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Marital Status and Twins' Health and Behavior: An Analysis of Middle-Aged Danish Twins

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Abstract

Objective—To disentangle the influences on health of selection processes related to genetic and rearing environmental factors from factors related to marriage benefits. We compared health status among same-sex male and female twin pairs who lived together during childhood and were discordant or concordant on adult marital status.

Methods—A cross-sectional survey of a random sample of middle-aged Danish twins was conducted in 1998 to 1999. This study included 1175 same-sex twin pairs (52.5% monozygotic (MZ) and 47.5% dizygotic (DZ)). Data were obtained on adult marital status and on height, body mass index (BMI), depression symptoms, self-rated health, cognitive function, physical activity, smoking, and alcohol intake.

Results—Among all 2350 individual twins, men who were divorced/widowed or never married had higher depression scores, lower cognitive test scores, lower physical activity scores, and were also less often moderate drinkers and nonsmokers compared with married men. Divorced/widowed women had higher depression scores and those divorced/widowed or never married were more often smokers than married women. Within twin pairs discordant on marital status, the divorced/widowed twin had higher average depression scores and was more likely to be a smoker. Never married twins had lower physical activity scores and never married male twins had higher BMI and higher depression scores than their married co-twin.

Conclusion—This study suggests that the relationships of adult divorce with depression and smoking in Danish twins are due to the stressful effects of marital dissolution, but that marital differences in other health and behavioral outcomes are most consistent with selection effects related to genetic or rearing environmental factors.

Keywords

marital status; health status; twin study

INTRODUCTION

Living alone or being unmarried are well-known risk factors for poor health, whereas becoming divorced or widowed is a strong predictor of mortality (1–4). At least two possible

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mechanisms have been suggested to explain the association between marital status and health—marriage benefits and health selection. The protection hypothesis focuses on the beneficial effects of marriage through, for example, better economic security, social integration, and health behavior. The selection hypothesis assumes that persons with certain traits or behaviors that are influenced by their genotypes or early rearing environments are selected into marriage although some persons, for example, people with health problems, are at a higher risk of never getting married or of getting divorced (4,5). It is difficult to distinguish the beneficial impact of marital status on health from the confounding effect of selection into the married state (4). However, the study of twins provides an opportunity to isolate the effects of adult marital status from the genetic and social influences operating early in life. Twins not only share either all (monozygotic (MZ)) or on average half (dizygotic (DZ)) of their genes but nearly always also their childhood family environment. Consequently, differences in MZ twin pairs implicitly control for mechanisms linked to selection. Thus, studies of twins discordant for current marital status offer a unique opportunity to determine whether the association of marital status with health outcomes is consistent with marriage benefits or early selection effects.

If the association of adult marital status and health outcomes reflects selection effects only, then we do not expect health outcome differences in MZ pairs discordant on adult marital status because these twins are matched on early rearing environmental and genetic factors. Alternatively, health outcome differences in DZ but not MZ pairs discordant for adult marital status would suggest that genetic factors underlie selection effects because DZ twins share the same rearing environment but are imperfectly matched on genotype. Finally, a beneficial effect of marriage would be implicated by finding that both MZ and DZ twins discordant for marital status are also discordant on health and behavior outcomes. In the present study, we investigate whether differences in marital status influence the health and behavior of same-sex twins who share genetic constitution and rearing environment. We use data from a cohort of Danish twins born 1931 to 1952 and compare health status and behavior among male and female, MZ and DZ twin pairs who lived together during childhood and were either discordant or concordant on adult marital status.

We have used a similar approach to investigate whether differences in adult socioeconomic circumstances influence the health and behavior of twins who share genetic constitution and rearing environment (6). This analysis showed that, for most health outcomes, the variability within twin pairs was related to zygosity (higher for DZ than for MZ) but not to occupational social class, and it was concluded that the relationship between social class and health is due mainly to selection effects rather than a causal effect of social class exposures on health and behavior. However, marital dissolution is considered to be a stressful life event (2,3) and marital status may have other effects on health. Thus, in the present study, we address the following questions:

1. Is there an association between marital status and health in Danish twins and is the relationship the same in men and women?
2. In MZ and DZ twin pairs discordant for marital status, does the health of the married twin differ from that of the never married or divorced/widowed twin and are any such differences larger among DZ than MZ twin pairs?

