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Anxiety Sensitivity as a Transdiagnostic Factor in Emotional Disorders, Addictive Disorders, and Their Comorbidities: How Basic Research Informs Intervention Research

Public Significance Statement

Emotional disorders (anxiety, depressive, and stress/trauma disorders) and addictive disorders (substance use and gambling disorders) are highly comorbid conditions. This review covers basic and intervention research on anxiety sensitivity (AS) as a transdiagnostic factor which may help explain this comorbidity and which can be targeted to effectively treat or prevent both emotional and addictive disorders. The article also illustrates how basic, mechanistic research is essential for informing effective intervention content.

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Abstract

The present article summarises our research program on anxiety sensitivity (AS)—a cognitive–affective dispositional factor involving fears of anxiety-related sensations due to beliefs that these sensations have catastrophic consequences. AS and its lower order dimensions are established as transdiagnostic risk or maintenance factors for emotional disorders and addictive disorders. Understanding mechanisms by which AS exerts its effects can reveal key intervention targets for AS-focused preventative and treatment programs. In the present article, I review basic research we have conducted to understand the mechanisms linking AS to these disorders and their symptoms. I also describe AS-targeted

transdiagnostic interventions and illustrate how basic research informed the content of these interventions. Finally, I review current projects underway in my lab and highlight important future directions for this field. While substantial progress has been made over the past 3 decades, and research has considerably advanced our understanding of AS as a transdiagnostic factor, there are many remaining questions. Answers should help us further refine interventions to maximally benefit people with a high level of fear of fear.

Keywords: anxiety sensitivity, transdiagnostic factor, emotional disorder, addictive disorder, cognitive behaviour therapy

The present article is an invited article to accompany my receipt of the 2023 Donald O. Hebb Award for Distinguished Contributions to Psychology as a Science from the Canadian Psychological Association. In this article, I will focus on my interests in and discoveries relevant to the nature, causes and consequences, and intervention of anxiety sensitivity (AS)—a trait which I have been studying for over 3 decades. I began this work as a clinical psychology graduate student at McGill University and continued to expand and refine it as a faculty member at Dalhousie University. I am truly honoured to receive an award that celebrates the legacy of D. O. Hebb given overlaps in our institutional histories, research epistemologies, and student mentorship philosophies. When I was an undergraduate honours psychology student at Dalhousie in the mid-1980s, Hebb was a professor emeritus there, as he had returned to his home province of Nova Scotia in his retirement; his influence was pervasive in the top-notch experimental methodology, cognitive psychology, and neuroscience training I received as an undergraduate. Hebb's legacy continued to shape my doctoral training at McGill where Hebb spent most of his academic career; his philosophy that mechanistic research is needed to inform effective interventions can be seen in my PhD dissertation research—a set of basic, mechanistic studies designed to understand the role of AS in the comorbidity of anxiety and alcohol use disorders. Hebb's influence persisted as I returned home to Nova Scotia to begin as a faculty

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member in the newly established clinical psychology doctoral training program at Dalhousie in the early 1990s where I continued my mechanistic research interests studying fundamentals of the AS construct. As a licenced, practicing clinical psychologist, towards the end of the 1990s, I began to use the basic research knowledge we had gleaned to inform intervention development and I applied experimental methods to evaluate intervention efficacy. Another point of my overlap with Hebb is our shared commitment to graduate student mentorship and our common training philosophy that graduate students should be supported and guided to pursue their interests and passions within their supervisor's broad areas of expertise yet should be allowed substantial independence in doing so.

So, what is AS? It has been defined as a cognitive-affective individual difference variable involving a fear of anxiety-related sensations based on beliefs that those sensations portend dangerous consequences (Reiss & McNally, 1985). For example, a high AS person might fear sensations such as dizziness, difficulties concentrating, or observable shakiness due to beliefs that such sensations signal oncoming catastrophe. In contrast, a low AS individual would interpret these same sensations as temporary consequences of being in an anxious state and would not experience additional fear in response to those sensations. AS is said to be an "anxiety amplifying" trait: When a high AS person is anxious, they become alarmed by their anxiety and arousal sensations, and this creates an escalation in their anxiety (Reiss, 1991). While AS is correlated with trait anxiety, it is a conceptually and empirically distinct personality characteristic. While trait anxiety refers to the cross-situational tendency to be more likely than others to experience anxiety, only a high AS person will experience additional anxiety due to their fears of anxious emotions and associated arousal-related sensations.

While initially conceptualised as a unidimensional construct (Reiss & McNally, 1985), much work has now shown that AS is better conceptualised as consisting of three dimensions: physical concerns (e.g., fearing that a racing heart is a sign of an oncoming heart attack), cognitive concerns (e.g., fearing that an experience of derealization is a sign that one is going crazy or about to lose control), and social concerns (e.g., fearing that trembling in front of others will lead to social rejection/exclusion). One of our early factor analytic studies of the original 16-item Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1992) revealed these three factors were replicable across gender and further suggested a hierarchical structure to the ASI with the three lower order AS dimensions each loading onto a single higher order global AS factor (Stewart et al., 1997). However, most items on the original ASI-tapped AS physical concerns leading to several attempts to revise the original ASI to produce more reliable AS cognitive and social concern subscales. The ASI-3, which I codeveloped and validated, is a psychometrically sound and now commonly used measure of AS which reliably taps each of the AS lower order dimensions with a set of three six-item subscales (Taylor et al., 2007). My former graduate student Kristi Wright has shown that these same three dimensions are evident in children/adolescents (Wright et al., 2010).

Distinguishing among these three dimensions of AS appears important as each has relatively unique emotional disorder correlates in both adults and children/adolescents, as illustrated in my work with graduate students (e.g., Jemcov et al., 2023; McLaughlin et al., 2007; Olthuis, Watt, & Stewart, 2014; Zahradnik et al., 2009). For example, AS physical concerns has been repeatedly linked to symptoms of

panic disorder and posttraumatic stress disorder (PTSD), AS cognitive concerns to symptoms of generalized anxiety disorder and depression, and AS social concerns to symptoms of social anxiety disorder. Moreover, the various AS domains are correlated with other transdiagnostic factors in ways that would be expected theoretically, yet still established to be conceptually and empirically distinct. For example, fear of negative evaluation is most closely linked to AS social concerns, and yet factor analysis has shown the two constructs to be factorially distinct (McWilliams et al., 2000).

