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Workforce disengagement stressors and retiree alcohol misuse: The mediating effects of sleep problems and the moderating effects of gender

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Abstract

We generate and test a moderated mediation model of the effects of two retirement-related stressors (namely, financial and marital) on the severity of alcohol misuse among retirees. We posit that in addition to using alcohol to cope with stressors in retirement, alcohol may also be used to self-medicate the secondary, sleep-related effects of such stressors, and that gender serves as a key boundary condition, moderating the impact of such stressors on sleep-related problems, and of sleep-related problems on alcohol misuse. Using longitudinal data collected from a sample of 292 retirees, our findings generally support this model, suggesting that both stressors are associated with the severity of alcohol misuse among male retirees. Moreover, our findings demonstrate that – for male retirees – the effect of both stressors on the severity of alcohol misuse is to a large extent secondary to the stressors themselves, mediated by the sleep-related problems they may generate.

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Introduction

Although workforce disengagement, be it in the form of unemployment, underemployment or retirement, can have significant mental health implications (Lin and Lueng, 2010), few studies have examined the impact of workforce disengagement on alcohol misuse, with those that have generating largely inconsistent findings (Brennan et al., 2010; Dooley and Prause, 1998; NIAAA, 2006). For example, although cross-sectional and aggregate longitudinal studies find community unemployment rates to be associated with increased alcohol sales (Weeks and Drengacz, 1982) and treatment program admissions (Brenner, 1975), results of longitudinal studies at the individual level are more mixed, with some studies finding unemployment to significantly increase the risk of an alcohol disorder diagnosis (Dooley et al., 1992), and others finding either null (Hammer, 1992) or highly contingent effects (Lahelma et al., 1995). Similarly, although several studies have identified a link between retirement and older adults' drinking behavior (Perriera and Sloan, 2001), others suggest that there is little or no difference between retirees' and non-retirees' patterns of alcohol consumption (Ekerdt et al., 1989; Midanik et al., 1995), and still others find retirement to be associated with *reduced* alcohol consumption (Rosenkoetter et al., 2001).

In light of these mixed findings, several scholars have recently proposed that rather than trying to identify a direct link between workforce disengagement and drinking, research should focus on individuals' appraisal of their disengagement experience as a determinant of their mental health (Lin and Lueng, 2010) in general, and drinking behavior (Bacharach et al., 2007, 2008a; Brennan et al., 2010) in particular. Such a perspective is grounded on findings that suggest that most of the adverse mental health consequences associated with such disengagement stem from a handful of disengagement-related stressors, with economic hardship and marital conflict being among those most commonly cited (Kessler et al., 1988; McKee-Ryan et al., 2005; Price et al., 2002). Although a recent study demonstrated the impact of such stressors on the general mental health among the unemployed (Lin and Lueng, 2010), to date, we have little understanding of the implications of these same stressors on more specific mental health outcomes such as alcohol misuse, particularly among those disengaging from the workforce on a more permanent basis, namely retirees. The absence of such research is particularly disturbing in that alcohol misuse is a serious and growing health problem among older adults, affecting nearly the same proportion of adults aged 60+ as between the ages of 18 and 45 (approximately 20% of those in that cohort in the USA, 10–17% of those in that cohort in the UK, and over 25% of males in that cohort in Italy – Barnes et al., 2010; Blow, 1998; Hallgren et al., 2010), and resulting in direct hospital costs for this population in the USA of over $60b per year (Dar, 2006; Schonfeld et al., 1995). Accordingly, a primary objective of the current research is to enhance our understanding of the extent to which financial and marital stressors in retirement may be linked to the onset or exacerbation of alcohol misuse among retirees.

Additionally, we seek to understand *how* such stressors may affect alcohol misuse among older adults. Research examining the stress-alcohol relationship has largely been based on the tension reduction hypothesis that posits that alcohol misuse may serve as a means by which to mitigate the strain generated by exposure to stressors (Conger, 1956; Frone, 1999, 2008). This perspective suggests a direct effect of financial and marital stressors on alcohol misuse. However, from a resource ecology perspective (Hobfoll, 1988), there may be reason to believe that at least some of the effect of such stressors on alcohol misuse may be more indirect, with individuals turning to alcohol to medicate the physiological consequences of stress-related resource drain such as sleep-related problems. While subtle, this difference in how financial and marital stressors influence alcohol use may have significant implications with respect to both prevention and treatment. Accordingly, a second objective of the current study is to assess the degree to which sleep-related problems mediate the association between financial and marital stressors on retiree alcohol misuse.

Finally, while research suggests that males are at greater risk of alcohol misuse than females (NIAAA, 1998; Su et al., 1997), to date research on the consequences of disengagement-related stressors on mental health has yet to assess whether these consequences are the same for men and women. Accordingly, a third objective of the current study is to examine the degree to which gender may serve as a moderator of the relationships noted above.

In sum, in the current study we examine how two key stressors in retirement may be linked to the severity of alcohol misuse, how sleep-related problems may mediate this association, and how gender may moderate this pattern of relationships. More specifically, we propose a moderated-mediation model according to which financial and marital stressors serve as primary antecedents of shifts in retiree alcohol misuse, but whose effects are mediated by the impact such events may have on sleep-related problems and moderated by gender (see Figure 1). Defining retirement as 'the exit from an organizational position or career path of considerable duration, taken by individuals after middle age, and taken with the intention of reduced psychological commitment to work thereafter' (Feldman, 1994: 287), we test this model on the basis of a three-wave prospective design, regressing the pre- to 10-year post-retirement change in older employees' alcohol misuse on stressors experienced five to six years after retiring, and sleep-related problems one to two years after that. Our findings contribute to both the workforce disengagement and alcohol literatures by offering insight into the psycho-physiological

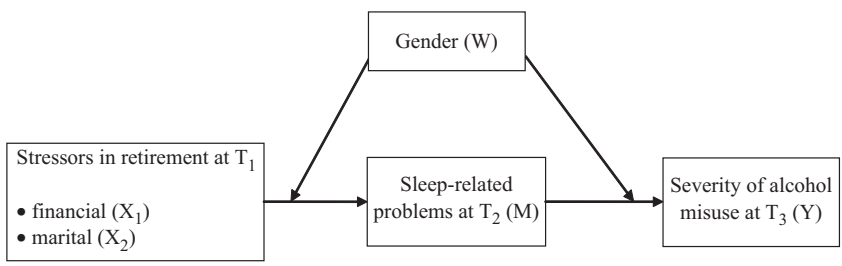

Figure 1 Conceptual model.

dynamics governing how and for whom stressors experienced in retirement may affect well-being in general, and alcohol misuse in particular.

