculine and feminine scales from the BEM Sex Role Inventory and used logistic regression to test whether masculine or feminine gender characteristics influenced the likelihood of NMUPD (lifetime measure of any use and by category). This analysis shows that self-identified characteristics associated with masculinity increase the odds of NMUPD, while femininity is associated with lower odds of NMUPD. Findings from this study increase our knowledge of gender orientation and sex interactions as factors that might influence NMUPD, thus demonstrating the importance of differentiating sex from gender-orientation.

ARTICLE HISTORY
Received 21 July 2015
Revised 18 December 2015
Accepted 7 January 2016
Published online 30 May 2016

KEYWORDS
Gender; gender orientation; nonmedical use of prescription drugs; college; sex

Introduction

Nonmedical use of prescription drugs (NMUPD) has emerged as a particularly dangerous health behavior among college students (Ford 2008). Emergency department visits involving nonmedical use of prescriptions recently rose by 115% between the years 2004 and 2010 (Substance Abuse and Mental Health Services Administration (SAMHSA) 2010). In 2013, one in five of new users of illicit drug use (20.6%) initiated with prescription drug use with a 'past-month prevalence of 4.8% among young adults aged 18–25' (SAMHSA 2012). Outcomes associated with NMUPD include overdose, mortality and morbidity, depression, other mental health problems and initiation of injection drug use (NIDA 2001; SAMHSA 2003). While sex category differences (i.e. female vs. male status) have been thoroughly examined in the extant NMUPD literature, no research has studied the effect of gender-orientation (i.e. feminine and masculine orientation) and sex category simultaneously on NMUPD in the general population or among college students. This paper is the result of an initial 'proof-of-concept' study which set out to determine whether gender-orientation and sex category contribute unique variance to NMUPD.

Prevailing explanations for NMUPD include misperceptions about prescription drug safety, increased availability and individual motivation (which ranges from self-medication purposes to 'getting high') (Looby et al. 2015). Gender orientation has yet to be identified as an underlying correlate of prescription drug misuse in addiction research and theory. Inconsistent results in regard to sex differences in NMUPD are common. Some studies suggest that there is an increased risk of NMUPD for females (Simoni-Wastila et al. 2004; Neff & Waite 2007; Conn & Marks 2014). These scholars suggest girls may have a higher rate of prescriptions being written by physicians compared to boys leading to abuse, or, girls may 'self-medicate' more often because they are not receiving prescriptions for certain disorders (such as attention-deficit hyperactivity disorder) compared to boys. Others cite increased risk for males (Hall et al. 2005; McCabe & Boyd 2005; Teter et al. 2005; Weyandt et al. 2013). McCabe et al (2005) report that while undergraduate women were more likely to be prescribed pain medication, undergraduate males were more likely to report higher rates of illicit prescription pain medication use. Other literature differentiates – in very specific terms – between 'illicit' (nonprescribed use) and 'medical use' (use of prescribed drugs for other medically related purposes) of prescription drugs whereby men are more likely to use illicitly and women are more likely to use for nonprescribed medical reasons (McCabe et al. 2006). These inconsistencies, largely due to operationalization and sample differences, nevertheless raise important questions about the potential relevance of sex

CONTACT Robert L. Peralta rp32@uakron.edu Department of Sociology, The University of Akron, Olin Hall, Akron 44325-1905, OH, USA

category (i.e. male vs. female status) and gender orientation (masculine orientation vs. feminine orientation) as intersecting phenomena that may play a role in NMUPD more generally.

A social constructionist theory of gender (West & Zimmerman 1987) establishes a framework for understanding NMUPD risk status by positing that gender roles are learned, reinforced by sociocultural mechanisms and actively performed behaviorally. Women and men actively contribute to the creation and maintenance of gender norms via social interaction. Although sex category is uniform, feminine and masculine socialization vary which may explain why rates of health risk behavior also vary between men and women and among men and women of different ethnic, racial, or socioeconomic groups (Marsiglia & Nagoshi 2012; Conn & Marks 2014). While feminine and masculine ideologies and expressions vary by culture and context, culturally or regionally dominant forms of femininity and masculinity have been referred to as emphasized femininity and hegemonic masculinity (Connell 1995; Schippers 2007). Theoretically, college students who strongly conform to dominant masculine constructs may be more likely to engage in health risk behavior as a way to socially express masculinity (Levant et al. 2011). Alternatively, students who conform to dominant feminine constructs should be protected from risk behaviors, such as NMUPD, regardless of sex category (Iwamoto et al. 2016).

A growing body of research has reported sex differences in NMUPD (Ford 2008). However, what is missing from the overall body of NMUPD research – and a factor that may help to explain variations in sex as described above – is a consideration of gender socialization in 'sex differences' research (Mahalik et al. 2007; Muehlenhard & Peterson 2011). We know little about if and how gender-orientation shapes NMUPD behavior. While hazardous health behavior is generally associated with men and masculinity (Mahalik et al. 2007), no research to our knowledge examines the relationship between gender-orientation (i.e. masculinity versus femininity) and NMUPD.

Huselid and Cooper (1992) may have been the first scholars to consider sex apart from gender orientation in addressing sex differences in substance use. Huselid and Cooper (1992), for example, reported that sex differences in alcohol use were substantially mediated by 'gender-role attributes.' Specifically, traditional gender-role attitudes were positively associated with alcohol use among males and negatively associated with alcohol use among females. Research such as this, in addition to the perspectives of Courtenay (2000), West (2001) and Mahalik et al. (2007) inform the present research. While a literature supports the role of masculine socialization in shaping health behavior in general (Courtenay 2000) and in shaping substance use (Liu & Iwamoto 2007) and alcohol use (Peralta 2008; Iwamoto et al. 2011; Wells et al. 2013) in particular, we are unaware of literature that focuses on the association between feminine or masculine socialization and NMUPD. We know that health behaviors such as heavy episodic drinking (HED) and risky sexual behavior are gendered behaviors that are symbolic of toughness, strength, virility and heterosexuality and are stereotypically associated with the male sex (Iwamoto et al. 2011; West 2001; deVisser & Smith 2007; Peralta 2008; Johnson et al. 2013; Iwamoto & Smiler 2013). Could gender-orientation be associated with NMUPD? While research on health behavior, women and femininity is uncommon, what research has been conducted on these intersections suggests that women drink less and less often compared to men for gendered reasons (e.g. for fear of date rape, weight gain and/or stigmatization) stemming from a double standard where women who drink heavily are more apt to be marginalized by their peers compared to men (Peralta 2010).