We have accumulated considerable evidence on the origins of AS. Behaviour genetics research comparing rates of concordance in monozygotic and dizygotic twins has determined that AS arises in part from heritable factors (i.e., a genetically inherited tendency to fear arousal-related sensations) at least among females (Taylor et al., 2008). Moreover, among women, more severe forms (compared to milder forms) of AS were more strongly influenced by genetics (Taylor et al., 2008). A set of collaborative studies that I have conducted with my longtime collaborator, Margo Watt, have also shown an important role for childhood learning experiences involving operant and vicarious conditioning in the origins of AS. Our research has shown that AS arises from learning to catastrophize about the meaning of bodily sensations (anxiety-related sensations and other sensations like rashes) through operant and vicarious conditioning of sick role behaviour in response to such sensations in childhood/adolescence (Stewart, Taylor, et al., 2001; Watt et al., 1998; Watt & Stewart, 2000). For example, a family might inadvertently reward a child or adolescent who is experiencing dizziness by having them rest and watch TV whenever they experience these sensations; or the child/adolescent might observe parents being rewarded for sick role behaviour in response to parental experiences of bodily sensations. These studies also showed that the acquired fear of arousal-related sensations, particularly, puts high AS individuals at risk for the development of panic, whereas the acquired fear of bodily sensations more generally puts high AS individuals at risk for the development of health anxiety. We have also shown that childhood/adolescent exposure to parental loss of control (e.g., due to anger or alcohol intoxication) may contribute to AS development, particularly AS cognitive concerns (MacPherson et al., 2001; Watt & Stewart, 2003). Overall, it appears that both heredity and learning experiences contribute to the development of global AS and its components.

As a clinical psychology graduate student, studying under the mentorship of alcohol research expert, Robert Phil, I was interested in understanding mechanisms underlying the high comorbidity between panic disorder and alcohol use disorder (see review by Stewart et al., 2016). While developing my plans for my doctoral dissertation, I came across the AS construct and became fascinated with this individual difference variable as a potential common factor that might contribute to both panic and alcohol use disorders. While originally conceptualised as a trait distinguishing panic disorder from generalized anxiety disorder (with AS levels higher in panic disorder; McNally, 1992), AS is now well-established as an important transdiagnostic factor involved in several different emotional disorders (i.e., anxiety, mood, and trauma/stress disorders) and several different addictive disorders. Transdiagnostic risk factors are a central element in the so-called "third wave" of CBT and have been defined as functionally important factors that can be targeted in intervention and that represent important change pathways that cut across a variety of different diagnoses (e.g., Hayes & Hofmann, 2017).

Identifying transdiagnostic risk and maintenance factors is important clinically given the very high rates of comorbidity within and between emotional disorders and addictive disorders. For example, anxiety disorders are highly comorbid with one another (Lewinsohn et al., 1997) and with depressive disorders (Kalin, 2020). PTSD is highly comorbid with both anxiety and depressive disorders (Sareen, 2014). Similarly, the various addictive disorders are highly comorbid with one another (Cunningham-Williams et al., 2000). Moreover, emotional disorders co-occur with addictive disorders at rates that far exceed chance (Stewart, 1996; Stewart et al., 2016). Why should we care about comorbidity? Emotional and addictive disorder comorbidity is associated with having a worse course, more severe symptoms, poorer response to treatment, and higher rates of relapse (Stewart et al., 2016). These high rates of comorbidity present problems for intervention as it is onerous for both the client and the health care system to have the client attend one evidence-based intervention for each of the client's comorbid disorders. Thus, integrated treatments have been developed (e.g., Concurrent Treatment of PTSD and Substance use Disorders Using Prolonged Exposure for comorbid PTSD and substance use disorder; Back et al., 2014). But such integrated treatments have high dropout rates likely because they are highly demanding of clients (Conrod & Stewart, 2005). Transdiagnostic treatments have the advantages of streamlining treatment to common processes contributing to both disorders and reducing provider burden in having to learn/achieve competency in delivery of several different integrated treatments for each form of comorbidity. AS is one very promising transdiagnostic factor that may help with our understanding of the development and maintenance of emotional disorders, addictive disorders, and their comorbidities.

The purposes of this review article are threefold. First, I will guide readers through work I have conducted with my mentors, colleagues, and students on the topic of AS as a transdiagnostic factor for emotional and addictive disorders. This summary includes sharing the insights uncovered through our experimental, correlational, and longitudinal research on relevant mechanisms to explain the high comorbidity both within and between emotional disorders and addictive disorders. Second, I will review the work we have conducted on AS as a transdiagnostic intervention target for simultaneously intervening with emotional disorder and addictive disorder symptoms and risk, highlighting how the more basic research has contributed to these intervention innovations. This is not meant to be an exhaustive review of the work in this field but rather a more focused review of the work that I have done with my colleagues and students as a way of illustrating the links across basic and applied research over my career in this field. Finally, I will briefly consider some of the unanswered questions in this field and review the purposes of some of our ongoing research projects. This article concludes with suggestions about where I believe research in this area needs to go in future.

Basic Research on AS

Lab-Based Research: Alcohol Challenge

As a graduate student, I was interested in whether high AS individuals might be particularly sensitive to the arousal-dampening properties of alcohol and whether this might be a mechanism that would contribute to risk for heavier or more problematic alcohol use

in this group. My first study in this area (Stewart & Pihl, 1994), conducted as a part of my doctoral dissertation, involved a sample of university women divided into three AS groups (low, moderate, and high) based on their scores on the original 16-item ASI (Peterson & Reiss, 1992). We examined their subjective-emotional and autonomic responses to threat in the form of aversive noise bursts both when they were sober and after they had consumed an intoxicating dose of alcohol. In the sober testing condition, the high AS women reported greater subjective-emotional arousal as they anticipated the noise bursts relative to the low AS women. Alcohol consumption was associated with a dampening of subjective-emotional arousal as women anticipated the noise bursts, particularly among the high AS women. ASI scores were positively correlated with the degree of autonomic reactivity (skin conductance) when anticipating the noise bursts. We also found that ASI scores were correlated with the degree of alcohol-induced dampening of autonomic threat reactivity. It was concluded that high AS women's sensitivity to this alcohol dampening of their anticipatory emotional and autonomic threat reactivity would be negatively reinforcing, contributing to their greater drinking.

While this early alcohol challenge study was useful in identifying mechanisms that might contribute to alcohol risk in high AS women, at that time, experimental psychopathologists were finding ways to specifically provoke arousal-related bodily sensations in the lab as means for studying mechanisms contributing to panic disorder aetiology and maintenance. These lab-based arousal-induction challenges included inhalation of carbon dioxide enriched air, breath-holding, and voluntary hyperventilation (see review by Abrams et al., 2008). These so-called "biological challenge" paradigms reliably bring on arousal-related sensations that mimic the experience of state anxiety. For example, we had a sample of healthy nonclinical participants complete a set of inhalations of 20% CO₂-enriched air in the lab to examine psychological predictors, including AS, of various aspects of subjective-emotional and physiological responses to the arousal-induction challenge (Zvolensky et al., 2001). Different dimensions of AS (namely physical and cognitive concerns) consistently predicted different aspects of response to this CO₂ inhalation challenge. AS physical concerns predicted self-reported fear and affective ratings of emotional arousal. AS cognitive concerns predicted emotional displeasure and emotional dyscontrol. Although no variables predicted the physiological index of arousal, we had utilised heart rate which, in hindsight, may not have been the best physiological index of anxiety (see Fowles, 1983). This study, and others like it, established AS as a useful trait for predicting fear and emotional reactivity in response to arousal-induction challenge.