MATERIALS AND METHODS

Study Population

The twin pairs included were members of the Middle Age Danish Twin (MADT) study (7). The MADT sample was ascertained through the Danish Twin Registry and the Danish Central Person Registry. This sampling framework targeted 240 twins from 120 intact twin

pairs (both surviving and living in Denmark until 1998) for each of the 22 consecutive birth years (1931 through 1952) that were randomly selected from all available twin pairs from each of these birth years. The 120 twin pairs from each birth year consisted of 20 pairs each of monozygotic males, monozygotic females, same-sex dizygotic males, and same-sex dizygotic females as well as 40 pairs of opposite-sex DZ pairs. Of the 5280 individual twins in the sampling framework, 90 died before the time the survey was undertaken and 4314 (83%) of the 5190 surviving twins participated in a personal interview and a health examination in late 1998 or early 1999. A total of 546 participants whose twin was a nonrespondent were excluded, leaving 1884 intact twin pairs. There were 1266 same-sex twin pairs (52.5% MZ and 47.5% DZ) and 617 opposite-sex DZ pairs; only the same-sex pairs are reported in the present study. The sample was further reduced by excluding 42 twin pairs where both twins had not lived together until at least age 14 years.

Measurements

Interviews were conducted by trained interviewers from the Danish National Institute of Social Research. The survey, which lasted on average 1½ hours, comprised a questionnaire, and tests of cognitive and physical functioning.

Information on marital status was retrieved during the interview where participants were asked: “What is your current marital status?” with response categories: married, living with a partner, divorced, separated, widowed, or never married. Twin pairs were classified with respect to their adult marital status as concordant married or living with partner (849 pairs), discordant married or living with partner/divorced or widowed (242 pairs), and discordant married or living with partner/never married or living with partner (84 pairs). Nine pairs with both twins never married, 26 pairs with both twins divorced or widowed, and 14 pairs with the combination never married/divorced or widowed were excluded. This left 1175 intact twin pairs (n = 2350 individuals) for the present analyses (Table 1).

Further, the following data on health and health behavior were collected:

Height in cm and weight in kg were self-reported and were used to calculate body mass index (BMI).

The depression score used in the present study was based on the factor analytically derived depression score described by McGue and Christensen (8,9). The scale consists of 17 individual symptoms of depression that cover mood and affect (e.g. “Are you happy with your life?” “Do you sometimes feel life is not worth living?”) and the somatic sequelae of depression (e.g. “Do you find it difficult to concentrate?” “Have you lost pleasure or interest in doing things?”). The total depression scale score used in the present study is both internally consistent ($\alpha > 0.85$) and stable ($r > .60$) over a 2-year interval (9). Self-reported health was based on responses to a single item (“How do you consider your health in general?”), which were dichotomized as excellent/good versus fair/poor. Cognitive functioning was assessed using a composite of six brief tests covering four major domains of cognitive functioning (semantic memory, working memory, episodic memory, and perceptual speed). The specific tests included in the composite were 1) fluency (the number of different animals named in a single minute, 2) forward digit span, 3) backward digit span, 4) immediate recall of a 12-item list, 5) delayed recall of the 12-item list, and 6) a speeded digit symbol task in which the respondent was asked to write the digit for each of a sequence of symbols as quickly as possible. The multiple cognitive tests were positively intercorrelated, supporting the formation of a composite score computed by summing the six component scores after standardization. Physical activity was assessed using a 9-item self report of the frequency and intensity of walking, running, and biking (a common form of transport in Denmark). The resulting scale has an internal consistency reliability of 0.75.

Alcohol consumption was assessed as the number of drinks per day. Results were similar when responses were treated as either continuous or dichotomized data (i.e., drinking 1–21 (males) or 1–14 (females) drinks per week) (yes/no), so we only report those for the dichotomous variable. Further, we included data on current smoking (dichotomized as yes/no).

The study was approved by the Ethics Committee of Fynen and the Danish Data Protection Agency.