Using a sociological perspective that has proven useful in understanding forms of substance use such as alcohol may prove equally useful for understanding NMUPD. Without examining sex and gender orientation together, sex category may likely be confounded by gender orientation in addiction research. Given the above-cited literature, the conflation of sex and gender in behavioral science may likewise impair the effectiveness of treatment and prevention approaches. We posit that the traditional 'male–female' binary classification (i.e. 'sex') fails to capture an important source of sex-related variation in the occurrence of NMUPD, namely gender orientation (Connell 1995; Schippers 2007; Marsiglia & Nagoshi 2012; Conn & Marks 2014). Young women who have a masculine identity may be engaging in NMUPD: using the conventional treatment of sex category, these women would likely be grouped with other women who have a feminine identity thus obscuring within-sex variance. On the other hand, traditional masculine gender norms may encourage risk behaviors among masculine-oriented men (Courtenay 2000; Mahalik et al. 2007; Levant et al. 2011).

It is important to note that emerging adults facing identity formation are more likely to engage in substance use (Arnett 2000, 2005; Christie-Mizell & Peralta 2009). College students may be particularly at risk of substance use in general due to their developmental stage: college students are less likely to be married, be parents and/or be employed full time compared to their noncollege peers (note the gendered nature of these statuses (e.g. being a 'father,' 'mother,' 'husband,' 'wife'). During this developmental period, Arnett (2000) suggests that about one-third of emerging adults leave their childhood home for college where they slowly transition to independent living and form individual identities via intimacy, work and new worldviews.

Depression is a particularly important variable to control for when examining the young adult population. Depression is most common among young adults ages 18 to 25 (SAMHSA 2007). Moreover, there has been a regularly occurring finding that NMUPD is associated with depression (Weitzman et al. 2004; Ford & Schroeder 2009; Teter et al. 2010) among young adults and college students.

We adopt a gender construction framework where gender is defined as active, performed, and expressed in social interaction (West & Zimmerman 1987) to better understand sex differences in NMUPD. Our framework fills a significant gap in the literature by examining NMUPD, gender orientation and sex category as intersecting behaviors during a critical developmental period: late adolescence/emerging adulthood/college student status. We ask if: (a) gender orientation might account for NMUPD health-risk behaviors over and above a

binary male–female classification; (b) male–female differences in NMUPD might vary as a function of feminine and/or masculine gender-orientation; (c) male–female differences might be indirectly effected by feminine gender orientation. We present four specific hypotheses: H1: males will have higher odds of NMUPD compared to females; H2: individuals with masculine gender orientation will have higher odds for NMUPD compared to those with feminine orientation; H3: individuals with feminine gender orientation will have lower odds for NMUPD compared to those with masculine orientation. H4: sex will influence NMUPD indirectly though gender orientation (though we predict that sex will influence NMUPD, this may not only be direct effect but may also be acting indirectly through gender orientation because they are two separate but related constructs).

Methods

The data are from an online survey (Survey Gizmo) at one medium-sized Midwestern university. After Institutional Review Board approval was granted, recruitment was conducted by advertising the survey to Introduction to Sociology courses during the semesters of Fall 2013 and Spring 2014[1] (total enrollment of over 2000 students). Students were offered extra credit for taking part in the survey (students were asked to print a 'Thank you' note which appeared at the end of the survey which served as a receipt for extra credit). The survey was confidential: no personal identifying information was collected (e.g. home/email address; student ID) except for standard demographic data. The survey took approximately 50 minutes to complete.

Data collection concluded with an initial sample size of 1026 participants, yielding an approximate response rate of 44%. Our sample was consistent with the demographics of the student body (Table 1). The initial sample size was 1026; however, those over age 25 and those under age 18 were dropped from the analysis. To detect participants who were not truthful in their responses, a fictitious drug was incorporated into the drug use section of the survey (Poulin et al. 1993). Nineteen participants indicated taking the fictitious drug – these surveys were dropped from the analysis. Adjusting for missing data yielded a final study sample size of 796. The total number of students at the University where the study took place is not reported for confidentiality purposes, as including the *N* may make the university where the study was conducted readily identifiable.

Table 1. Total enrolled in introduction to sociology, student population, study participants and NMUPD analytical sample; Fall 2013/Spring 2014.

	Introduction to sociology	Student population	Study participants	NMUPD sample
Enrolled	[a]>2000	[a]>20,000	1026	796
Mean age	20.4	24.2	19.6	19.6
Athletes	3.3%	2.0%	5.8%	5.7%
Pell grant eligible	42.0%	40.7%	–	–
Percent of parents without college degree	–	–	52.0%	57.0%
Female	54.8%	48.0%	59.5%	60.4%
Male	45.0%	52.0%	40.5%	39.6%
Race/ethnic breakdown				
African American	15.0%	13.0%	16.00%	15.0%
Two or more races	3.0%	3.0%	6.00%	5.0%
Other: Hispanic; Asian; Native American	5.0%	4.5%	10.0%	4.0%
White	73.0%	75.0%	74.00%	76.0%
College breakdown				
Arts & sciences	16.50%	23.19%	–	–
Business administration	4.08%	9.90%	–	–
Health professions	15.04%	9.14%	–	–
Education	8.38%	9.56%	–	–
Engineering	3.27%	11.50%	–	–
Applied arts and technology	18.91%	21.84%	–	–
Undecided	27.72%	11.06%	–	–
Associates Degree	6.10%	3.81%	–	–

53 students took the course in Fall 2013 and repeated in Spring 2014
[a]The exact number of students enrolled is not reported for confidentiality purposes.
[b]Proxy measure for social class.