Early in my faculty position at Dalhousie, my former graduate student, Alan MacDonald, and I embarked upon a set of studies that brought together the use of alcohol challenge methods I had learned as a doctoral student, with the biological arousal-induction challenge methods for bringing on feared arousal sensations in the lab. We were specifically interested in understanding whether high AS might promote heightened sensitivity to alcohol's emotional reactivity dampening effects to a more theoretically relevant lab-based stressor. We also investigated alcohol dose-response effects. We employed another biological challenge—namely voluntary hyperventilation—which has been shown to reliably bring on the arousal-related anxiety sensations that are so feared by high AS individuals. We invited high and low AS students (identified with the original ASI; Peterson & Reiss, 1992) with no

history of panic disorder to the lab and randomly assigned them to one of three beverage conditions: placebo, low-dose alcohol, or high-dose alcohol. Following beverage consumption and absorption, they underwent a 3-min voluntary hyperventilation challenge. They then completed a measure (Rapee & Medoro, 1994; Sabourin et al., 2013) assessing their subjective experiences of somatic responses (e.g., pounding heart), cognitive responses (e.g., losing control), and affective responses (e.g., fear) to the hyperventilation challenge. High AS participants assigned to the placebo condition reported greater fear and catastrophizing responses to the hyperventilation challenge than did the low AS individuals assigned to the placebo condition. This finding is consistent with a cognitive perspective that high AS individuals' tendency to catastrophize the meaning of arousal-related sensations when sober contributes to their greater fear reactions when experiencing anxiety-related bodily sensations like rapid heartbeat or shortness of breath. Interestingly, only the high AS participants showed sensitivity to alcohol's reduction in their affective and cognitive responses to the hyperventilation challenge, and this dampening was greatest in the high-dose alcohol condition. Thus, consistent with the results of our earlier study (Stewart & Pihl, 1994), alcohol dampened the fear response to a threatening challenge. What was new was learning that this subjective-emotional effect of alcohol could be at least partially cognitively mediated since the high dose of alcohol significantly dampened high AS participants' sober tendency to catastrophize the meaning of arousal-related bodily sensations. Dose-dependent alcohol-induced reductions in somatic reactivity to hyperventilation were observed in both the high and low AS groups alike making it an unlikely candidate to explain high AS individuals' greater drinking (e.g., Stewart et al., 1995). Results of this study suggested that high AS individuals are particularly sensitive to alcohol-induced dampening of their fear and catastrophizing in response to arousal-related physical sensations. Moreover, higher doses of alcohol may be particularly negatively reinforcing since they produce greater dampening of these tendencies than lower alcohol doses. This study suggested that cognitive behavioural interventions should focus on challenging high AS individuals' tendencies to engage in cognitive distortions like catastrophizing the meaning of arousal-related sensations as a way of reducing their risk of turning to excessive drinking.

This first combined alcohol-hyperventilation challenge study ruled out alcohol expectancies (i.e., beliefs about alcohol's anxiety- or arousal-dampening properties) as contributors to the observed effects of alcohol, through the use of a placebo control (MacDonald et al., 2000). However, this did not rule out the possibility that alcohol expectancy might exert additional influences beyond those observed in the alcoholic beverage conditions in the MacDonald et al.'s (2000) study. Thus, we conducted an additional study (MacDonald et al., 2001) where high AS individuals were assigned to one of three conditions: alcohol (pharmacology + expectancy), placebo (expectancy alone), and control (no expectancy, no pharmacology). Following beverage consumption and absorption, participants underwent the same 3-min voluntary hyperventilation challenge used in our previous study and reported on their somatic, affective, and cognitive responses to the hyperventilation challenge. Results replicated the MacDonald et al.'s (2000) findings: high AS participants in the alcohol condition showed dampened affective, cognitive, and somatic responses to hyperventilation compared to those in the both the alcohol and control conditions. A comparison

of the responses to hyperventilation among those in the placebo and control conditions revealed no dampening of scores on the Hyperventilation Questionnaire among those in the expectancy alone (placebo) condition. However, we conducted additional exploratory analyses. We noted that the shape of the data suggested greater (rather than lesser) affective and cognitive responses in those in the placebo compared to the control condition suggesting the possibility of an inverse placebo effect. This effect can occur when people are expecting to receive a drug and do not experience the expected pharmacological (e.g., anxiolytic) effects of the drug following ingestion, causing them to experience even more anxiety than had they not been expecting the relieving effects of the drug. To explore the inverse placebo effect further, we divided placebo condition participants into those with high and low levels of theoretical expectancy activation based on their self-reported alcohol intoxication levels. Those with high levels of alcohol expectancy activation in the placebo condition showed greater levels of both affective and cognitive reactions (but not somatic reactions) to hyperventilation than those with lower levels of expectancy activation, consistent with the possibility of an inverse placebo effect. Given the possible involvement of elevated tension-reduction alcohol outcome expectancies (or "relief" expectancies more broadly) in contributing to the inverse placebo effect among high AS participants in the MacDonald et al.'s (2001) study, we suggested that assessment and challenge of such positive alcohol outcome expectancies might prove a useful additional component of interventions for preventing/treating problem drinking in high AS individuals (see Darkes & Goldman, 1993, for alcohol expectancy challenge methods).

Lab-Based Research: Drinking Contexts for High AS Individuals

One key lesson learned along the way is that studies often do not produce the hypothesised results and such studies often result in just as much new knowledge as when hypotheses are supported. My lab-based research on the contextual factors influencing high AS individuals' alcohol consumption is a case in point. As part of my former graduate student, Sarah Samoluk's first doctoral dissertation study, we made use of an unobtrusive taste-rating test developed by Alan Marlatt to study the conditions under which high AS individuals change their alcohol consumption behaviour in the lab (Samoluk & Stewart, 1996). The taste-rating task involves having individuals consume various alcoholic and nonalcoholic beverages under the guise of rating the beverages on various dimensions of taste to help the experimenters chose a beverage for use in an upcoming experiment; the actual outcome of interest is their level of alcoholic beverage consumption. University students were selected for their high or low AS status based on ASI scores (Peterson & Reiss, 1992) and were randomised either to a condition where they anticipated speaking with an interviewer about their experiences with anxiety or to a "control" condition where they anticipated an interview about their food preferences. While awaiting their interview, they were asked to complete the Marlatt taste-rating task; they were not made aware of our interest in the effects of interview condition on their consumption levels. Directly contrary to prediction, high AS individuals did consume significantly more alcoholic beverages than the low AS participants, but only when they were anticipating the interview about food. We speculated that

social evaluative concerns in the high AS individuals may have suppressed their normally higher levels of alcoholic beverage consumption when they were anticipating the interview about their anxiety experiences. Alternatively, their enhanced interoceptive sensitivity (discussed later) may have led high AS students to use alcohol to dampen the physical discomfort brought on by anticipating an interview about food given that all participants were asked to fast prior to the interview so that all would have similar effects of alcohol consumption. While the results were not as expected, they made us consider more closely how social evaluative concerns among high AS individuals might, under certain contexts, suppress alcohol consumption, and the roles that interoceptive sensitivity and physical discomfort might play in motivating alcohol consumption in high AS individuals. I will return to both these themes at later points in this article.

