Table 1

Alexithymia and Attention

Study	Sample Size & Characteristics	Alexithymia Measures/ Controls	Attention Measures	Results (Total/Facets (if specified))	Implications
Brandt et al (2015)	89; 60% F M_{age}=32; M_{TAS} =42; M_{OAS}=41	TAS-20 (C, OAS) Controls(**1**): depression (BDI), positive/negative affect (PANAS), symptoms (SOMS)	**Affective priming** Faces (angry, happy, & neutral) and words (positive, negative, neutral & illness) as both primes and targets	HA<LA: TAS-20 related to faster RTs for illness words primed with positive and negative faces.	HA = <u>Deficit</u> [↓] in automatic attention to affect.
Coffey et al (2003)	129; 58%F M_{age} = 19; M_{TAS} = 46	TAS-20 (C) w/facets Controls (**2**): emotional intelligence (TMMS); mood (MAS); extraversion, neuroticism (NEO; likened to positive/negative affect)	**Emotional Stroop** Positive, negative, and neutral words	HA<LA: Stroop interference positively related to 'attention to emotion' factor, which was negatively associated with EOT.	HA (EOT)= <u>Deficit</u> [↓] in attention to emotion.
Fujiwara (2018)	76 LA (M_{TAS}=42), 62% F, M_{age}=20; 73 HA (M_{TAS}=67), 52% F, M_{age}=19	TAS-20 (D) Controls(**1**): depression, anxiety (DASS-21)	**Eye-tracking** Eye movements recorded whilst participants judged the ratio of emotions in a set of blended faces	HA=LA: accuracy, face task. HA<LA: dwell time, eyes. HA<LA: HA fewer errors related to eye dwell time.	HA= <u>Deficit</u> [↑] in attention to eyes, but this led to more accurate performance.
Galderisi et al (2008)	28 PD, 68% F, M_{age}=31, M_{TAS}=57; 32 HC, 59% F, M_{age}=28, M_{TAS}=39	TAS-20 (C) Controls(**1**): depression (HRSD), anxiety (HRSA, SCRAS), IQ (WAIS-R)	**Emotional Stroop** Positive, neutral, panic-related and threat words	No association between TAS scores and Stroop RTs.	*No alexithymia effect* on attention to words.
Grynberg et al (2014)	<u>Study 1</u>: 41, 73% F, M_{age}=22; M_{TAS}=46 <u>Study 2:</u> 68, 79% F, M_{age}=22, M_{TAS}=44	TAS-20 (C) w/facets Controls(**2**): positive/ negative affect (PANAS)	**Rapid Serial Visual presentation (RSVP)** <u>Study 1</u>: T1 targets: faces (fear, pain, happy, neutral). T2 targets: neutral scenes. Distractors: neutral faces. <u>Study 2:</u> T1 targets: faces (fear, anger, neutral); T2: as study 1.	HA>LA: (DDF, Study 1#; EOT, Study 2) associated with increased delay following T1 before T2 targets can be accurately detected, but only when T1=faces of negative affect.	HA (DDF & EOT) = <u>OR</u> [↓] to threat. HA associated with prolonged processing of negative affect.

Hsing et al (2013)	115, 57% F, M_{age}=19, Mdn_{TAS} =47 56 HA 59 LA	TAS-20 (D) Controls(**2**): depression (BDI), anxiety (STAI), verbal IQ (ERVT)	**Emotional Stroop** Task required classifying adjectives as angry or sad; images of sad, angry or neutral faces were superimposed, varying in display time (primes)	HA=LA: classification of adjectives and faces (presented alone). HA>LA: slower responding overall, and to sad words with sad (congruent) and angry (incongruent) primes. HA>LA (trend): when affect controlled, lower IQ HA had greater Stroop interference.	HA = <u>OR</u> [↓] greater distraction from negative faces with sad target words. HA: *no deficit* in overall Stroop interference, or categorizing isolated verbal, nonverbal stimuli.
Liossi et al (2011)	15 CH, 60% F, M_{age}=33, M_{TAS}=50 18 HC, 72% F M_{age}=30, M_{TAS}=41	TAS-20 (C) Controls: none	**Visual Probe Task** Pain words paired with neutral words, presented for short (500ms) or long (1250ms) durations before probe onset	TAS-20 not associated with probe RTs under any condition.	*No alexithymia effect* on attention to pain words.
Lundh & Simonsson-Sarnecki (2002)	120, 52% F, M_{age}=37, M_{TAS}=39 20 HA (>49) 20 LA (<31)	TAS-20 (C, D) Controls(**2**): somatic anxiety (KSP), health (HQL-I)	**Emotional Stroop** Illness-related, negative, and neutral words	HA=LA, no alexithymia correlations in total sample. HA>LA, HA had greater Stroop interference to unmasked illness words than masked negative words#.	HA= <u>OR</u> [↓] to illness words.
Mueller et al (2006)	45, 67% F, M_{age}=45, M_{TAS}=54 Psychiatric inpatient sample	TAS-20 (D), OAS Controls(**2**): depression (BDI), anxiety (STAI, ASI), traits (NEO) symptoms (SCL-90)	**Emotional Stroop** Positive, negative, neutral, and body-related words	HA<LA: HA had reduced interference from negative and body words#.	HA=<u>Deficit</u> [↓] in responding to negative and body words.
Pandey (1995)	12 HA (M_{TAS}=66) 12 LA (M_{TAS}=36) 0% F, M_{age}=NR (undergraduates)	TAS-20 (D) Controls: None	**Emotional Stroop** Baseline (nonword, OOOOO), neutral and emotionally arousing (sexual) words	HA>LA: HA exhibited greater Stroop interference for arousing words.	HA= <u>OR</u> [↓] to arousing words.
Sharpe et al. (2016)	52, 100% F M_{age}=22, M_{TAS}=45 Eating disorder sample	TAS-20 (C) Controls(**2**): depression (BDI), anxiety (STAI), symptoms (EDI)	**Eye-tracking** Free viewing of happy and angry faces paired with neutral faces	HA=LA; TAS-20 not related to attention bias metrics.	*No alexithymia effect* on attention to faces.

