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Masculine boys, feminine girls and cancer risk behaviors: An 11-year longitudinal study

Andrea L. Roberts, PhD*,

Department of Social and Behavioral Sciences, Harvard School of Public Health, Boston, MA

Margaret Rosario, PhD,

Department of Psychology, City University of New York, The City College and Graduate Center, New York, NY

Jerel P. Calzo, PhD,

Division of Adolescent/Young Adult Medicine, Boston Children's Hospital, Boston, MA, and the Department of Pediatrics, Harvard Medical School, Boston, MA

Heather L. Corliss, PhD,

Division of Adolescent and Young Adult Medicine, Boston Children's Hospital, The Channing Division of Network Medicine, Brigham and Women's Hospital and the Harvard Medical School

Lindsay Frazier, MD, and

Dana-Farber Cancer Institute, the Harvard Medical School, and the Department of Epidemiology, Harvard School of Public Health

S. Bryn Austin, ScD

Department of Social and Behavioral Sciences, Harvard School of Public Health, the Division of Adolescent/Young Adult Medicine, Boston Children's Hospital, Boston, MA and the Channing Division of Network Medicine, Brigham and Women's Hospital and Harvard Medical School

Abstract

Objective—Cancer risk behaviors often begin in adolescence and persist through adulthood. Tobacco use, indoor tanning, and physical inactivity are highly prevalent, socially patterned cancer risk behaviors, and their prevalence differs strongly by sex. It is therefore possible that these behaviors also differ by gender expression within the sexes due to social patterning.

Methods—We examined whether 5 cancer risk behaviors differed by childhood gender expression within the sexes and whether patterns of media engagement (e.g., magazine readership

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*Correspondence should be sent to: Andrea L. Roberts, Harvard School of Public Health, Landmark Building 111 WS 24, 401 Park Drive, Boston, MA 02115. Telephone: 617-416-8155. Fax: 617-384-8994. aroberts@hsph.harvard.edu.

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and trying to look like media personalities) explained possible differences, in a US population-based cohort (N=9,435).

Results—The most feminine girls had higher prevalence of indoor tanning (prevalence risk ratio (pRR)=1.32, 95% CI=1.23, 1.42) and physical inactivity (pRR=1.16, 95% CI=1.01, 1.34) and lower prevalence of worse smoking trajectory (prevalence odds ratio (pOR)=0.75, 95% CI=0.65, 0.88) and smoking cigars (pRR=0.61, 95% CI=0.47, 0.79) compared with least-feminine girls. Media engagement accounted for part of the higher prevalence of indoor tanning. The most masculine boys were more likely to chew tobacco (pRR=1.78, 95% CI=1.14, 2.79) and smoke cigars (pRR=1.55, 95% CI=1.17, 2.06), but less likely to follow a worse smoking trajectory (pOR=0.69, 95% CI=0.55, 0.87) and be physically inactive (pRR=0.54, 95% CI=0.43, 0.69) compared with least-masculine boys.

Conclusions—We found some strong differences in patterns of cancer risk behaviors by gender expression within the sexes. Prevention efforts that challenge the “masculinity” of smoking cigarettes and cigars and chewing tobacco and challenge the “femininity” of indoor tanning to reduce their appeal to adolescents should be explored.

Keywords

masculinity; femininity; cigarette smoking; cigar smoking; chewing tobacco; physical activity; tanning; cancer

Introduction

Tobacco use, indoor tanning, and physical inactivity are risk behaviors for cancer that are highly prevalent among US adolescents and young adults. These risk behaviors differ strongly by sex. Nationally, substantially more young men than young women smoke: 28% of men versus 16% of women ages 18-24 years are current smokers[1]. Use of chewing tobacco and cigar smoking are also more prevalent in males[2], while indoor tanning[3] and physical inactivity are more prevalent in females[4-6].