In a second study involving this same alcohol taste-rating task, we examined whether a solitary versus social context influenced alcoholic and nonalcoholic beverage consumption (Samoluk et al., 1999). Participants selected for high and low AS status were randomly assigned either to a condition where they played a game alone or where they played the same game in a social context with two experimental confederates. Consistent with hypothesis, the high AS solitary context participants drank more alcohol than the low AS solitary context and the high AS social context participants. Unexpectedly, the same pattern of significant differences was observed for levels of nonalcoholic beverage consumption suggesting a lack of specificity of our context effects to alcohol intake. However, consistent with hypothesis, only alcoholic beverage intake, and not nonalcoholic beverage intake, was correlated with negative affect scores and only among the high AS participants. Given that solitary alcohol consumption and alcohol use motivated by a desire to manage negative affect are both risk factors for problematic alcohol use (e.g., Bresin & Mekawi, 2021; Keough et al., 2018), these lab-based findings were consistent with high AS individuals showing a risky pattern of situation specific alcohol consumption. Findings suggest the importance of reducing solitary drinking and coping-motivated alcohol use among high AS students.

Lab-Based Research: Cognitive Paradigms

Another area of lab-based research that has proven helpful in understanding AS as a transdiagnostic factor is the use of experimental tasks assessing various cognitive biases that may contribute to risk. These various tasks tap processes occurring at distinct phases of information processing: attention, interpretation, and memory.

In one such experiment, we examined attentional bias for threat among high AS individuals using the Stroop colour-naming task (Stewart et al., 1998). Participants were selected to fill two AS groups (high and low) based on scores on the original ASI (Peterson & Reiss, 1992). A computerised Stroop contained three categories of target words: physical threat (e.g., *suffocated*, *coronary*), social/psychological threat (e.g., *crazy*, *embarrass*), or neutral (e.g., *towel*, *motel*). The participants' task was to name the colour of ink in which words were printed as quickly and accurately as possible. On the Stroop task, colour-naming speed is slowed if the respondent's attention is selectively drawn to and/or held by the content of the word, interfering with the assigned task of colour-naming. High AS participants demonstrated more threat-related interference in colour-

naming overall, when compared to low AS participants, establishing a selective attentional bias pertaining to the feared catastrophic physical, social, and psychological consequences of anxiety sensations among high AS individuals.

In a collaboration with my former graduate student Susan Buffett-Jerrott, we reasoned that the selective attention to physical threat words on the Stroop observed in the Stewart et al.'s (1998) study should translate into selective attention to internal arousal sensations among high AS individuals, and hence greater interoceptive sensitivity (Stewart, Buffett-Jerrott, et al., 2001). We studied this in the lab through a heartrate awareness task with high and low AS individuals selected according to scores on the original ASI (Peterson & Reiss, 1992). We employed a mental arithmetic/spelling task as a stressor. We examined heartrate reactivity to the stressor and compared participants' heartrate estimations to their actual heartrate both before and after the stressor. The stressor was successful in increasing heart rate, although there were no significant AS group differences in heartrate reactivity to the stressor. High AS individuals were more accurate in their heartrate perceptions than low AS individuals both before and after the stressor, consistent with greater interoceptive sensitivity in the high AS participants. Contrary to our predictions, however, high AS individuals were not more accurate in estimating their heartrate when in an emotionally aroused state than when in a relaxed state at baseline. This suggests that high AS individuals may remain chronically vigilant toward bodily arousal cues (Stewart, Buffett-Jerrott, et al., 2001).

In a study of interpretive biases (Olthuis et al., 2012), participants were selected to fill two AS groups (high and low) based on scores on the original ASI (Peterson & Reiss, 1992). Participants completed a measure of interpretive bias and outcome measures of panic and generalized anxiety symptoms. The interpretive bias measure examined the likelihood of choosing catastrophic interpretations of ambiguous events, and the degree of belief in those catastrophic interpretations, in four domains: arousal-related bodily sensations, general events, social events, and other bodily sensations. High AS individuals scored significantly higher than low AS individuals on all interpretation scores (likelihood and belief scores in each domain). We also used hierarchical regressions to examine the unique and shared contributions of AS and each type of interpretive bias to the prediction of panic and generalized anxiety symptoms, respectively. AS alone predicted each anxiety outcome. When the interpretive bias scores were added in, the magnitude of the prediction by AS was decreased but not eliminated and different domains of interpretive bias predicted each outcome. AS and interpretive bias for ambiguous arousal sensations predicted panic symptoms. AS and interpretive bias for ambiguous general and social events predicted generalized anxiety symptoms. Results were quite consistent regardless of whether interpretive bias was indexed with the likelihood scores or the degree of belief in the interpretation. Findings are consistent with the conceptualisation of AS being the transdiagnostic predisposing factor that contributes to both panic and generalized anxiety, and interpretive bias being the cognitive process through which AS exerts (some of) these risk effects. Although AS sets up for several types of interpretive bias, the particular interpretive bias exerts more specific effects in terms of risk for certain forms of anxiety-related psychopathology. Finally, the fact that AS continued to predict both anxiety outcomes even after accounting for interpretive bias suggests that interpretive

bias is merely one mechanism explaining how AS contributes vulnerability for various anxiety-related disorders.

In another such experiment (Lefavre et al., 2006), we examined automatic associative memory processes in high and low AS individuals based on scores on the original ASI (Peterson & Reiss, 1992). We used an associative memory paradigm called the Extrinsic Affective Simon Task (EAST; De Houwer, 2003). This is a reaction time task that examines how quickly a specific category of word is responded to when it is mapped onto the same or a different response key as another theoretically related (or unrelated) category of word. When two categories of words are strongly associated in semantic memory, processing speed should be quicker when the two categories of word are mapped onto the same response key. We used the EAST to test whether individuals with high AS show stronger automatic memory associations between arousal-related sensations and harmful (vs. harmless) consequences. High AS participants' reaction times were significantly faster on trials where anxiety sensation target words were mapped onto the same response key as harmful consequences. No such bias was seen for low AS participants nor when target words were neutral body parts. Between-group differences persisted when controlling trait anxiety and panic but not when controlling illness-related beliefs suggesting an important role for health anxiety beliefs in accounting for the strong automatic memory associations between bodily arousal sensations and catastrophe in high AS individuals.

Studies such as these have helped identify cognitive biases operating in high AS individuals that may help explain how AS confers risk for various forms of emotional and addictive disorders. For example, high AS individuals' tendencies to selectively attend to social threat cues may help explain high AS's role as a risk for social anxiety disorder given prior findings of selective attention to social threat among those with social anxiety disorder (e.g., Hope et al., 1990). Or high AS individuals' tendencies to selectively attend to physical threat cues and their enhanced interoceptive sensitivity may help explain high AS's role as a risk for panic disorder given prior findings of selective attention to physical threat (e.g., Hope et al., 1990) and enhanced heart rate awareness (Ehlers & Breuer, 1992) among those with panic disorder. Finally, work with my former graduate student Carol Thompson, showing selective attention to physical threat cues is associated with benzodiazepine use (Stewart et al., 2000) suggests a possible mechanism linking AS with sedative drug dependence (Conrod, Pihl, et al., 2000).