Direct effects of stressors in retirement on retiree alcohol misuse

While for many, if not most individuals, retirement represents relief from the stresses and strains associated with work, for others, it may be associated with the precipitation or exacerbation of situational stressors (Atchley, 1989). Two stressors have received particular attention in the retirement literature; namely, those associated with financial/economic concerns (Beehr, 1986; Wang, 2007; Wang et al., 2008) and marital/family conflict (Kim and Feldman, 2000; Shultz et al., 1998; Szinovacz, 2003). Research suggests that for some, retirement may be associated with financial stressors as income from retirement sources (e.g. pension, social security) fails to match income previously earned on the job (Keith, 1993; Shultz, 1985). Indeed, studies suggest that discontinued sources of income, liquidated assets, and servicing debt on a fixed income could lead to increased mood disturbances even if these economic strains are anticipated (Dew and Yorgeson, 2010). Similarly, retirement may precipitate or exacerbate marital stressors (Kim and Moen, 2001) as couples adjust to new roles at home (Richardson and Kilty, 1991; Szinovacz, 1996) or to reduced income levels (Dew and Yorgeson, 2010). Such stressors may be particularly severe to the extent that couples' retirement is asynchronous (i.e. one partner retires before the other) and/or to the extent that retirement generates a sense of status dissonance relative to traditional gendered roles at home (Moen et al., 2001). According to the tension reduction theory (Conger, 1956; Frone, 2008), exposure to stressors induces alcohol misuse as individuals attempt to mitigate experienced tension and strain. The mechanisms by which substance use may reduce tension or strain include reduction of self-awareness (Hull, 1981), or redirection of one's focus away from stress-producing cues toward more immediate cues (Steele and Josephs, 1988). Similarly, conservation of resources theory (Hobfoll, 1989) suggests that such stressors may result in the draining of psychological resources as individuals cope or attempt to cope with the loss or threatened loss of key personal resources such as energies (e.g. financial resources) and supportive relationships (e.g. marriage), and that, as a result, individuals may opt to use alcohol in an attempt to stem the depletion of psychological resources. More specifically, while retirement itself may be framed as resulting in the loss or potential loss of key resources such as money or support, secondary resource loss may occur as energy and social resources are utilized to stem the risk of primary resource loss. COR theory posits that as resources become depleted, individuals tend to adopt less efficient or maladaptive loss-control strategies and that this may result in the emergence of loss-spirals – a pattern of increasingly more rapid depletion of the resources needed in order to be able to offset stress, improve one's condition and reduce future stress vulnerability (Hobfoll et al., 2003: 633). Alcohol misuse may represent one maladaptive approach by which individuals attempt to address resource drain or depletion (Bacharach et al., 2008b; Muys, 2007). Accordingly, consistent with the notion of tension-reduction, COR theory suggests

that as resources become depleted, there may be an increased tendency to reject more resource-costly, problem-focused strategies of coping in favor of coping strategies viewed as resource-conserving (at least in the short-run) such as those involving physical or psychological withdrawal (Hobfoll, 2002) like alcohol misuse. Accordingly, we posit:

> *Hypothesis 1*: The higher the intensity of financial (H1a) and marital (H1b) stressors in retirement, the greater the increase in the severity of alcohol misuse from pre-retirement levels.

The mediating role of sleep-related problems

Although alcohol may be used as a maladaptive means by which to mitigate strain or conserve resources in the face of stressors experienced in retirement (Frone, 2008; Hobfoll et al., 2003), another possibility is that alcohol misuse is *secondary* to such problems; used as a means by which to self-medicate the problems potentially generated by stressor-related resource depletion. Given that sleep disorders are common manifestations of resource drain and depletion (Söderström et al., 2004; Vela Bueno et al., 2008), as well as common health problems among older adults (Kalimo et al., 2000; Schubert et al., 2002), we propose that the sleep-related problems potentially generated by financial and marital stressors may explain much of the impact of such stressors on alcohol misuse.

Research indicates that aside from being linked to a number of demographic and hereditary factors, sleep-related problems may also be precipitated by resource drain and serve as a manifestation of resource depletion (Grossi et al., 2003; Melamed et al., 2006; Söderström et al., 2004). Indeed, in several studies, exhausted subjects consistently reported more sleep complaints, shorter sleep duration and frequent napping, and poor sleep quality than did vital subjects (Armon, 2009; Nicolson and Van Diest, 2000; Van Diest, 1990). Likely underlying this association between resource drain and sleep-related problems is the tendency of individuals to ruminate about their inability to fall asleep (Lundh and Broman, 2000; Middelkoop et al., 1996) and/or become hypervigilant while trying to fall asleep (Åkerstedt et al., 2002; Arata et al., 2000) Such behaviors may be self-reinforcing and result in the disturbance of the hypothalamic-pituitary-adrenal (HPA) axis (Melamed et al., 2006) and the precipitation or exacerbation of sleep-disturbance cycles (Hall et al., 2008; Roth and Roehrs, 2003).

Research also suggests that alcohol is commonly used as a means of self-medication for those experiencing sleep problems with the motivation being the belief that alcohol will stem rumination, help them relax and thus fall asleep (Johnson, 1997; Roth, 2005). Indeed, more than 30 percent of individuals with persistent insomnia report using alcohol in such a manner (Ancoli-Israel and Roth, 1999). Studies also suggest that the self-medication of sleep problems on the basis of alcohol misuse is particularly pervasive among older populations (Johnson, 1997; Roth, 2005).

