



Short communication

Spousal concordance in the use of alternative tobacco products: A multi-country investigation

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ARTICLE INFO

Article history:

Received 26 July 2016

Received in revised form 8 November 2016

Accepted 12 November 2016

Available online 23 November 2016

Keywords:

Alternative tobacco products

Spousal concordance

Global health

ABSTRACT

Background: Married couples often share similar health-related characteristics and behaviors, including cigarette smoking status. Despite their rising popularity in the U.S., little research has examined the patterns of spousal concordance (SC) for alternative tobacco products (ATPs), such as e-cigarettes, cigars, and hookah.

Methods: The purpose of this project was to examine the roles of age, gender, and culture in the strength of SC for these ATPs. Analyses focused on a diverse community sample of married individuals in Ohio, U.S. (N = 278), but also examined patterns in Austria, Greece, Israel, the Netherlands, and Slovakia. All participants completed a survey in which they indicated both their own, and their spouse's ever-use of various tobacco products.

Results: For the U.S. sample, SC was highest for e-cigarettes, flavored e-cigarettes, flavored cigarettes, and hookah (ϕ s = 0.48–0.61); SC appeared to be stronger among younger couples, and when there was only a small female vs. male differences in use. Similar patterns were found in the other countries, with a few key exceptions. In particular, there was low SC for e-cigarettes and flavored e-cigarettes in the other countries, where e-cigarettes had been federally regulated by the time of data collection.

Conclusion: Overall, these findings have implications for the continued spreading popularity of these tobacco use behaviors.

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1. Introduction

Married couples often share similar health-related characteristics and behaviors, including cigarette smoking status (Sutton, 1993; Venters et al., 1984). For example, in one study with 5459 spousal pairs, there was 79.7% agreement within couples for current-smoking status and 65.3% agreement for ever-smoking status (Treur et al., 2015). This spousal concordance (SC) in cigarette smoking is likely due to several factors. Assortative mating theory suggests that people tend to marry those with similar traits as them (Agrawal et al., 2006; Kuo et al., 2007). Further, once they are married, a smoking spouse can instigate his/her partner's initiation (Daly et al., 1993) or reduce the likelihood that his/her partner can quit successfully (Homish and Leonard, 2005; Severson et al., 1995).

The SC in cigarette smoking has been identified across the globe (Bloch et al., 2003; Jurj et al., 2006; Kuo et al., 2007) although there

are cultural differences in the strength of the association. For example, compared to 79.7% agreement in a large Dutch sample (Treur et al., 2015), a large study in China found only 39.2% agreement (Jurj et al., 2006). Although many factors likely account for these differences, it is worth noting that for the Chinese sample, 52.6% of the husbands but only 2% of the wives were current smokers (compared to 23.3% and 20.0%, respectively, in the Dutch sample). SC also appears to be stronger among younger vs. older cohorts: the Dutch sample found the odds of a couple being in agreement (vs. not in agreement) for current smoking status was 1.85 more for a recent cohort, compared to cohorts sampled in the previous eight years.

In contrast to the decades of research on SC for cigarette smoking, there has been very little focus on SC for use of alternative tobacco products (ATPs). Many of these products, such as e-cigarettes, hookah, and snus have only risen in popularity in the U.S. in recent years, especially among young people (Delnevo et al., 2014; Singh et al., 2016). Other products, such as smokeless tobacco, pipes, and cigars, have remained popular for many years, especially among men (SAMHSA, 2013). Although other countries show similar trends for the use of some of these ATPs (e.g., hookah;

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Maziak et al., 2014), the patterns are not universal. For example, stricter regulation of e-cigarettes has kept prevalence low in countries such as Australia (Yong et al., 2015).

The SC for ATPs could have important public health implications. A strong SC would suggest that spouses may be influencing their partners' initiation and inhibiting their cessation. Thus, one could anticipate a faster spread in use for popular products with a strong SC. Conversely, a weak SC could forecast a slower rise in prevalence, but also hidden health costs for the non-using spouses. For example, a smoking spouse exposes his/her non-using partner to the dangerous effects of secondhand smoke.

The purpose of this study was to examine the patterns of SC for ATPs. Beyond determining whether there was SC for these products, we sought to elucidate the factors associated with a strong vs. weak concordance. In particular, we noted the importance of age, gender, and culture for product use and anticipated that these factors would also be related to SC. Our foremost hypothesis was that there would be SC for most ATPs. There were two corollary hypotheses to this: (1) SC would be stronger among younger individuals; (2) SC would be stronger for products where prevalence rates were more equal across genders. Finally, an exploratory hypothesis posited that, across different countries, we would find similar patterns for SC – both in terms of strong vs. weak effects, and also in terms of the relation between SCs, age, and gender.