Measures

Dependent variable

The dependent variable was 'nonmedical use of prescription drugs' over a respondents' lifetime. The drug questions were derived from the *Monitoring the Future* survey (Johnston et al. 2013). Respondents were asked 'On how many occasions (if any) have you taken tranquilizers on your own – that is, without a doctor telling you to take them …' Possible responses included 0 occasions, 1–2, 3–5, 6–9, 10–19, 20–39 and 40 or more occasions. Questions asked about use of both specific prescription drugs (Adderall, Ritalin, Vicodin, OxyContin and Tramadol) and prescription drug categories (sedatives, tranquilizers, narcotics, steroids). Given the skewness of the responses, we collapsed the dependent variable into a dichotomous NMUPD variable that included any prescription drug use (yes = 1; no = 0). Low rates of self-reported use were expected given that we sampled a nonclinical college population. We were able to collapse medications into categories based on physiologic effects (i.e. narcotics, sedatives and stimulants) for further refinement and clarity. Because this study constitutes a 'proof-of–concept' initial project, we aimed to generally test whether gender identity influenced any NMUPD and use within three categories: narcotics, sedatives and stimulants. Analysis of specific prescription drug use is beyond the scope of the present paper.

Main covariates of interest

We employ the short-form BEM Sex Role Inventory (from here forward referred to as BSRI) to measure gender-orientation. The BSRI is a psychometric instrument extensively used to measure masculine and feminine gender orientation (Bem 1974). Though the original measure is arguably dated, the BSRI measure continues to be a particularly useful tool to gauge masculine and feminine gender-orientation (Choi et al. 2009; Peralta 2010; Wiley 2014). The short form of the BSRI offers thirty one-word descriptions for respondents to indicate how much they identified with each gendered characteristic (items available in Appendix A). Previous research indicates

[1]The survey was not advertised in "Distance Learning" courses because they typically enroll a high number of high-school students, and individuals under age 18 were ineligible for participation.

that the short-form demonstrates better reliability and validity than the more traditional 60-item scale (Choi et al. 2009). Respondents were asked to report to what degree they identified with each characteristic (1 = 'never/almost never true' through 7 = 'almost always true'). Two scales of masculinity and femininity were created using a summated rating scale, taking the mean score of the items. Higher values on each scale indicate increased adherence to masculinity and femininity. Cronbach alpha calculations were performed in order to assess internal consistency; masculinity ($\alpha = 0.85$) and femininity BSRI ($\alpha = 0.82$) were at satisfactory levels.

Factor analysis was conducted on both measures in order to confirm the structure of our independent variables using a promax (oblique) rotation. A one-factor solution for both masculinity and femininity was determined using the eigenvalues, scree plot and the Kaiser criterion. For masculinity, the first eigenvalue was at 3.64, while the second was at 0.73 with a difference of 2.9. The first eigenvalue for femininity was at 4.3 followed by a second at 0.36 with a difference of 4.0. The scree test also determined that there was one meaningful factor for masculinity and one meaningful factor for femininity. When examining the rotated factor pattern significant loadings were determined using the 0.30 criterion and the results revealed at least three significant loadings on each factor indicating a simple structure.

Bi-serial correlations were conducted to determine the extent to which sex and gender overlap because they are both included in our multivariate analysis. The significant correlations between sex (male =1) and femininity −0.253 ($p = 0.001$) and masculinity 0.112 ($p = 0.001$) suggest that while some overlap exists between these variables, sex and gender are truly separate constructs both theoretically and methodologically.

Potential confounding variables

Potential confounding covariates of NMUPD were age, sex, race, parent's highest level of education, on/off-campus residence and depression. Race, sex and living arrangement were coded as dichotomous variables. Sex was coded male "1" and female, '0.' Because the majority of respondents were White (75%), race/ethnicity was coded as a dichotomous variable ('White' coded '1'; and non-White, '0'). Unfortunately, we had too few ethnic and racial minorities in our sample to examine differences in use by race and ethnicity. Living-on-campus was coded '1'; living off-campus coded '0.' As a proxy for SES, we included parent's education: if a parent completed some high school or grade school, this was coded '0,' completed high-school coded '1,' attended some college coded '2,' completed college coded '3' and attending graduate or professional school coded '4.' The CES-D was used to assess depression: it had satisfactory levels of internal consistency ($\alpha = 0.73$). Descriptive statistics and the bivariate distribution of self-reported participant sex by self-reported gender-orientation are shown in Table 2.

Table 2. Descriptive Statistics ($N = 796$)

	N	Mean/%	STD	Range	Alpha
Dependent Variable					
NMUPD (lifetime)				0–1	0.75
Yes (1)	236	0.30			
No (0)	560	0.70			
NMUPD by Sex and Gender-orientation					
Sex					
Male (1)	116	0.37		0–1	
Female (0)	120	0.25			
Gender/Sex					
Masculine Men (1)	55	0.38		0–1	
Masculine Women (2)	61	0.35		0–1	
Feminine Men (3)	32	0.26		0–1	
Feminine Women (4)	88	0.25		0–1	
Control Variables					
Age (18 = 0, 25 = 7)	796	1.65	1.72	0–7	
Sex				0–1	
Male (1)	315	0.40			
Female (0)	481	0.60			
Race (White =1 Other =0)				0-1	
White (1)	604	0.76			
Non-White (0)	192	0.24			
Parents education		2.63	1.00	0–4	
Some high school or less (0)	15	0.02			
Completed high school (1)	96	0.12			
Some college (2)	222	0.28			
Completed college (3)	295	0.37			
Graduate or professional school (4)	168	0.21			
Living on campus				0–1	
Yes (1)	304	0.38			
No (0)	492	0.62			
CESD	796	8.71	4.45	0–21	0.28
Independent Variables					
Masculine BSRI	796	4.85	0.91	1–7	0.85
Feminine BSRI	796	5.37	0.94	1–7	0.82
Gender/Sex	796	2.89	1.16	1–4	
Masculine Men (1)		143	0.18		
Masculine Women (2)		123	0.16		
Feminine Men (3)		171	0.22		
Feminine Women (4)		356	0.45		

Data analysis

Very few variables for the NMUPD analysis contained missing values due to item rejection or inconsistent data (i.e. less than 5%). Therefore, all analyses were performed with the same sample, and a 'Hotdeck' method was used to impute missing values with randomly assigned values matched to age and gender characteristics. This method is adequate because variance estimation is not deflated artificially (Mander & Clayton 1999). As an additional measure to ensure the adequacy of the imputation process, we tested and ruled out the possibility that group prevalence had been affected by the imputation process (data not shown in a table, but available per request).