Self-Report Research: Substance Use Motives and Contexts

One reason that high AS individuals may be at risk for problematic substance use is that they consume substances for riskier reasons than others do. In an early study, we examined the role of AS in predicting motives for use of alcohol, cannabis, and tobacco in adolescents when controlling other relevant traits (Comeau et al., 2001). We found that, in the case of alcohol and cannabis, AS significantly predicted greater conformity motives for use (a form of negative reinforcement motive involving use to fit in with a peer group and to reduce social censure for not using). We also found that AS and trait anxiety positively interacted in predicting coping motives for alcohol and tobacco use: The positive relationship between trait anxiety and coping motives was strongest among those high in AS. Thus, being an anxious adolescent

motivated alcohol and tobacco use to cope when the individual was also high in fear of anxiety. This interaction was consistent with theoretical speculations that trait anxiety and AS may interact in predicting substance use outcomes (e.g., Stewart & Kushner, 2001).

Our study of adult, community-recruited cannabis users (Hecimovic et al., 2014) found that distinct personality factors were associated with different motives for cannabis use. For example, we showed once again that AS was linked to increased conformity motives for cannabis use. Similarly, in two studies with adolescents involved in the child welfare system and Indigenous adolescents, respectively, led by my former postdoctoral fellow, Amanda Hudson, and my former graduate student, Christopher Mushquash, AS was again linked to conformity motives for use, even among these higher risk samples (Hudson et al., 2015; Mushquash et al., 2014).

In a three-wave, 1-year longitudinal study with my former postdoctoral fellow, Sean Mackinnon, and graduate student, Ivy-Lee Kehayes, we (Mackinnon et al., 2014) examined links between personality factors including AS on the Substance Use Risk Profile Scale (SURPS; Woicik et al., 2009) and drinking motives on the five-factor Modified Drinking Motives Questionnaire—Revised. This measure of drinking motives is a validated expansion of Cooper's (1994) four-factor drinking motives model, validated by my former graduate student Valerie Grant, but with coping motives broken down into drinking to cope with anxiety and drinking to cope with depression (Grant et al., 2007). In the between-subjects model, when accounting for the other SURPS traits and other drinking motives, AS was associated with both conformity drinking motives and coping with anxiety drinking motives. This pattern suggests both these risky negative reinforcement drinking motives (Grant et al., 2007) should be targeted in interventions with high AS undergraduates.

In a study of smokers attending a tobacco cessation program, in a project with my former graduate students Susan Battista and Heather Fulton, we examined links of AS with motives for smoking when program participants were assessed at pretreatment baseline (Battista et al., 2008). Participants completed the original ASI (Peterson & Reiss, 1992) as well as the Reasons for Smoking Test (RFS; Ikard et al., 1969). An initial principal components analysis of the RFS items revealed two motivational factors: negative and positive reinforcement. ASI scores were significantly positively correlated with both smoking motives. However, the correlation of AS with negative reinforcement motives remained significant when controlling positive reinforcement motives, but the correlation of AS with positive reinforcement smoking motives did not remain once negative reinforcement motives were controlled. At the level of AS components, AS physical concerns were more strongly related to negative reinforcement smoking motives, whereas AS cognitive concerns were related to both negative and positive reinforcement smoking motives. This is interesting as AS physical concerns are most strongly related to panic disorder and AS cognitive concerns to depression, both of which are highly comorbid with tobacco dependence (e.g., Zvolensky et al., 2003). It is possible that AS physical concerns may selectively drive negative reinforcement smoking motives (e.g., smoking to cope with negative affect and withdrawal) in panic-prone smokers, whereas AS cognitive concerns may selectively drive both smoking for negative reinforcement (relief from negative affect) and for positive reinforcement (to relieve anhedonia) among depression-prone smokers.

We examined the relations of AS levels (measured by the original ASI; Peterson & Reiss, 1992) to drinking motives after controlling two other traits related to AS, namely experiential avoidance and alexithymia (Stewart et al., 2002). Once again, AS was independently related to greater conformity motives for drinking. A novel finding was a significant indirect relation of AS to coping-motivated drinking through experiential avoidance. In other words, AS led students to avoid internal experiences (emotions and bodily sensations) which in turn motivated drinking to cope. This novel finding suggested that interventions for high AS young people should target their general tendency to avoid internal experiences to reduce their risky coping-motivated drinking.

In another study (Stewart, Zvolensky, et al., 2001), we conducted the first test of how risky drinking motives may help to explain associations between AS and drinking behaviour. University drinkers were parcelled into three AS groups: low, moderate, and high. In addition to completing the original ASI (Peterson & Reiss, 1992), participants also completed measures of drinking motives (Cooper, 1994) and of drinking behaviour. We showed that the high AS students reported greater weekly drinking frequency and yearly binge drinking than the moderate and low AS students. Moreover, higher negative reinforcement drinking motives (coping and conformity) mediated the links of AS group to both indices of drinking behaviour. The relation of AS to drinking behaviour was mediated through conformity motives for males and largely through coping motives for females. Finally, of the three AS dimensions, it was AS social concerns that showed the strongest relations to the drinking indices, suggesting it should be targeted in interventions for high AS students to reduce their risk for excessive drinking.

Other research investigated links of AS to specific drinking contexts. In our first study in this area (Samoluk & Stewart, 1998), we utilised the original ASI (Peterson & Reiss, 1992) and the validated 42-item Inventory of Drinking Situations (Annis et al., 1987) with a large sample of university students. AS was related to a greater propensity to consume alcohol in three specific negative reinforcement drinking situations: situations involving negative emotions, physical discomfort, and conflict with others. In addition, AS was also related to a greater propensity to drink in situations involving sudden temptations to drink and those involving testing personal control over drinking. These findings were largely replicated in a study with adult women in treatment for an alcohol use disorder (Reyno et al., 2006). In this second study, we controlled for the impact of anxiety and depression and still found that AS was uniquely associated with a propensity for drinking in negative reinforcement and temptation situations and unrelated to the propensity for drinking in positive reinforcement situations. Thus, interventions for reducing risky drinking in high AS individuals, whether as a treatment or as an early intervention strategy, should target drinking in negative reinforcement and temptation types of drinking situations.

Interoceptive Avoidance

In collaboration with former clinical psychology graduate students Brigitte Sabourin and Christopher DeWolfe, who had interests at the intersection of clinical psychology with health psychology and sport psychology, respectively, we examined links of AS to involvement in physical activity/formal exercise. Illustrating how one's clinical work with clients can point to

unaddressed research topics of potential importance, I had noticed in my part time private practice that many of my clients with panic disorder (a clinical group with particularly high levels of AS; e.g., Stewart et al., 1992) avoided physical activity and formal exercise. Given that high AS individuals, by definition, fear arousal-related bodily sensations that accompany an anxious state (e.g., rapid heart rate, sweating, shortness of breath), my students and I reasoned that this fear might promote avoidance of activities like physical exercise that bring on similar bodily arousal sensations. This could have adverse long-term health consequences given the well-established links of physical activity with both physical and mental health (World Health Organization, 2022). Our initial study (Sabourin et al., 2011) showed, as suspected, that high AS university students engaged in less weekly physical activity than their low AS peers. Moreover, high AS students reported more barriers to engaging in physical activity. Unexpectedly, high AS students also perceived more benefits to physical exercise than did low AS students which one might think would promote *greater* participation in exercise among high AS (than low AS) students. However, when directly comparing perceived risks and benefits to exercise, we found that high AS individuals reported a lower benefit:barrier ratio than low AS students, indicating why barriers might have a greater adverse impact on the exercise engagement of high than low AS students (Sabourin et al., 2011).

