EPIDEMIOLOGY AND POLICY

Psychological Distress in Non-Drinkers: Associations with Previous Heavy Drinking and Current Social Relationships

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Abstract — **Aims:** The aim of this paper is to investigate two possible explanations for the higher levels of psychological distress observed among alcohol abstainers relative to light and moderate drinkers, and to investigate possible moderating effects of age on this association. The possible explanations were that: (i) the higher level of psychological distress among abstainers is due to the presence of a subset of former heavy drinkers in this group; and (ii) abstainers have poorer social relationships than light/moderate drinkers. **Methods:** A national cross-sectional survey yielded data from 2856 Australians aged 20–22, 30–32 and 40–42 years (response rate 15.9%). **Results:** The sample was representative for many socio-demographic factors but under-represented people not in the labour force and over-represented those with university qualifications. In the oldest but not the younger age groups, abstainers reported significantly higher psychological distress relative to light/moderate drinkers. While abstainers in the oldest age group who were former heavy drinkers showed the highest levels of distress, excluding them from the analysis did not account for differences in distress between current abstainers and light/moderate drinkers. Abstainers aged 40–42 years were less socially integrated, less extraverted and had lower social support than light/moderate drinkers, and controlling for these factors partially explained their increased distress. **Conclusions:** Significantly increased psychological distress of abstainers compared to light/moderate drinkers was demonstrated only in the oldest age group (40–42 years). The higher distress reported by abstainers in this age group was partially explained by abstainers having poorer social relationships than light/moderate drinkers.

INTRODUCTION

Many studies have found a U- or J-shaped relationship between alcohol consumption and health, with abstainers and heavy drinkers scoring worse on health measures relative to light and moderate drinkers (for a review, see de Lorimier, 2000). This pattern of poorer outcomes for abstainers (referred to hereafter as the 'abstainer effect') provides the focus for the current study. The abstainer effect has been found for physical health outcomes such as mortality and coronary heart disease (Shaper *et al.*, 1988; Poikolainen, 1995; Pittman, 1996; Corrao *et al.*, 2000; Doll *et al.*, 2005), chronic and limiting illnesses (Power *et al.*, 1998), hypertension (Sesso *et al.*, 2008) and self-rated poor health (San José *et al.*, 1999) as well as for psychological and mental health measures such as cognitive ability (Mukamal *et al.*, 2003; Rodgers *et al.*, 2005), depression, anxiety and psychological distress (Rodgers *et al.*, 2000a, b; Degenhardt *et al.*, 2001). This paper describes an investigation of two possible explanations for the poorer mental health observed in abstainers relative to light and moderate drinkers.

Sick-quitter hypothesis

One possible explanation for the abstainer effect as it relates to mental health is that it reflects a high prevalence of mental health problems among previously heavy drinkers who become abstainers, the so-called 'sick-quitter hypothesis' (Shaper *et al.*, 1988). If this hypothesis is correct, removing ex-heavy drinkers from analyses should eliminate or reduce the abstainer effect (Power *et al.*, 1998).

Previous research has shown that abstainers have a diverse range of drinking histories (e.g. Dyer *et al.*, 1981; Goldman and Najman, 1984) and that ex-drinking abstainers tend to have worse outcomes relative to long-term abstainers on health and demographic measures (Wannamethee and Shaper, 1988; Fillmore *et al.*, 2006; Manninen *et al.*, 2006). However, excluding ex-heavy drinkers from analyses has yielded mixed results. On the one hand, when comparing lifetime non-/occasional drinkers to lifetime moderate drinkers, Sareen *et al.* (2004) found no abstainer effect for lifetime depression and anxiety disorders. In contrast, Power *et al.* (1998) and Alati *et al.* (2005) found that the abstainer effect remained after excluding abstainers who had reported heavy drinking when interviewed 5–14 years earlier (for depressive and anxiety symptoms, psychological distress, self-reported health status and longstanding limiting illness). Caldwell *et al.* (2002) found that excluding past hazardous/harmful drinkers from analysis 'exacerbated' the abstainer effect seen in young men's self-reported symptoms of anxiety, depression and negative affect.

Further grounds for doubt about the sick-quitter hypothesis arise from research demonstrating that the proportion of ex-heavy drinkers increases monotonically with level of current consumption (Caldwell *et al.*, 2002; Rodgers *et al.*, 2005), i.e. there is a higher proportion of ex-heavy drinkers among current moderate drinkers than among abstainers. This may explain why statistical adjustment for past heavy drinking can exacerbate, rather than account for, the abstainer effect (Rodgers *et al.*, 2007a,b).

The current study builds upon previous research concerned with the sick-quitter hypothesis by testing whether a history of heavy drinking changes the relationship between current alcohol consumption and mental health.

Social relations hypothesis

A second possible explanation for the abstainer effect is that non-drinkers tend to have poorer social relationships than

moderate drinkers, and that these rather than their abstention explain their poorer mental health. Previous research has found that abstainers are less socially integrated than moderate drinkers (Leifman *et al.*, 1995; Pape and Hammer, 1996), less extraverted (Cook *et al.*, 1998; Rodgers *et al.*, 2000a,b; Anstey *et al.*, 2005) and report lower levels of social support (Rodgers *et al.*, 2000a,b). Statistical adjustment for a combination of characteristics including social support has been found to account for the abstainer effect observed for psychological distress (Rodgers *et al.*, 2000a,b).