We began our analysis with cross-tabulations to differentiate sex from gender orientation in our analysis of NMUPD behavior. We fitted several logistic regression models to document differences in the associations with the inclusion of gender measures and the other selected covariates. Logistic regression was chosen as the data analysis technique because our outcome variable, NMUPD, was dichotomized. We dichotomized NMUPD due to the rare occurrence of individual forms of NMUPD and because we were interested in examining the association between gender-orientation and a global measure of NMUPD as part of a 'proof-of-concept' study. We conducted the same analysis for 'type' of prescription drug use. Data analysis was performed using Stata 13.1 (College Station, TX). Multicollinearity was examined through bivariate correlations, the variance inflation factors (VIF) and tolerance-level diagnostics in the multivariate

analysis via STATA. The VIF was never above 1.2 for any of the variables and the tolerance levels for all variables were above 0.92, indicating that multicollinearity was not a threat.

Results

Table 2 presents descriptive statistics of our sample. Approximately 30% of the sample had lifetime NMUPD with more males (37%) self-reporting lifetime use compared to females (25%). Masculine males and masculine females reported the highest frequency of use (38% and 35% respectively), followed by feminine men (26%) and feminine women (25%). These results present evidence of adequate variability in the masculine and feminine scales across male and female participants. Table 3 presents frequencies of individual prescription drug use. The most frequently reported prescription drug use category was prescription narcotics (15%); steroids were the least reported (2%).

Table 4 presents the multivariate analysis for lifetime NMUPD. In Model 1, age, sex, race and depression all have a positive, significant influence on NMUPD. Being white, older in age, having a high score on the depression scale and being male increase the odds of engaging in NMUPD. In respect to sex, the odds of NMUPD are 1.68 for males controlling for other variables in the model. Living on or off campus and level of parent's education were not significantly associated with NMUPD.

Model 2 demonstrates the association of masculinity on NMUPD while including control variables. Similar to the first model, age, sex, race and depression maintained their significance; however, masculine gender orientation was not significant in this model with an odds ratio of 1.20. Feminine gender-orientation was examined in Model 3. Similar to earlier models, our control variables remained significant and predictive. In Model 3, feminine gender-orientation was negative and significant. The odds ratio for feminine BSRI is 0.85. This means that, other conditions being equal, a more feminine gender-orientation is associated with lower odds of NMUPD by 14.6% ($p < 0.05$).

In Model 4, when accounting for both masculine ($p < 0.05$) and feminine-orientation ($p < 0.05$), each remain significant and in the predicted direction. When considering all study variables, the findings in this model reveal that masculine gender-orientation increases the odds of NMUPD by 23%, and feminine gender-orientation decreases the odds of NMUPD by 19% which supports our first three hypotheses. The McFadden's pseudo *r*-square was 0.06 and changed very little from model 1. However, McFadden's values tend to be considerably lower compared to others on the *r*-square index and may change little from model to model unlike OLS regression where much larger changes are expected with hypothesized variables (McFadden 1979). In this combined model, we examined hypothesis 4, the possible indirect effects of gender-orientation using a Sobel test. The standardized indirect effect of femininity was 0.022 and is significant ($p < 0.05$) with a 95% confidence interval that ranged from 0.00–0.04. Further, the total indirect effect of masculinity and femininity is 0.03, and this effect is also significant ($p < 0.05$) with a confidence interval that ranged from 0.01–0.05.

In Table 5, we examined the effects of gender orientation on the following three separate drug categories: narcotics, sedatives and stimulants. The results indicate that masculinity associated with sedative use ($p < 0.05$), but not narcotic ($p < 0.10$) or stimulant use ($p < 0.10$). Masculine orientation increased the odds of sedative use by 37%. However, femininity was associated for all three drug categories narcotics ($p < 0.01$) sedatives ($p < 0.05$) and stimulants ($p < 0.01$). As demonstrated in prior models, feminine gender-orientation decreases the odds of narcotic and sedative use by 25% and stimulant use by 24%.

Table 3. Frequencies of lifetime NMUPD ($N = 796$).

	Full Sample		Male		Female	
	n	%	*n*	%	*n*	%
Tramadol	34	4.27	20	6.34	14	2.91
Steroids	14	1.76	10	3.17	4	0.83
Ritalin	31	3.89	18	5.71	13	0.27
Oxycontin	27	3.39	14	4.44	13	0.27
Vicodin	96	12.06	45	14.29	51	1.06
Adderall	111	13.94	52	16.51	59	12.27
Any NMUPD	236	29.65	116	36.83	123	25.63

Discussion

We focus on gender identity as a central construct that is connected to NMUPD as an outcome during a critical developmental period: the college years. Specifically, we start by identifying feminine orientation as an important but generally neglected behavioral and social science construct (Peralta et al. 2010). In our analysis of femininity, we also analyze the effects of masculine orientation of NMUPD for substantive

Table 4. Logistic regression: NMUPD on control variables and gender orientation ($N = 796$).