But not all levels of exercise are created equal. Indeed, exercise involving greater physical exertion (i.e., higher intensity exercise) brings on more intense arousal-related bodily sensations suggesting that theoretically, high AS individuals might be more likely to avoid exercise of relatively higher intensity. We examined this in a second study where we compared AS as a predictor of engagement in low intensity (e.g., walking), moderate intensity, and vigorous intensity exercise (Galbraith et al., 2022). Consistent with the theoretical prediction, we found main effects of AS only predicting less engagement in *vigorous* intensity exercise.

A considerable body of research has accumulated to date on the relation of AS to physical activity. As part of his dissertation, Christopher DeWolfe conducted a meta-analysis of this literature to answer the questions of whether AS was significantly inversely related to physical activity involvement, and what variables moderate this relation (DeWolfe et al., 2023). Across 43 studies examining the AS physical activity relationship (including a total of 10,303 participants), we found that, indeed, AS was significantly inversely related to physical activity levels. One important moderator was exercise intensity as the inverse relationship with AS was stronger for vigorous intensity (e.g., aerobic) exercise than low intensity exercise (e.g., walking). We also showed that this relationship was significant for AS physical and cognitive concerns but not for AS social concerns. We speculated that perhaps AS social concerns (fears of the adverse social consequences of others noticing one's arousal-related sensations like sweating) would only matter in motivating exercise avoidance if one was exercising in a social as opposed to solitary context. Finally, we found that clinical versus nonclinical status of the sample was an additional moderator with the inverse relationship between AS and exercise participation unexpectedly proving stronger in nonclinical samples. We speculated that perhaps range restriction played a role in the clinical samples (largely consisting of anxiety disordered samples), where AS levels might have been high enough to motivate widespread exercise avoidance, with the range for AS only being

sufficient to allow for strong prediction of exercise engagement in the nonclinical samples.

Taken together, this set of studies have important intervention implications. Since avoidance is a well-established fear maintenance factor, one potentially useful technique for reducing AS could be interoceptive exposure—that is, intentionally bringing on the arousal-related sensations that are so feared by high AS individuals (Stewart & Watt, 2008). Since our studies suggest that high AS individuals appear to be avoiding physical exercise, particularly vigorous intensity exercise like running (Galbraith et al., 2022), aerobic exercise might be a very effective form of interoceptive exposure to use as a component of transdiagnostic intervention for reducing fear of arousal-related sensations (i.e., high AS) and associated psychopathology symptoms. Moreover, given the moderation results of sample type (clinical vs. nonclinical) found in our meta-analysis (DeWolfe et al., 2023), running might be a technique that is particularly useful in nonclinical samples (i.e., in prevention or early intervention approaches). The findings of a high level of perceived barriers to engaging in exercise among high AS individuals suggests that such use of interoceptive exposure in an AS-targeted intervention might need to include problem-solving perceived barriers to engaging in physical activity. The findings that high AS individuals already see greater benefits to engaging in physical activity than low AS individuals suggest that interventions that focus on promoting the benefits of exercise are unlikely to have much impact on changing the exercise behaviour of high AS individuals (Sabourin et al., 2011).

Intervention Research

Given established links of AS to both emotional disorders and addictive disorders, we reasoned that targeting AS in intervention might be a useful transdiagnostic means of managing both disorders simultaneously in comorbid individuals or those at risk. In an early study, we community-recruited a large sample of women with substance use disorder. We identified a set of four individual difference risk factors—AS, hopelessness, sensation seeking, and impulsivity—each related to a distinct set of mental health and substance use disorder diagnoses. For example, AS was related to higher rates of anxiety-related disorder and anxiolytic dependence (Conrod, Pihl, et al., 2000). We developed brief, manualized cognitive behavioural interventions for each personality type. For the high AS individuals, the intervention consisted of psychoeducation about AS and its links to anxiety-related psychopathology and to risk for maladaptive avoidance-based coping, including negative reinforcement-based use of arousal-dampening substances. Behavioural exercises included consideration of the short- and long-term positive and negative consequences of different coping strategies (e.g., avoidance, distraction, substance use). Cognitive techniques involved identifying common thinking errors to which high AS individuals are prone (e.g., catastrophizing the meaning of arousal-related sensations) and learning to challenge those thoughts as a way of reducing anxiety. Along with my former McGill lab mate Patricia Conrod and my mentor Robert Pihl, we conducted the first test of this “personality-targeted” intervention with a large sample of women with substance use disorder in a randomised controlled trial (Conrod, Stewart, et al., 2000). Participants were subtyped based on their personality and randomised into one of three cells: personality matched (e.g., AS individual received intervention

designed for AS substance users), personality mismatched (e.g., AS individual received intervention designed for another subtype of substance user like high sensation seeking), or motivational control intervention (designed to control for the enhancement of motivation to change with no specific cognitive behavioural skills training). The comparison of personality matched to personality mismatched interventions allowed us to establish if any of the interventions would be effective for all substance users or whether personality-matching increased their efficacy. All interventions were delivered individually with a trained facilitator. At 6-month follow-up, only those in the personality-matched condition showed reduced frequency and severity of problematic alcohol and other substance use relative to those randomised to the motivational control condition. Results suggested promise for this skills-based intervention when delivered in a personality-matched fashion.

Our next step was to modify this therapy approach to be suitable as a preventative/early intervention for youth at risk of mental health and substance-related problems. We modified the interventions into a group-based format suitable for delivery in the school context. Our rationale was that the group format would allow adolescents to learn from the experiences of those with traits similar to their own. We also added a goal setting exercise where students identified their personal goals and examined how their personality could lead to behaviours and thoughts that interfere with achieving those goals. The idea was to help with increasing motivation to change, which can be an issue in prevention programs when participants may not yet be experiencing substantial distress emerging from their personality and associated maladaptive coping. An additional modification to the Conrod, Stewart, et al.’s (2000) intervention was creating composite “scenarios” based on our research and interviews with adolescent drinkers with elevations on one of the four traits of interest; these scenarios illustrated challenging situations faced by adolescents with the trait in question and served as the basis of group discussions and cognitive behavioural exercises. The two-session intervention was manualized with homework between sessions. We conducted a randomised controlled trial of this intervention approach—PreVenture—when administered in high schools in Nova Scotia and British Columbia (Conrod et al., 2006). Students were selected for drinker status and elevations on one of the three traits of interest—AS, hopelessness, and sensation seeking (our impulsivity module was developed later). Students were then randomised to either the intervention for their personality or to a no-treatment control. At 4-month follow-up, students with elevations on AS or hopelessness who received the intervention were less likely to be drinking than their like-trait peers in the control group and students with elevations in sensation seeking who received the active intervention were less likely to be engaging in binge drinking than their like-trait peers. We also saw beneficial effects of the intervention on problem drinking. This pattern of results suggested promise for an intervention targeting high AS as an early intervention approach for reducing drinking and emerging alcohol-related problems. After adding in a fourth targeted intervention for high impulsive students, several randomised controlled trials have shown benefits of the PreVenture program in reducing alcohol and other substance use behaviour as well as related mental health problems (see review by Conrod, 2016). For example, the AS intervention has shown benefits in reducing panic attacks (e.g., Castellanos & Conrod, 2006) and severe anxiety (O’Leary-Barrett et al., 2013).