Statistical Analyses

Analyses were undertaken at both the individual level (the first research question, reported in Table 2) and in terms of discordant twins pairs (the second research question, reported in Tables 3 and 4). In the individual analyses, we used multivariable linear and logistic regression controlling for age to investigate the association of marital status with each of the eight outcomes (height, BMI, depression, cognitive function, physical activity, alcohol use, smoking, and self-rated health). Possible gender differences were examined by adding an interaction term between gender and marital status in regression models with both sexes combined. Models with and without the interaction term were compared using likelihood ratio tests. This revealed that gender was an interactive determinant for several outcomes; hence, analyses were carried out for each gender separately. There is a substantial dependence within twin correlation for many traits (e.g., height); to account for this dependency within twin pairs, we used the Hubert-White-Sandwich (robust) estimator of variance with a cluster option in STATA (StataCorp, College Station, TX) that relaxes the independence assumption and only requires that the observations are independent across clusters. Thus, the scores that enter the calculation of the estimator of variance are the sums of the individual scores within the twin pair (10). In the second, or co-twin analyses, we used matched pair analysis where the health score (for continuous) or the risk (odds for dichotomous) of the outcome in the exposed (divorced or unmarried) twin is compared with the married co-twins. Differences in the association of marital status with health/health behavior between MZ and DZ pairs were evaluated by tests of interaction terms between zygosity and marital status. All analyses were performed in STATA version 8 (StataCorp).

RESULTS

A total of 1175 twin pairs were included in the analyses and of them 51% were male, 49% were female same-sex twin pairs (Table 1).

Table 2 describes the association of marital status with the various outcomes with the 2340 twins classified as individuals. In males, marital status was a significant predictor of all the examined outcomes, whereas in female twins, the differences in health among the marital status groups were small and nonsignificant, except for depression and smoking, where the scores were highest among the divorced/widowed. The tests for gender differences in marital status effects were significant for height, BMI, cognitive function, and physical activity ($p = .06$).

Table 3 shows that among all male twins discordant on marital status, the divorced/widowed twin had a higher depression score, a lower cognitive score, and a higher prevalence of smoking than the married co-twin. Among all female twins discordant on marital status, the divorced/widowed twin had a higher depression score and a borderline significant ($p = .08$) higher prevalence of smoking than the married co-twin. The test for statistical interaction between gender and marital status was significant for cognitive function. For some of the estimates, the effects seemed to differ between MZ and DZ twin pairs; however, the confidence intervals were wide and none of the tests for statistical interaction between

zygosity and marital status reached significance (all $p > .15$). The number of discordant twin pairs with the combination married/never married was smaller and we again found only few differences within the discordant pairs (Table 4). Thus, never married twins of both sexes were less physically active than their married co-twins; never married male twins had a higher BMI and higher depression scores than their married co-twin. All the tests for interaction with zygosity and gender were also insignificant.

DISCUSSION

This study of the association of marital status with health and behavior among randomly sampled middle-aged Danish twins revealed the following: 1) being married was associated with having better health status and behavior; and 2) the effects of marital status were diminished within MZ and DZ twin pairs discordant for being married versus divorced/ widowed, and were only significant for smoking and our measure of depression. The discordant twins did not differ consistently on other health and behavioral indicators.

In the overall sample of 2350 twins, the marriage benefit was generally greater for males than for females, although both divorced/widowed males and females had significantly higher rates of depression and smoking than those who were married. This is in agreement with a number of studies showing that men seem to have a greater health benefit from marriage than women (1,2,5,11). The rationale for the co-twin control study is that it allows us to adjust for all mediators or confounders linked to genetic factors or rearing environment. We chose not to include opposite sex pairs because the main purpose of the intrapair comparison was to distinguish between the causal and the selection effects within each gender. In the present study, male twins discordant for marital status did not differ for levels of height, BMI, physical activity, alcohol use, and self-rated health. This finding suggests that the marital status effect on health outcomes we observed in the individual level analyses (Table 2) was due to selection processes related to confounding from genetic factors or rearing environment. However, after co-twin control, we continued to observe effects on our depression scores and on smoking. These differences are consistent with a protective effect of marriage, although later selection effects cannot be excluded as the dissolution of marriage for the divorced or widowed can be a stressful event that can have an effect on behavior, such as smoking (4,12,13). We cannot exclude that the age of the cohort may have influenced some of the findings. In many countries, smoking in women was less accepted in the older cohorts and genetic effects may therefore possibly be more pronounced in the women than in the men. However, in Denmark, smoking has been prevalent and rather well accepted among women also back in 1950 to 1970 when the present cohort initiated smoking. Thus, 40% of women were smokers in the first Danish survey on smoking habits in 1953 and this percentage remained rather stable until the 1990s (14).