	Model 1			Model 2			Model 3			Model 4		
	OR	CI	$p > z$	OR	CI	$p > z$	OR	CI	$p > z$	OR	CI	$p > z$
Control variables												
Age	1.18	(1.08, 1.31)	0.001	1.18	(1.07, 1.30)	0.001	1.18	(1.08, 1.31)	0.001	1.18	(1.07, 1.30)	0.001
Sex (Male =1)	1.68	(1.22, 2.31)	0.001	1.63	(1.19, 2.25)	0.003	1.55	(1.11, 2.15)	0.009	1.48	(1.06, 2.06)	0.020
Race (White =1)	1.51	(1.03, 2.22)	0.033	1.6	(1.09, 2.36)	0.017	1.54	(1.05, 2.26)	0.026	1.65	(1.12, 2.42)	0.012
Parent's education	1.01	(0.86, 1.18)	0.883	1.01	(0.86, 1.19)	0.896	1.01	(0.87, 1.19)	0.868	1.01	(0.86, 1.19)	0.884
On campus (Yes =1)	1.12	(0.78, 1.61)	0.540	1.14	(0.79, 1.64)	0.484	1.12	(0.78, 1.61)	0.537	1.46	(0.80, 1.65)	0.464
CES-D	1.08	(1.05, 1.12)	0.000	1.08	(1.04, 1.12)	0.000	1.09	(1.05, 1.12)	0.000	1.09	(1.05, 1.50)	0.000
Independent variables												
Masculine BSRI Score				1.20	(0.99, 1.44)	0.057				1.23	(1.02, 1.48)	0.030
Feminine BSRI Score							0.83	(0.70, 0.99)	0.036	0.81	(0.68, 0.97)	0.019
McFadden R^2	0.05			0.06			0.06			0.06		

Table 5. Logistic regression: separate drug categories

	Narcotics ($n = 120$)			Sedatives ($n = 94$)			Stimulants ($n = 117$)		
	OR	CI	$p > z$	OR	CI	$p > z$	OR	CI	$p > z$
Control variables									
Age	1.12	1.00, 1.26)	0.054	1.34	(1.18, 1.52)	0.000	1.08	(0.96, 1.23)	0.196
Sex (Male =1)	1.29	(0.85, 1.96)	0.228	0.89	(0.56, 1.43)	0.630	1.21	(0.79, 1.83)	0.380
Race (White =1)	1.37	(0.84, 2.22)	0.205	1.82	(1.02, 3.25)	0.042	2.27	(1.31, 3.92)	0.003
Parent's education	0.97	(0.79, 1.18)	0.729	1.27	(1.00, (1.60)	0.048	1.06	(0.86, 1.30)	0.569
On campus (Yes =1)	1.17	(0.73, 1.86)	0.516	0.98	(0.57, 1.69)	0.947	0.90	(0.57, 1.44)	0.671
CES-D	1.08	(1.03, 1.13)	0.001	1.08	(1.02, 1.13)	0.003	1.08	(1.04, 1.14)	0.000
Independent variables									
Masculine BSRI Score	1.22	(0.97, 1.54)	0.093	1.37	(1.05, 1.79)	0.020	1.24	(0.98, 1.58)	0.071
Feminine BSRI Score	0.75	(0.61, 0.93)	0.008	0.75	(0.59, 0.95)	0.017	0.74	(0.60, 0.92)	0.006
McFadden R^2	0.05			0.08			0.05		

and comparative reasons. From our bivariate results, we conclude that gender orientation is associated with NMUPD. We observe that feminine-men and feminine-women were most likely to avoid taking part in NMUPD, while masculine-men and masculine-women were more likely to report NMUPD. Participant gender-orientation appears to account for NMUPD above and beyond participant sex alone.

Our multivariate results for any NMUPD (Table 4) indicate that feminine gender-orientation is significantly associated with lower odds of NMUPD while being male; reporting a masculine gender-orientation, and depressive symptoms are associated with higher odds of NMUPD. In all models, including our final and full model, we found support for all of our study hypotheses: being male was found to be associated with higher odds of NMUPD; female status was found to be associated with lower odds of NMUPD; individuals with a masculine gender-orientation were found to have higher odds of NMUPD; and individuals with a feminine gender-orientation were found to have lower odds of NMUPD. Further, we found that masculine men and masculine-women reported NMUPD at a higher rate than feminine men and feminine-women. Interestingly, indirect effects are present in the model that included both masculinity and femininity, which demonstrates that when accounting for the full spectrum of gender-orientation, sex indirectly influences NMUPD through gender-orientation. Analysis results for individual drug categories (Table 5) by and large produced similar results with masculinity associated with use and femininity not associated with use.

Given that previous research on sex and NMUPD has found inconsistent results where some studies suggest increased risk of females (Simoni-Wastila et al. 2004; Neff & Waite 2007; Ford 2008; Steele et al. 2011; Conn & Marks 2014) and others cite increased risk of males (Hall et al. 2005; McCabe et al. 2005; Teter et al. 2005; Weyandt et al. 2013) our findings indicate that measuring gender-orientation may be an important factor which may help to explain sex variation in NMUPD. In sum, our results suggest gender (i.e. femininity; masculinity) as a specified construct in part may help explain sex variation in NMUPD over and above the explanatory value of the more traditional binary 'sex' variable relied upon by biomedical research.

Perhaps, it is through gender role socialization that girls and young women learn and cultivate personal characteristics regarding stereotypical assumptions about behavior and attributes associated with the female sex that later manifest themselves in the avoidance of risky behavior (Courtenay 2000). Similarly, perhaps men, in part due to their greater likelihood of masculine socialization, feel free to engage in risky behaviors in part to demonstrate or express a certain 'fearlessness' or 'toughness' stereotypically associated with the male sex (Courtenay et al. 2002). While we cannot establish the aforementioned relationships empirically, the patterns we have presented here are commensurate with a gender socialization explanation for substance use behavior.

Other findings of interest include the robust association between depressive symptomology and NMUPD. Consistent with previous research, NMUPD is associated with depression: specifically, as rates of NMUPD increase so does depression (Teter et al. 2010; Schepis & McCabe 2012; Zullig & Divin 2012; Cerdá et al. 2014); however, the directionality of the relationship is unclear. Age also had a robust association with NMUPD. It is conceivable that as students age, social stressors accumulate as independence from parents escalate and movement toward adult roles becomes eminent. Being male and white are also found to be associated with NMUPD. Perhaps social phenomenon such as institutionalized racism and minority perceptions of heightened police surveillance of minority populations keep non-white students from participating in NMUPD. It is also possible that the subpopulation of minority students who attend a majority white college tend to be more focused on their studies and have extensive and continued family support and monitoring (Zhu et al. 2008) compared to their white counterparts. Finally, perhaps women are more likely to avoid NMUPD compared to their male counterparts for fear of sexual victimization stemming from NMUPD.