Along with Margo Watt and my former graduate students, Janine Olthuis, Brigitte Sabourin, and Cheryl Birch, we developed and tested an AS-targeted transdiagnostic intervention that was designed to reduce both emotional disorder psychopathology and substance misuse. Our first version of this intervention was designed for university women. This three-session brief intervention contained some of the same elements as the PreVenture program's AS intervention (i.e., psychoeducation about AS; decatastrophizing arousal sensations) but additionally utilised physical exercise (specifically running) as interoceptive exposure to bring on the arousal-related sensations so feared by high AS individuals and allow for fear habituation. Running also allowed participants to make use of the previously learned cognitive restructuring techniques in real time while they experienced arousal sensations (Stewart & Watt, 2008). Our first randomised controlled trial of this approach involved university women selected to be high or low in AS (on the ASI; Peterson & Reiss, 1992). They were randomised to either the active AS Cognitive Behavioural Therapy (CBT)-based intervention group or to a three-session control group put on by the same graduate student facilitators involving education about and discussion of psychology ethics. By the 10-week follow-up, high AS women who had received the active intervention showed greater reductions in AS, conformity motives for drinking, relief alcohol outcome expectancies, and alcohol-related problems compared to high AS women who had participated in the control group or low AS women who had participated in either group (Watt, Stewart, Birch, et al., 2006). We also showed that the intervention had impacts on anxiety-related psychopathology. A three-way interaction was revealed between AS group, intervention condition, and time on pain-related anxiety (an outcome strongly linked to AS; Stewart & Asmundson, 2006): Only the high AS participants in the active CBT intervention showed reductions in this anxiety-related outcome from pre- to 10-weeks postintervention (Watt, Stewart, Lefaivre, et al., 2006).

In another trial (Sabourin et al., 2016), we wished to replicate and extend the findings of Watt, Stewart, Birch, et al. (2006), Watt, Stewart, Lefaivre, et al. (2006), using a more stringent control than a group discussion of psychology ethics. Thus, our next trial used a health education control as a more active control group. Again, women undergraduates were selected for their status as high or low AS and were randomised to the active CBT group (three sessions plus 42 running trials) or to the health education control group (three sessions of active discussions and problem solving around nutrition, sleep, and exercise). As hypothesised, only the high but not the low AS students assigned to the AS-targeted CBT group showed significant and sustained changes (over 14 weeks) in AS and the emotional outcomes. Unexpectedly, though, the high AS individuals assigned to the active health education control showed similar magnitude sustained changes in AS and the emotional outcomes. While these reductions tended to be specific to the high AS individuals, the efficacy of the health education control was unexpected. We speculated that the substantial focus on the benefits of increasing aerobic exercise and problem-solving barriers to implementing changes in aerobic exercise (which we know are elevated in high AS individuals; Sabourin et al., 2011) may have led to similar increases in exercise in both active groups allowing for interoceptive exposure and consequent habituation of fear to arousal-related sensations in both high AS groups.

In both the abovementioned trials of the three-session AS-targeted CBT intervention, we conducted additional analyses to examine the role of the running trials as interoceptive exposure. Specifically, those in the CBT condition completed a brief version (Sabourin et al., 2013) of the reactions to arousal-induction questionnaire used in the MacDonald et al.'s (2000) study after each running trial. In analysis of this data from the Watt, Stewart, Birch, et al. (2006), Watt, Stewart, Lefaivre, et al. (2006) trial, at the onset of the running trials, high AS individuals reported greater somatic, affective, and cognitive reactions to the running trials than low AS individuals. However, the catastrophizing about and fear to the arousal-related sensations brought on by the running were significantly decreased among the high AS participants over the course of 10 running trials. The physical exercise interoceptive exposure was associated with equal reductions in self-reported somatic sensations across running trials among the high and low AS participants. Findings were consistent with a cognitive mediation pathway where running trials provided opportunities to practice challenging catastrophic interpretations of arousal-related sensations, allowing for reduction of fear to the sensations. Alternatively, by countering their tendency to avoid arousal-related sensations through exercise avoidance, running trials may have allowed for habituation of the fear response to arousal-related sensations like rapid heart rate (Sabourin et al., 2008).

We conducted a similar analysis of data collected during the interoceptive exposure running trials in Sabourin et al.'s (2016) study in the active CBT arm. Across 20 running trials, high AS but not low AS participants displayed reductions in affective, cognitive, and somatic reactions to running (Sabourin et al., 2015). We also found that reductions in cognitive and affective, but not self-reported somatic, responses to the running trials were significantly related to reductions in AS. This suggested that the therapeutic effects of repeated interoceptive exposure exercises in the form of aerobic exercise are related to altering cognitive and affective reactions to arousal sensations rather than to a decrease in the somatic sensations themselves (Sabourin et al., 2015).

Our next step in this line of work was to develop and evaluate a more intensive version of our AS-targeted intervention designed as a transdiagnostic treatment (rather than early intervention) with community-recruited men and women with high AS. This work was conducted in collaboration with Margo Watt and former graduate student Janine Olthuis. This more intensive intervention contained the same elements as our three-session program (Watt, Stewart, Birch, et al., 2006; Watt, Stewart, Lefaivre, et al., 2006) but with more sessions in each module to allow for more intensive work; patients in this trial were sent patient manuals (Watt & Stewart, 2008) and the intervention was delivered one-on-one rather than in group format and involved eight weekly sessions with the therapist, followed by four additional weeks of interoceptive exposure via running. In our first trial of this intervention approach, treatment seeking individuals were recruited from the community for their high AS status on the ASI-3 (Taylor et al., 2007). Structured clinical interviews were conducted, along with a variety of self-report measures tapping emotional disorder psychopathology, drinking motives, and alcohol-related problems, at pre, post, and follow-up. Participants were randomised to either the active CBT intervention or a wait list control. We saw significant reductions in AS and in symptoms of panic disorder, social anxiety disorder, and

PTSD, as well as in number of diagnoses on the structured interview, in the active intervention group relative to the control group from pre- to posttreatment which were maintained at follow-up. Unexpectedly, the active CBT intervention did not reduce symptoms of generalized anxiety or depression relative to the wait list control. Mediated moderation analyses revealed that changes in AS mediated changes in anxiety disorder symptomatology (Olthuis, Watt, Mackinnon, et al., 2014). We also examined changes in alcohol-related problems. The active intervention relative to the wait list control was associated with greater pre- to postintervention reductions in alcohol-related problems. We also found evidence, through mediated moderation analyses, for a chained mediational model to explain these intervention-induced changes in alcohol-related problems: The intervention led to reductions in AS which in turn contributed to reductions in coping with anxiety motives for drinking which ultimately contributed to reductions in alcohol-related problems (Olthuis et al., 2015).