Thus, beyond using alcohol as a maladaptive means of resource conservation in the face of stressors experienced in retirement, the linkages noted above suggest that alcohol may also be used as a means by which to self-medicate the effects of resource depletion (i.e. exhaustion) generated by these stressful experiences. Accordingly, we posit that at

least part of the impact that stressors in retirement may have on alcohol misuse may be explained by sleep-related problems, or in other words:

> *Hypothesis 2*: The impact of financial (H2a) and marital (H2b) stressors experienced in retirement on the severity of alcohol misuse is mediated by sleep-related problems.

The moderating role of gender

Gender likely serves as a critical conditioning factor for both the stressors in retirement → sleep-related problems and the sleep-related problems → retiree alcohol misuse relationships. Regarding the former, a higher prevalence of sleep-related problems among females, and particularly older females, has consistently been found across numerous epidemiological studies since the 1970s (Bixler et al., 1979; LeBlanc et al., 2009; Li et al., 2002; Quan et al., 2005). More importantly for our model, there is evidence that environmental stressors may take a greater toll on women's sleep than on men's (Kushnir and Melamed, 1992). A number of factors have been proposed as underlying such an amplified effect of stressors on sleep (Li et al., 2002). For example, several researchers argue that a higher prevalence of psychiatric morbidities (e.g. anxiety) among women may increase the likelihood (relative to men) of their manifesting sleep-related problems in response to heightened stress (Lindberg et al., 1997; Middelkoop et al., 1996). Biological differences in sex steroids have also been postulated to account for women's heightened sleep-related sensitivity to environmental stressors with several researchers proposing that hormone-related changes in the post-menopausal state may increase the sensitivity of female's sleep cycles to such stressors (Landis and Moe, 2004; Lee-Chiong, 2006; Manber and Armitage, 1999). Thus, we propose:

> *Hypothesis 3*: Gender moderates the first stage of the sleep-mediated impact of financial (H3a) and marital (H3b) stressors in retirement on the severity of retiree alcohol misuse such that the impact of these stressors on sleep-related problems is stronger for female than male retirees.

The notion that gender conditions the association between sleep-related problems and the severity of alcohol misuse (the second stage of the sleep-mediated impact of stressors in retirement on alcohol misuse severity) is consistent with research indicating that women and men react differently to sleep loss (Blatter et al., 2006). We posit that sleep-related problems will be more strongly associated with alcohol misuse for male than female retirees for two reasons. First, women tend to cope with sleep-related problems by using tranquilizers/sleeping pills, while men may be more likely to use alcohol as a means by which to self-medicate sleep-related problems and the distress that such problems may generate (Lex, 1991). Second, a number of studies indicate that while the pharmacological effects of alcohol may be stress-reducing for both men and women, the cognitive impact is different. For example, several studies indicate that simply the belief that alcohol has been consumed may actually *increase* distress among women (Abrams and Wilson, 1979; Sutker et al., 1982), while other research indicates that women expect less relaxation after drinking than do men (Rohsenow, 1983). Cooper et al.'s (1992) findings – that the association between life event stress and alcohol misuse is significant and

robust for men but not for women – lends further support to these assertions, as does a recent study of over 20,000 Finnish adults finding men experiencing sleep problems to be nearly five times more likely to engage in periodic heavy drinking than women experiencing similar sleep-related problems (Hublin et al., 2007). Accordingly we posit:

> *Hypothesis 4*: Gender moderates the second stage of the sleep-mediated impact of stressors in retirement on the severity of retiree alcohol misuse such that the impact of sleep-related problems on alcohol misuse severity is stronger for male than female retirees.

Method

Sample and procedure

We test our hypotheses using data from a longitudinal study of older workers who, at the time of initial data collection (T_0 in 2000), were within six months of being eligible to retire on the basis of full retirement benefits. Of the 2812 individuals in the target sample (identified through the membership files of nine American unions representing transportation, manufacturing and construction workers), 1279 agreed to participate (i.e. 46% response rate), with all data collected on the basis of telephone interviewing. Approximately half of the 1279 participants chose to retire upon becoming eligible for these benefits (i.e. within a year of the initial interview).

Given our focus on retirees in the current study, we analyzed data collected from the subset of those remaining in the study six years after initial contact and who had opted to fully retire (i.e. completely withdraw from the workforce). Accordingly, T_1 data were collected in late 2006, with T_2 data collected approximately 18 months later and T_3 data collected two years after T_2. We opted for a two-year interval between T_2 and T_3 based on the research of Weissman et al. (1997) and Crum et al. (2004), which suggests that while the effect of sleep-related problems on alcohol misuse may already be statistically capturable within a year of the onset of sleep problems, longer follow-up periods likely reduce the risk of confounds and increase the robustness of the effect. Of the 927 participants remaining in the study at T_1 (i.e. a drop-out rate of 39.5 percent from the 1279 initially agreeing to participate at T_0 in 2000, the bulk of which resulted from outdated contact information), 868 participated in the T_3 survey. At T_1, the number of respondents from each employment sector was as follows: 660 respondents were members of three unions representing transport workers, 149 respondents were members of two unions representing manufacturing workers, and 118 respondents were members of four construction workers' unions. In order to be included in the study, the 868 remaining participants at T_3 had to have fully retired by T_1 ($n = 673$ or 73% of the T_1 sample). Additionally, because hospitalization would likely have a direct impact on drinking, they could not have been hospitalized during the past year ($n = 577$). Finally, we retained only those for whom we had complete data along all study variables at all three points of data collection ($n = 292$ or 43% of those who retired by T_1). T-test analysis indicates that those dropping out of or excluded from the sample between times T_1 and T_3 were not significantly different along any of the study variables from those remaining. Moreover, there was no significant change in the overall composition of the sample from T_1 to T_3, with the latter

composed of 221 male respondents and 71 females (i.e. 76% male) having a mean age of 67.2 years (SD = 4.3). 234 of the T_3 study participants were Caucasian (80.14%).