Suslow (1998)	32, 59% F, M_{age}=27, M_{TAS}=39	TAS-20 (C) w/facets Controls: none	**Affective Priming** Positive and negative words primed with positive, negative, or neutral words	HA (DDF): greater priming facilitation, negative prime-targets. HA (EOT): greater priming facilitation, positive prime-targets.	HA (DDF & EOT) =<u>OR</u> [↑] in automatic attention to affective primes.
Suslow & Junghanns (2002)	31, 52% F, M_{age}=26, Mdn_{TAS}=39 15 HA (M_{TAS}=51) 16 LA (M_{TAS}=30)	TAS-20 (C, D) w/facets Controls: none (positive/ negative affect measured (DES) but did not analyse because no group difference	**Affective Priming** Neutral, emotional, and non-words primed with congruent or incongruent situational scenarios	Lexical decision times for emotional words: HA: congruent > incongruent LA: congruent < incongruent DIF associated with reduced situation priming	HA (DIF)=<u>Deficit</u> [↓] in automatic attention towards the emotional primes
Vermeulen et al (2006)	<u>Study 1:</u> 64, 61% F, M_{age}=20, M_{TAS}=50 <u>Study 2:</u> 58, 84% F, M_{age}19, M_{TAS}=49 <u>Study 3:</u> 60, 75% F, M_{age}=21, M_{TAS}=47	TAS-20 (C) Controls(**1**): Negative affect (NAS; Study 1,3), anxiety (STAI, Study 2,3), depression (ZDS; Study 2,3)	**Affective Priming** <u>Study 1:</u> Targets: words (positive, negative, neutral). Primes: words (positive, negative, neutral) and faces (happy, threat, neutral) <u>Study 2:</u> As Study 1 plus sad faces and words <u>Study 3:</u> As Study 2, plus face targets (happy, sad, angry, disgusted)	HA<LA; HA correlated with reduced priming from angry schematic faces (Study 1, 2, 3). HA=LA; face priming by verbal stimuli did not correlate with alexithymia.	HA=<u>Deficit</u> [↓] in automatic attention to angry faces. *No alexithymia effect* in attention to emotional words.
Vermeulen et al (2019)	55, NR % F, M_{age}=22, Mdn_{TAS}=45 27 HA (M_{TAS} =53) 28 LA (M_{TAS} =38)	TAS-20 (D) Controls: None	**Rapid Serial Visual presentation (RSVP)** Task with relaxation and exercise conditions T1 targets: neutral words T2 targets: neutral and low or high arousal words Distractors: random symbols	HA<LA. For T2 target accuracy, HA exercise= relaxation and no difference by target category, while LA exercise>relaxation, with high arousal>low arousal or neutral targets.	HA=<u>Deficit</u> [↓] in attention to arousing stimuli. HA= Deficit [↓] in attentional benefit of situational arousal.
Wiebe et al (2017)	99, 63% F, M_{age}=24, M_{TAS}=41	TAS-20 (C) w/facets Controls(**1**): depression (BDI), anxiety (STAI), IQ (WAIS-R), sex	**Eye-tracking** Free viewing of pictures (positive, neutral, threat-relevant, depression-relevant) presented in a 2x2 grid.	HA<LA (EOT). HA had reduced dwell time on depression-relevant images.	HA (EOT)= <u>Deficit</u> [↓] in strategic attentional processing of negative images.

Notes. All studies used non-clinical samples (unless otherwise stated); TAS-20: Toronto Alexithymia Scale 20 Items (C-continuous, D-dichotomous, OAS- Observer Alexithymia Scale); DIF: Difficulty Identifying Feelings subscale of the TAS-20; DDF: Difficulty Describing Feelings subscale from the TAS-20; EOT: Externally Oriented Thinking subscale of the TAS-20; LA: Low Alexithymia Scorers; HA High Alexithymia Scorers; F=Female; CH=chronic headache; HC=healthy controls; PD=panic disorder; M_{TAS}= mean (Mdn=median) TAS-20 total score; M_{age}=mean (Mdn=median) age (years); NR=not reported; ns=not significant; OR=over-responding; [↓]=detrimental effect of HA; [↑]=potentially beneficial effect of HA; (**1**)results reported effects after affect variables controlled; (**2**)results reported indicating separable or unique effect of controls; (**3**)negative affect control reduced alexithymia effect.

Instruments: ASI = Anxiety Sensitivity Index; BDI=Beck Depression Inventory; BVAQ = Bermond-Vorst Alexithymia Questionnaire; ERVT=The Extended Range Vocabulary Test; DAS-21=Depression, Anxiety and Stress Scale; DES = Differential Emotions Scale; HQL-I= Health and Quality of Life Interview; EDI=Eating Disorders Inventory; HRSA=Hamilton Anxiety Rating Scale; HRSD =Hamilton Rating Scale for Depression; KSP = Karolinska Scales of Personality; MAS=Mood Awareness Scale; NAS = Negative Affectivity Schedule; NEO = The NEO Five-Factor Inventory (60 items); PANAS=positive and negative affect scale; SCRAS =Sheehan Clinician Rated Anxiety Scale; SCL-90=90-item Symptom Checklist Revised; SOMS=Screening for Somatoform Symptoms; STAI=State Trait anxiety Inventory; TMMS= Trait Meta Mood Scale; WAIS-R= Wechsler Adult Intelligence Scale (verbal); ZDS=Zung Depression scale.

Table 2

Alexithymia and Appraisals

Study	Sample Size & Characteristics	Alexithymia Measures/Controls	Appraisal Measures	Results (Total/Facets (if specified))	Implications
Aaron et al. (2018)	108, 67% F, M_{age}=19, M_{TAS}=46	TAS-20(C); w/facets Controls: none	**Valence** Presented 14 video clips eliciting discrete emotion states (anger, amusement, contentment, disgust, fear, sadness, surprise). Primary, secondary emotions (open-ended) assessed: emotional granularity (fine-grained emotional distinctions) and dialecticism (recognizing concurrent pleasant and unpleasant states)	HA<LA (DDF): reduced emotional granularity, only for negative videos. HA<LA (EOT): reduced dialecticism, only for negative videos.	HA (DDF, EOT): Deficit [↓]. HA had reduced ability to for fine and gross distinctions of negative situations. Unpleasantness reduced in negative context. *No effect*: pleasantness in positive context.
De Timary et al. (2008)	28, 0% F, M_{age}=21, M_{TAS}=48	TAS-20(C); w/facets Controls: none	**Stress anticipation, response** Ps exposed to stressful task (TSST), measured effects of anticipatory appraisals on cortisol response	HA>LA (DDF): cortisol response, stress anticipation. HA=LA: stress exposure and recovery.	HA (DDF): OR [↓] Stronger stress response when appraising potential threat.
Fantini-Hauwel et al. (2015)	225, 69% F M_{age}=21, M_{TAS}=49	TAS-20(C); w/facets Controls(**1**): sex; negative, positive frequency (when predicting intensity; vice versa)	**Valence** Measured overall affect intensity (AIM; positive, negative subscales) and affect frequency (PANAS) without manipulation or reference to emotional events	(1) HA>LA (DIF): higher positive intensity. (2) HA<LA (DDF): lower positive intensity. (3) HA>LA (DIF): higher negative frequency.	HA (DDF): Deficit [↓] positive intensity. HA (DIF): OR [↓] higher positive intensity and greater negative frequency.
Koven et al. (2014)	96, 59% F, M_{age}=19, M_{TAS}=46	TAS-20(D) Controls(**2**): negative affect (POMS), anhedonia (CRSPAS)	**Valence** Ps viewed appetitive and aversive words and pictures	HA<LA: appetitive words and pictures rated less positively. HA=LA: aversive word and picture ratings.	HA: Deficit [↓] Pleasantness decreased in positive contexts. *No effect*: unpleasantness in negative context.