A substantial body of research indicates that levels of social integration, extraversion and social support are positively associated with mental health outcomes. Increased social integration benefits mental health both through limiting the intensity and duration of negative affective states (Cohen, 2004; Ueno, 2005) and by allowing for the fulfilment of satisfying social roles (Moen, 1996; Cohen, 2004; Ueno, 2005). High levels of extraversion are associated with fewer symptoms of anxiety and depression (Faravelli and Albanesi, 1987; Barnett and Gotlib, 1988; Levenson *et al.*, 1988; Gershuny and Sher, 1998), with a decreased likelihood of using mental health services and with increased resilience (Campbell-Sills *et al.*, 2006). Social support improves mental health both through buffering the effects of high stress and by providing regular positive social experiences which enhance self-esteem, affective stability and emotion regulation (Cohen and Wills, 1985; Cohen, 2004).

The aims of the current study were to investigate the sick-quitter and the social relations hypotheses as possible explanations for the abstainer effect seen for psychological distress, using data from three age groups: 20–22, 30–32 and 40–42 years.

METHODS

Sample

Participants were 2856 respondents to the Food, Drink, Lifestyle and Wellbeing Survey (FDLWBS), a postal questionnaire sent to 18,000 Australians nationwide in 2006 (a crude response rate of 15.9%). Potential recipients born in the years 1983–1985, 1973–1975 and 1963–1965 were randomly selected from the Australian electoral roll. It is a legal requirement with very few exceptions that adult Australian citizens are included on the roll. Questionnaires were sent to an equal number of males and females in each age group. The response rate was highest in the oldest age group (14.7% for 20–22-year-olds, 14.8% for 30–32-year-olds and 18.2% for 40–42-year-olds). Responding to the questionnaire was voluntary and respondents were not remunerated. The research was approved by the Australian National University Human Research Ethics Committee (protocol no. 2006/97).

Measures

Current alcohol consumption was measured by the consumption questions of the Alcohol Use Disorders Identification Test (Saunders *et al.*, 1993). These questions were: (i) how often do you have a drink containing alcohol? ('not in the last year' to 'every day'); (ii) how many standard drinks do you have on a typical day when you are drinking? ('1 or 2' to '11 or

more'); and (iii) how often do you have five or more (for females; seven or more for males) standard drinks on one occasion? Average weekly consumption was calculated according to the quantity/frequency method outlined by Shakeshaft *et al.*, (1999), with further adjustment for binge drinking. Categories of consumption were derived, based on an Australian standard drink of 10 g of alcohol: (i) abstainers (not in the last year); (ii) occasional drinkers (monthly or less); (iii) light drinkers (up to 14 standard drinks per week for men and seven for women); (iv) moderate drinkers (up to 28 standard drinks per week for men and 14 for women); (v) hazardous drinkers (up to 42 standard drinks per week for men and 28 for women); and (vi) harmful drinkers (>42 standard drinks per week for men and 28 for women). Hazardous and harmful levels were those defined by the National Health and Medical Research Council of Australia (National Health and Medical Research Council, 2001). Past-highest alcohol consumption was estimated using the same quantity/frequency method as that applied to current alcohol consumption. Participants were asked to: 'Think back to when your regular drinking was at its highest level. The next three questions are about the time when you were drinking at your highest level over a period of three months or longer'. This instruction was followed by the same three questions used to estimate current alcohol consumption (Caldwell *et al.*, 2002).

Social integration was measured using a three-item scale adapted from the British National Survey of Health and Development that is correlated with psychological distress (Rodgers, 1996). Respondents rated: (i) how often they meet with friends or relatives socially (five options ranging from 'monthly or less' to 'four or more times per week'); (ii) how many friends or relatives they meet socially on a regular basis (six options ranging from 'none' to 'more than 15'); and (iii) how many friends or relatives they have that they can visit, or can be visited by, without an invitation (six options ranging from 'none' to 'more than 15'). The reliability of the scale in the current study was acceptable ($\alpha=0.69$).

Extraversion was measured using a short version of Goldberg's unipolar big-five markers, $\alpha=0.81$ (Saucier, 1994); perceived social support was assessed using the medical outcomes survey (MOS) social support survey, $\alpha=0.97$ (Sherbourne and Stewart, 1991); and psychological distress was assessed using the K6 measure of non-specific psychological distress, $\alpha=0.88$ (Kessler *et al.*, 2002).

Additional questions covered self-reported sex, highest level of education (less than year 12, year 12, trade or other certificate, bachelor's degree or higher) and language other than English spoken at home (yes, no).

Statistical analysis

All analyses were performed using SPSS version 16.0. Missing values were deleted listwise on a per-analysis basis. Rates of missing data were generally low, at <1% for all variables except past-highest alcohol consumption (5.0%), extraversion (2.9%), current alcohol consumption (2.3%) and education (1.4%). Missing data varied across analyses from 1.5% to 10.7%. Sample representativeness was investigated using logistic regressions which compared our sample with two large nationally representative samples: the 2006 Australian Census (Australian Bureau of Statistics, 2006) and the 2004 National Drug Strategy Household Survey (Australian Institute of

Table 1. Sample characteristics (% and means) and bivariate associations between socio-demographic characteristics, past-highest alcohol consumption, social relations variables and current alcohol consumption

