

# A smartphone app to assess alcohol consumption behaviours: Development, validity, compliance, and reactivity

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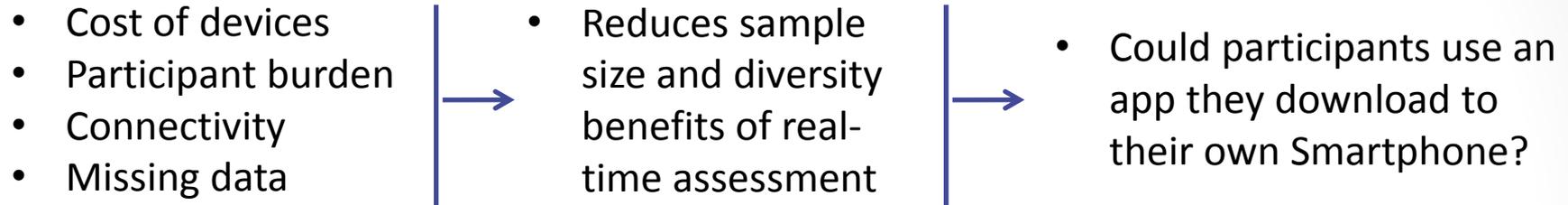
University of Melbourne



# Background

- In research focusing on the causes and consequences of problem drinking, accurate assessment of alcohol use – both in terms of volume and pattern – is vital
  - Real-time electronic methods of assessing alcohol consumption are increasingly advocated in the research arena
  - Allows data to be captured repeatedly; in the natural environment; and in the absence of the researcher
- Facilitates collection of actual intake information
  - Minimises recall & responses biases
  - Reduces missing data
  - Potentially yields a large, diverse sample
  - Allows variations in behaviour to be examined

# Issues



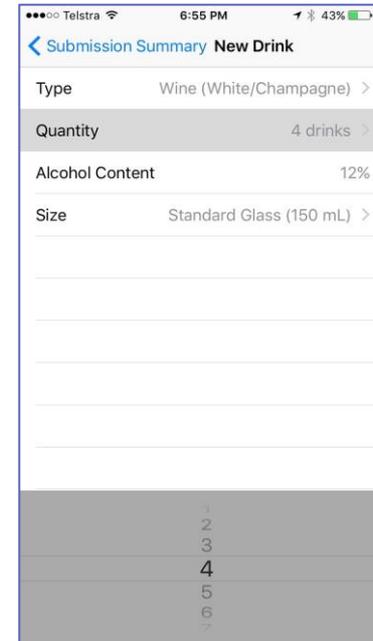
But

- There is little guidance regarding app development
- Is app data valid?
- Do participants comply with app protocols?
- Is reactivity evident?
- Are there hazard vs non-hazard compliance and/or reactivity differences?

# App Development

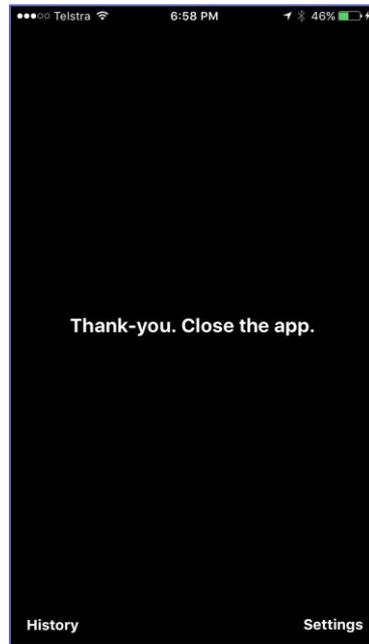
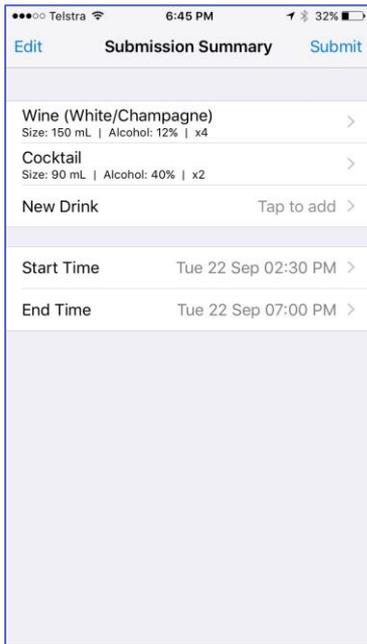
- Custom-built smartphone app to measure real-time (or near real-time) alcohol consumption behaviour in the healthy population
- Designed for use in the research arena
- Iterative development process
- Development involved elements typical of agile software design
  - Requirements analysis
  - Feature & interface design
  - Implementation

