Attention Bias Modification Training and its role in AOD treatment

Melanie White
We acknowledge the traditional custodians of the land on which we meet today and pay respect to Elders past, present and emerging.

We also extend that respect to other Aboriginal and/or Torres Strait Islanders who are joining us here today.

David R Horton, creator, © Aboriginal Studies Press, AIATSIS and Auslig/Sinclair, Knight, Merz, 1996.
View an interactive version of the AIATSIS map www.abc.net.au/indigenous/map/

Header Artwork produced for Queensland Health by Gilimbaa
Implicit cognitions & substance use

- “The central paradox in addictive behaviors is that people continue to use drugs even though they know the harm” (Wiers & Stacey, 2006, p.292)

- Dual process models of addiction (e.g., Wiers et al., 2007)
  - Automatic/associative/impulsive processes vs. controlled/propositional/reflective processes determine drinking behaviour

- Implicit vs. explicit cognitive processes
Implicit cognitions & substance use – meta-analytic results

- 2 meta-analyses: moderate sized associations of implicit cognitions with extent of alcohol/substance use (Reich et al., 2010 – alcohol; Rooke et al., 2008 – all substances (n=89 effect sizes):
  - Strongest: semantic memory associations ($r = .38$), implicit attitudes ($r = .27$) & attentional bias for alcohol-related cues ($r = .26$);
  - Marijuana ($r = .43$), cigarettes ($r = .29$), alcohol ($r = .23$), mix/other ($r = .36$)

- Association between implicit substance-related attentional biases with subjective craving ($r = .19$); larger for illicit drug & caffeine craving (.34) than alcohol (.17) & tobacco craving (.16); larger for high craving (.23) (Field et al., 2009; 68 studies)

- Impulsivity significantly related to substance-related attentional ($r = .11$), memory (.08) & approach (.07) biases (total $r = 0.10$) (Leung et al., 2017; 19 studies: 14 alcohol)
Implicit cognitions & alcohol cravings – recent research

- AB reduces when heavy & moderate drinkers consume alcohol (in ascending phase of BAC curve) vs. placebo (Roberts & Fillmore, 2015)
  - AB may be more relevant to initiation than continuation of drinking

- AB predicted weekly alcohol use in Dutch young adolescents 2 years later; approach biases did not ($N = 378$; Janssen et al., 2015).

  - Type of bias most relevant may depend on stage of alcohol use
Cognitive Bias Modification (CBM)

- Substantial evidence base for cognitive bias modification in anxiety
- Growing evidence base for substance use
  - Most commonly tested in alcohol & tobacco smoking; preliminary studies in cannabis, cocaine
- 3 common approaches/targets in AOD use:
  - Attention bias modification (ABM)
  - Approach bias modification (Avoidance Training/Approach-Avoidance Task/training, CBM-AAT)
  - Interpretation bias modification (IBM or CBM-I)
Attentional Bias Modification (ABM)

Modified Visual Probe Task:

Participant view:

- 1000ms
- 500ms
- 1000ms (or sooner upon response)

+ beer tape *
Approach-Avoidance Training (AAT)

Fig. 1 Example of an avoidance trial of a smoking cue in the approach avoidance task, in which the cue zooms out.
In Wiers et al., 2013 *Automatic approach bias toward smoking cues is present in smokers but not in ex-smokers.* *Psychopharmacology, 229*(1). DOI: 10.1007/s00213-013-3098-5.
## Interpretation Bias Modification (CBM-I)