		Abstainer	Occasional	Light	Moderate	Hazardous	Harmful	Total	Bivariate association
Total	N	277	412	1386	491	161	62	2789	
	%	9.9	14.8	49.7	17.6	5.8	2.2	100.0	
Age group	20–22 %	8.1	12.8	54.5	16.5	5.7	2.3	100.0	$\chi^2(10) = 20.92$, $P = 0.022$
	30–22 %	10.6	16.5	48.5	17.8	5.5	1.3	100.0	
	40–42 %	10.8	15.0	46.9	18.3	6.0	2.9	100.0	
Sex	Male %	7.1	8.9	57.5	16.6	6.0	3.9	100.0	$\chi^2(5) = 84.92$, $P < 0.001$
	Female %	11.5	17.9	45.6	18.1	5.6	1.3	100.0	
Education	Less than year 12 %	12.1	18.9	43.3	16.5	5.8	3.4	100.0	$\chi^2(15) = 32.21$, $P = 0.006$
	Year 12 %	10.4	14.6	49.6	16.6	6.4	2.4	100.0	
	Trade or other certificate %	7.9	15.2	52.1	17.0	5.1	2.8	100.0	
	Bachelor's degree or higher %	10.6	12.5	50.0	20.0	5.8	1.0	100.0	
LOTE[a]	Yes %	18.8	24.7	43.0	9.3	2.0	2.2	100.0	$\chi^2(5) = 90.66$, $P < 0.001$
	No %	8.6	13.3	50.7	18.9	6.3	2.2	100.0	
Past-highest alcohol consumption	Ex-hazardous/harmful %	3.4	4.2	35.3	31.4	17.7	8.0	100.0	$\chi^2(5) = 665.27$, $P < 0.001$
	Ex-other %	12.3	18.9	55.0	12.4	1.3	0.1	100.0	
Psychological distress	Mean	5.37	4.68	4.84	4.70	5.02	5.61	5.09	$F(5, 2776) = 1.38$, $P = 0.229$
	(SE)	(0.25)	(0.21)	(0.11)	(0.19)	(0.33)	(0.54)	(0.12)	
Social integration	Mean	7.16	7.33	8.37	8.71	9.19	8.92	8.28	$F(5, 2763) = 23.44$, $P < 0.001$
	(SE)	(0.17)	(0.14)	(0.08)	(0.13)	(0.23)	(0.37)	(0.08)	
Extraversion	Mean	5.17	5.35	5.60	5.92	5.89	5.93	5.64	$F(5, 2709) = 15.47$, $P < 0.001$
	(SE)	(0.08)	(0.07)	(0.04)	(0.06)	(0.11)	(0.17)	(0.04)	
Social support	Mean	72.92	75.50	77.65	78.42	76.59	69.68	75.13	$F(5, 2767) = 7.70$, $P < 0.001$
	(SE)	(0.99)	(0.81)	(0.44)	(0.74)	(1.29)	(2.07)	(0.48)	

Percentages may not sum to 100 due to rounding. [a]Language other than English spoken at home.

Health and Welfare, 2004). Bivariate associations of current level of alcohol consumption with socio-demographic covariates, past-highest consumption and social relations variables were examined using chi-squared tests and analysis of variance (ANOVA). A series of ANOVA models investigated associations between current alcohol consumption and psychological distress to address (i) moderating effects of age, (ii) the sick-quitter hypothesis and (iii) the social relations hypothesis. The statistical interaction between age group and current consumption level, controlling for other socio-demographic characteristics, indicated the extent to which the abstainer effect varied as a function of age. The sick-quitter hypothesis was tested by examining the interaction between current and past-highest consumption. Finally, the social relations hypothesis was examined by assessing the change in the magnitude of the abstainer effect after statistical adjustment for the effects of the psychosocial variables (social integration, extraversion, social support).

RESULTS

FDLWBS was compared to two large national representative samples, the 2006 Australian census (Australian Bureau of Statistics, 2006) and the 2004 National Drug Strategy Household Survey ($n = 29,445$; Australian Institute of Health of Welfare, 2004). Logistic regression (and predicted probabilities) explored whether FDLWBS participants were significantly different to Australian citizens of the same age and sex with regard to their alcohol consumption and socioeconomic background. The FDLWBS sample was nationally representative in terms of speaking a language other than English (12.9% FDLWBS vs 14.2% census) and unemployment (3.9% FDLWBS vs 4.2% census). However, FDLWBS under-represented people not in the paid labour force (10.4% vs 15.4%), born outside Australia (13.2% vs 15.6%), and over-repre-

sented those with university qualifications (29.6% vs 16.7%). Significant interactions (between age and sex on socioeconomic and substance use outcomes) indicated that FDLWBS was less representative amongst specific age and sex groups, particularly the younger cohorts. For instance, FDLWBS tended to under-represent non-drinkers amongst 30–32-year-old men (4.5% vs 10.1%) and 20–22-year-old women (8.0% vs 11.3%), otherwise the proportion of non-drinkers lay within 1% of national estimates. Similarly, the proportion of women with children was significantly lower across the younger two FDLWBS cohorts (31.9% vs 21.7%), but not in 40–42-year-olds (84.1% vs 81.9%).

Table 1 displays sample characteristics by current alcohol consumption group. In each age group, the largest proportion of participants reported 'light' drinking, followed by 'moderate', 'occasional', 'abstainer', 'hazardous' and then 'harmful' consumption. Age, sex, highest level of education, speaking a language other than English at home and past-highest alcohol consumption were significantly associated with current alcohol consumption. Social integration, extraversion and perceived social support were also significantly associated with current alcohol consumption, with abstainers being less integrated, less extraverted and reporting lower levels of social support than light and moderate drinkers. Psychological distress was not significantly associated with current alcohol consumption at the bivariate level.