We now turn to the limitations of our study. Because our study is based on a convenience sample of students who responded to an online survey, we are only able to interpret and discuss results in this context. Therefore, generalizations outside of this sample should be made with caution. There is risk of selection bias given that the sample was self-selected and motivated by extra credit. The cross-sectional and observational nature of the data make it difficult to establish causality. We did not use cross-validation due to the confidential nature of data collection. Further, we rely only on self-report

data. Next, our sample did not have adequate minority representation: we only compared 'White' and 'non-Whites.' This presents significant difficulty in understanding NMUPD behavior among members of specific non-White populations (e.g. African Americans, American Indians) (Zullig & Divin 2012).

While the survey did include questions about past month, past year and lifetime NMUPD, we focused only on lifetime use. This decision may over estimate current use of NMUPD. Next, we collapsed various forms of NMUPD into a single global measure of any NMUPD. This methodological decision makes it impossible to understand the impact of our independent (i.e. gender orientation) and control variables on specific forms of NMUPD, which vary in important ways. The question, 'In your lifetime, have you used X prescription drug without a doctor's orders?' is problematic because the misuse of a legitimate prescription cannot be accounted for because of the question's grammatical structure. In a similar vein, our resulting outcome variable is expansive. It is not likely able to differentiate between a patient who uses a spare hydrocodone for pain resulting from an acute injury versus the individual meeting prescription opioid use disorder criteria. Relatedly, a major limitation of our study is our inability to associate gender-orientation with clinically problematic uses of prescription drugs. Such a limitation makes it difficult to understand the role of gender in those clinically dependent on prescription drugs.

Finally, our variable 'gender-orientation' (i.e. masculine; feminine orientation) serves only as a proxy for gender socialization. While gender-socialization is a lifelong process, taking a 'snap shot' of gender-orientation can only serve as a very rough measure of gender-socialization in that we only have data based on a single point in time: data on the process of gender socialization would be a more ideal measure. Next, the BSRI has been subjected to many critiques (Holt & Ellis 1998; Auster & Ohm 2000; Hoffman & Borders 2001; Choi & Fuqua 2003). Attempts to replicate the BSRI and inconsistent findings using the BSRI have made the BSRI a contested measurement of gender and gender role orientation (Holt & Ellis 1998). Moreover, the BSRI has been criticized due to its focus on personality characteristics stereotypically associated with gender roles and because the BSRI may not function the same for minority groups (Hoffman & Borders 2001). Finally, we do not report on androgynous or (gender) undifferentiated individuals – omitting responses from these individuals' limits our understanding of gender characteristics. However, such analysis is beyond the scope of our study which is focused on femininity and masculinity.

Limitations aside, our study offers, albeit cautiously, an empirically supported theoretical understanding of how gender-orientation in tandem with sex category might be associated with a growing substance use problem: NMUPD. Our study has additional strengths and contributions. Because our prescription drug use questions from the Monitoring the Future Survey are standardized, our results can be compared to national figures. In addition, these questions have strong construct reliability in regard to drug use questions (Bachman et al. 2011). Furthermore, Darke's (1997) review of both the validity and reliability of self-report data among injection drug users suggest that there is considerable reliability and validity of self-report data regarding drug use. Also, incorporating depression into our models adds an often neglected yet important mental health control. Finally, we find further support for the use of the BSRI (Holt & Ellis 1998; Hoffman & Border 2001; Choi & Fuqua 2003; Wiley 2014). While not all researchers agree that the BSRI is the best measure of gender role orientation, it may remain a useful tool in measuring aspects of gender.

Conclusion

As the impact of gender-orientation on NMUPD has been largely overlooked, this research fills a noticeable gap in the existing literature and moves the field forward by looking beyond 'sex difference' analysis toward understanding the intersection of sex category and gender orientation in substance use behavior. These findings thus have implications for the broader public health context of NMPUD. Perhaps gender orientation and sex category – either separately or together – have an impact on prevention, intervention and or treatment outcomes. Public health approaches may need to consider the intersecting nature of gender and sex when addressing substance use and abuse as a broader public health concern. Determining public health interventions on sex-category alone may not yield optimal results.

Future research should include not only sex-category data, but also gender-orientation, sex biomarker and sexuality data. Comprehensive sex/gender/sexuality data would shed new light on the intersecting effects of identity characteristics on substance use behavior. Detailed information on specific forms of prescription drug use and the frequency and quantity of such use should also be collected. Importantly, we know of no research which has examined the 'androgynous' (e.g. undifferentiated BSRI scoring) component of the BSRI. While androgyny is beyond the scope if the present paper, future research would benefit from an analysis of this facet of gender identity. Other confounding variables should be considered in future research such as risk taking propensity and impulsivity.

Finally, it remains important to understand the purpose of prescription drug use. Are college students using prescriptions for reasons other than what their prescribing physician intended? Are these reasons 'medical' (e.g. using pain medication to treat pain associated with a new injury) or recreational in nature? It is possible that the impact of depression (particularly among men) might be traced back, at least in part, to gender role differences? Due to stigma, males might mask or deny depression symptoms, which might be externalized in the form of drug use (Gonzalez-Forteza et al. 2015). Future research should examine the degree to which depression moderates the relationship between gender-orientation and drug use. Research on prevention and treatment approaches might also be served well by differentiating between sex and gender.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

References

Arnett JJ. 2000. Emerging adulthood: a theory of development form the late teens through the twenties. Am Psychol. 5:469–480.

Arnett JJ. 2005. The developmental context of substance use in emerging adulthood. J Drug Issues. 35:235–254.