Sex differences in socially influenced risk behaviors are likely to in part reflect underlying gender processes, processes that may also lead to differences in risk behaviors by gender expression within the sexes. Research in this emerging area has found differences by gender expression in disordered eating[7, 8], body-shape concerns[9] and problem drinking[8]. However, it is unknown whether differences in cancer risk behaviors by gender expression exist within the sexes, in other words, whether masculine versus feminine boys have higher prevalence of risk behaviors more common in males and whether feminine versus masculine girls have higher prevalence of risk behaviors more common in females. Children who do not conform to the norms for their biological sex in terms of style of play, appearance and friendships may be less likely to adopt risk behaviors typical for their sex. Similarly, children who do not conform to gender norms for their sex may be more likely to adopt risk behaviors more typical of the other sex, compared with gender-conforming children.

Media may play an important role in the perception of certain cancer risk behaviors as masculine or feminine. For example, in the past decade magazine advertisements for chewing tobacco have targeted males and have succeeded in increasing chewing tobacco use

among men[10]. Similarly, indoor tanning advertisements are targeted at adolescent girls and young women, purporting to improve sexual appeal, attractiveness, fitness, and mood[11]. Media exposure has been associated with adoption of cancer risk behaviors in adolescents[12-15]. Therefore, exposure to media may partly explain associations between childhood gender expression and cancer risk behaviors. Better understanding of differences in cancer risk behaviors within sexes by gender expression and the role media may play in creating these differences could improve the content and targeting of prevention efforts. However, to our knowledge, no studies have examined the prevalence of cancer risk behaviors in adolescence and young adults by gender expression in childhood, nor have they examined the role of media use in possible differences in prevalence of cancer risk behaviors by gender expression.

In the present study, we assess the relationship between childhood gender expression and five cancer risk behaviors across adolescence and early adulthood in the Growing Up Today Study, a longitudinal cohort of adolescents followed into adulthood. We examine risk behaviors in three domains: physical inactivity, indoor tanning, and tobacco use, including cigarette, cigar and chewing tobacco use. Furthermore, we explore the contribution of media use to possible behavior differences.

We hypothesize that the most masculine boys will be more likely to engage in behaviors more prevalent among males, including cigarette, cigar, and chewing tobacco use, and will be less likely to engage in behaviors more prevalent among females, including physical inactivity and indoor tanning, compared with the least masculine boys. Similarly, we hypothesize that the most feminine girls will be more likely to engage in behaviors more prevalent among females, including physical inactivity and indoor tanning, and less likely to engage in behaviors more prevalent among males, including cigarette, cigar and chewing tobacco use, compared with the least feminine girls. We hypothesize that different patterns of involvement with media during adolescence by gender expression will partly account for these differences.

Methods

Sample

The Growing Up Today Study is an ongoing US longitudinal study of children of participants of the Nurses' Health Study II, enrolled in 1996 at ages 9 to 14 years and followed annually or biennially. Participants who responded to questions about their childhood gender expression in the 2005 or 2007 waves (collected, respectively, in 2005-2007 and 2007-2009) and who responded to items assessing cancer risk behaviors in any wave were included in our analyses. This research was approved by the Brigham and Women's Hospital Institutional Review Board.

Measures

Childhood gender expression before age 11 years was assessed in the 2005 wave with 4 questions from the Recalled Childhood Gender Identity/Gender Role Questionnaire[16] querying roles taken in pretend play, characters on TV admired or imitated, favorite toys and

games, and feelings of masculinity and femininity. In a validation study, the complete measure had excellent discriminant validity by sex, sexual orientation, congenital adrenal hyperplasia, and gender identity disorder[16]. Querying gender expression before age 11 years meant that, for most participants, we assessed gender expression occurring before the first risk behaviors were measured. Response options ranged on a five-point scale from “always women or girls/very ‘feminine’” to “always boys or men/‘very masculine.’” A gender-expression score was created by taking the mean of responses (Cronbach's $\alpha=0.78$). The score was then divided into approximate quartiles, separately for males and females: from least masculine (reference group for males) or least feminine (reference group for females) to most masculine or feminine (Figure 1)[17-19].

