

# Exploring the utilisation of a machine learning approach to predict outcomes of a telephone-delivered intervention for alcohol use problems

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## BACKGROUND

Globally, alcohol is the most prevalent substance use of dependence and in Australia, 1.9 million people meet criteria for alcohol dependence (Peacock et al., 2018; AIHW 2020). Rates of treatment for alcohol use disorders (AUD) remain low with only 27% of Australians with AUD making treatment contact in their lifetime (Mekonen et al., 2021; Chapman et al., 2015).

Telephone-delivered treatment has potential to overcome barriers but has been largely understudied in populations with AUD. The expansion of telehealth presents an urgent need to understand the effects of telephone treatment and whether certain client characteristic can help predict treatment outcomes.

## AIM

To explore whether a machine learning (ML) approach could identify outcome predictors from a telephone-delivered intervention, Ready2Change (R2C), among a general population sample with problem alcohol use.

## RESULTS

Demographic and clinical characteristics are presented in Table 1.

The traditional regression identified 4 significant predictor variables ( $p < 0.05$ ) associated with change in AUDIT score at each follow-up (see Figure 1 – yellow). Psychological distress was the only significant variable consistent across all time points, total number of standard drinks and age were consistent across two time points, with all other significant variables appearing only once.

The penalized regression identified a 6-variable predictor profile at 3 months ( $R^2=0.11$ ; Figure 1 – circled yellow). The strongest predictor of change in AUDIT score was reporting uncertainty about the potential of harm associated with participants alcohol consumption ( $b=-6.15$ ). Other important predictors identified in the model included education level, number of alcohol treatment types, days consuming <4 standard drinks, quality of life and psychological distress. No predictor profiles emerged at 6 or 12 months.

Table 1. Baseline characteristics of participants randomized to Ready2Change intervention (N=344)

VARIABLES	COUNT (%)	MEAN (SD)
Age (years)	-	39.9 (11.4)
Male	177 (51.5)	-
Born in Australia	265 (77)	-
Aboriginal or Torres Strait Islander	9 (2.6)	-
In a relationship	198 (57.6)	-
LGBTQIA+	37 (10.8)	-
Geographical area - major city	230 (66.9)	-
Tertiary Educated	245 (71.2)	-
Full time employment	151 (43.9)	-
Age first consumed alcohol	-	18.2 (5.4)
Age commenced regular alcohol consumption	-	15.2 (2.5)
Previous AOD treatment	101 (29.4)	-
Number of alcohol treatment types	-	0.4 (0.7)
Past month (30-day) alcohol consumption (TLFB)		
Number of drinking days	-	19.9 (8.0)
Days consuming >2 standard drinks	-	18.5 (8.4)
Days consuming >4 standard drinks	-	15.5 (9.1)
Total number of standard drinks	-	168.7 (108.2)
Any other substance use	209 (60.8)	-
Impact of alcohol consumption on health - harmful	307 (89.2)	-
Psychological distress (K10)	-	21.7 (6.0)
Suicidal Ideation (SIDAS)	-	1.7 (4.6)
Quality of Life (AQoL-6D)	-	38.8 (8.7)