# App

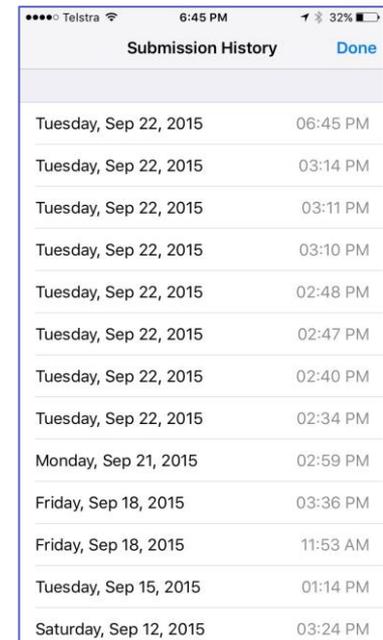


- Available for iOS & Android
- Event & time-based (via alerts) assessments

- Drink type, quantity, & size input by participant
- Alcohol content automatically generated



- Participants see submission history in terms of date and time, but not drinks submitted

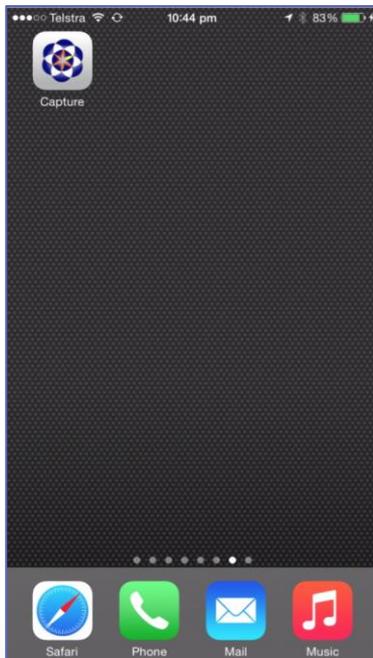


- Participants supply start/end time
- Data uploads to server

# Study Design

## Procedure

- Completion of online survey
- Download and use of free smartphone app designed specifically for the study (21 days)



## Materials

- Demographics
- Surveys
  - TLFB, AUQ, AUDIT
  - ASSIST (drug use)
- App

# Results

- Participants ( $N = 671$ ) used the app 20.27 ( $SD = 1.88$ ) days out of 21

	M (SD)	95% CI
Age	23.12 (7.24)	[22.57, 23.67]
Gender (F:M)	470:201	
Education (years)	14.80 (2.31)	[14.62, 14.97]

	Full Sample	Hazard (n = 286)	Non-hazard (n = 385)
AUDIT	7.97 (5.49)	12.45 (4.30)	4.64 (3.59)

Note. AUDIT scores  $\geq 8$  indicate hazardous use

# Validity

	TLFB	APP			
	M (SD)	M (SD)	t(670)	p	r
Drinking days (%)	24.79 (21.00)	26.44 (20.75)	2.73	.007	0.10
Total drinks	20.30 (22.02)	24.26 (25.41)	5.37	<.001	0.20
Drinks/day	0.97 (1.05)	1.20 (1.25)	6.58	<.001	0.25
Drinks/drinking day	3.35 (2.77)	3.98 (3.02)	6.72	<.001	0.25
6/6+ intake	1.26 (1.90)	1.31 (1.92)	0.74	.458	0.03
8/8+ intake	0.72 (1.39)	0.85 (1.44)	2.47	.014	0.09
12/12+ intake	0.21 (0.71)	0.31 (0.80)	3.18	.002	0.12