Four *cigarette smoking trajectories* incorporating age of onset, age of cessation and number of cigarettes smoked per week at each age, occurring from ages 12 to 23 years were determined using general growth mixture modeling. Because patterns of smoking trajectories were similar for males and females, an unconditional model with both genders was used to estimate trajectories. Models with two through six class solutions were estimated to determine the optimal number of classes that best fit the data. The best-fitting model comprised four trajectories, which were, in order of lowest to highest risk: nonsmoker, experimenter, late initiator leading to moderate consumption, and early initiator leading to high consumption. Participants were assigned to the trajectory group for which they had the highest posterior probability of membership.[20, 21] We refer to the trajectory of early initiation leading to high consumption as the “worst” trajectory and consider each higher-risk trajectory “worse” than lower-risk trajectories (e.g., “experimenter” is worse than “nonsmoker”; “late initiator leading to moderate consumption” is worse than “experimenter” or “nonsmoker”). Past-year *chewing tobacco use* was queried in the 1997, 1998, 1999, and 2001 waves and was coded as any or none. Past-year *cigar smoking* was queried in 2001 and was coded as any or none.

Participation in 14 to 16 sports (e.g., swimming, soccer, weight training) was reported in 6 waves from 1996 to 2007. Time spent in moderate or vigorous exercise (hours/week) was calculated at each wave from these responses. Respondents who spent less than 1 hour/week of moderate or vigorous exercise were considered *physically inactive* for that wave. *Indoor tanning* was measured in five waves from 1999 to 2009. Participants were asked, “During the past year, how many times did you use a tanning booth or tanning salon?” Responses were coded as any or none.

Magazine preference was asked in the 1997, 1998 and 1999 waves with the question, “Which one type of magazine do you read most frequently?” Response options were: don't regularly read magazines, music, fashion, men's, humor, sports, gossip/celebrities, news, teen, health/fitness, TV/movies, women's, science, other. As some responses were rare, magazine preferences were grouped as: don't read magazines; music/television/gossip; sports; teen/fashion/men's/women's; health/fitness; and other. *Trying to look like people in the media* was queried in 6 waves from 1996 to 2003. Participants were asked “In the past year, how much have you tried to look like the girls or women (for girls; ‘boys or men’ for boys) you see on television, in movies or in magazines?” Five response options ranged from “not at all” to “totally.”

Included participants compared with those excluded were more likely to be female (63.7% versus 40.7%) and somewhat less likely to smoke cigars (12.8% versus 14.8% in 2001) and follow the worst smoking trajectory (15.2% versus 16.9%; all P -values <0.05). Included participants were similar to excluded participants in terms of age (included mean=11.6 versus 11.5 years in 1996), race/ethnicity (6.9% versus 7.2% nonwhite), chewing tobacco use (1.3% versus 2.7% in 1996), tanning indoors (9.2% versus 9.1% in 1996), and physical inactivity (0.7% versus 0.6% in 1996; all P -values >0.05).

Analysis

We examined patterns of cancer risk behaviors and media consumption by childhood gender expression. As 2001 was the only wave in which all risk behaviors were measured together, we used data from that wave to examine patterns of these behaviors by gender expression. To examine patterns of media engagement by gender expression, we used data from the first waves in which media engagement was queried, the 1996 and 1997 waves.

Next, to ascertain the risk of engaging in each behavior across all waves by gender expression, we created separate models with each behavior as the dependent variable. To examine the extent to which media engagement accounted for possible differences in risk behaviors, we further adjusted models for past-year magazine preference and trying to look like people in the media, updated annually as available. We then calculated the mediation proportion for media engagement, that is, the extent to which engagement with media accounted for possible gender-expression differences in cancer risk behaviors[22, 23]. If media engagement were a pathway by which gender-expression differences in cancer risk behaviors emerged, we would expect that adjusting for media engagement would attenuate the association between gender expression and the risk behavior. For these analyses chewing tobacco, physical inactivity and tanning were time-varying outcomes. As cigar smoking was measured once and cigarette smoking was categorized as one of four trajectories across adolescence, these two outcomes were time-invariant.