## METHOD

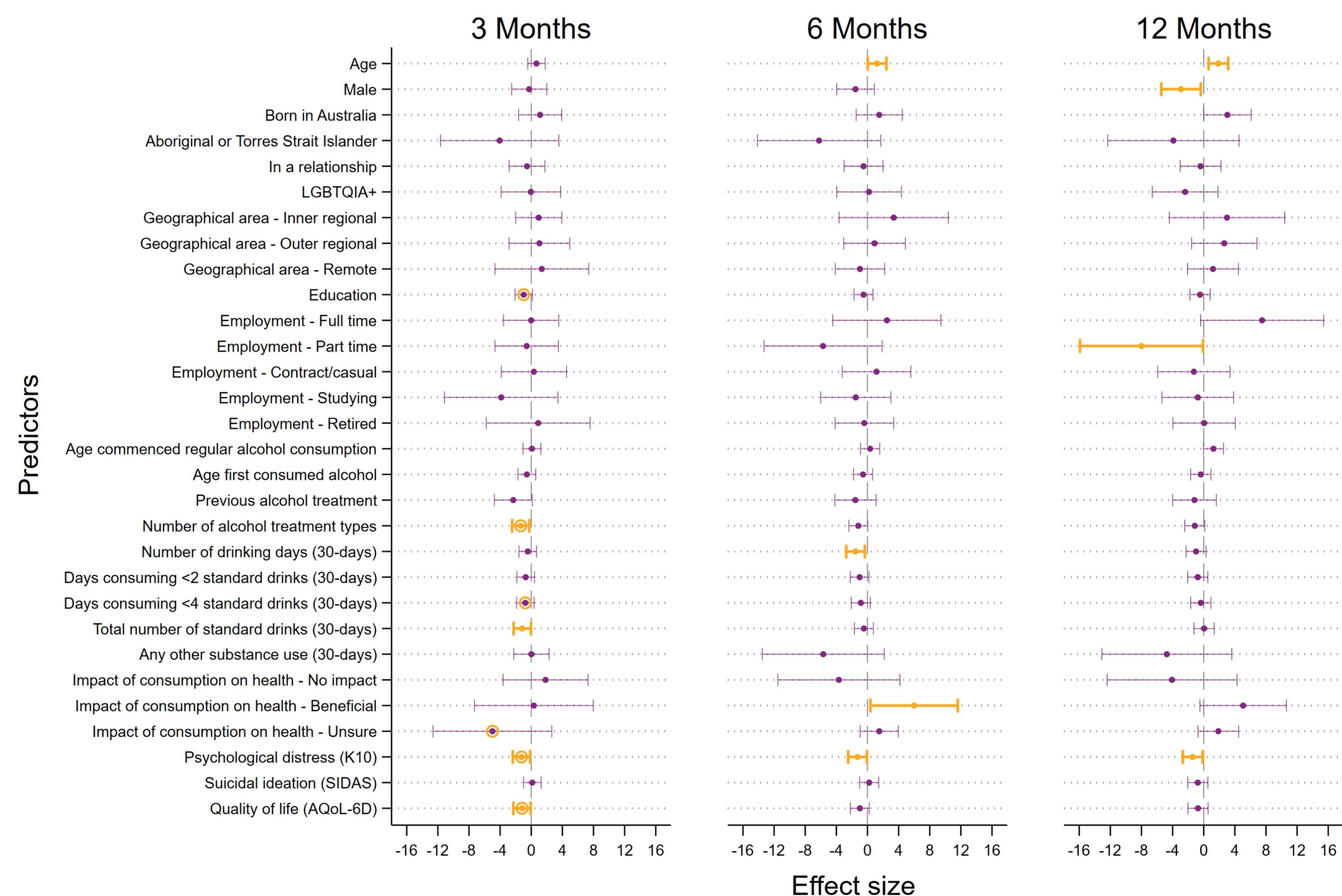
**Study Design** Secondary analysis of data from the Ready2Change (R2C) study, a double blind, parallel-group randomized controlled clinical trial conducted at Turning Point, Australia over October 2019 – September 2020.

**Participants** Australia-wide recruitment of individuals  $\geq 18$  years with problem alcohol use, per the Alcohol Use Disorders Identification Test (AUDIT) score  $>6/7$  (females/males).

**Ready2Change Intervention** 4 to 6 sessions of a structured telephone cognitive and behavioral intervention delivered by a psychologist.

**Analysis** Of 344 participants, 173 (50.3%) were randomized to receive the R2C intervention and included in analysis. Traditional regression and penalized regression models were compared on treatment outcome. Outcome measure examined was change in participants AUDIT score at 3, 6, and 12 months'. Penalized regression (LASSO; machine learning approach) used to develop predictive profiles (30 effects from 22 predictors).

Figure 1. Predictor outcomes of regression and penalized regression (LASSO) of change in AUDIT score by follow-up time point. Significant variables from traditional and penalized regression highlighted (yellow).



## CONCLUSION

Traditional regression identified some significant predictors, yet were generally inconsistent across time. Although the penalized regression model identified a predictor profile at 3 months, high-variability in the data resulted in low goodness-of-fit (11% of variance explained) and no longer-term predictors emerged. These findings demonstrate the challenges in predicting treatment outcomes of telephone-delivered treatment for alcohol use problems.

## IMPLICATIONS FOR PRACTICE

Predicting treatment outcomes has potential to improve health care efficiency, including assisting with intake and assessment decisions. However, different predictors may be needed for individualized treatment recommendations.

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