The abstainer effect

Figure 1 shows mean psychological distress scores across current consumption levels for each age group, adjusted for sex. The general pattern indicates that abstainers had higher levels of distress than occasional, light and moderate drinkers among 40–42-year-olds group, whereas 20–22- and 30–32-year-old abstainers had similar levels of distress to occasional, light and moderate drinkers.
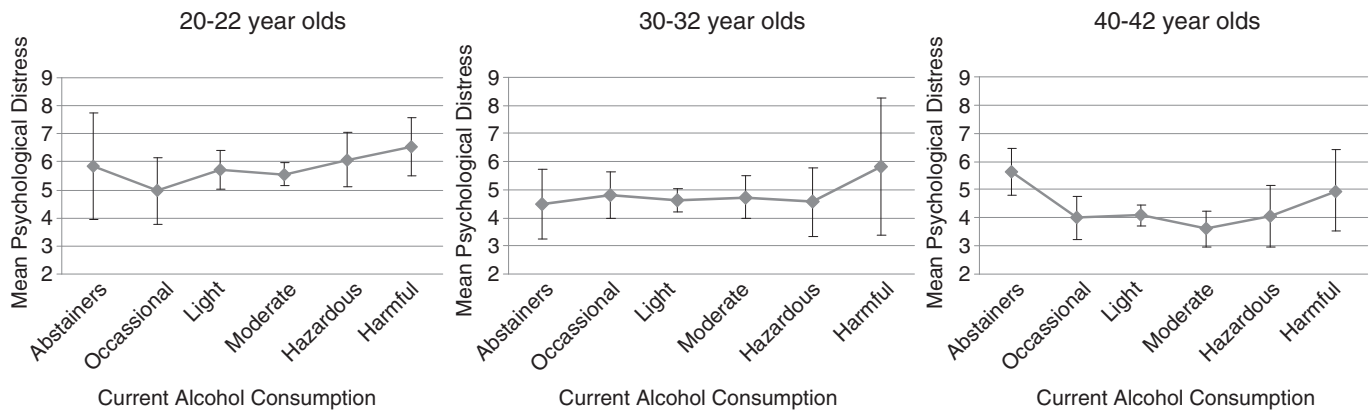
Note: Error bars represent 95% confidence interval. Means are adjusted for sex.

Fig. 1. Mean psychological distress by current consumption category in each age group.
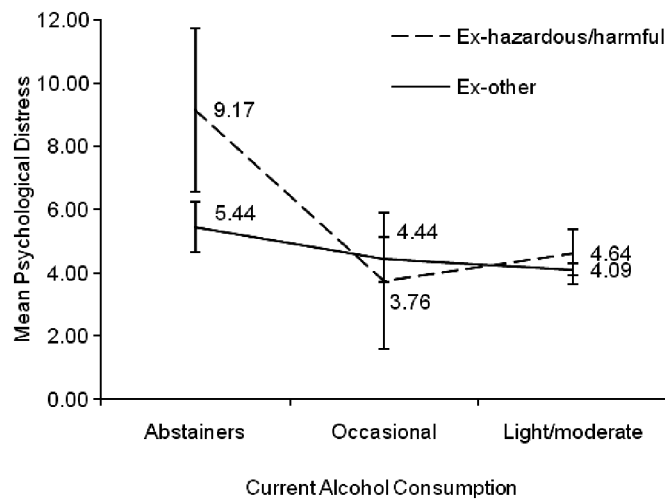
Note: Vertical bars depict 95% confidence intervals. Means are adjusted for: sex, highest level of education and speaking a language other than English at home.

Fig. 2. Mean psychological distress scores of abstainers, occasional drinkers and light/moderate drinkers by past-highest consumption in 40–42-year-olds.

A between-subjects ANOVA, adjusted for sex, age group (20–22, 30–32, 40–42), highest level of education and language other than English at home, compared distress levels for current consumption groups. As an independent *t*-test revealed no significant difference between light and moderate drinkers, $t(1870) = 0.67$, $P = 0.506$, $CI_{95} = -0.28, 0.56$, and in keeping with previous research (Anstey *et al.*, 2005), light and moderate drinkers were combined into a single group. Current hazardous and harmful drinkers were excluded from further analysis given the theoretical focus on the lower end of consumption. A two-way interaction between alcohol consumption and age group, which approached the level of statistical significance, $F(4, 2482) = 2.11$, $P = 0.077$, indicated that the abstainer effect might not be the same in different age groups.

To further elucidate age differences, associations between current alcohol consumption (abstainers, occasional, light/moderate) and psychological distress were examined separate-

ly within each age group using a between-subjects ANOVA, adjusting for sex, highest level of education and language other than English spoken at home. Current alcohol consumption was associated with distress amongst 40–42-year-olds, $F(2, 915) = 6.50$, $P = 0.002$, but not 20–22- ($P = 0.623$) and 30–32-year-olds ($P = 0.663$). In the oldest age group, paired contrasts demonstrated that both abstainers ($P = 0.003$) and occasional drinkers ($P = 0.008$) had significantly higher levels of distress than light/moderate drinkers. No significant two-way interaction between alcohol consumption and sex was found ($P = 0.431$). As a significant abstainer effect was observed only in the 40–42–year-old group, tests of the sick-quitter and social relations hypotheses focused just on this group.

Sick-quitter hypothesis
ANOVA was used to investigate whether the relationship between current alcohol consumption and psychological distress

Table 2. Mean (and SE) psychological distress scores for 40–42-year-olds, with and without adjustment for possible confounders

	Abstainers	Occasional	Light/moderate	Hazardous/harmful
Model 1 (Adjustment for sex)	5.62 (0.41)**	4.00 (0.37)	3.99 (0.15)	4.53 (0.41)
Model 2 (Adjustment for all socio-demographic covariates)[a]	5.40 (0.40)**	4.15 (0.35)	3.99 (0.23)	4.61 (0.44)
Model 3 (Model 2 excluding past and present hazardous/harmful drinkers)	5.46 (0.44)**	4.42 (0.38)	3.99 (0.52)	-
Model 4 (Model 2 including social relations variables)[b]	4.82 (0.40)*	3.78 (0.34)	3.99 (0.21)	4.61 (0.42)
Model 5 (Models 3 and 4 combined)	4.82 (0.44)	4.05 (0.37)	3.99 (0.27)	-