The married member of discordant male twin pairs performed better on the cognitive tests than his divorced/ widowed co-twin. Cognitive ability is largely determined before adulthood, when twins share a rearing environment and have the same (unmarried) marital status. Thus, these findings suggest that the association of this outcome with marital status likely reflects selection effects rather than an effect of marriage on cognitive functioning. For example, poor health during childhood in one twin might influence school participation, educational status, and subsequent cognitive abilities, and marital status. Alternatively, cognitive function differences might be the result of social selection whereby the chance is higher for cognitively well functioning men to get married. Differences between the two members of male twin pairs never married/married for BMI and depression might also reflect health selection. In discordant pairs from both sexes, the lower activity levels in never married as compared with married twins might reflect that having a family is associated with more activity, e.g., in the household. In general, we observed less difference

between never married and married female twins than we observed in male twins, and this might reflect a sex difference in factors that lead to getting married.

The twin design used here has some advantages as it makes it possible to control for both genetic and early environmental factors. Further, the present study includes a random sample of all middle-aged Danish twins. However, differences in social relations and health between twins and singletons might influence the generalizability of findings from the present study. The MADT interview included questions concerning the twins' frequency of contact with their co-twins and other family members. These data showed that 50% of the twins had contact with their co-twin at least once a week, whereas 80% had contact with children and other close family members. This frequency of contacts seems to be higher than the 60% of the general population who report they had been in contact with close family members within a week (15,16). We did a subanalysis on the 50% of the twins who did not have contact with their co-twin at least once a week. Although the sample was small, the results pointed in a similar direction as in the overall sample. Further, the prevalence of marriage of around 86% in the present study was similar to the 90% found among middle-aged Danes in 2000. Also, the prevalence of smoking was close to rates found in other Danish surveys (15). Further, we found marital status differences in health in this twin population (Table 2) that were comparable to those seen in other population surveys (15,16). As a study limitation, we also need to emphasize the relative small number of discordant twin pairs. For some of the estimates, the effects seemed to differ between MZ and DZ twin pairs; however, the confidence intervals were wide and our data set might not have power to detect all differences. But this, on the other hand, strengthens the discordant twin pair findings on depression and smoking that were detected. We increased the sample size by including the 617 opposite-sex pairs and reanalyzed all the individual level analyses. This approach gave essentially the same results as those based on smaller same-sex sample. However, it would complicate the co-twin analyses of differences between MZ and DZ discordant pairs to include opposite sex pairs because all MZ are same-sex pairs. Consequently, we restricted the co-twin analysis to samesex pairs only. Further, we compare the results from the individual analysis with those from the co-twin analysis, and therefore we present the results for the same-sex twin sample.

In conclusion, the present study suggests that, in Denmark, the associations of adult divorce with depression and smoking are due to the stressful effects of marital dissolution, but that marital differences in other health and behavioral outcomes are most consistent with selection effects.

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Glossary

BMI	body mass index
MZ	monozygotic
DZ	dizygotic
MADT	middle-aged Danish twins

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TABLE 1

Sociodemographic Characteristics: Middle-Aged Danish Twins

	Same-Sex Male Twin Pairs ***n*** **= 598**	**Same-Sex Female Twin Pairs** ***n*** **= 577**
Age, mean ± SD, years	56.7 ± 8.4	56.5 ± 6.3
Current marital status		
Both married, %	79.9	64.4
Married/divorced or widowed, %	13.9	27.6
Married/never married, %	6.4	8.0
Monozygotic, %	52.4	53.8
Dizygotic, %	47.6	46.2

SD = standard deviation.

TABLE 2

Health Characteristics in Relationship to Marital Status in 2350 Middle-Aged Danish Twins