As some mothers enrolled more than one child in the Growing Up Today Study and to account for repeated measures of the risk behaviors, we used generalized estimating equations with a Poisson distribution and a log link to estimate prevalence risk ratios (pRR) for chewing tobacco use, cigar smoking, indoor tanning, and physical inactivity[24]. As smoking trajectory was an ordinal variable in four levels, to estimate prevalence odds ratios (pOR) of a worse smoking trajectory, we used ordered logistic regression with a cumulative logit link and a multinomial distribution. All models adjusted for age and race/ethnicity (white/nonwhite) and were stratified by sex.

Results

Participants were ages 9-15 years at the first wave of data collection and 19-27 years at the last included wave. Participants comprised 6010 females and 3425 males and were 93.1% white. Examining covariate-unadjusted prevalences, more females in the highest quartile of femininity tanned indoors, fewer smoked cigars, and fewer followed the worst smoking trajectory (i.e., early initiation leading to high consumption) than females in the lowest quartile of femininity (Figure 2). More males in the highest quartile of masculinity chewed

tobacco and smoked cigars and fewer were physically inactive or followed the worst smoking trajectory compared with males in the lowest quartile of masculinity. Differences by gender expression in prevalence of tanning among males and physical inactivity and chewing tobacco use among females were not statistically significant.

Magazine reading and trying to look like people on TV and in the movies differed by childhood gender expression (Table 1). Feminine girls were more likely to read teen/fashion magazines and less likely to read sports magazines than girls in the lowest quartile of femininity. Least-feminine girls were more likely to respond that they did not read magazines than most-feminine girls. Masculine boys were more likely to read sports magazines and less likely to read music/TV/gossip or other magazines than were boys in the lowest quartile of masculinity. Feminine girls were more likely, while masculine boys were less likely, to try to look like people in the media, compared, respectively, to least feminine girls and least masculine boys.

In models examining repeated measures across adolescence and early adulthood, females in the highest quartile of femininity had higher risk of indoor tanning (pRR=1.32, 95% CI=1.23, 1.42) and physical inactivity (pRR=1.16, 95% CI=1.01, 1.34) compared with females in the lowest quartile of femininity (Table 2). Least-feminine females were more likely to follow a worse cigarette smoking trajectory (i.e., a trajectory associated with more health risks) or to smoke cigars compared with most-feminine females (Table 3). Males in the middle two quartiles of masculinity in childhood were less likely to tan indoors than the least masculine males (2nd quartile, pRR=0.68, 95% CI=0.54, 0.86; 3rd quartile, pRR=0.73, 95% CI=0.57, 0.95). Compared with least masculine males, males in the 2nd, 3rd, and 4th quartile of masculinity (most masculine) were less likely to be physically inactive (pRR range, 0.54-0.74, Table 2). The most masculine males were more likely to chew tobacco (pRR=1.78, 95% CI=1.14, 2.79) and smoke cigars (pRR=1.55, 95% CI=1.17, 2.06) than the least masculine males (Table 3).

Media engagement accounted for approximately one-third to one-half of the higher risk of indoor tanning among females (2nd quartile, mediation=75.1%, p=0.08; 3rd quartile, mediation=56.2%, p<0.001; 4th quartile (most feminine), mediation=39.9%, p<0.001; Table 2, Models 2a, 2b). Media engagement accounted for a small portion of the lower risk of tanning among males in the 2nd quartile of masculinity (mediation=17.4%, p<0.05, Table 2, Models 2a, 2b), and lower risk of physical inactivity among masculine males (2nd quartile, mediation=20.3%, p<0.05; 3rd quartile, mediation=17.3%, p<0.001; 4th quartile (most masculine), mediation=14.4%, p<0.001; Table 2, Models 1a, 1b). Adding media engagement to models also attenuated gender-expression differences in odds of a worse smoking trajectory among males, although the odds remained statistically significantly lower for most-masculine males (from OR=0.69 to OR=0.78 for most masculine males, mediation=35.5%, p<0.01; 3rd quartile, mediation=26.7%, p<0.01; 2nd quartile, mediation=36.0, p<0.001, Table 3, Models 1a, 1b). Media engagement did not account for gender-expression differences in physical inactivity or cigarette smoking in females, or cigar smoking or chewing tobacco use in either sex.