Values have been standardized to a constant value for light/moderate drinking to allow comparison across models. Asterisks indicate the consumption categories that differ significantly from light/moderate drinkers: *$P < 0.05$, **$P < 0.01$. [a]Socio-demographic covariates are sex, highest level of education and language other than English spoken at home. [b]Social relations variables are social integration, extraversion and social support.

among 40–42-year-olds was attenuated by adjusting for past-highest level of alcohol consumption. The analysis adjusted for socio-demographic covariates, social integration, extraversion and social support. In keeping with previous research (Caldwell *et al.*, 2002), past-highest levels of hazardous and harmful consumption were combined into a single category. An independent *t*-test demonstrated that ex-hazardous and ex-harmful drinkers' distress scores did not differ significantly, $t(176.43) = -0.76$, $P = 0.449$, $CI_{95} = -1.46, 0.65$.

We found a significant main effect for past-highest consumption, with ex-hazardous/harmful drinkers ($M = 5.77$, $SE = 0.56$) recording higher mean distress scores than others ($M = 4.41$, $SE = 0.21$), $F(1, 868) = 5.77$, $P = 0.016$. A significant main effect of current consumption, $F(2, 868) = 6.82$, $P = 0.001$, was consistent with the previously observed abstainer effect. A significant two-way interaction between past-highest and current alcohol consumption, $F(2, 868) = 3.94$, $P = 0.020$, reflected a pattern where ex-hazardous/harmful drinkers currently drinking at occasional to moderate levels showed no elevation in psychological distress, whereas ex-hazardous/harmful drinkers who were current abstainers had substantially elevated distress levels (Fig. 2).

Social relations hypothesis

Compared with light/moderate drinkers, abstainers were less socially integrated ($M = 6.76$, $SD = 3.05$ for abstainers; $M = 7.98$, $SD = 2.87$ for light/moderate; $t(801) = -4.13$, $P < 0.001$, $CI_{95} = -1.79, -0.64$), less extraverted ($M = 5.21$, $SD = 1.34$ for abstainers; $M = 5.69$; $SD = 1.32$ for light/moderate; $t(784) = -3.49$, $P = 0.001$, $CI_{95} = 0.76, 0.21$) and had lower perceived social support ($M = 69.92$, $SD = 19.49$ for abstainers; $M = 74.98$, $SD = 16.24$ for light/moderate, $P < 0.001$, $t(140.08) = -2.63$, $P = 0.003$, $CI_{95} = -8.89, -1.26$). Occasional drinkers were also less socially integrated ($M = 7.00$, $SD = 2.79$, $t(844) = -3.83$, $P < 0.0005$, $CI_{95} = -1.47, -0.47$), less extraverted ($M = 5.44$, $SD = 1.33$, $t(829) = -2.07$, $P = 0.039$, $CI_{95} = -0.48, -0.13$) and had lower social support ($M = 73.34$, $SD = 17.84$, $t(218.55) = -1.06$, $P = 0.262$, $CI_{95} = -4.70, 1.42$) than light/moderate drinkers, although this last difference was non-significant.

A final series of models contrasted evidence for both the sick-quitter and social relations hypotheses. Estimated marginal means for psychological distress scores are shown in Table 2. Models 1 and 2 show that abstainers had significantly

higher psychological distress scores than light/moderate drinkers after controlling first for sex and then for the other socio-demographic covariates. Model 3 excluded past and present hazardous/harmful drinkers. This approach was taken, rather than statistical adjustment for past drinking, because of the significant interaction shown in Fig. 2. Marginal means across Models 2 and 3 were not substantively different, suggesting that the abstainer effect was not a consequence of quitting by former heavy drinkers.

Model 4 examined the social relations hypothesis by adding social integration, extraversion and social support to the covariates in Model 2. These adjustments reduced but did not fully account for higher levels of psychological distress among abstainers relative to light/moderate drinkers. Finally, the combined sick-quitter and social relations hypotheses were examined in Model 5 by excluding past and present hazardous/harmful drinkers and including social integration, extraversion and social support as covariates. There was no reduction in mean psychological distress of abstainers in this model compared with Model 4, although the difference between abstainers and light/moderate drinkers was no longer significant due to reduced statistical power following removal of past hazardous/harmful drinkers.

In order to investigate whether the very high distress of ex-hazardous/harmful drinkers who now abstain is due to their poor social relationships, we conducted a series of *t*-tests comparing the extraversion, social integration and social support of ex-hazardous/harmful drinkers who currently abstain with those who currently drink at light/moderate levels. These analyses revealed similar levels of social integration, extraversion and social support in the two groups, suggesting that differences in social relationships are unlikely to explain the increased distress of ex-hazardous/harmful drinkers who now abstain (extraversion—$M = 5.51$, $SD = 1.85$ for abstainers; $M = 5.76$, $SD = 1.39$ for light/moderate, $t(156) = -0.517$, $P = 0.606$, $CI_{95} = -1.209, 0.707$; social integration—$M = 6.89$, $SD = 3.48$ for abstainers; $M = 7.80$, $SD = 2.83$ for light/moderate, $t(159) = -0.924$, $P = 0.357$, $CI_{95} = -2.85, 1.03$; social support—$M = 69.33$, $SD = 18.87$ for abstainers; $M = 76.05$, $SD = 15.07$ for light/moderate, $t(160) = -1.28$, $P = 0.202$, $CI_{95} = -17.07, 3.64$). Note, however, that our capacity to detect differences between these groups is limited by the small number of ex-hazardous/harmful drinkers who now abstain ($n = 9$).