Measures

Dependent variable Severity of Alcohol Misuse was assessed on the basis of the Drinking Problems Index (DPI), an instrument specially designed to assess the severity of drinking problems among older adults (Finney et al., 1991). We did so both prior to retirement eligibility (i.e. T_0) and subsequent to retirement at T_1 and T_3. Based on their analysis of the comparative validity of alternative measures of problem drinking (e.g. the CAGE instrument), Bamberger et al. (2006: 132) find the DPI to offer high levels of both sensitivity and specificity, and conclude that, 'the DPI offers significant advantages over the CAGE when the target population includes large numbers of older adults employed or soon to retire.'

For the DPI, respondents were read the following statement: 'People often report that a variety of things happen as a result of their drinking.' Then, they were asked to respond to 17 problem-based items and indicate how often such problems were experienced in the last 12 months with response categories ranging from 'never' (1) to 'often' (5). A sample item is: 'How often have you had a family member worry or complain about your drinking?' In order for the DPI scale (calculated by summing all the responses to the 17 items) to have a minimum response of zero (indicating NO drinking problems), per Finney et al. (1991), we transformed all the items from a 1 to 5 scale to a 0 to 4 scale. Additionally, as recommended by Finney et al. (1991: 398), in order to decrease the influence of two 'liberal' items (i.e. 'got a buzz/high' and 'drink to forget worries'), responses to these two items were dichotomized (responses 0 to 2 were recoded as 0, and responses 3 and 4 were recoded to equal 1 prior to their inclusion in the summed, scale score). As such, the potential scoring range for the DPI was 0 to 62 (top score of 4 for 15 items plus top score of 2 for two items). Despite the count nature of this variable, inter-item reliability is high (alpha for the DPI = .76 at T_0 and .85 at T_3).

Independent variables Financial stressors (T_1) were assessed on the basis of five items from Ilfeld's (1976) financial stressors measure. Participants were asked to report on a five-point scale (1 = never, 5 = often), how often in the past year it happened that they did not have enough money to afford the kind of food they or their family should have, the kind of medical care they or their family should have, etc. Cronbach alpha was .78. Marital stressors (T_1) were measured using two items from Spanier's (1976) Dyadic Adjustment Scale (DAS). The items were drawn from two DAS subscales, namely satisfaction (e.g. 'How often do you and your mate "get on each other's nerves"?') and conflict (e.g. 'How often do you and your partner quarrel?'). The items were rated on a five-point scale (0 = never, 4 = several times a day). Cronbach alpha was .78.

Mediator variable Sleep-related problems were measured at T_2 using the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). This self-administered questionnaire assesses quality of sleep during the previous month and contains 19 self-rated questions covering seven components including subjective sleep quality, sleep duration and disturbance, and

daytime dysfunction. Each component is scored from 0–3, yielding a global score between 0–21 (higher scores = greater sleep-related problems).

Moderator variable Gender was coded such that 0 = male and 1 = female.

Control variables Because post-retirement drinking may be associated with a variety of demographic, health, and situational factors, we controlled for the following variables at T_1: Age (in years, ranging from 53 to 74); Marital status (1 = married, else = 0); Minority (0 = Caucasian; 1 = other); and Education – measured on the basis of a six-level categorical variable with up to some high school = 1, high school degree or equivalent = 2, some college = 3, associates degree or equivalent = 4; bachelors degree or equivalent = 5, advanced (MA/MSc or PhD) degree = 6. Additionally, we controlled for Years since retirement at T_3, and Recent physical health at T_1 – measured on the basis of six items adapted from Moos and Moos (1994) by asking participants to report whether they experienced certain symptoms in the past month (e.g. trouble breathing, pain in back/spine). Finally, Social desirability at T_1 was included as a control variable because it may in some cases create spurious relationships, whereas in others, it might suppresses relationships that might otherwise be significant. Using the self-deceptive enhancement component of Paulhus' (1991) Balanced Inventory of Desirable Responding instrument, social desirability was measured on the basis of a five-point response format (1 = not at all true, 5 = very true), with a higher value indicating greater self-deceptive enhancement and consequently an increased risk of a social desirability bias. As Paulhus recommends, we summed the responses for the 19 items. Finally, in order to capture the impact of the hypothesized variables on the change in individual drinking behavior from pre-retirement levels, we controlled for the baseline level of alcohol misuse (i.e. DPI at T_0).

Analytical procedure

Our dependent variable (severity of alcohol misuse) has two important characteristics that influence the choice of the appropriate analytical method. First, it is non-negative. Second, it exhibits a pattern of over-dispersion (i.e. a high frequency of abstinence or moderate consumption with no problems relative to other levels of problem drinking). In such cases, where over-dispersion may occur as a result of excess zeros, a zero-inflated count model can be used. Zero-inflated count models assume that the process generating the excess zeros is qualitatively different from the process that generates the non-zeros (Greene, 2008; Tu, 2006). With our data exhibiting evidence of excess zeros as well as over-dispersion owing to unobserved heterogeneity, we opted to test our hypotheses on the basis of a Zero-inflated Poisson (ZIP) model (Cheung, 2002; Lambert, 1992). ZIP models correct for these types of distributions by assuming a Poisson distribution and incorporating a correction for over-dispersion (Hernandez-Avila et al., 2006; Zorn, 1996).

Following the approach recommended by Edwards and Lambert (2007) and Muller et al. (2005) we tested our hypotheses in four steps. First, we tested the main effect model suggested by Hypotheses 1a and 1b. We then tested the simple mediation model suggested by Hypotheses 2a and 2b. Finally, we incorporated into this same model gender as a moderator variable in order to test for moderated-mediation (posited in

Hypotheses 3a, 3b and 4, respectively). Prior to the analyses, the continuous variables (i.e. marital and financial stressors and sleep-related problems) were mean-centered as recommended by Aiken and West (1991). Simple slopes for the effects of sleep-related problems (M) on alcohol misuse at T_3 (Y) were evaluated on the basis of Aiken and West (1991). We assess the significance of the indirect effects on the basis of bootstrapped confidence intervals (Edwards and Lambert, 2007; Preacher et al., 2007). Additionally, we assess the relative predictive utility of the alternative models that we test on the basis of differences in the pseudo R^2 and -2 log likelihood associated with these comparative models.