	AUQ	APP			
	M (SD)	M (SD)	t(670)	p	r
Rate of intake/hour	1.94 (1.30)	2.20 (2.09)	3.14	.002	0.12

# Compliance

- Participants used CNLab-A 20.27 (SD 1.88) days out of 21 (96.5%)
- 96.0% of participants completed at least 1 submission per day for the entire 21-day experimental period
- No significant differences as a function of gender, age bracket, or hazard/non-hazard group membership with regard to number of days of app use or the number of app responses per day
- 27,355 data points captured via the app in total

# Reactivity

Linear growth model parameter estimates of drinks per day as a function of hazard/non-hazard groups

Fixed effects (intercept, slopes)	Estimate (SE)	<i>t</i>	<i>df</i>	<i>p</i>	95% CI	
					<i>LL</i>	<i>UL</i>
Intercept (level at Day 0)	0.67 (0.08)	8.68	2301.73	<.001	0.52	0.82
Time	-0.01 (0.01)	-1.80	13418.00	.072	-0.02	0.001
Hazard	1.48 (0.11)	13.26	2301.73	<.001	1.26	1.70
Hazard by time	-0.03 (0.01)	-3.50	13418.00	<.001	-0.04	-0.01

Random effects ([co-]variances)	Estimate (SE)	<i>z</i>	<i>p</i>	95% CI	
				<i>LL</i>	<i>UL</i>
Between-person (level 2)					
Intercept	0.74 (0.06)	12.28	<.001	0.63	0.87
Within-person (level 1)					
Residual	7.54 (0.09)	81.91	<.001	7.37	7.73

Linear growth model parameter estimates of daily responses as a function of hazard/non-hazard groups

Fixed effects (intercept, slopes)	Estimate (SE)	<i>t</i>	<i>df</i>	<i>p</i>	95% CI	
					<i>LL</i>	<i>UL</i>
Intercept (level at Day 0)	0.32 (0.02)	18.24	982.85	<.001	0.28	0.35
Time	-0.003 (0.001)	-3.63	13418.00	<.001	-0.004	-0.001
Hazard	0.15 (0.03)	5.99	982.85	<.001	0.10	0.20
Hazard by time	-0.004 (0.001)	-3.53	13418.00	<.001	-0.006	-0.002

Random effects ([co-]variances)	Estimate (SE)	<i>z</i>	<i>p</i>	95% CI	
				<i>LL</i>	<i>UL</i>
Between-person (level 2)					
Intercept	0.08 (0.01)	16.86	<.001	0.07	0.09
Within-person (level 1)					
Residual	0.14 (0.002)	81.91	<.001	0.14	0.15

# Key Findings

- Large diverse sample
- Days drinking, total quantity consumed, drinks per day, and drinks per drinking day were all significantly greater when measured via the app
- Significantly greater number of high intake occasions captured via the app (at all levels from 8/8+ drinks and up)
- Rate of consumption greater when measured via the app
- Both hazard and non-hazard participants appeared highly compliant when using app protocols
- Although there was some evidence of reactivity in our study, especially among hazardous drinkers, effect sizes were small

# Further Reading

- Poulton, A., Pan, J., Bruns, L.R., Sinnott, R.O., & Hester, R. (2018). Assessment of alcohol intake: Retrospective measures versus a smartphone application. *Addictive Behaviors*, 83, 35-41.
- Poulton, A., Pan, J., Bruns, L.R., Sinnott, R.O., Hester, R. (2019). A smartphone app to assess alcohol consumption behaviour: Development, compliance, and reactivity, *JMIR Mhealth Uhealth*, 7, e11157.

## Assessment of alcohol intake: Retrospective measures versus a smartphone application

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### Original Paper

## A Smartphone App to Assess Alcohol Consumption Behavior: Development, Compliance, and Reactivity

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Thank you