Discussion

Our principal finding is that differences in adolescent and young adult cancer risk behaviors occurred by gender expression within the biological sexes as well as between the sexes. Most-feminine females were at higher risk of carcinogenic behaviors more prevalent among females, including tanning indoors and being physically inactive, and lower risk of behaviors more prevalent among males, including smoking cigars and following worse smoking trajectories, compared with females in the lowest quartile of femininity. Most-masculine males were at higher risk of smoking cigars and chewing tobacco, behaviors more prevalent among males, and lower risk of being physically inactive, a behavior more prevalent among females, compared with least-masculine males. Thus, our findings indicate that conforming to norms of masculinity and femininity in childhood may increase later risk of engaging in certain carcinogenic behaviors.

However, for some risk behaviors differences by gender expression occurred in unexpected ways: least-masculine males were more like to follow a worse smoking trajectory than were most-masculine males, and males in the middle two quartiles of masculinity were at lower risk of tanning indoors than least-masculine males. Least- versus most-masculine males may have been at elevated risk of cigarette smoking due to increased exposure to psychosocial stressors. Males who do not conform to gender norms in childhood are more likely to be bullied and experience childhood abuse compared to gender-conforming males[17, 25], and smoking is often adopted and maintained to facilitate social integration and to regulate negative affect[26-28]. As least-masculine boys are more likely to identify as gay or bisexual as adults[17], it may be that stressors related to sexual orientation increased risk of smoking in this group. It is possible that the association of tanning with body building[29] has made this behavior more appealing to boys and men seeking to appear masculine[30, 31]. Additionally, the most masculine boys and men may be more likely to be concerned with achieving the masculine ideal of the toned, muscular physique, and tanned skin can enhance the appearance of muscle definition, although neither of these factors could account for the higher prevalence of indoor tanning among men in the lowest quartile of masculinity.

Patterns of media engagement differed by gender expression. We found that these differences explained a sizeable part of gender-expression differences in indoor tanning among women, and some of the differences in indoor tanning among men. Media engagement accounted for a small part of gender-expression differences in physical inactivity and cigarette smoking and did not explain differences in cigar and chewing tobacco use. Our measures may not have adequately captured exposure to and internalization of ubiquitous media messages promoting certain cancer risk behaviors as masculine or feminine. Adolescents may receive messages about the meaning of these behaviors through other sources, including parents, peers, and other media not assessed in our measures.

Our study has several limitations. Our sample was comprised of children of nurses and was predominantly White (93%), thus findings may not apply to other racial/ethnic or socioeconomic groups. Enrollment into the cohort and dropout may have biased our results. Included participants had slightly lower prevalence of the highest-risk smoking trajectory

and cigar smoking than excluded participants, although prevalences of physical inactivity and indoor tanning were similar. Gender expression was by self-report, however, a study comparing adulthood reporting of childhood gender expression with ratings based on childhood home video recordings found good concordance[32].

Qualitative studies of the characterization of risk behaviors as masculine or feminine have indicated that issues of “prettiness,” “competence,” “toughness,” “hardness” and “risk taking”[33] are related to adolescents' perceptions of the masculinity or femininity of risk behaviors. Media consumption patterns differ by gender beginning in early childhood[34–36]. Magazines frequently read by adolescents of both sexes present content focused on body image, appearance, and having a provocative, authority-challenging attitude[36], factors which may relate to tobacco use, exercise and tanning behavior[37–41]. As media engagement explained only a part of gender-expression differences in risk behavior, future research should explore other possible mechanisms, including socialization by parents[42] and peers[43, 44].