**Table 1**

Examples of stimuli during the CBM-I training and Encoding Recognition phase.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Type</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>Title</td>
<td>Cinema</td>
</tr>
<tr>
<td></td>
<td>Alcohol training sentence</td>
<td>You are going to the cinema with some friends. This includes buying some</td>
</tr>
<tr>
<td></td>
<td></td>
<td>something yummy to eat and to drink. You buy some ...</td>
</tr>
<tr>
<td></td>
<td>Alcohol word fragment</td>
<td>beer</td>
</tr>
<tr>
<td></td>
<td>Neutral word fragment</td>
<td>M &amp; ‘s (M&amp;M’s)</td>
</tr>
<tr>
<td></td>
<td>Comprehension question</td>
<td>Are you going to a concert?</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>Studying together</td>
</tr>
<tr>
<td></td>
<td>Neutral training sentence</td>
<td>You and your study buddy are working on an assignment.</td>
</tr>
<tr>
<td></td>
<td>Word fragment A</td>
<td>You notice that your way of working differs a lot. You are very ...</td>
</tr>
<tr>
<td></td>
<td>Word fragment B</td>
<td>accurate (accurate)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inaccurate (inaccurate)</td>
</tr>
<tr>
<td>Encoding</td>
<td>Title</td>
<td>Day at the beach</td>
</tr>
<tr>
<td></td>
<td>Encoding sentence</td>
<td>You had a day at the beach with some friends. You enjoyed the sun ...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>throughout the whole day. At the end of the day, you all fancy ...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yummy (yummy)</td>
</tr>
<tr>
<td></td>
<td>Comprehension question</td>
<td>Are you at the beach?</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>Day at the beach</td>
</tr>
<tr>
<td></td>
<td>Alcohol-related target</td>
<td>At the end of the day, you all fancy a cold beer.</td>
</tr>
<tr>
<td></td>
<td>Alcohol-unrelated target</td>
<td>At the end of the day, you all fancy French fries.</td>
</tr>
<tr>
<td></td>
<td>Foil 1</td>
<td>At the end of the day, you all fancy something special.</td>
</tr>
<tr>
<td></td>
<td>Foil 2</td>
<td>At the end of the day, you all fancy something they sell at the beach kiosk</td>
</tr>
</tbody>
</table>

Woud et al., 2015; J. Behav. Ther & Exp. Psychiat. 49, 61-68.
RCTs of CBM for AOD use

Cristea et al. (2017) meta-analysis RCTs CBM for substance use

- 25 RCTs to Dec 2015, most>2014 ; significant heterogeneity
- 18 alcohol (5 ABM, 7 AAT, 1 CBM-I), 7 smoking (6 ABM, 1 AAT)
- **Cognitive bias: significant large effect** (g=.60, 19 trials)
  - similar across alcohol/ smoking, AB/AAT, settings; stronger for 1 sessions)
- **Post-test addiction outcomes: ns & small ES overall** (g = .08)
  - alcohol (g=.10, 17 trials incl other paradigms); smoking (g=.02)
  - 4 studies included more versions of CBMs *(averaged)* -> **using comparison most favourable for CBM = small significant ES** (g=.11)
- **Post-test craving: ns & v. small** (g = .05, 18 trials; 12 alcohol trials, g = .07)
- **Follow-up addiction outcomes: Significant, small effect** (g = .18)
  - only 7 studies: 4 alcohol, 3 smoking, see table next slide;
  - much stronger in patients (n=4) vs. consumer samples (n=3)
## Subsample of studies with follow-up assessments

<table>
<thead>
<tr>
<th>Study</th>
<th>Pop Description</th>
<th>Nran d</th>
<th>CBM</th>
<th>Control</th>
<th>Conc Tx</th>
<th>Addiction measures</th>
<th>Bias measure</th>
<th>D</th>
<th>Ns</th>
<th>FU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beg, 2015</td>
<td>Smokers trying to quit (≥10 cig/day)</td>
<td>119</td>
<td>ABM(VPT)</td>
<td>Sham (no cont)</td>
<td>Nicotine Patch</td>
<td>Craving, mood, CO-verified abstinence</td>
<td>VPT; Pictorial Stroop</td>
<td>Clinic</td>
<td>4</td>
<td>1,2,3 &amp; 6 mths</td>
</tr>
<tr>
<td>Lopes, 2014</td>
<td>Smokers trying to quit (≥5 cig/day &gt;30 days)</td>
<td>67</td>
<td>ABM(VPT)</td>
<td>Sham (no cont)</td>
<td>Group CBT</td>
<td>Craving (QSU-B); FTND; Cig/day; CO(ppm)</td>
<td>VPT</td>
<td>Lab</td>
<td>3</td>
<td>1,6,12 mths</td>
</tr>
<tr>
<td>Schoenmakers, 2010</td>
<td>AD inpatients</td>
<td>43</td>
<td>ABM(VPT)</td>
<td>Categorisation task</td>
<td>CBT</td>
<td>Craving (DAQ); Relapse</td>
<td>VPT</td>
<td>Clinic</td>
<td>5</td>
<td>3mths</td>
</tr>
<tr>
<td>Eberl, 2013</td>
<td>AD inpatients</td>
<td>509</td>
<td>A-AAT</td>
<td>No training</td>
<td>TAU (CBT)</td>
<td>Relapse</td>
<td>A-AAT</td>
<td>Clinic</td>
<td>12</td>
<td>12mths</td>
</tr>
<tr>
<td>Wiers, 2011</td>
<td>AD inpatients</td>
<td>214</td>
<td>A-AAT (explicit/implicit)</td>
<td>Placebo (no cont); WL</td>
<td>TAU (CBT)</td>
<td>Craving (Likert); relapse</td>
<td>A-AAT</td>
<td>Clinic</td>
<td>4</td>
<td>12mths</td>
</tr>
<tr>
<td>Wiers, 2015</td>
<td>Drinkers (AUDIT&gt;8)</td>
<td>314</td>
<td>A-AAT; AACTP</td>
<td>Placebo (no cont)</td>
<td>-</td>
<td>Craving (VAS); Drinks/day (TLFB)</td>
<td>A-AAT</td>
<td>Home</td>
<td>4</td>
<td>1&amp;2mths</td>
</tr>
<tr>
<td>Cox, 2015</td>
<td>Drinkers (≥14 (W) or 21 (M) units/wk)</td>
<td>148</td>
<td>AACTP</td>
<td>No training</td>
<td>-</td>
<td>Weekly drinking (DRQ); problems (SIP)</td>
<td>Stroop</td>
<td>Lab</td>
<td>4</td>
<td>3&amp;6 mths</td>
</tr>
</tbody>
</table>