Auster CJ, Ohm SC. 2000. Masculinity and femininity in contemporary American society: a reevaluation using the Bem sex-role inventory. Sex Roles. 43:499–528.

Bachman JG, Johnston LD, O'Malley PM, Schulenberg JE. 2011. Monitoring the future project after thirty-seven years: design and procedure (Occasional Paper No. 76). Ann Arbor (MI): The University of Michigan.

Bem SL. 1974. The measurement of psychological androgyny. J Consult Clin Psychol. 42:155–162.

Cerdá M, Bordelois P, Keyes KM, Roberts AL, Martins SS, Reisner SL, Austin SB, Corliss HL, Koenen KC. (2014). Family ties: maternal-offspring attachment and young adult nonmedical prescription opioid use. Drug Alcohol Depend. 142:231–238.

Choi N, Fuqua DR. 2003. The structure of the BEM sex-role inventory: a summary report of 23 validation studies. Educ Psychol Meas. 63:872–887.

Choi N, Fuqua DR, Newman JL. 2009. Exploratory and confirmatory studies of the structure of the Bem sex role inventory short-form with two divergent samples. Educ Psychol Meas. 69:696–705.

Christie-Mizell AC, Peralta RL. 2009. The gender gap in alcohol consumption during late adolescence and young adulthood: gendered attitudes and adult roles. J Health Soc Behav. 50:410–426.

Conn BM, Marks AK. 2014. Ethnic/racial differences in peer and parent influence on adolescent prescription drug misuse. J Dev Behav Pediatr. 35:257–265.

Connell R. 1995. Masculinities. Cambridge, Polity Press; Sydney, Allen & Unwin; Berkeley, University of California Press.

Courtenay WH. 2000. Constructions of masculinity and their influence on men's well-being: a theory of gender and health. Soc Sci Med. 50:1385–1401.

Courtenay WH, McCreary DR, Merighi JR. 2002. Gender and ethnic differences in health beliefs and behaviors. J Health Psychol. 7:219–231.

Darke S. 1997. Self-report among injecting drug users: a review. Drug Alcohol Depend. 51:253–263.

deVisser RO, Smith JA. 2007. Alcohol consumption and masculine identity among young men. Psychol Health. 22:595–614.

Ford JA. 2008. Nonmedical prescription drug use among college students: a comparison between athletes and nonathletes. J Am Coll Health. 57:211–219.

Ford JA, Schroeder RD. 2009. Academic strain and non-medical use of prescription stimulants among college students. Deviant Behav. 30:26–53.

Gonzalez-Forteza C, Hermosillo EA, Vacio-Muro MA, Peralta R, Wagner FA. 2015. Depression among adolescents. A hidden problem for public health and clinical practice. Boletín Médico del Hospital Infantil de México (English Edition). 72:149–155.

Hall KM, Irwin M, Bowman KA, Frankenberger W, Jewett DC. 2005. Illicit use of prescribed stimulant medication among college students. J Am Coll Health. 53:167–174.

Hoffman RM, Borders LD. 2001. Twenty-five years after the Bem sex-role inventory: a reassessment and new issues regarding classification variability. MeasEval Couns Dev. 34:39–55.

Holt CL, Ellis JB. 1998. Assessing the current validity of the Bem sex role inventory. Sex Roles. 39: 929–941.

Huselid RF, Cooper ML. 1992. 'Gender roles as mediators of sex differences in adolescent alcohol use and abuse.' J Health Soc Behav. 33: 348–362.

Iwamoto DK, Cheng A, Lee CS, Takamatsu S, Gordon D. 2011. "Manning" up and getting drunk: the role of masculine norms, alcohol intoxication and alcohol-related problems among college men. Addict Behav. 36:906–911.

Iwamoto DK, Smiler AP. 2013. Alcohol makes you macho and helps you make friends: the role of masculine norms and peer pressure in adolescent boys' and girls' alcohol use. Subst Use Misuse. 48:371–378.

Iwamoto DK, Grivel M, Cheng A, Clinton L, Kaya A. 2016. Asian American women and alcohol-related problems: the role of multidimensional feminine norms. J Immigr Minor Health. 18:360–368.

Johnson LD, O'Malley PM, Bachman JG, Schulenberg JE. 2013. Monitoring the future national survey results on drug use, 1975–2012. Volume II: College students and adults ages 19–50. Ann Arbor: Institute for Social Research, The University of Michigan.

Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. 2013. Monitoring the future national results on drug use: 2012 overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan.

Levant RF, Wimer DJ, Williams CM. 2011. An evaluation of health-behavior Inventory-20 (HBI-20) and its relationships to masculinity and attitudes toward seeking psychological help among college men. Psychol Men Masc. 12:26–41.

Liu WM, Iwamoto DK. 2007. Conformity to masculine norms, Asian values, coping strategies, peer group influences and substance use among Asian American men. Psychol Men Masc. 8:25–39.

Looby A, Beyer DL, Zimmerman L. 2015. Non-medical prescription stimulant use: investigating modifiable risk factors. Addict Res Theory. 23:143–147.

Mahalik JR, Burns SM, Syzdek M. 2007. Masculinity and perceived normative health-behaviors as predictors of men's health-behaviors. Soc Sci Med. 64:2201–2209.

Mander A, Clayton D. 1999. Hotdeck imputation. Stata Tech Bul. 51:32–34.

Marsiglia FF, Nagoshi JL. 2012. Gender roles and substance use among Mexican American adolescents: a relationship moderated by acculturation? Subst Use Misuse. 47:214–229.

McCabe SE, Boyd CJ. 2005. Sources of prescription drugs for illicit use. Addict Behav. 30:1342–1350.

McCabe SE, Knight JR, Teter CJ, Wechsler H. 2005. Non-medical use of prescription stimulants among U.S. college students: prevalence and correlates from a national survey. Addiction. 99:96–106.

McCabe SE, Cranford JA, Boyd CJ. 2006. The relationship between past-year drinking behaviors and nonmedical use of prescription drugs: prevalence of co-occurrence in a national sample. Drug Alcohol Depend. 84:281–288.