Our findings suggest that public health messages questioning the “masculinity” or “femininity” of cancer risk behaviors may be important to evaluate in prevention efforts: for example, that tanning makes one beautiful or that cigar and chewing tobacco use is rugged or manly. Given the long-term health consequences of engaging in cancer risk-behaviors in adolescence and early adulthood, prevention efforts challenging the perceived masculinity or femininity of risk behaviors to reduce their appeal to adolescents may have substantial benefits. Moreover, carcinogenic behaviors in middle and late adulthood may also be patterned by gender expression. Future research should investigate this possibility; such findings would have long-term implications for the role of gender expression in the development of cancer.

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Implications and Contribution

It is unknown whether cancer risk behaviors differ by gender expression within the sexes. This study found that masculine boys and feminine girls had substantially higher prevalence of some risk behaviors compared with gender-nonconforming adolescents. Prevention efforts challenging the “masculinity” and “femininity” of risk behaviors may reduce their appeal to adolescents.

Figure 1. Childhood gender expression, range of mean response by gender expression group and sex (N= 9,435)

Figure 2. Cancer risk behaviors by childhood gender expression and sex, 2001 (N= 9,435)

Table 1
Magazine reading and trying to look like men/women on TV by gender expression before age 11 years, Growing Up Today Study, 1996-1997 waves (N= 9,435)

		Type of magazine most often read						Try to look like men/women in the media			
		Don't read magazines	Music, television, gossip	Sports	Teen, fashion	Health, fitness	Other	Never	A little	Sometimes	A lot
N											
Males		%									
Gender expression											
Least masculine	416	20.0	7.5	16.8	1.4	0.2	54.1	66.4	24.6	3.9	5.1
2 nd quartile	1126	18.9	5.9	26.6	0.9	0.2	47.5	75.9	18.3	2.9	2.8
3 rd quartile	720	18.8	4.7	30.6	0.4	0.3	45.3	69.2	24.0	3.6	3.2
Most masculine	1163	18.6	4.2	29.4	0.4	0.2	47.2	72.6	21.1	4.0	2.3
Wald χ^2	$P<0.001$	$P<0.01$									
Females											
Gender expression											
Least feminine	1384	16.9	4.8	5.3	45.2	0.4	27.4	58.4	29.8	4.7	7.2
2 nd quartile	1058	16.5	4.5	2.7	52.1	0.5	23.8	59.8	30.1	3.9	6.2
3 rd quartile	1733	14.1	3.7	2.3	52.5	0.3	27.1	53.3	34.6	5.9	6.2
Most feminine	1835	16.0	2.8	1.4	54.1	0.3	25.5	55.6	30.6	6.6	7.2
Wald χ^2	$P<0.0001$	$P<0.01$									

Table 2
Physical inactivity and indoor tanning by gender expression before age 11 years, Growing Up Today Study, 1996-2007 waves (N= 9,434)[†]

	Physically inactive, past year		Indoor tanning, past year, any	
	Model 1a: Gender expression	Model 1b: Further adjusted for media engagement	Model 2a: Gender expression	Model 2b: Further adjusted for media engagement
Prevalence risk ratio (95% confidence interval)				
MALES				
Gender expression				
Least masculine	1.0 [reference]	1.0 [reference]	1.0 [reference]	1.0 [reference]
2 nd quartile	0.74 (0.59, 0.92)**	0.77 (0.62, 0.96)*	0.68 (0.54, 0.86)**	0.74 (0.59, 0.93)*
3 rd quartile	0.55 (0.43, 0.72)***	0.60 (0.47, 0.77)**	0.73 (0.57, 0.95)*	0.78 (0.60, 1.00)*
Most masculine	0.54 (0.43, 0.69)***	0.58 (0.46, 0.74)***	0.94 (0.75, 1.18)	0.99 (0.80, 1.14)
FEMALES				
Gender expression				
Least feminine	1.0 [reference]	1.0 [reference]	1.0 [reference]	1.0 [reference]
2 nd quartile	1.01 (0.85, 1.19)	1.01 (0.86, 1.20)	1.06 (0.97, 1.15)	1.03 (0.95, 1.13)
3 rd quartile	1.10 (0.95, 1.27)	1.11 (0.97, 1.28)	1.13 (1.05, 1.23)**	1.08 (1.00, 1.16)*
Most feminine	1.16 (1.01, 1.34)*	1.20 (1.04, 1.38)**	1.32 (1.23, 1.42)***	1.21 (1.13, 1.30)***