DISCUSSION

This study demonstrated significantly higher levels of psychological distress in alcohol abstainers relative to light and moderate drinkers among 40–42-year-olds but not among 20–22- or 30–32-year-olds. The abstainer effect was stronger among former heavy drinkers than among lifetime non-/moderate drinkers, providing partial support for the sick-quitter hypothesis among 40–42-year-olds. Excluding past and present hazardous/harmful drinkers from analysis, however, did not attenuate the abstainer effect. Results also provided support for the social relations hypothesis among 40–42-year-olds, as abstainers had lower levels of social integration, extraversion and social support relative to light/moderate drinkers, and controlling for these variables reduced the mean difference in psychological distress between abstainers and light/moderate drinkers by almost half.

The finding of an abstainer effect in the 40–42-year-olds but not in the two younger groups is consistent with some, but not all, previous studies. Bell *et al.* (1977) reported a stronger abstainer effect for depression and anxiety in 45–49-year-olds compared with 30–44-year-olds and a reversal in younger groups aged 16–22 years and 23–29 years. Anstey *et al.* (2005) similarly found that higher depression and anxiety scores in abstainers relative to drinkers were more prominent with increasing age across groups assessed at 20–24, 40–44 and 60–64 years. Alati *et al.* (2005) reported a less straightforward pattern from a longitudinal study of women where no abstainer effect was found for depression/anxiety at mean age 25 years; an effect was found at 30 years, but the effect did not persist to age 40. The possibility of a sex difference is also discussed by Caldwell *et al.* (2002) who found that young adult male, but not female, abstainers had elevated depression scores relative to moderate drinkers. Sex interaction terms were non-significant in the present study but its smaller sample size limited the power to detect such a pattern. The present study also had an underrepresentation of abstainers in 30–32-year-old men and 20–22-year-old women (by comparison with national figures) which further compromised statistical power in the younger groups and may have introduced bias in reported differences between abstainers and moderate drinkers. Confirmation of possible age and gender interaction terms would require studies with very large sample sizes.

If the evidence for an abstainer effect in the older but not the younger age groups is a true reflection of differences in the general population, it raises questions about the possible factors contributing to this pattern. In line with the sick-quitter hypothesis, older people are more likely to have experienced physical health problems (Australian Bureau of Statistics, 2005) and may abstain from alcohol as a result, either to protect their health (Satre and Areán, 2005) or to avoid negative interactions between alcohol and medications (National Institute on Alcohol Abuse and Alcoholism, 2007). As physical health problems are associated with mental distress (MacHale, 2002), abstinence may become more strongly associated with distress with increasing age. Whilst the present study found some support for this (Fig. 2), the number of abstainers among 40–42-year-olds who had previously been hazardous or harmful drinkers was very small (*n* = 9). A previous study of Anstey *et al.* (2005) with a similar age group (40–44 years) found a higher prevalence of asthma and diabetes in abstainers compared with

drinkers but no increased prevalence of cancer, heart disease, stroke or hypertension that have been linked with abstention in older samples. Unfortunately, no information on physical health problems was available in the present study to test directly their role in giving up drinking.

Another possible factor in the abstainer effect is that the minority of former heavy drinkers who become complete abstainers may do so as a result of more severe psychopathological symptoms by comparison with former heavy drinkers who reduce their alcohol intake to light and moderate levels. This extends the sick-quitter hypothesis to cover existing psychopathology, not just physical health problems. Alternatively, or additionally, past heavy drinkers who give up alcohol completely may become highly distressed as a consequence of their abstinence. Since alcohol is an integral part of many social activities in Australia (Commonwealth Department of Health and Aged Care, 2001), heavy drinkers who become abstainers may experience a more intense period of social readjustment, including social discrimination (Paton-Simpson, 2001), than those who reduce their drinking to moderate levels.

The results regarding social relationships are consistent with previous research demonstrating lower social integration, extraversion and social support among abstainers compared with drinkers (Leifman *et al.*, 1995; Cook *et al.*, 1998; Rodgers *et al.*, 2000a,b). Moreover, the mean differences between abstainers and light/moderate drinkers were consistently around one-third of a standard deviation for each of the social relations measures. Our findings are also consistent with research and theory suggesting that low scores on these variables are associated with poor mental health (Cohen and Wills, 1985; Barnett and Gotlib, 1988). These results are important not just for indicating that social relationships may contribute a substantial part of the elevated psychological distress of middle-aged non-drinkers but also suggesting that such factors should be investigated as possible contributors to poorer physical health and mortality of abstainers.

A number of limitations to this study should be noted. First, due to the cross-sectional nature of the study, it is not possible to infer causality in the associations between abstinence, social relationships and psychological distress. The 2007 Australian alcohol guidelines for low risk drinking, developed by the National Health and Medical Research Council (2007), review the evidence for a beneficial effect of moderate drinking on mental health, concluding that the nature of the relationship is unclear. The current findings complement this review, adding additional grounds for caution. Whilst it remains a possibility that drinking promotes social behaviors that are protective for mental health, it is also plausible that alcohol use is a consequence of a more sociable disposition rather than a cause. The natural extension of the present study is to investigate the temporal sequence of alcohol consumption, social relationships and psychological distress using a prospective longitudinal design.

A second limitation is that the study could not adjust for differences in the experience of physical health conditions as a possible factor contributing to the abstainer effect. Third, Caldwell *et al.* (2006) noted that measures of drinking history which rely on participants' recollection may be inaccurate, again supporting greater use of prospective longitudinal studies.