Larwood et al. (2020) (this issue)	162, 56% F, M_{age}=21, M_{TAS}=54	TAS-20(C) Controls(**2**): depression (DASS).	**Valence** Ps listened to ten 15 sec musical pieces (happy, sad, tender, angry, fearful), listed emotion word conveyed by music.	HA=LA: number of emotion words generated. HA<LA: sad, angry, fearful music judged more neutral. HA=LA: happy, tender.	HA: Deficit [↓] negative stimuli. Unpleasantness reduced, negative context. *No effect*: pleasantness, positive context.
Luminet et al. (2000)	Study 1: 99, 86% F, M_{age}=20, M_{DDF}=23, M_{F}=16 Study 2: 101, 74% F, M_{age}=22, M_{DDF}=22, M_{F}=17	BVAQ(C); w/facets Controls(**1**): Emotional intensity event; Neuroticism and Extraversion (NEO PI-R)	**Valence** Measured rumination and social sharing for recent (3 months, Study 1; 6 months Study 2) negative and positive autobiographical events	HA<LA (DF): less rumination about positive, but not negative events. HA<LA (DDF): less sharing with others, lower emotional involvement in sharing for negative, but not positive events.	HA (DF, DDF): Deficit [↓] Decreased unpleasantness in negative context (DDF) Decreased pleasantness in positive context (DF)
Luminet et al. (2004)	50, 44% F, M_{age}=64, M_{BVAQ}:NR	BVAQ(C); w/facets Controls: gender, age, health status	**Valence, familiarity, importance** Measured familiarity, importance, emotional reactions to sad movie	HA<LA (EOT): lower unpleasantness. HA<LA (DDF): lower familiarity. HA<LA (EOT): lower importance.	HA (DDF, EOT): Deficit [↓] potentially due to avoidance. Decreased unpleasantness in negative contexts (EOT, DDF).

Notes. All studies used non-clinical samples. TAS-20=Toronto Alexithymia Scale 20; BVAQ=Bermond Vorst Alexithymia Questionnaire (DF=difficulty fantasizing); C=continuous, D=dichotomous; DDF=difficulty describing feelings; DIF=difficulty identifying feelings; EOT=externally oriented thinking; F=Female; M_{TAS}= mean TAS-20 total score; M_{DIF}= mean DIF factor; M_{DDF} = mean DDF factor ; M_{EOT}= mean EOT factor; M_{F}= mean difficulty fantasizing factor; M_{age}=mean (Mdn=median) age (years); Ps=participants; OR=over-responding; [↓]=detrimental effect of HA; [↑]=potentially beneficial effect of HA; NR=not reported; (**1**)results reported effects after affect variables controlled; (**2**)results reported indicating separable or unique effect of controls; (**3**)negative affect control reduced alexithymia effect.

Instruments: AIM= Affect Intensity Measure; CRSPAS= Chapman Revised Social and Physical Anhedonia Scales; DASS= Depression, Anxiety and Stress Scale; NEO PI-R = NEO Personality Inventory-Revised; PANAS= Positive Affectivity Negative Affectivity Schedule; POMS= Profile of Mood States; STAI= State-Trait Anxiety Inventory (S=State; T=Trait); TSST= Trier Social Stress Test; Zung= Zung depression questionnaire.

Table 3

Alexithymia and Memory

Study	Sample Size & Characteristics	Alexithymia Measures/ Controls	Memory Measures	Results (Total/Facets (if specified))	Implications
Correro et al. (2020) (this issue)	Exp. 1: 296, 73% F, M_{age}=20, M_{TAS}=45 Exp. 2: 139, 67% F, 18-89 yrs, M_{TAS}=43 Exp. 3: 121, 67% F, 18-92 yrs, M_{TAS}=41	TAS-20(C), w/facets Screened: intact cognition Controls (all exp.)(**4**): age, sex, anxiety (BSI.BAI), depression (BSI/BDI)	**Neutral Words, Narratives** Exp. 1: neutral word list (*d'*, 60 min delay). Exp. 2: EF battery. Exp. 3: EF; memory: WMS-III (neutral story; 30-min delay).	Exp. 1: HA<LA; EOT and DIF predicted memory, but EOT fully mediated DIF. Exp. 2: HA<LA: DIF predicted EF. Exp. 3: HA<LA: DIF predicted EF; EOT predicted memory; moderation: poor EF + EOT = poor memory.	HA: Deficit [↓], poorer memory (EOT) and executive function (cognitive control) (DIF) in *neutral context*. Executive function interacts with EOT [↓] to influence memory.
DiStefano and Koven (2012)	12 LA (M_{TAS}=46), 12 HA (M_{TAS}=63) 18-22 yrs 75% F	TAS-20(D) Controls: none	**Neutral Words, Faces, Narratives, Scenes** WMS-III (neutral), immediate, 30-min delay; verbal: words, story; visual: faces, social scenes.	HA=LA verbal, immediate and delayed; HA<LA visual, immediate and delayed	HA: Deficit [↓], visual memory (not verbal) in *neutral* context.
Donges & Suslow (2015)	40, 100% F, M_{age}=23, M_{TAS}=35	TAS-20(C), w/facets Controls(**2**): vocab (MVT), anxiety (STAI-T), depression (BDI) Correlational analysis.	**Emotive Faces** Intentional encoding of faces (angry, fearful, happy, neutral). 30 min delayed recognition.	HA<LA (DDF): DDF inversely correlated with angry, fearful hits; HA=LA: happy, neutral	HA (DDF): Deficit [↓] emotive face memory (anger, fear).
Dressaire et al. (2014)	Exp. 1 (negative words): 60, 50% F, 35-99 yrs, M_{TAS}=52 Exp. 2 (neutral words): 60, 50% F, 35-98 yrs, M_{TAS}= 51	TAS-20(C), w/facets Controls(**1**): age, anxiety and depression (HADS)	**Neutral, Emotive Words** Directed forgetting (list method); 1 min retrieval delay. Exp. 1: negative words Exp. 2: neutral words	Exp. 1 (negative): HA<LA (EOT); HA predicted poorer recall, greater false memory; Exp. 2 (neutral): HA<LA (EOT); EOT correlated with poorer retrieval; HA>LA (DIF); DIF predicted *better* recall.	HA (EOT): Deficit [↓] *negative*; *neutral* (ns)*;* HA (EOT): OR [↓] false negative memory (cognitive control *deficit*); HA (DIF): OR [↑] *neutral*.