Finally and as noted above, restrictions on the nature of the causal influences between our variables of interest were included in these models. More specifically, Rogosa (1980) elaborated on the problems of inferring causality from a longitudinal panel data in which the relations between two variables are examined without controlling for the appropriate baseline variables. It has been argued that controlling for the dependent variable at baseline (Y_0 or in this case, alcohol misuse prior to retirement) when examining the effect of X (i.e. stressors,) on Y_3 (i.e. alcohol misuse at T_3) may not only allow one to rule out the rival hypothesis that alcohol misuse causes stressors, but also greatly reduces the threat of spuriousness (Allison, 1990: 94). Accordingly, in the current study we applied the regressor variable method, where Y_3 is regressed on both Y_0 and X, in order to control for alcohol misuse at baseline (i.e. before retirement) (see Alison, 1990).

Results

Descriptive statistics

Means, standard deviations, and correlations among the variables are displayed in Table 1. Based on these results, it appears that the mean alcohol misuse (i.e. DPI) score remained stable from the assessment at baseline (i.e. before retirement) to the assessment at Time 3 (M = .56, SD = 1.53; M = .57, SD = 1.96, T_0 and T_3 respectively). Notable are the significant positive correlations between sleep-related problems at T_2 and the severity of alcohol misuse at T_3 (r = .21, $p < .001$). Moreover, the findings show a significant positive correlation between the severity of alcohol misuse at T_1 and the severity of alcohol misuse at T_3 (r = .52, $p < .001$).

Hypotheses testing

To provide a baseline against which to compare the predictive utility of our more specified models, we first tested a control model capturing the effects of pre-retirement alcohol misuse (i.e. T_0). This 'Control model' (Model 1; Table 2) shows a significant positive effect of alcohol misuse at T_0 on alcohol misuse at T_3 (estimate = .15, $p < .001$).

Tests of simple mediation According to Baron and Kenny (1986), four conditions are necessary to establish mediation: (a) the independent and dependent variables must be significantly related; (b) the independent and mediating variables must be significantly related; (c) the mediator and dependent variable must be significantly related; and (d) the

Table 1 Means, standard deviations and intercorrelations of the variables (n = 292)

	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Alcohol misuse at T_3	.57	1.96													
(2) Alcohol misuse at pre-retirement (i.e. T_0)	.56	1.53	.52[c]												
(3) Alcohol misuse at T_1	.62	1.74	.65[c]	.67[c]											
(4) Heath related symptoms at T_1	.19	.19	.06	.20[c]	.11										
(5) Age at T_1	67.21	4.36	−.14[c]	−.10	−.10	−.03									
(6) Minority (0 = No, 1 = Yes)	.20	.40	.09	−.03	.03	−.11	−.07								
(7) Education	2.86	1.14	.04	−.02	.03	.000	−.33[c]	−.12[a]							
(8) Marital status (0 = other, 1 = married)	.94	.24	.002	−.02	−.02	−.04	.06	−.05	−.12[a]						
(9) Years since retirement at T_3	5.87	1.09	.01	.01	−.04	−.03	.33[c]	−.18[b]	−.26	.10					
(10) Social desirability at T_1	54.31	7.50	−.09	−.08	−.10	−.27[c]	.04	.04	−.05	.03	.12[a]				
(11) Financial stressors at T_1	1.11	.29	.07	.04	.004	.22[c]	.01	−.06	−.05	−.01	.04	−.12[a]			
(12) Marital stressors at T_1	.97	.70	.11	.16[b]	.19[a]	.21[c]	−.07	−.09	.03	.02	−.08	−.21[c]	.13[a]		
(13) Sleep-related problems at T_2	5.94	2.58	.21[c]	.27[c]	.26[a]	.26[c]	−.13	−.002	.04	−.04	−.05	−.11	.25[c]	.23[c]	
(14) Gender (0 = male, 1 = female)	.24	.43	.03	.04	.11	.13[a]	−.43[c]	−.02	.53[c]	−.09	−.36[c]	−.08	−.07	.08	.12[a]

[a]$p \leq 0.05$; [b]$p \leq 0.01$; [c]$p \leq 0.001$.

Table 2 Results of moderated mediation analysis (n = 292)