	Male Twins		Female Twins		Test for Difference in Effect in Male and Female Twins
	n	%; Mean ± SD	*n*	%; Mean ± SD	*p*[a]
Height (cm)					
Married	1078	176.5 ± 6.4	952	164.6 ± 5.6	
Divorced/widowed	82	176.1 ± 6.7	160	163.9 ± 5.9	
Never married	36	174.6 ± 6.7*	40	165.8 ± 6.6	.01
BMI (kg/m^2)					
Married	1078	25.9 ± 3.0	951	24.1 ± 3.8	
Divorced/widowed	82	25.2 ± 3.4	160	23.9 ± 3.6	
Never married	35	27.9 ± 4.1*	40	24.0 ± 5.1	<.01
Depression score					
Married	1078	18.9 ± 2.9	950	19.4 ± 3.5	
Divorced/widowed	81	21.2 ± 5.7*	161	21.5 ± 5.1*	
Never married	34	20.5 ± 4.9*	40	20.6 ± 3.7	.41
Cognitive function					
Married	1078	5.13 ± 3.17	951	4.97 ± 3.18	
Divorced/widowed	80	4.03 ± 3.30*	161	5.06 ± 3.62	
Never married	34	3.46 ± 3.31*	39	5.09 ± 3.35	<.01
Physical activity score					
Married	1078	32.2 ± 5.8	952	30.8 ± 5.8	
Divorced/widowed	82	31.1 ± 7.7*	162	30.8 ± 6.5	
Never married	36	29.9 ± 4.9*	40	30.2 ± 5.8	.06
% Nonmoderate alcohol drinking					
Married	1078	24.4	952	33.2	
Divorced/widowed	82	36.9*	162	41.6	
Never married	36	32.5	40	41.3	.69
% Smokers					

	Male Twins		Female Twins		Test for Difference in Effect in Male and Female Twins
	n	%; Mean ± SD	*n*	%; Mean ± SD	p^a
Married	1078	39.4	952	35.7	
Divorced/widowed	82	52.6*	162	49.7*	
Never married	36	47.5*	40	54.4*	.63
% Poor/fair self-reported health					
Married	1077	15.9	952	21.9	
Divorced/widowed	82	30.9*	162	28.6	
Never married	36	17.5	40	21.7	.24

*$p < .05$ for the marked category compared with married in age-adjusted regression analysis.

[a]Likelihood ratio test for interaction between gender and marital status.

SD = standard deviation; BMI = body mass index.

TABLE 3

Difference (β Coefficients and 95% CI Intervals From Linear or Logistic Regression) in Health Outcomes for *Divorced/Widowed With Married as Reference*. Results for Within Twin Pair Comparison in Twin Pairs Discordant on Marital Status

Health Outcomes	β Coefficient (95% CI Interval) Divorced/Widowed Versus Married			*p* for Different Effect in MZ and DZ Pairs[a]	*p* for Different Effect in Male/Female Pairs
	All	MZ	DZ		
Males (*n* = 167)					
Height	−0.24 (−1.71 to 2.19)	−0.44 (−3.29 to 2.40)	0.92 (−1.77 to 3.61)	.48	.49
BMI	−0.57 (−1.59 to 0.44)	−0.26 (−1.51 to 1.25)	−0.89 (−2.48 to 0.69)	.54	.80
Depression score	**2.55 (1.21 to 3.88)**	**1.99 (0.08 to 3.72)**	**3.18 (1.21 to 5.15)**	.33	.25
Composite cognitive score	**–1.21 (−2.14 to –0.29)**	−0.93 (−2.27 to 0.41)	**–1.43 (−2.69 to –0.18)**	.54	.01
Physical activity score	0.44 (−1.67 to 2.54)	−0.28 (−3.04 to 2.47)	1.15 (−2.15 to 4.45)	.50	.75
No moderate alcohol use	−0.60 (−1.28 to 0.06)	−0.14 (−0.46 to 0.76)	−0.99 (−1.91 to 0.06)	.23	.51
Smoking	**0.62 (0.00 to 1.24)**	0.73 (−0.14 to 1.60)	0.51 (−0.36 to 1.33)	.73	.27
Self-rated health	0.35 (−0.34 to 1.02)	0.41 (−0.38 to 1.41)	0.27 (−0.66 to 1.21)	.83	.79
Females (*n* = 206)					
Height	−0.58 (−1.87 to 0.74)	−0.21 (−2.03 to 1.61)	−0.94 (−2.86 to 0.97)	.57	
BMI	−0.75 (−1.67 to 0.15)	−0.84 (−2.22 to 0.51)	−0.64 (−1.36 to 0.52)	.81	
Depression score	**1.52 (0.46 to 2.59)**	1.26 (−0.02 to 2.59)	**1.79 (0.11 to 3.48)**	.61	
Composite cognitive score	0.40 (−0.34 to 1.15)	−0.11 (−1.22 to 1.06)	0.93 (−0.08 to 1.94)	.17	
Physical activity score	0.00 (−1.38 to 1.39)	0.14 (−1.84 to 2.13)	−0.13 (−2.08 to 1.80)	.83	
No moderate alcohol use	−0.16 (−0.61 to 0.28)	−0.08 (−0.78 to 0.54)	−0.25 (−0.90 to 0.40)	.70	
Smoking	0.35 (−0.08 to 0.80)	0.83 (−0.39 to 0.86)	0.48 (−0.14 to 1.19)	.58	
Self-rated health	0.46 (−0.05 to 0.97)	0.52 (−0.20 to 1.25)	0.40 (−0.30 to 1.16)	.81	

Variables in italics are dichotomous.