Jacob and Hautekeete (1998)	21 LA (TAS-26<62) 24 HA (TAS-26>74) ~90% F, 18-22 yrs	TAS-26 (French; D) Controls(**1**): anxiety (non-standard), depression (BDI)	**Neutral, Emotive Words** Incidental learning, sentence game (phrase substitution, w/tone (negative, positive, neutral)). Immediate recognition (old/new).	HA>LA: slower response time HA<LA: errors (*more* correct rejections, not more hits). HA=LA: positive>negative >>neutral.	HA: Deficit [↓] in decision time only, not memory; HA: OR [↑]; fewer errors (rigorous decision criterion, greater need for cues).
Luminet et al. (2006)	42 HA (TAS>56), 40 LA (TAS<40) 56% F, age NR (undergraduates)	TAS-20(D), w/facets Controls(**2**): positive/ negative affect (PANAS), optimism (LOT-R), depression (ZSDS)	**Neutral, Emotive Words** Incidental word learning (positive, negative, neutral), R/K paradigm, retrieval delay, 1-min w/distraction.	HA<LA: R (confident), poorer positive (total, all facets) and negative (DIF), whether shallow or deep processing. HA=LA for recall, K (familiarity), Neutral.	HA: Deficit [↓], conscious access to emotional words (*positive*: DIF, DDF, EOT; *negative*: DIF).
Lundh et al. (2002)	Exp. 1: 88, 76% F, M_{age}=29, M_{TAS}=40	TAS-20(C), w/facets Controls: none	**AMT** (positive, negative prompts).	HA=LA; No correlation of TAS-20 (total or facets) with latency or retrieval of positive or negative memories.	Alexithymia *did not contribute to* retrieval time or memory.
Meltzer and Nielson (2010)	42 LA (TAS<43) 43 HA (TAS>42) 69% F, M_{age}=19	TAS-20(D) Controls: none	**Neutral, Emotive Words** Incidental learning (word rating); positive, negative, neutral, illness words. Recall delay, 45 min.	HA<LA: negative recall HA>LA: illness recall, HA>LA: neutral recall (trend).	HA: Deficit [↓], *negative*; HA: OR [↓], *illness,* possibly pre-occupation, salience of illness
Muir, Madill, & Brown (2017)	185, 92% F, 18-36 yrs, M_{TAS}=49	TAS-20(C), w/facets Controls: none	**AMT** (negative, positive, neutral memory probes); Fading of Affect Bias (FAB, over time, negative> positive fading).	HA<LA (total score only) FAB; HA: greater positive fading, less negative fading. No effects were significant with TAS subscales.	HA: OR [↓] less affect fading; due to greater positive fading, negative persistence (*negative* salience).
Nielson & Meltzer (2009)	30 LA (TAS<38), 67% F 30 HA (TAS>53), 57% F Age NR (undergraduates)	TAS-20(D) Controls(**4**): vocab. (WAIS-R), stress (PSS), depression (BDI), anxiety (BAI)	**Neutral Words** Intentional learning, word list (neutral) followed by arousing or neutral video. Retrieval delay 24-hrs (surprise).	HA<LA: immediate recall HA<LA subjective arousal HA=LA physiological arousal HA=LA 24 hr recall, arousal condition (deficit direction).	HA: Deficit [↓] of arousal appraisal and immediate memory of *neutral* stimuli; *No effect*: delayed memory.

Ridout, Smith & Hawkins (2020) (this issue)	Exp. 1: 39, 100% F, M_{age}=20, M_{TAS}=40 Exp. 2: 38, 100% F, M_{age}=20, M_{TAS}=42	TAS-20(C), w/facets Controls(**1**): age, depression (HADS), anxiety (HADS)	**Neutral, Emotive Faces, Scenes** Emotion identification (angry, sad, happy, neutral), intentional learning. R/K paradigm, retrieval delay: 5 min. Exp. 1: faces. Exp. 2: social videos.	Exp. 1: HA=LA emotion identification; HA<LA (DDF): *d'*, angry; HA>LA (DIF): *d'*, sad; Exp. 2: HA<LA (DIF, EOT); HA predicted poorer emotive memory (DIF, EOT: hits; DIF: R, anger and happy); HA>LA (DIF); HA predicted better neutral familiarity (K).	HA: Deficit [↓], *anger* (faces, DDF; videos, DIF, EOT) and *happy* videos (DIF, EOT); HA: OR (DIF) [↓], *better* retrieval of *sad* faces; HA: OR (DIF) [↑], greater familiarity of *neutral* videos.
Senior et al., 2019	83, 87% F, M_{age}=20, M_{TAS}=46	TAS-20 (C), w/facets Controls(**2**): depression (HADS), anxiety (HADS) Correlational analysis.	**Emotive Faces** Affect matching, short-term memory (faces; anger, disgust, fear, happy, sad, surprise, neutral), with RM (25% increased / decreased expression intensity) during match decisions.	HA<LA (Total), accuracy; HA<LA (DIF), errors, forward cond. HA>LA (DIF), response time, forward cond. HA<LA (EOT): RM effect (forward > backward; fear, happy), except reduced in HA trend, p=.07). (Note accuracy >95%).	HA (total): Deficit [↓], accuracy; HA (DIF): Deficit [↓], slower RT; HA (EOT): Deficit [↓], RM effect HA (DIF): OR [↑], *reduced* errors to forward trials, possible benefit RM perception.
Suslow, Kersting, & Arolt (2003)	30, 50% F, M_{age}=36, M_{TAS}=38	TAS-20 (C), w/facets Controls(**2**): depression (BDI), vocab. (WAIS-R) Correlational analysis	**Neutral, Emotive Words** Incidental memory, pair evaluation (positive, negative adjective targets; positive, negative, neutral noun distractors). Immediate free recall.	HA>LA (DIF): DIF positively correlated with intrusions to positive distractors. HA=LA, positive, negative targets, and neutral distractors.	HA (DIF): OR [↓], more intrusion errors in recall, positive stimuli. HA: Emotional valence less salient, poorer memory organization.
Takahashi, Hirano, & Gyoba (2015)	Exp. 1: 15 LA (TAS<52), 53% F, M_{age}=21; 15 HA (TAS>60), 73% F, M_{age}=20 Exp. 2: 8 LA (TAS<52), 63% F, M_{age}=21; 8 HA (TAS>60), 63% F, M_{age}=20	TAS-20(D) Controls: none	**Neutral, Emotive Faces** Visual STM; search and change detection of abstract faces. Exp 1: montage, encoding v. storage; happy, angry. Exp. 2: probed single item (storage v. retrieval); happy, angry, neutral.	Exp. 1: HA=LA in search and change detection response time; HA<LA in change accuracy (*d'*) for happy, and within HA, happy<angry; storage effect, not encoding. Exp. 2: HA=LA (happy, angry; neutral presented but not probed); no effect on retrieval.	HA Deficit [↓], *happy* accuracy only, via immediate memory storage. No effect on response speed. Note: face stimuli were not realistic.