Dep. variable Indep. variable	Control model (Model 1)		Total effect model (Model 2)		Mediation model (Model 3)				Moderated mediation model (Model 4)			
	Alcohol misuse at T_3		Alcohol misuse at T3 X->Y		Sleep-related problems X->M		Alcohol misuse at T_3 M->Y		Sleep-related problems X->M		Alcohol misuse at T_3 M->Y	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Intercept	4.06[b]	1.54	1.13	1.75	6.68[a]	2.85	1.20	1.78	7.19[b]	2.84	3.80[a]	1.97
Heath related symptoms at T_1	–.01	.49	.03	.50	2.39[b]	.80	–.01	.50	2.32[b]	.79	.02	.52
Age at T_1	–.05[b]	.02	–.01	.02	–.06	.04	–.01	.02	–.03	.04	–.02	.02
Minority (0 = Caucasians, 1 = other)	1.02[c]	.22	.56[a]	.27	.17	.36	.63[a]	.27	.25	.36	.30	.29
Education	.11	.09	.04	.09	.01	.13	.06	.09	-.02	.15	.17	.11
Matrial status (0 = other, 1 = married)	–.47	.39	–.05	.45	–.31	.58	.00	.45	-.06	.58	.22	.44
Years since retirement	.16[a]	.08	.05	.09	.01	.14	.08	.09	.02	.14	–.06	.10
Social desirability at T_1	–.03[b]	.01	–.04[c]	.01	.00	.02	-.05[c]	.01	.004	.02	–.05[c]	.01
Alcohol misuse at pre-retirement (i.e. T_0)	.15[c]	.03	.17[c]	.03	---	---	.14[c]	.03	---	---	.14[c]	.03
Alcohol misuse at T_1	---	---	---	---	.30[c]	.08	---	---	.26[c]	.08	---	---
Financial stressors at T_1 (X_1)			1.49[c]	.37	1.77[c]	.49	1.08[a]	.48	1.36[b]	.51	.31	.54
Marital stressors at T_1 (X_2)			.04	.16	.47[a]	.21	.01	.16	.48a	.23	.05	.15
Gender (0 = male, 1 = female) (W)									.60	.42	–.32	.28
Financial stressors * gender (X_1*W)									5.97c	1.83		
Marital stressors * gender (X_2*W)									.09	.50		
Sleep-related problems at T_2 (M)							.06	.04			.21[c]	.06
Sleep problems * gender (M*W)											–.16[b]	.07
R-Square	.26		.30		.19		.30		.22		.32	
Δ R-Square			.04[a] (rel. to Model 1)		---		0 (rel. to Model 2)		---		.02[a] (rel. to Model 2)	
-2 log likelihood	499.97		484.62		---		482.57		---		474.12	
Δ -2 log likelihood			15.35[c] (rel. to Model 1)		---		2.05 (rel. to Model 2)		---		10.50[a] (rel. to Model 2)	

Note: Except for Model 3 and Model 4 'sleep-related problem X->M' (linear regression), all analyses were run using ZIP regression.
[a]$p \leq 0.05$; [b]$p \leq 0.01$; [c]$p \leq 0.001$.

relationship between the independent variable and dependent variable should be non-significant or weaker when the mediator is added.

The regression results for testing mediation are reported in Table 2. First, the results in column 2 of Table 2 show that, after taking the control variables into account, financial (but not marital) stressors at T_1 were positively related to alcohol misuse at T_3 (estimate = 1.49, $p < .001$), supporting Hypothesis 1a. Second, the results also indicate that beyond the effects of alcohol misuse at T_1 (estimate = .30, $p < .001$), financial and marital stressors at T_1 (estimate = 1.77, $p < .001$; estimate = .47, $p < .05$, respectively) were positively related to sleep-related problems at T_2 (column 3, Table 2). Finally, sleep-related problems at T_2 were positively but non-significantly (estimate = .06, NS) related to the severity of alcohol misuse at T_3 (column 4, Table 2), thus violating a key condition for mediation (Baron and Kenny, 1986) and suggesting that in contrast to Hypotheses 2a and 2b, sleep-related problems at T_2 fail to mediate the impact of financial and marital stressors on the severity of alcohol misuse at T_3. However, given that we also posited that both stages of the proposed mediation are moderated by gender (Hypotheses 3a and 3b), we next investigate the possibility of moderated mediation.

Tests of moderated mediation The results of the tests for the moderated-mediation implied by Hypotheses 3a, 3b, and 4 are shown in Model 4 of Table 2. This model tests: (a) whether gender (W), as specified by Hypotheses 3a and 3b, amplifies the strength of the first stage of mediation (i.e. the relationship between stressors [X_1 and X_2], and sleep-related problems [M]), and (b) whether, as specified by Hypothesis 4, it moderates the second stage of mediation (i.e. the relationship between sleep-related problems [M] and the severity of alcohol misuse [Y]).

As is evident from the left-hand column of Model 4 ('Moderated-mediation model'), the impact of financial (but not marital) stressors (X_1; estimate = 5.97, $p < .001$) on sleep-related problems is significantly moderated by gender. As recommended by Aiken and West (1991), we used simple slopes analysis to assess the degree to which these effects were consistent with those hypothesized. As shown in Figure 2, while the slope of financial stressors at T_1 on sleep-related problems at T_2 was positive and significant for both men and women, consistent with Hypothesis 3a, it was amplified for females (estimate = 8.48 versus 1.79 for women and men, respectively, $p < .001$ for both). Accordingly, with respect to the moderation of the first stage of the hypothesized mediation, our data suggest support only for Hypothesis 3a and not for 3b.

Full support for moderated mediation was found with respect to the second stage of mediation (i.e. the relationship between sleep-related problems [M] and alcohol misuse [Y]). Consistent with Hypothesis 4, the results indicate that the interaction of sleep-related problems at T_2 (M) × gender (W) (estimate = -.16, $p < .01$) is significant in predicting the severity of alcohol misuse at T_3 (see the right-most column of Table 2). The results of the simple slopes analysis for this model (shown in Figure 3) indicate that – consistent with Hypothesis 4 – while the slope of sleep-related problems at T_2 on alcohol misuse at T_3 for women was non-significant (estimate = .10, NS), for men, the slope was positive and significant (estimate = .19, $p < .001$).

To further assess the degree to which these sleep-mediated effects are moderated by gender, we tested the significance of the indirect effects on the basis of the bootstrapped

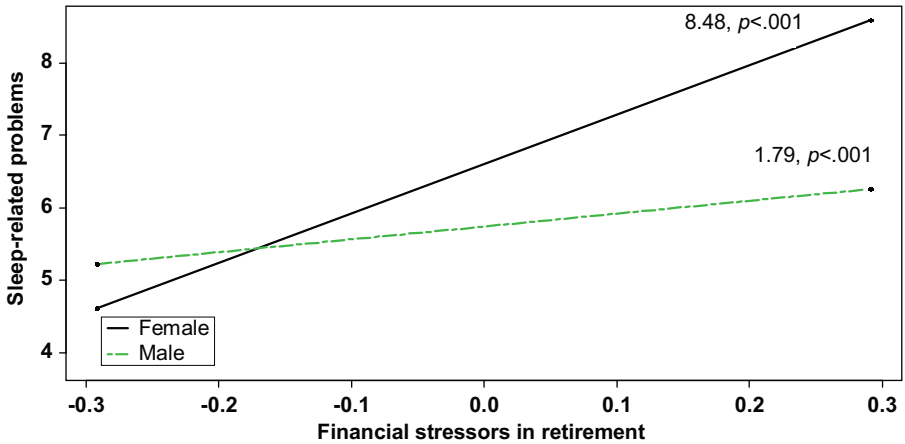

Figure 2 Moderation of the effect of (centered) financial stressors in retirement at T_1 (X) on sleep-related problems T_2 (M).