A negative β coefficient means lower score or prevalence in the divorced/widowed compared with the married co-twin.

A bold β coefficient indicates $p < .05$.

[a]Likelihood ratio test for interaction between MZ and DZ twins.

CI = confidence interval; MZ = monozygotic; DZ = dizygotic; BMI = body mass index.

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TABLE 4

Difference (β Coefficients and 95% CI Intervals From Linear or Logistic Regression) in Health Outcomes for *Never Married With Married as Reference*. Results for Within Twin Pair Comparison in Twin Pairs Discordant on Marital Status

Health Outcomes	β Coefficient (95% CI) Never Married Versus Married			*p* for Different Effect in MZ and DZ Pairs[a]	*p* for Different Effect in Male/Female Pairs
	All	MZ	DZ		
Males (*n* = 77)					
Height	−0.50 (−3.10 to 2.09)	−0.78 (−4.85 to 3.37)	−0.37 (−3.84 to 3.09)	.87	.44
BMI	**1.57 (0.02 to 3.12)**	0.79 (−1.54 to 3.13)	2.03 (−0.08 to 4.22)	.43	.23
Depression score	**1.98 (0.31 to 3.63)**	1.13 (−1.43 to 3.71)	**2.46 (0.25 to 4.68)**	.43	.51
Composite cognitive score	−0.72 (−2.11 to 0.66)	0.43 (−2.15 to 3.02)	−1.31 (−3.09 to 0.37)	.20	.77
Physical activity score	**–3.32 (−5.87 to –0.77)**	**–4.71 (−8.32 to –1.10)**	−2.53 (−6.09 to 0.93)	.70	.52
No moderate alcohol use	−0.29 (−1.27 to 0.68)	0.00 (−1.63 to 1.62)	−0.46 (−1.68 to 0.76)	.64	.83
Smoking	0.22 (−0.69 to 1.13)	0.29 (−1.31 to 1.77)	0.18 (−0.93 to 1.30)	.90	.91
Self-rated health	0.13 (−1.07 to 1.34)	0.00 (−1.80 to 1.79)	0.24 (−1.37 to 1.86)	.84	.82
Females (*n* = 91)					
Height	0.95 (−1.75 to 3.65)	0.50 (−4.32 to 5.32)	1.19 (−2.18 to 4.57)	.79	
BMI	0.03 (−1.88 to 1.93)	−0.01 (−3.54 to 3.45)	0.04 (−2.32 to 2.27)	.96	
Depression score	1.24 (−0.25 to 2.75)	0.24 (−2.30 to 2.80)	1.78 (−0.08 to 3.67)	.32	
Composite cognitive score	−0.96 (−2.19 to 0.26)	−0.51 (−0.2.36 to 1.73)	−1.29 (−3.27 to 0.69)	.60	
Physical activity score	**–2.32 (−4.38 to –0.26)**	−0.55 (−3.30 to 2.18)	**–3.26 (−6.08 to –0.44)**	.21	
No moderate alcohol use	−0.37 (−1.23 to 0.48)	−0.57 (−2.06 to 0.92)	0.56 (−1.68 to 0.40)	.59	
Smoking	0.37 (−0.47 to 1.20)	0.79 (−0.65 to 2.34)	0.13 (−0.88 to 1.15)	.45	
Self-rated health	0.30 (−0.77 to 1.38)	−0.21 (−1.97 to 1.21)	0.81 (−0.68 to 2.39)	.29	

Variables in italics are dichotomous.

A negative β coefficient means lower score or prevalence in the never married compared with the married co-twin.

A bold β coefficient indicates $p < .05$.

[a]Likelihood ratio test for interaction between MZ and DZ twins.

CI = confidence interval; MZ = monozygotic; DZ = dizygotic; BMI = body mass index.