Terock et al., (2019)	Exp. 1: 1980, 53% F, M_{age}=55, M_{TAS}=45 Exp. 2: 3799, 51% F, M_{age}=51, M_{TAS}=42	TAS-20(C), w/facets Controls(**1**): age, sex, education, lifetime major depression (MCIDI)	**Neutral Words** Intentional neutral word list learning, multiple trials; Delay interval: immediate, 20-min;	Exp. 1: HA<LA (EOT, DIF): poorer immediate, delayed recall predicted by EOT, with DIF to lesser degree. Exp. 2: HA<LA (EOT): replicated Exp. 1, trend only at delayed recall.	HA (EOT) Deficit [↓], immediate, delayed word memory for *neutral* words in neutral context.
Vermeulen (2020) (this issue)	Exp. 1: 44, 66% F, M_{age}=21, M_{TAS}=45 Exp. 2: 44, 75% F, M_{age}=21, M_{TAS}=48	TAS-20(C), w/facets Controls(**1**): age, sex, positive/negative affect (PANAS)	**Neutral, Emotive Words** Verbal STM (auditory); 20 6-item lists; positive, negative, neutral. Exp. 1: pure lists (one word valence type/list) Exp 2: mixed lists	Exp. 1 (pure): HA< LA (TAS-total, EOT); EOT predicted poorer positive, negative recall (neutral-trend); HA<LA (DDF); DDF predicted poorer positive recall. Exp. 2 (mixed): HA=LA;.	HA: Deficit [↓] (EOT *negative, positive,* and *neutral* (trend) stims; DDF *positive* stims) when contextually cohesive. No effect in mixed context.
Vermeulen & Luminet (2009)	65, 83% F, M_{age}=19, M_{TAS}=48	TAS-20(C), w/facets Controls(**1**): anxiety (STAI-S); positive/negative affect (PANAS)	**Neutral, Emotive Words** Incidental learning; word evaluation task of neutral, joy, disgust, and anger words (shallow or deep processing). Surprise immediate (Remember/ Know) retrieval.	HA<LA (DIF); DIF associated with poorer emotion word memory (R); HA>LA (EOT) *better* memory, all categories, via emotional introspection EOT items, not external thinking items.	HA (DIF): Deficit [↓], emotive words; emotion regulation difficulty, lack of motivation for emotion processing; HA (EOT): OR [↑], improved all categories.
Vermeulen, Toussaint, & Luminet (2010)	55 LA (TAS<47), 73% F, M_{age}=22 52 HA (TAS>48), 67% F, M_{age}=21	TAS-20(D) Controls(**1**): positive/ negative affect (PANAS)	**Neutral, Emotive Words** Incidental learning; word evaluation task of neutral, joy, disgust, and anger words (shallow or deep processing) with happy or sad background music. Surprise immediate (Remember/ Know) retrieval.	HA>LA: Congruent music facilitated word processing, deep condition. HA<LA anger word retrieval, overall memory w/ angry music. HA>LA congruence effect (happy music: joy>anger; angry music: anger>joy). HA=LA: processing time.	HA Deficit [↓], anger. HA OR [↑], *congruence effect*; matching context provided support for memorizing, retrieving anger and joy words.

Notes. All studies used non-clinical samples; TAS-26: Toronto Alexithymia Scale 26 Items; TAS-20: Toronto Alexithymia Scale 20 Items (C-continuous, D-dichotomous); DIF: Difficulty Identifying Feelings subscale of the TAS-20; DDF: Difficulty Describing Feelings subscale from the TAS-20; EOT: Externally Oriented Thinking subscale of the TAS-20; LA: Low Alexithymia Scorers; HA High Alexithymia Scorers; F=Female; *d'*= d-prime, recognition sensitivity (accuracy); EF=executive functioning; K= 'know' response (familiarity in recognition); M_{TAS}= mean TAS-20 total score; M_{age}=mean age (years); NR=not reported; ns=not

significant; OR=over-responding; R= 'remember' response (confident retrieval in recognition); RM= representational momentum, perceptual extrapolation in direction of an implied trajectory; STM=short-term memory; [↓]=detrimental effect of HA; [↑]=potentially beneficial effect of HA; (**1**)results reported effects after affect variables controlled; (**2**)results reported indicating separable or unique effect of controls; (**3**)negative affect control reduced alexithymia effect; (**4**)affect variables left out of analysis as they did not correlate with DV.

Instruments: AMT=Autobiographical Memory Test; BAI=Beck Anxiety Inventory; BDI= Beck Depression Inventory; BSI=Brief Symptom Inventory; HADS=Hospital Anxiety and Depression Scale; KSP=Karolinska Scales of Personality (Trait); LOT-R=Life Orientation Test-Revised; MCIDI=Munich Composite International Diagnostic Interview; MVT=Multiple-choice Vocabulary Test; PANAS=Positive Affectivity Negative Affectivity Schedule; PSS=Perceived Stress Scale; SPM=Raven's Standard Progressive Matrices; STAI=State-Trait Anxiety Inventory (S=State; T=Trait); WAIS-R=Wechsler Adult Intelligence Scale-Revised (vocabulary subtest); WMS-III=Wechsler Memory Scale-III; ZSDS=Zung Self-rating Depression Scale.