Adapted from Cristea et al. 2016, Table 1.
Recent RCTs (2016-17)

Alcohol

- Manning et al., 2016: CBM-AAT (x4s, daily) in 83 Aus AUD inpatients during 1-week alcohol detox program reduced early relapse @2wks post (75% vs. 45% controls); no effects on craving or other clinical outcomes [vs. non-alcohol AAT]

- Clerkin et al., 2016: ABM-anx + ABM-alc (pictorial; x8s across 4wks in lab) for co-occurring symptoms social anxiety & AD in 86 adults (2 x 2 design). ↓ trial-level AB & most symptoms but in both conditions.

Smoking

- Elfeddali et al., 2016: ABM (pictorial, x6s in 2 wks, web-based) in 434 smokers who’d made a quit attempt. No effects in total sample but in heavy smokers (n=319; ≥15cig) ↑ abstinence@6mths post baseline vs sham (OR = 3.15).

- Baird et al., 2017 (pilot): CBM-AAT (x4s in 2 wks, lab) ↓ approach bias vs. sham condition; reductions related to N. days abstinent in the week following a self-guided quit attempt (upon completion Tx; final N = 40).
Recent RCTs (2016-17)

Cocaine

- Mayer et al., 2016: MI (1s) then **ABM** vs. sham (pictorial; x5s in 4 wks in lab) in 37 treatment-seeking CUD Ps. Explicit instruction on contingencies in each condition.
  - ↓ cocaine use, craving & withdrawal post, 2-wks & 3-mths later, but in both conditions

All ‘motivated to change’ participants
Alcohol ABM

Of 6 alcohol ABM RCTs, only 3 >1 session (more recent)

- Schoenmakers, 2010: 5S. Dependent drinkers ($N = 43$) in ABM (away alcohol) discharged earlier from treatment & took longer to relapse, but no less likely to experience relapse & no improvements in craving.

- McGeary, 2014: 9S ↓ reported drinking for heavy drinking college students ($N = 41$) in ABM vs sham training (home-based)

- Clerkin et al., 2016: 8S (ABM-anx + ABM-alc); ↓ trial-level AB & most symptoms but in both conditions.

- Further research needed to determine whether the ABs do not have a causal effect on outcomes, or the methods used have been unable to meaningfully change the biases.
Alcohol CBM-AAT

- Promising results in reducing relapse in dependent drinkers (Eberl et al., 2013; Eberl et al., 2014; Manning et al., 2016; Wiers et al., 2011).
- Inconsistent results for other outcomes, such as cravings or drinking quantity (Manning et al., 2016), & for other drinking populations, including heavy & social drinkers (Lindgren et al., 2015; Wiers, Houben, et al., 2015).
- Systematic review (Kakoschke et al., 2017): improvement in alcohol consumption or lower likelihood of relapse occurred when the approach bias was successfully retrained (consistent with anxiety ABM findings, see Clarke & MacLeod, 2015).
Neuroimaging findings: AUD & CBM-AAT