confidence intervals. The bootstrap analysis indicated that while the indirect effects of both financial and marital stressors as specified in Model 4 of Table 2 were significant for men (effects = .28 [90% CI = 0.01 to 0.73)] and .10 [90% C.I. = 0.01 to 0.32] respectively), they were not significant for women (the confidence interval included a zero).[1] We assessed the relative size of the indirect effect for male retirees by comparing it with the size of the total effect of financial and marital stressors as specified in Model 4. Respectively, these total effects were .59 and .15, suggesting that while the indirect effects via sleep problems explained approximately half of the total effect of financial stressors on male retirees' alcohol misuse, marital stressors explained approximately two-thirds of the effect of marital stressors on male retirees' alcohol misuse.

Further evidence in support of a significant moderated mediation effect is provided on the basis of: (a) the significant $\Delta -2$ log likelihood, and (b) a significant increase in R^2. In terms of the former, $\Delta -2$ log likelihood (relative to Model 2) = 10.50 ($p < .05$) indicating that the inclusion of the interaction of sleep problems × gender significantly contributes to the model's explanatory potential. In terms of the latter, as the alcohol misuse models were assessed on the basis of ZIP regressions, effect sizes were estimated based on Cox and Snell's (1989) generalized R^2. Although such likelihood-based R^2 estimates are typically lower than those obtained in linear regression, they still provide an indication of the relative explanatory strength (Hosmer and Lemeshow, 2000) of a model. Accordingly, our results indicate that the interaction model ('Model 4' of Table 2) (R^2 =.32) added .02 ($p < .05$) to the generalized R^2 of the total effect model ('Model 2' of Table 2), indicating a significant increase in explanatory strength.

Finally, in order to confirm the causal ordering assumed by our model, we tested the reversed specification; namely, that alcohol misuse severity affects financial and marital stressors via sleep-related problems. The results indicate that after controlling for the same variables included in the models presented above, alcohol misuse at T_1 was

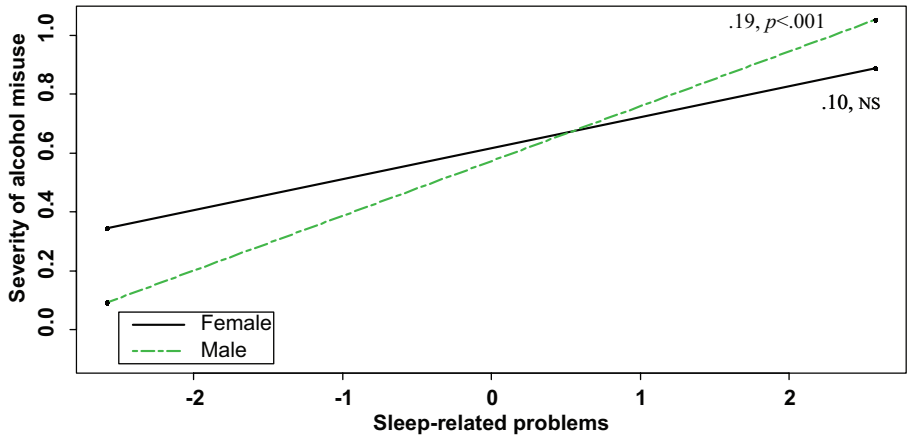

Figure 3 Moderation of the effect of (centered) sleep-related problems T_2 (M) on the severity of alcohol misuse at T_3 (Y).

positively related to sleep-related problems at T_2 (estimate =.32, $p < .001$). However, it is important to note that the model tested above, by incorporating the effect of alcohol misuse severity at T_1 on sleep-related problems at T_2, already took such a reciprocal relationship into account and demonstrated that financial stressors have an effect on subsequent sleep-related problems above and beyond the effects of alcohol misuse severity at T_1. Moreover, alcohol misuse at T_1 was not significantly related to either financial or marital stressors at T_3 (estimate = .00 and .15, respectively, NS for both), and sleep-related problems at T_2 were not significantly related to the financial or marital stressors at T_3 (estimate = -.00 and .02, respectively, NS for both). Furthermore, neither of the two stages of the sleep-mediated, alcohol misuse → marital and financial stressors relationship was significantly moderated by gender. These findings suggest little if any support for the reverse causal pathway (i.e. that alcohol misuse, via sleep-related problems, generates marital or financial stress).

Taken as a whole, these results indicate substantial support for Hypotheses 1a and 3a, and support for Hypothesis 4, suggesting that (a) gender moderates the first stage of the sleep-mediated impact of financial stressors on the severity of retiree alcohol misuse such that the impact of these stressors on sleep-related problems is even more pronounced for females, and (b) gender moderates the second stage of the sleep-mediated impact of financial stressors on the severity of retiree alcohol misuse, such that the impact of sleep-related problems on alcohol misuse is amplified for men.