[†] Adjusted for age (continuous), race/ethnicity (white/nonwhite). Past-year physical inactivity measured in the 1996, 1997, 1998, 1999, 2001, 2005 waves; past-year indoor tanning measured in the 1999, 2001, 2003, 2005, 2007 waves.

* Wald χ^2 $P < 0.05$.

** Wald χ^2 $P < 0.01$.

*** Wald χ^2 $P < 0.001$.

Table 3
Tobacco use by gender expression, Growing Up Today Study, 1996-2007 waves, (N= 9,434)[†]

Cigarette smoking, risk of worse trajectory across adolescence				Chewing tobacco use, past year, any		Cigar smoking, past year, any					
Model 1a: Gender expression		Model 1b: Further adjusted for media engagement		Model 2a: Gender expression		Model 2b: Further adjusted for media engagement		Model 3a: Gender expression		Model 3b: Further adjusted for media engagement	
Prevalence odds ratio (95% confidence interval)											
Prevalence risk ratio (95% confidence interval)											
MALES											
Gender expression											
Least masculine		1.0 [reference]		1.0 [reference]		1.0 [reference]		1.0 [reference]		1.0 [reference]	
2 nd quartile		0.67 (0.53, 0.85)***		0.77 (0.61, 0.98)*		1.50 (0.95, 2.36)		1.60 (1.00, 2.54)*		1.20 (0.89, 1.60)	
3 rd quartile		0.64 (0.49, 0.83)***		0.71 (0.55, 0.93)**		1.57 (0.96, 2.57)		1.66 (1.01, 2.73)*		1.33 (0.98, 1.80)	
Most masculine		0.69 (0.55, 0.87)**		0.78 (0.62, 1.00)*		1.78 (1.14, 2.79)*		1.88 (1.19, 2.97)**		1.58 (1.19, 2.09)**	
FEMALES											
Gender expression											
Least feminine		1.0 [reference]		1.0 [reference]		1.0 [reference]		1.0 [reference]		1.0 [reference]	
2 nd quartile		0.84 (0.71, 1.00)*		0.84 (0.70, 1.00)*		0.63 (0.36, 1.11)		0.64 (0.36, 1.13)		0.58 (0.43, 0.80)***	
3 rd quartile		0.74 (0.63, 0.86)**		0.70 (0.60, 0.82)***		0.92 (0.60, 1.43)		0.88 (0.57, 1.37)		0.58 (0.45, 0.75)***	
Most feminine		0.75 (0.65, 0.88)**		0.70 (0.60, 0.82)***		0.68 (0.42, 1.08)		0.60 (0.38, 0.94)*		0.59 (0.46, 0.76)***	

[†] Adjusted for age and race/ethnicity (white/nonwhite). Past-year chewing tobacco use measured in the 1997, 1998, 1999, and 2001 waves. Past-year cigar smoking measured in the 2001 wave. Odds ratios of following a worse smoking trajectory were calculated with ordered logistic regression with a cumulative logit link and a multinomial distribution.

* Wald χ^2 $P < 0.05$.

** Wald χ^2 $P < 0.01$.

*** Wald χ^2 $P < 0.001$.