A fourth limitation is the low response rate of this study. This only presents a problem if it leads to biases in the re-

ported analyses. Comparisons with national figures from other sources showed that the study participants were broadly representative of the age groups covered in terms of a range of socioeconomic and demographic factors but were more highly educated, more likely to be in the paid labour force and less likely to be born outside of Australia than the general population. Participants overall were also less likely to be abstainers from alcohol consumption. However, this and other examples of non-representativeness were notably more a feature of the younger samples included in the study and applied less to the 40–42-year-old group for which the most important findings emerged. If bias is a problem in the present study, it is possible that it is obscuring equivalent findings in the younger age groups rather than leading to spurious results in the oldest group. There is no *a priori* reason to predict that bias in recruitment would increase the symptom levels of abstainers relative to moderate drinkers and our reported findings for 40–42-year-olds were consistent with several previous studies (Rodgers *et al.*, 2000a,b; Rodgers *et al.*, 2007a,b).

Several possibilities for future research arise from the current study in addition to the need for prospective designs. First, a greater emphasis on the heterogeneity of abstainers (including stated reasons for not drinking) may help identify other factors contributing to the abstainer effect. For example, if those who abstain because they dislike the effects of alcohol are more distressed than those who abstain for religious reasons, this will help determine underlying reasons for elevated distress. Second, it may be valuable to assess the duration of past-heavy alcohol consumption periods and the time that has elapsed since these periods occurred. Third, it would be informative to extend the current study by examining the possible role of other personality traits in the abstainer effect, such as conscientiousness (Cook *et al.*, 1998). Finally, the statistical methods used in this study can be applied to other outcomes where abstainer effects have been found, such as physical health and cognitive ability (Corrao *et al.*, 2000; Anstey *et al.*, 2005).

The present study provides important new insights into the poorer psychological health of alcohol abstainers in middle life. Our findings indicate that abstainers who were heavy drinkers in the past are particularly likely to report high levels of distress. However, this small group does not account for a significant part of the abstainer effect observed at the population level. More importantly, our findings indicate that psychosocial characteristics of abstainers, in particular their social relationships and personality characteristics, could account for much of the higher levels of psychological distress observed in this group.

REFERENCES

Alati R, Lawlor DA, Najman JM *et al.* (2005) Is there really a 'J-shaped' curve in the association between alcohol consumption and symptoms of anxiety and depression? Findings from the Mater-University Study of Pregnancy and its outcomes. *Addiction* **100**:643–51.

Anstey KJ, Windsor TD, Rodgers B *et al.* (2005) Lower cognitive test scores in alcohol abstainers are associated with demographic, personality, and biological factors: the PATH Through Life Project. *Addiction* **100**:1291–301.

Australian Bureau of Statistics (2005) *National Health Survey: Summary of results, Australia (No. 4364.0)*. Canberra: Australian Capital Territory. Author.

Australian Bureau of Statistics (2006) Australian Census of Population and Housing, 2006. *Basic CURF, CD-ROM. Findings based on use of ABS CURF data*.

Australian Institute of Health and Welfare (2004) National Drug Strategy Household Survey, 2004. *Findings based on use of AIHW NDSHS data*.

Barnett PA, Gotlib IH. (1988) Psychosocial functioning and depression: distinguishing among antecedents, concomitants, and consequences. *Psychol Bull* **104**:97–126.

Bell RA, Keeley KA, Buhl JM. (1977) Psychopathology and life events among alcohol users and nonusers. In Seixas FA (ed). *Currents in Alcoholism.* New York: Grune & Stratton. **2**:103–123.

Caldwell TM, Rodgers B, Jorm AF *et al.* (2002) Patterns of association between alcohol consumption and symptoms of depression and anxiety in young adults. *Addiction* **97**:583–94.

Caldwell TM, Rodgers B, Power C *et al.* (2006) Drinking histories of self-identified lifetime abstainers and occasional drinkers: findings from the 1958 British Birth Cohort Study. *Alcohol Alcohol* **41**:650–54.

Campbell-Sills L, Cohan SL, Stein MB. (2006) Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behav Res Ther* **44**:585–99.

Cohen S. (2004) Social relationships and health. *Am Psychol* **59**:676–84.

Cohen S, Wills TA. (1985) Stress, social support and the buffering hypothesis. *Psychol Bull* **98**:310–57.

Commonwealth Department of Health and Aged Care (2001) *Alcohol in Australia: issues and strategies*. Canberra: Australian Capital Territory. Author.

Cook M, Young A, Taylor D *et al.* (1998) Personality correlates of alcohol consumption. *Personality and Individual Differences* **24**:641–7.

Corrao G, Rubbiati L, Bagnerdi V *et al.* (2000) Alcohol and coronary heart disease: a meta-analysis. *Addiction* **95**:1505–23.

Degenhardt L, Hall W, Lynskey M. (2001) Alcohol, cannabis and tobacco use among Australians: a comparison of their associations with other drug use and use disorders, and psychosis. *Addiction* **96**:1603–14.

de Lorimier AA. (2000) Alcohol, wine and health. *Am J Surg* **180**:357–61.

Doll R, Peto R, Boreham J. *et al.* (2005) Mortality in relation to alcohol consumption: a prospective study among male British doctors. *Int J Epidemiol* **34**:199–204.

Dyer AR, Stamler J, Oglesby P *et al.* (1981) Alcohol, cardiovascular risk factors and mortality: The Chicago experience. *Circulation* **64**:III20–III27.

Faravelli C, Albanesi G. (1987) Agoraphobia with panic attacks: 1-year prospective follow-up. *Compr Psychiatry* **28**:481–87.