Discussion

The current study was aimed at addressing three main gaps in the research on alcohol-related consequences of retirement as a form of workforce withdrawal; namely: (1) How stressors in retirement (as opposed to retirement per se) may affect an important adjustment-related behavior (i.e. alcohol misuse); (2) how the impact of these stressors on the

severity of retiree alcohol misuse may be secondary to the stressors themselves, operating instead via the sleep-related problems precipitated or exacerbated by such stressors; and (3) how gender may serve as a moderator of these relationships. While findings from previous research regarding the link between workforce withdrawal and alcohol misuse are equivocal, our results indicate that – consistent with both prior research on unemployment (Lin and Leung, 2010) and resource-based treatments of retirement (Wang and Shultz, 2010) – two key stressors (financial and marital) experienced in retirement are associated with the precipitation or exacerbation of alcohol misuse among male retirees. Moreover, our findings demonstrate that – at least for male retirees – the impact of such stressors experienced in retirement on alcohol misuse is, at least in part, secondary to the stressors themselves, mediated by the sleep-related problems such stressors may generate. That is, while we found no evidence that sleep-related problems mediate the impact of financial and marital stressors in retirement on female retirees' alcohol misuse, our findings suggest that male retirees may use alcohol as a mode of self-medication (Roth, 2005; Rumble and Morgan, 1992) in order to cope with a critical, *secondary* effect of such stressors, namely sleep-related problems. This finding suggests that while male retirees may, indeed, turn to alcohol to cope with financial and marital stressors, female retirees are unlikely to do so, perhaps relying on other coping behaviors (e.g. talking to friends or relatives, or addressing the problem source), viewing these other mechanisms as offering similar, if not greater, relief with fewer negative side effects.

The findings with respect to financial and marital stressors experienced in retirement are largely consistent with our hypotheses. We found evidence of a robust, albeit distal effect of both stressors on the change in alcohol misuse from pre-retirement levels. While sleep-related problems were not found to mediate the effect of such stressors on alcohol misuse in general, a robust mediation effect *was* found when gender was taken into consideration. More specifically, the second stage of the mediation was found to be significant among male retirees only. Interestingly, although we also posited gender moderation in the first stage of the mediation (i.e. between both stressors and sleep-related problems), gender was found to amplify the impact only of financial stressors experienced in retirement on sleep-related problems. For marital stressors experienced in retirement, the effect on sleep-related problems was no greater for female retirees than male retirees. While the literature on sleep disorders among older adults suggests that stressors may be a more robust risk factor for women than men (Middelkoop et al., 1996), our findings suggest that marital stressors experienced in retirement may be of equal salience with respect to sleep-related problems for both female and male retirees, and that feeling content in one's marriage may be beneficial for both male and female retirees' sleep patterns.

Our findings are generally consistent with related findings in the geriatrics, sleep and alcohol literatures that suggest that stressors experienced by retirees may play a significant role in precipitating or exacerbating sleep-related problems (Middelkoop et al., 1996), and that alcohol-based self-medication is a common means by which particularly male retirees may attempt to cope with such problems (Roth, 2005). No less importantly, these findings are also consistent with a number of contemporary retirement adjustment perspectives (Wang and Shultz, 2010) and particularly those taking a more ecological approach (e.g. Wang et al., 2008). Consistent with such an approach, our findings

suggest that the mental health consequences of disruptions in the maintenance of life patterns in retirement (experienced as financial or marital stressors) stem in no small part to the drain such disruptions may place on retirees' psychological resources and the potentially maladaptive ways in which some retirees attempt to address such resource outflows.

However, beyond merely providing additional evidence in support of such perspectives on retirement adjustment, our findings offer an important theoretical contribution by offering insight into the psycho-physiological mechanisms by which such stressors experienced in retirement affect retirees' well-being. More specifically, consistent with COR theory (Hobfoll et al., 2003), they suggest that the drain on resources caused by such stressors experienced in retirement may manifest itself physiologically in the form of sleep-related problems, and that behaviors indicative of maladjustment such as alcohol misuse may increase in severity as individuals adopt maladaptive strategies for coping with such problems. We view this as an important step forward in understanding the relatively widespread misuse of alcohol among older adults noted in the introduction. Contrary to the tension reduction hypotheses and the idea that older adults use alcohol as a means by which to address the more dysphoric aspects of retirement (Perreira and Sloan, 2001), our results indicate that, at least for male retirees, any increase in the severity of alcohol misuse may be just as likely to be secondary to such a sense of dysphoria, having to do with the individual's attempt to self-medicate the sleep-related problems generated by such stressors in retirement.

Limitations

The findings of our study should be considered in light of its limitations, which may also offer important research opportunities. First, while our study was designed to track the change in alcohol misuse from before retirement, it was beyond the scope of our study to model the impact of change in stressors in retirement. Future research might apply growth modeling to examine how shifts in alcohol misuse at multiple points in time in retirement may map on to such stressor-based changes. Second, our rather strict inclusion criteria (i.e. full retirement by T_1; complete data along all study variables at all three points of data collection; not hospitalized during the past year), limited the size of our sample size to 292 individuals. While our sample bias checks suggest that these strict criteria did not limit the external validity of our findings, they may have limited statistical power. Studies aiming to replicate or extend our results should therefore consider increasing the size of the baseline sample. Finally, given the limitations imposed by relying on participants' subjective assessment of sleep-related problems, future research may benefit from the use of more physiological measures (e.g. electroencephalography).

Practical implications

Despite these limitations, our findings suggest two important implications for policy and practice. First, they highlight the need to recognize financial and marital stressors in retirement as potential risk factors for male retiree well-being, and for organizations to

assist workers nearing retirement eligibility to engage in the kind of retirement planning activities that might reduce such risks. Second, our findings underscore the key role potentially played by sleep-related problems as a mediator of the effects of financial stressors in retirement on male retirees' physical and emotional well-being. Accordingly, they suggest the need to go beyond simply helping older adults adjust to workforce disengagement so as to mitigate the stressors associated with it. Rather they suggest the need to increase the awareness of retirees' primary care physicians to the stressors often faced in workforce disengagement and their sleep-related implications so that these professionals might be able to offer more effective and less risky means by which retirees might address or manage sleep-related problems. They also suggest the value of extending employee assistance services to retirees as a means by which to facilitate early intervention and thereby reduce the risk that such problems in retirement may lead to the exacerbation of alcohol misuse and/or the precipitation of alcohol dependence.

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Note

1 We used 90% confidence intervals to correspond to one-tailed, .05 hypothesis tests, which according to Preacher et al. (2011: 217) is justified in mediation research.

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