Table 4
Alexithymia and Language

Study	Sample Size & Characteristics	Alexithymia Measures/ Controls	Language Measures	Results (Total/Facets (if specified))	Implications
Camia, Desmedt, & Luminet (2020)	4 LA, 75% F, M_{age}=50, M_{TAS}=44; 4 HA, 25% F, M_{age}=43, M_{TAS}=64 Chronic alcoholism sample	TAS-20 (D) Controls: none	**Expressive: Autobiographical Narratives** Qualitative narrative analysis (LIWC) of personal events (TSIA); 6 yes/no questions per TAS-20 facet, with elaboration using personal examples.	HA=LA: specificity HA>LA: personalization, concreteness, avoidance. HA<LA: coherence, affect ratio (HA: positive> negative), elaboration (context, feelings, interpretation).	HA Deficit [↓] in language expression, particularly negative processing; reflected personalized but low quality, unelaborated, concrete, avoidant approach.
Edwards et al. (2020)	96; 76% F, M_{age}=21, M_{TAS}=44	TAS-20(C) w/facets Controls(**1**): positive/ negative affect (PANAS)	**Expressive: Autobiographical Narratives** Narrative analysis of 6 probed personal events (5 min; 3 negative and 3 neutral or positive). Linguistic analysis (LIWC). Uncorrected correlations.	HA<LA (DIF, DDF): less positive language. HA>LA (DIF, DDF): more negative language, more self-focus, and stronger emotion-situation correspondence.	HA (DIF, DDF) Deficit [↓] in positive expression. HA (DIF, DDF) OR [↓] More negative language and perseveration on self-relevance (salience) in emotive context.
Jakobson & Pearson (2020) (this issue)	70, 51% F, M_{age}=21, M_{TAS}=47	TAS-20(C) w/facets Controls: sex, verbal IQ (WASI)	**Receptive: Social Inference** Social video vignettes (neutral), infer speaker intentions (literal, sarcastic, jocular, white lies) with or w/o verbal context.	HA>LA (DDF): *better* accuracy when no context. HA>LA (DIF): *slower* on non-literal exchanges when no context.	HA (DIF) Deficit [↓], via response time and when no context available. HA (DDF) OR [↑], *better* accuracy when no context.
Jelinek et al. (2010)	N_{PTSD}= 25, 64% F M_{age}=41, M_{TAS}=54; $N_{nonPTSD}$= 54, 48% F M_{age}=39, M_{TAS}=44 Trauma sample	TAS-20 (C) Controls: none	**Expressive: Autobiographical Narratives** Interview about trauma experience, analysed with LIWC.	HA=LA: no correlation with affect word use in full sample or non-PTSD. HA<LA: negative correlation in those with PTSD.	HA Deficit [↓] in language expression. Reduced emotional expression discussing trauma in HA with PTSD.

Kreitler (2002)	100, 50% F, M_{age}=23, M_{TAS}=55	TAS-20 (C) w/facets Controls: none	**Expressive: Autobiographical Narratives (neutral)** The Meaning Test; Communicate personal meaning of a 11 probe words (e.g., "telephone") to another person (i.e., neutral context).	HA>LA: concrete, simple, visual, externalized. (DIF: concreteness; DDF: avoidance of emotion (perceived, experienced); EOT: concrete, externalized).	HA (DIF, DDF, EOT) Deficit [↓] in *general* language expression qualitatively poorer (*neutral* context).
Luminet et al. (2004)‡	50, 44% F, M_{age}= 64, M_{BVAQ}= NR	BVAQ (C) w/facets (independent, as TAS-20) Controls: age, sex, health status	**Expressive: Emotional Narrative** Emotional video (sad), re-exposure 2d later, recount most emotional part; lexical task (bird names, emotion words). Scored emotion word content/frequency.	HA=LA: no correlation with emotion or neutral word frequency HA<LA (DDF): negatively correlated with emotion word frequency about film.	HA (DDF) Deficit [↓] in language expression. HA have sufficient emotion vocabulary, access, but use it less in emotional situations.
Meganck et al. (2009)	50, 62% F, M_{age}= 42 M_{TAS}= 60 Psychiatric inpatient sample	TAS-20 (C) w/facets Controls(**1**): positive/ negative affect (PANAS)	**Expressive: Autobiographical Narratives** Interview using CDI (2 hr; covering complaints, relationships, work/school, symptoms, etc. and follow-up probes). Used LIWC analysis of communication word frequency, complexity.	HA=LA: word frequency HA<LA (DIF, EOT) lower complexity HA>LA (EOT) more references to others v. self.	HA (DIF, EOT) Deficit [↓] in language expression. HA (EOT) OR [↓] more other-focused. HA discussions had reduced vividness, differentiation and self-disclosure.
Paez, Velasco, & Gonzalez (1999)	Exp. 3: 70 (via Exp. 1, 2); ≈65% F; M_{age}≈19; Md_{DDF}=12	TAS-20 (D)-DDF, median split. Controls: none (PPSS, positive/ negative affect (PANAS) measured but did not analyse because no group difference	**Expressive: Autobiographical Narratives** Expressive writing about traumatic or social event.	HA<LA: emotion words, esp. positive; introspection, self-reference. HA>LA: inhibition.	HA (DDF) Deficit [↓] in language expression. Intensive writing was *beneficial* relative to brief writing.