Fillmore KM, Kerr WC, Stockwell T *et al.* (2006) Moderate alcohol use and reduced mortality risk: systematic error in prospective studies. *Addiction Research and Theory* **14**:101–32.

Gershuny BS, Sher KJ. (1998) The relation between personality and anxiety: findings from a 3-year prospective study. *J Abnorm Psychol* **107**:252–62.

Goldman E, Najman JM. (1984) Lifetime abstainers, current abstainers and imbibers: a methodological note. *Br J Addiction* **79**:309–14.

Kessler RC, Andrews G, Colpe LJ *et al.* (2002) Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med* **32**:959–76.

Leifman H, Kühlhorn E, Allebeck P *et al.* (1995) Abstinence in late adolescence—antecedents to and covariates of a sober lifestyle and its consequences. *Soc Sci Med* **41**:113–21.

Levenson MR, Aldwin CM, Bossé R *et al.* (1988) Emotionality and mental health: longitudinal findings from the normative ageing study. *J Abnorm Psychol* **97**:94–6.

MacHale S. (2002) Managing depression in physical illness. *Advances in Psychiatric Treatment* **8**:297–306.

Manninen L, Poikolainen K, Vartiainen E *et al.* (2006) Heavy drinking occasions and depression. *Alcohol Alcohol* **41**:293–99.

Moen P. (1996) A life-course perspective on retirement, gender and well-being. *Journal of Occupational Health Psychology* **1**:131–44.

Mukamal KJ, Kuller LH, Fitzpatrick AL *et al.* (2003) Prospective study of alcohol consumption and risk of dementia in older adults. *JAMA* **19**:1405–13.

National Health and Medical Research Council (2001) *Australian alcohol guidelines: health risks and benefits*. Canberra: Australian Capital Territory. Author.

National Health and Medical Research Council (2007) *Australian alcohol guidelines for low risk drinking: draft for public consultation*. Canberra: Australian Capital Territory. Australian Government.

National Institute on Alcohol Abuse and Alcoholism (2007) Harmful interactions: mixing alcohol with medicines. [Brochure]. *National Institute of Health.*

Pape H, Hammer T. (1996) Sober adolescence—predictor of psychosocial maladjustment in young adulthood?. *Scand J Psychol* **37**:362–77.

Paton-Simpson G. (2001) Socially obligatory drinking: a sociological analysis of norms governing minimum drinking levels. *Contemporary Drug Problems* **28**:133–77.

Pittman DJ. (1996) What do we know about the beneficial consequences of moderate alcohol consumption? A critical review of the recent literature. *Contemporary Drug Problems* **23**:389–406.

Poikolainen K. (1995) Alcohol and mortality: a review. *JCE* **48**:455–65.

Power C, Rodgers B, Hope S. (1998) U-shaped relation for alcohol consumption and health in early adulthood and implications for mortality. *Lancet* **352**:877.

Rodgers B. (1996) Reported parental behaviour and adult affective symptoms. 2. Mediating factors. *Psychol Med* **26**:63–77.

Rodgers B, Korten AE, Jorm AF *et al.* (2000a) Risk factors for depression and anxiety in abstainers, moderate drinkers and heavy drinkers. *Addiction* **95**:1833–45.

Rodgers B, Korten AE, Jorm AF *et al.* (2000b) Non-linear relationships in associations of depression and anxiety with alcohol use. *Psychol Med* **30**:421–32.

Rodgers B, Windsor TD, Anstey KJ *et al.* (2005) Nonlinear relationships between cognitive function and alcohol consumption in young, middle-aged and older adults: the PATH Through Life Project. *Addiction* **100**:1280–90.

Rodgers B, Parslow R, Degenhardt L. (2007a) Affective disorders, anxiety disorders and psychological distress in non-drinkers. *J Affect Disord* **99**:165–72.

Rodgers B, Windsor TD, Caldwell TM *et al.* (2007b) Misclassification bias and moderate drinking. *Addiction Research and Theory* **15**:29–33.

San José B, Van de Mheen H, Van Oers JAM *et al.* (1999) The U-shaped curve: various health measures and alcohol drinking patterns. *J Stud Alcohol* **60**:725–31.

Sareen J, McWilliams L, Cox B *et al.* (2004) Does a U-shaped relationship exist between alcohol use and DSM-III-R mood and anxiety disorders?. *J Affect Disord* **82**:113–8.

Satre DD, Areán PA. (2005) Effects of gender, ethnicity, and medical illness on drinking cessation in older primary care patients. *Journal of Ageing and Health* **17**:70–84.

Saucier G. (1994) A brief version of Goldberg's unipolar Big-Five markers. *J Pers Assess* **63**:506–16.

Saunders JB, Aasland OG, Babor TF *et al.* (1993) Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO. *Addiction* **88**:791–804.

Sesso HD, Cook NR, Buring JE *et al.* (2008) Alcohol consumption and the risk of hypertension in women and men. *Hypertension* **51**:1080–87.

Shakeshaft AP, Bowman JA, Sanson-Fisher RW. (1999) A comparison of two retrospective measures of weekly alcohol consumption: diary and quantity/frequency index. *Alcohol Alcohol* **34**:636–45.

Shaper AG, Wannamethee G, Walker M. (1988) Alcohol and mortality in British men: explaining the u-shaped curve. *Lancet* **332**:1267–73.

Sherbourne CD, Stewart AL. (1991) The MOS social support survey. *Soc Sci Med* **32**:705–14.

Ueno K. (2005) The effects of friendship networks on adolescent symptoms. *Social Science Research* **34**:484–510.

Wannamethee G, Shaper AG. (1988) Men who do not drink: a report from the British Regional Heart Study. *Int J Epidemiol* **17**:307–16.