2. Methods

2.1. U.S. participant dataset

2.1.1. Participants. Our primary sample of interest was recruited from Columbus, Ohio, and surrounding areas. Potentially eligible individuals were approached by research staff in public areas (e.g., barber shops, community centers) and asked to take part in a research study on marriage. To be eligible to participate, an individual needed to be English-speaking, aged 18 years or older, and currently married. Eligible participants completed a paper-and-pencil survey, and received \$10.00 in compensation for their time. Recruitment was monitored to obtain a sample that was balanced on gender. All study methods were approved by the University IRB.

Three-hundred individuals completed the survey. Data were excluded for participants who had missing information for their own or their spouse's ATP use ($n=22$), leaving a sample of 278 for analyses. This sample was 50.2% female, had a mean age of 43.3 ($SD=12.9$), and the majority (54%) identified as White (30.6% African American; 6.5% Hispanic/Latino; 4.6% another race/ethnicity; 4.3% chose not to report).

2.1.2. Measures. Participants were asked about their own, and their spouse's use "even just one time" of twelve ATPs: E-cigarettes, smokeless tobacco products, flavored e-cigarettes, cigars, pipes, roll-your-own cigarettes, flavored cigarettes, clove cigars, flavored little cigars, hookah, snus, and dissolvable tobacco products (all response options were *yes* or *no*). Data for dissolvable tobacco products were ultimately excluded due to low reported prevalence rates ($n=4$), leaving eleven ATPs for analyses.

SC was calculated for each product as the association between a participant's and his/her spouse's ever-use of the product. A strong and positive SC indicated a strong association between a spouse and his/her partner's ever-use status. A weak SC indicated that there was little relation between a spouse's and his/her partner's ever-use status. And a negative relation indicated that a spouse's ever-use status was associated with the *opposite* ever-use status for the partner.

For age of ever-users, we obtained, for each product, the average age of participants who reported ever-use of the product (spouses' age was not incorporated into this variable).

Also for each product, we calculated the percentage of female participants reporting ever-use and the percentage of male participants reporting ever-use. The ratio of these two values was then computed to obtain the female-to-male use ratio.

2.2. Product dataset

When indicated, analyses were conducted using a dataset in which each product was a case with its associated variables (SC, average age of ever-users, and male-to-female use ratio). This setup allowed us to test the relation between SC, age, and gender across the various products. As we were analyzing eleven ATPs, there were eleven cases in this dataset.

2.3. Cross-cultural dataset

When indicated, we also analyzed tobacco-use data from community samples in Austria ($n=294$), Greece ($n=234$), Israel ($n=288$), the Netherlands ($n=285$), and Slovakia ($n=296$), which were obtained using the same survey as in the U.S. sample (see Table S1 for methodology details in Supplementary material). Data for all six countries were collected as part of a larger cross-cultural project concerning the relationships of married couples. Chi-square analysis indicated that the countries did not significantly differ on their gender distributions ($p > 0.8$). However an analysis of variance (ANOVA) on age with Games-Howell post-hoc comparisons indicated that: The average age in Austria was significantly older than for all other countries but Slovakia ($ps \leq 0.004$); the average age in the U.S. was also significantly younger than in the Netherlands and Slovakia ($ps < 0.03$); and the average age in Israel was significantly younger than all other countries ($ps < 0.001$).

2.4. Analyses

To test Hypothesis 1 we calculated, for each product, the relation between a participant's and his/her partner's ever-use of product. As the participant and partner variables were binary, we calculated the relation using the phi (ϕ) coefficient, which is similar to the correlation coefficient in its interpretation. For our corollary hypotheses, we used the product dataset to examine the correlation between the continuous variables of SC and (1) age of ever-users and (2) the female-to-male use ratio. For our exploratory hypothesis, we calculated SC values for each country in the cross-cultural dataset, and examined how these values varied as a function of ever-use and female-to-male ratio for each country.

3. Results and discussion

3.1. U.S. sample

As shown in Table 1, SC was negative and/or not significant for chewing tobacco, snus, cigars, and pipes (-0.13 to -0.01), low for clove cigars (0.14), moderate for flavored little cigars and roll-your-own cigarettes (0.24 and 0.22) and robust for e-cigarettes, flavored e-cigarettes, flavored cigarettes, and hookah (0.48–0.61).

The average age of ever-users of products varied from as low as 36.1 for hookah, to as high as 43.8 for pipes (see Table S2 in Supplementary material). Using the product dataset, we found a significant correlation between age and SC ($r = -0.76$, $p = 0.006$). Thus, consistent with Hypothesis 1, SC appears to become weaker with increasing age. This relation is illustrated in Fig. 1, which also indicates a clear outlier: snus is used by a younger population, but SC for snus is negative. Overall, findings suggest that products such

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