Parker, Bauermann, & Smith (2000)	8 LA, 50% F, M_{TAS}=31; 8 HA, 50% F, M_{TAS}=66; Age: NR (undergraduates)	TAS-20 (D) Controls: none	**Expressive: Autobiographical Narratives** Sleep study; dream recounting upon awakening from REM (dream) sleep.	HA=LA: valence of dreams, number of words. HA<LA: fantasy content	HA Deficit [↓] in language expression, specifically in elaboration and imagination.
Roedma & Simons (1999)	31 LA, 48% F, M_{TAS}<52; 34 HA; 56%; M_{TAS}>72; Age: NR (undergraduates)	TAS-26 (D) Controls: none	**Expressive: Autobiographical Narratives** Emotional slides; ratings, psychophysiological measures. Subjects wrote adjectives to describe how the slide made them feel.	HA<LA emotion words.	HA Deficit [↓] in language expression.
Samur et al. (2020) (this issue)	Online: 541, 55% F, M_{age}=36, M_{BVAQ}=100; Lab: 55, 55% F, M_{age}=22, M_{BVAQ}=100	BVAQ/subscores (Cognitive, aka TAS-20 total; Affective (DF)= emotionalizing, fantasizing) Controls: none	**Receptive: Narrative Engagement** Ss read fictional narrative, with either 1st- or 3rd-person perspective. Narrative engagement measured using TS.	HA<LA: (Total, DF): negatively correlated with narrative engagement. HA<LA (DF): effect of perspective (engagement 1st > 3rd) in LA, not in HA.	HA (Total, DF) Deficit [↓] in narrative processing, even w/ 1st person perspective. Developmental role in empathy, perspective-taking.
Smyth et al. (2002)	39_{asthma}, 73% F, M_{age}≈41 32_{RA}, 71%F, M_{age}≈51 Overall, M_{TAS}=44	TAS-20 (C) Controls: none	**Expressive: Autobiographical Narratives** Writing on 3 consecutive days (20 min ea.) about traumatic experience, coded for personal, emotional content and narrative structure.	HA=LA: No correlation with personal, emotional expression, change in positive or negative affect after writing; or narrative structure.	HA: no effect.
Tull, Medaglia & Roemer (2005)	541; 67% F, M_{age}=27, M_{TAS}=46	TAS-20 (C) w/facets Controls(**1**): negative affect (PANAS)	**Expressive: Autobiographical Narratives** 5-min interview about distressing past event, linguistic analysis with LIWC.	HA<LA (DIF): negative correlation with frequency, variety of positive words. HA>LA (DIF): *positive* correlation with frequency of negative words.	HA (DIF) Deficit [↓] in positive expression; may reflect reduced positive vocabulary store/access. HA (DIF): OR [↓] negative expression; may reflect mood and emotion regulation ability.

Vanheule, Maganck, & Desmet (2011)	32, 63% F, M_{age}=43, M_{TAS}=56 Mental health outpatient sample	TAS-20 (C) w/facets Controls(**1**): depression (BDI)	**Expressive: Autobiographical Narratives** Clinical interview (2hr); narrative analysis (LIWC) for frequency, complexity (diversity) of cognitive and social word use.	HA>LA (DIF): *more* cognitive words (CI incl. 0). HA<LA (EOT): *fewer* cognitive words (CI incl. 0), *fewer, less complex* social words, *less complex* cognitive words.	HA (EOT) Deficit [↓] in language expression. Reduced social word use, diversity of expression (i.e., social detachment, impaired cognitive processing).
Wagner & Lee (2008)	Exp. 1: 55, 100% F, M_{age}=20, M_{TAS}=47 Exp. 2: 54, 100% F, M_{age}=21, M_{TAS}=50	TAS-20 (C) w/facets Controls: none	**Expressive: Autobiographical Narratives** Oral narrative of a personal positive and negative event (w/ or w/o female experimenter present). Correlational analysis.	Exp. 1: HA<LA (DIF): less positive expression in positive context. HA< LA (DIF, EOT): less negative expression in negative context. Exp. 2: HA<LA; Replicated Exp. 1; social context, ns.	HA (DIF, EOT) Deficit [↓] in language expression congruent with context (DIF both positive, negative; EOT negative, may be mediated by DIF).
Wotschack & Klann-Delius (2013)	52 LA, 42% F, M_{age}=34; M_{TAS}=38; 50 HA; 42%; M_{age}=36; M_{TAS}=68	TAS-20 (D) Controls: none	**Expressive: Autobiographical Narratives** Interviews on positive, negative personal experiences (emotion word cues, autobiographical narratives, pictures, LEAS).	HA<LA: types of emotion words, emotion synonyms, fewer symptomatic and physiological words.	HA Deficit in [↓] language expression. Suggested reduced, less diverse semantic and conceptual vocabulary for emotion.

Notes. All studies used non-clinical samples except as noted; BVAQ: Bermond-Vorst Alexithymia Questionnaire (DF=difficulty fantasizing); TAS-26: Toronto Alexithymia Scale 26 Items; TAS-20: Toronto Alexithymia Scale 20 Items (C-continuous, D-dichotomous); DIF: Difficulty Identifying Feelings subscale of the TAS-20; DDF: Difficulty Describing Feelings subscale from the TAS-20; EOT: Externally Oriented Thinking subscale of the TAS-20; LA: Low Alexithymia Scorers; HA High Alexithymia Scorers; ‡=study appears in more than one table and section of the paper; F=Female; M_{TAS}= mean TAS-20 total score; M_{age}=mean age (years); *d'*= d-prime, recognition sensitivity (accuracy); PTSD=post-traumatic stress disorder; RA=rheumatoid arthritis; NR=not reported; ns=not significant; OR=over-responding; CI=Confidence Interval (contains 0=low confidence of true significance); [↓]=detrimental effect of HA; [↑]=potentially beneficial effect of HA; (**1**)results reported effects after affect variables controlled; (**2**)results reported indicating separable or unique effect of controls; (**3**)negative affect control reduced alexithymia effect.

Instruments: BDI= Beck Depression Inventory; CDI=Clinical Diagnostic Interview; LEAS= Levels of Emotional Awareness Scale; LIWC= Linguistic Inquiry Word Count; PANAS=Positive Affectivity Negative Affectivity Schedule; PPSS=Pennebaker Physical Symptoms Scale; TSIA=Toronto Structured Interviews for Alexithymia; TS=Transportation Scale; WASI= Wechsler Abbreviated Scale of Intelligence-2nd Ed. (vocabulary, similarities subtests).