2 AUD (recently abstinent) fMRI studies (6Ss AAT over 3 wks) suggest **CBM-AAT ↓ mPFC & amygdala activation in AUD** (regions involved in cue salience & craving):

- Pre-training: alcohol vs soft drinks cues induced activation in bilateral amygdala & Nacc; also ↑ activation in mPFC for alcohol approach bias contrast

- After CBM vs. sham:
  - Greater ↓ in alcohol cue-induced reactivity in the amgydala (& arousal ratings), associated with ↓ subjective craving in CBM group (Wiers et al., 2015b, N = 32)
  - Pre-post AAT BOLD response: ↓ mPFC activation for alcohol approach bias contrast, associated with ↓ in bias scores in CBM group, suggesting that PFC changes are contingent to training response (Wiers et al. 2015a, N = 26)
Criticisms & controversies

- Recent critiques on utility of CBM for addiction & results from meta-analysis of pooled effect sizes (e.g., Christiansen et al., 2015; Cristea et al., 2017)

- Suboptimal RCT designs (risk of bias) & variability of studies’ methods, design (e.g., type of control condition used), target stimuli (words, pictures, general/specific/contextual), samples (patients/consumers), follow-up periods, etc.
Counterpoints to criticisms/future directions

- Small Ns in subgroups of meta-analyses – underpowered to test moderators & questionable utility of pooled effects given variability
  - If one type of CBM & stimuli does not work in one population, does not infer another type/stimuli/population will not

- Preconditions for effectiveness? (see Gladwin et al., 2017)
  - Motivation to change (→ adjunct to MI?)
  - Actual bias change as mediator of clinical effects; differentiating between ‘responders’ & ‘non-responders’

- Not expect change after single session, or in absence of environmental exposure/interaction post-training
  - Meta-analysis of CBM on anx & dep (Hallion et al., 2011) found effects on symptoms only reliable when assessed after stressor exposure (video/exam).
    ➢ AOD: disorder-relevant ‘triggers’ (e.g., stress) or cue exposure necessary to observe effects too?
    ➢ Need for follow-up assessments outside lab/clinic experience
Feasibility: practical considerations

Strengths:

- Easy to setup, administer & complete; quick (<10mins/session)
- Theory & evidenced-based methods, with growing evidence base of applications to AOD treatment (+ as adjunct)
- Repetitive trials perceived by users as ‘helpful’ when administered +CBT (alignment of principles) & given explicit information about its purpose
Feasibility: practical considerations

Context considerations:

- Face validity to user groups?
- Multi-sessions repetitive & can be perceived as tedious → engagement if conducted alone in home/online environment?
- AAT effects most consistently seen with joystick-type setup (in-person administrations); generally don’t extend to online/touch-screen formats
- ABM & CBM-I: differences in salience of target stimuli for individuals/subgroups?
- CBM-I: development & validation of salient scenarios & associated stimuli
Latest directions

- Online & mobile administration; gamification
- Neural enhancers to CBM training (e.g., tDCS; see Clarke et al. 2014 ABM interacts with tDCS in effects on anxiety)
- Combination of CBM methods (e.g., ABM + IBM; ABM + ABMT)
- Combination of ABM stimuli to target comorbid conditions (e.g., alcohol + anxiety/social anx/depression)
- Combination of implicit + explicit methods (see reviews: Copersino 2017 review; Gladwin et al. 2017) – e.g., CBM + MI/CBT/Mindfulness
- Novel adaptations of established methods – e.g., targeting different types of biases &/or salient stimuli
  - e.g., my research (heavy episodic drinkers; expectancies & reflective)
  - implicit & explicit substance use self-concept (as drinker/smoker etc., see Lindgren et al. 2017 conceptual review)
Thomas E Gladwin, Corinde E Wiers, Reinout W Wiers

**Interventions aimed at automatic processes in addiction: considering necessary conditions for efficacy**

Current Opinion in Behavioral Sciences, Volume 13, 2017, 19–24

http://dx.doi.org/10.1016/j.cobeha.2016.08.001
Opportunities to engage & collaborate

Research projects/trials:
- Online AOD ABM/CBM as adjunct to existing treatment

Education:
- Psychology degree elective unit, “Psychopharmacology of Addictive Behaviours” – welcome your input into enhancing ‘real world’ curriculum
Questions, comments, thoughts?

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