McFadden D. 1979. 'Quantitative methods for analyzing travel behaviour on individuals:some recent developments." In: Hensher D, Stopher P, editors. Behavioural travel modelling London/Sydney: Croom Helm, Chapter 15.

Muehlenhard CL, Peterson ZD. 2011. Distinguishing between sex and gender: history, current conceptualizations, and implications. Sex Roles. 64:791–803.

Neff JL, Waite DE. 2007. Male versus female substance abuse patterns among incarcerated Juvenile offenders: comparing strain and social learning variables. Justice Q. 24:106–132.

National Institute on Drug Abuse (2001). Prescription drugs: abuse and addiction. Research report series. Publication Number 014881. Bethesda: National Institutes of Health.

Peralta RL. 2008. "Alcohol allows you to not be yourself": toward a structured understanding of alcohol use and gender difference among gay, lesbian and heterosexual youth. J Drug Issues. 38:373–400.

Peralta RL. 2010. Raced and gendered reactions to the deviance of drunkenness: a sociological analysis of race and gender disparities in alcohol use. Contemp Drug Problems. 37:381–416.

Peralta RL, Steele JL, Nofziger S, Michael Rickles. 2010. The impact of gender on binge drinking behavior among U.S. college students attending a Midwestern university: an analysis of two separate gender measures. Fem Criminol. 4:355–379.

Poulin C, MacNeil P, Mitic W. 1993. The validity of a province-wide student drug use survey: lessons in design. Can J Public Health. 84:259–264.

Schepis TS, McCabe SE. 2012. Exploring age of onset as a causal link between major depression and nonmedical use of prescription medications. Drug Alcohol Depend. 120:99–104.

Schippers M. 2007. Recovering the feminine other: masculinity, femininity, and gender hegemony. Theoretical Sociol.36:85–102.

Simoni-Wastila L, Ritter G, Strickler G. 2004. Gender and other factors associated with non-medical use of abusable prescription drugs. Subst Use Misuse. 39:1–23.

Steele JL, Peralta RL, Elman C. 2011. The co-ingestion of nonmedical prescription drugs and alcohol: a partial test of social learning theory. J Drug Issues. 41:561–585.

Substance Abuse and Mental Health Services Administration (SAMHSA) (2003). Misuse of prescription drugs. Rockville, MD: Office of Applied Studies. Available from (http://oas.samsha.gov).

Substance Abuse and Mental Health Services Administration (SAMHSA). (2007). The NSDUH report: depression and the initiation of cigarette, alcohol, and other drug use among young adults. Rockville, MD: Office of Applied Studies.

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. 2010. The DAWN report: highlights of the 2009 drug abuse warning network (DAWN) findings on drug-related emergency department visits. Rockville, MD.

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. 2012. The DAWN report: highlights of the 2010 drug abuse warning network (DAWN) findings on drug-related emergency department visits. Rockville, MD.

Teter CJ, McCabe SE, Boyd CJ, Guthrie SK. 2003. Illicit methylphenidate use in an undergraduate student sample: prevalence and risk factors. Pharmacotherapy. 23:609–617.

Teter CJ, McCabe SE, Cranford JA, Boyd CJ, Guthrie SK. 2005. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. J Am Coll Health. 53:253–262.

Teter CJ, Falone AE, Cranford JA, Boyd CJ, McCabe S. 2010. Nonmedical use of prescription stimulants and depressed mood among college students: frequency and routes of administration. J Subst Abuse Treat. 38:292–298.

Wells S, Flynn A, Tremblay PF, Dumas T, Miller P, Graham K. 2014. Linking masculinity to negative drinking consequences: the mediating roles of heavy episodic drinking and alcohol expectancies. J Stud Alcohol Drugs. 75:510–519.

West C, Zimmerman DH. 1987. Doing gender. Gend Soc. 1:125–151.

West LA. 2001. Negotiating masculinities in American drinking subcultures. J Men's Stud. 9:371–392.

Weyandt LL, Marraccini ME, Gudmundsdottir BG, Zavras BM, Turcotte KD, Munro BA, Amoroso AJ. 2013. Misuse of prescription stimulants among college students: a review of the literature and implications for morphological and cognitive effects on brain functioning. Exp Clin Psychopharmacol. 21:385.

Weitzman ER, Nelson TF, Lee H, Wechsler H. 2004. Reducing drinking and related harms in college: evaluation of the "a matter of degree" program. Am J Prev Med. 27:187–196.

Wiley LC. 2014. Alcohol use trajectories & the transition from adolescence into young adulthood: an examination of crime, sex, and gender. (Doctoral Dissertation, University of Akron). Available from: https://etd.ohiolink.edu/ap/10?0::NO:10:P10_ACCESSION_NUM:akron1395770516 (last accessed 3 Apr 2016).

Zhu S, Want Y, Browne DC, Wagner FA. 2009. Racial/ethnic differences in parental concern about their child's drug use in a nationally representative sample in the United States. J Natl Med Assoc. 101:915–919.

Zullig KJ, Divin AL. 2012. The association between non-medical prescription drug use, depressive symptoms, and suicidality among college students. Addict Behav. 37:890–899.

Appendix A

Short-form BEM Sex Role Inventory (BSRI): Rate yourself on each of the following items on a scale from 1 (never or almost never true) to 7 (almost always true).

Masculine Items	Feminine Items	Neutral Items
1. I defend my own beliefs	11. I am affectionate	21. I am conscientious
2. I am independent	12. I am sympathetic	22. I am moody
3. I am assertive	13. I am sensitive to the needs of others	23. I am reliable
4. I have a strong personality	14. I am understanding	24. I am jealous
5. I am forceful	15. I am compassionate	25. I am truthful
6. I have leadership abilities	16. I am eager to soothe hurt feelings	26. I am secretive
7. I am willing to take risks	17. I am warm	27. I am adaptable
8. I am dominant	18. I am tender	28. I am conceited
9. I am willing to take a stand	19. I love children	29. I am tactful
10. I am aggressive	20. I am gentle	30. I am conventional