Table 5

Alexithymia, Action Tendencies and Behaviors

Study	Sample Size & Characteristics	Alexithymia Measures/Controls	Action Tendencies/ Behaviors Measures	Results (Total/Facets (if specified))	Implications
Edwards & Wupperman (2017)	96, 76% F, Mdn_{age}=20, M_{TAS}=44	TAS-20(C) Controls: none	**Aggression** Self-reported impulsive aggression (IPAS), emotion regulation (DERS)	HA>LA: HA positively correlated wtih agression, which was mediated by emotion dysregulation.	HA: OR [↓] Poor access to emotion information produces emotion dysregulation in HA, predisposing them to acts of impulsive aggression.
Gvirts & Dery (2020) (this issue)	116, 65% F, M_{age}=24, M_{TAS-20}=46	TAS-20(C, D), w/facets Controls: none	**Social agreement** Videogame where Ps unaware whether playing with a bot (who acts rationally, always seeks consensus), or with other Ps.	HA<LA (EOT): HA had impaired ability to reach social agreement; evident when group harmony is low but not when group harmony is high.	HA (EOT): Deficit [↓] for interpersonal functions. Possibly due to low reliance on reward from social interactions.
Laloyaux et al. (2015)	Study 1: 255, 69% F, M_{age}=20; M_{TAS-20}=49 Study 2: 1111, 50% F, M_{age} = 41, M_{BVAQ}=106	Study 1: TAS-20(C); w/facets Study 2: BVAQ(C); w/facets Controls: age, education	**Emotion regulation** Used the ERQ; with reappraisal and suppression dimensions.	HA>LA (DDF): greater use of emotional suppression in HA; HA=LA: reappraisal	HA (DDF): OR [↓] excessive use of emotional suppression.
Panayiotou et al. (2015)	Study 1 (HC): 205, 79% F, M_{age}=21, M_{TAS}=53 Study 2 (anxiety sample): 163, 37% F, M_{age}=30; M_{TAS}=56	TAS-20(C), w/facets Controls: none	**Experiential avoidance** Self-report measures of psychosomatic symptoms (PHQ-15), depression (BDI), and experiential avoidance (AAQ)	HA>LA (DIF,DDF): positive correlation w/symptoms (Study 1), depression (Study 2); mediated by experiential avoidance. DIF reduced with depression treatment (Study 2); mediated by reduced experiential avoidance.	HA (DIF, DDF): OR [↓] (somatic symptoms, depression); mediated by experiential avoidance. Alexithymia change (DIF) with treatment due to change in experiential avoidance.

Teten et al. (2008)	38, 8% F, M_{age}=59, M_{TAS}=63 Trauma sample	TAS-20(C) Controls: none	**Aggression** Measured impulsive aggression (IPAS), verbal/physical aggression (BPAQ), empathic concern (IRI)	HA>LA: HA predicted higher impulsive agression (R^2 = .10)	HA: <u>OR</u> [↓] HA results in greates impulsive aggression, but not general aggression.
Velotti et al. (2016)	HC: 617, 46% F, M_{age}=37, M_{TAS}=43 Inpatient psychiatric sample: 257, 50% F, M_{age}=44, M_{TAS}=55	TAS-20(C) Controls(**2**): age, sex depression (BSI)	**Aggression** Measured aggression (AQ), emotion dysregulation (DERS), impulsivity (BIS-11)	HA>LA: HA positively correlated with aggression (both samples), which was mediated by emotion dysregulation (both samples), and impulsivity (only HC).	HA: <u>OR</u> [↓] emotion dysregulation responsible for the role of HA in aggression.
Venta et al. (2013)	64, 59% F, M_{age}=16, HA: M_{TAS}=71, LA: M_{TAS}=45 Psychiatric inpatient sample	TAS-20(D) Controls: none (age, sex, verbal IQ were comparable)	**Experiential avoidance** Examined self-reported emotion regulation (DERS), experiential avoidance (AFQ-Y)	HA>LA: HA positively associated with emotion dysregulation, which was mediated by experiential avoidance in this adolescent inpatient sample.	HA: <u>OR</u> [↓] HA exhbit emotion dysregulation, due to experiential avoidance.

Notes. All studies used non-clinical samples except as noted. TAS-20: Toronto Alexithymia Scale 20 Items (C-continuous, D-dichotomous); DIF: Difficulty Identifying Feelings subscale of the TAS-20; DDF: Difficulty Describing Feelings subscale from the TAS-20; EOT: Externally Oriented Thinking subscale of the TAS-20; BVAQ: Bermond Vorst Alexithymia Questionnaire (C-continuous, D-dichotomous); LA: Low Alexithymia Scorers; HA High Alexithymia Scorers; F=Female; M = Male; M_{TAS}= mean TAS-20 total score; M_{age}=mean age (years; Mdn=median); HC=healthy controls (community sample); OR=over-responding; Ps = Participants; [↓]=detrimental effect of HA; [↑]=potentially beneficial effect of HA; (**1**)results reported effects after affect variables controlled; (**2**)results reported indicating separable or unique effect of controls; (**3**)negative affect control reduced alexithymia effect.

Instruments: AAQ= Acceptance and Action Questionnaire (II); AFQ-Y= Questionnaire for Youth; AQ= Aggression Questionnaire; BIS-11=Barratt Impulsiveness Scale-11; BDI= Beck Depression Inventory(II); BPAQ= verbal and physical aggression, Buss–Perry Aggression Questionnaire; BSI=Brief Symptom Inventory; DERS= Difficulties in Emotion Regulation Scale; ERQ= Emotion Regulation Questionnaire; IPAS= Impulsive-Premeditated Aggression Scale (Impulsive Aggression Subscale); IRI= Interpersonal Reactivity Index; PHQ-15= Patient Health Questionnaire-15.

Table 6.

Frequencies of primary findings from the papers reviewed tallied across domains, for alexithymia total vs. facet scores, supporting deficits vs. over-responding

	TAS-20		**Facet-Level Analysis**					
	Total Only		**DIF**		**DDF**		**EOT**	
	Deficit	OR+/-	Deficit	OR+/-	Deficit	OR+/-	Deficit	OR+/-
Cognitive								
Attention (n=16*)	5/11	3/11	1/5	0/5	0/5	2/5	2/5	2/5
Appraisal (n=7*)	2/2	0/2	0/5	1/5	4/5	1/5	3/5	0/5
Memory (n=18)	6/6	4/6	5/12	5/12	4/12	0/12	7/12	2/12
Language (n=16)	6/6	0/6	6/10	2/10	4/10	2/10	5/10	1/10
Total (n=57*)	19/25 (76%)	7/25 (28%)	12/32 (38%)	8/32 (25%)	12/32 (38%)	5/32 (16%)	17/32 (53%)	5/32 (16%)
Behavioral (n=7)	0/4 (0%)	4/4 (100%)	0/3 (0%)	1/3 (33%)	0/3 (0%)	2/3 (67%)	1/3 (33%)	0/3 (0%)

Notes. OR -: over-responding with detrimental effect of HA. OR+: over-responding with beneficial effect of HA. *One paper (Luminet et al., 2004) appears in two domains and is counted twice. Percentage is not absolute; some studies produced no findings, others produced more than one primary finding, resulting in final percentages that may not tally to 100%.