Current and Future Directions in This Field

Current and Ongoing Research

I would now like to review five studies currently in progress that will substantially expand the basic and applied research we have conducted to date on interventions for high AS individuals. Some of these studies illustrate my commitment to knowledge translation and trying to ensure that effective interventions are scaled up.

First, in a project led by Janine Olthuis, we received funding from the Canadian Institutes of Health Research (CIHR) to conduct a two-site randomised controlled trial (in Halifax and Fredericton) comparing individuals with high AS plus a diagnosed emotional disorder who were randomised to receive either our AS-targeted transdiagnostic intervention or an empirically supported disorder-specific treatment targeted toward their primary diagnosis (NCT03015285; <https://ClinicalTrials.gov>). Our hypotheses are that our transdiagnostic treatment will be just as efficacious as the disorder-specific treatment in reducing symptoms of the primary disorder but that our transdiagnostic intervention will prove superior in treating comorbid symptoms. We have completed interventions and follow-up assessments and are excited to soon complete analyses and disseminate the findings.

Second, in a project led by Patricia Conrod, we received funding from CIHR to conduct a trial testing the longer term outcomes of the four personality-targeted PreVenture modules when delivered to adolescents at over 30 schools in Montreal. While the PreVenture program has been shown to lead to sustained reductions in substance use and substance-related problems in several randomized controlled trials around the world, with findings persisting up to 2 years following the intervention (see review by Conrod, 2016), this randomized controlled trial, called CoVenture, was specifically designed to examine PreVenture's preventative efficacy at 4 year follow-up in terms of students transitioning to substance use disorder (NCT01655615; <https://ClinicalTrials.gov>; see also protocol by O'Leary-Barrett et al., 2017). The interventions have been successfully delivered to adolescents in Grade 7 and the annual follow-ups completed. We look forward to completing the analyses and disseminating results soon.

Our third ongoing study, the Canadian Underage Substance Prevention (CUSP) trial, is designed to address an implementation

science question. One big problem in the prevention science field is getting efficacious programs adopted by and delivered in the schools. A multisite study led by Patricia Conrod and funded through the CIHR is addressing how to best get the now well-established PreVenture program (Conrod, 2016) rolled out in schools. CUSP is taking place in three sites across Canada: British Columbia, Ontario, and Nova Scotia (NCT04198974; <https://ClinicalTrials.gov>). Participating schools are randomised to one of three conditions: a usual training model where school staff are trained and supervised in delivering the PreVenture program; an implementation facilitation condition where, in addition to the usual training and supervision of school staff in PreVenture delivery, researchers work closely with the schools to tackle barriers to implementation, offering ongoing supervision and web-based supports; and a delayed training control condition. After training, we will follow up to see if implementation facilitation promotes longer term sustainability of PreVenture delivery. As a hybrid effectiveness/implementation facilitation trial, CUSP is also testing for the first time whether the PreVenture program has an impact on adolescents' uptake of prescription drug use given the ongoing toxic drug crisis in Canada where youth are now showing the greatest increases in hospitalisations due to opioids (O'Connor et al., 2018). PreVenture seems an intervention well-suited for potentially impacting prescription drug misuse given the traits targeted in the model have each been linked with specific forms of prescription drug use/misuse in young people (e.g., AS with sedative/tranquiliser use and misuse; Chinneck, Thompson, Mahu, et al., 2018; Stewart et al., 2021). While CUSP is still in progress, my involvement as a site lead has led me to an enhanced appreciation of the multiple barriers faced by those working within the educational system to putting on evidence-based prevention and early intervention programs. These barriers include funding and personnel shortages, frequent staffing changes, and additional challenges presented to the educational system by the COVID-19 pandemic.

I am leading a fourth ongoing trial, with funding from a partnership grant from the Social Sciences and Humanities Research Council (SSHRC). The purpose is to adapt and test the personality-targeted PreVenture program to be used in the context of emerging adults undergoing the stressful transition to university; we call this intervention UniVenture (NCT05383989; <https://ClinicalTrials.gov>). This work thus builds upon my prior work in AS-targeted interventions through PreVenture (e.g., Conrod et al., 2006) and my work with the three-session AS intervention previously designed for and tested with university students (Sabourin et al., 2016; Watt, Stewart, Birch, et al., 2006; Watt, Stewart, Lefavre, et al., 2006). We are closely engaging with various partner organizations, particularly the Student Affairs units at the five participating Canadian universities where the trial is taking place. By engaging these partners in the project from the start, universities may be more likely to adopt the intervention into their regular programming if it proves efficacious. Students scoring high in any one of the four traits on the SURPS including AS are randomised to one of three conditions: in-person UniVenture; online UniVenture; or usual services only control. The active interventions are delivered in group format. Thus, the UniVenture AS intervention is very much like the three-session AS intervention developed and tested with Brigitte Sabourin and Margo Watt with the main changes being that: Both men and women are being tested in UniVenture (vs. the sole focus on women in Sabourin et al., 2016; Watt, Stewart, Birch, et al., 2006;

Watt, Stewart, Lefavre, et al., 2006); UniVenture only involves two sessions (it does not include an interoceptive exposure component); UniVenture is scenario based with the scenarios developed from interviews with students high in each trait; and UniVenture is testing an accessible online delivery format). Our planned trial outcomes are reduced substance misuse, improved emotional disorder symptoms, and improved academic outcomes (as mediated through reduced substance misuse and improved mental health). While we expect to see similar improvements in our outcomes in the two active conditions, we expect online delivery will result in greater recruitment and retention due to its greater accessibility. We pilot-tested online UniVenture during the COVID-19 pandemic lockdown. We showed improved pandemic-related distress and improvements in coping drinking for the two internalising traits (AS and hopelessness) along with positive feedback on the intervention by students, and good retention (Stewart et al., 2022). However, recruiting students into the intervention has proven challenging. We have completed interventions with five cohorts of students across all five participating campuses and are now completing the follow-ups.

Finally, in an ongoing project that I am leading, with funding from a CIHR Patient Oriented Research grant and additional funding from the Atlantic Node of the Canadian Research Initiative in Substance Matters (CRISM; a national research-to-practice addictions network), we are working to adapt and pilot-/feasibility-test the PreVenture program for use with clients with opioid use disorder who are receiving opioid agonist therapy (OAT; e.g., methadone). The resultant program, called OpiVenture, will be tested as a supplementary psychosocial approach to clients' OAT medication (NCT06211972; <https://ClinicalTrials.gov>). In doctoral research by my former graduate student, Ioan (Tib) Mahu, we validated the four-factor personality risk model among OAT clients, showing that personality vulnerability factors including AS were still relevant at later stages of addiction, in terms of associations with ongoing substance use and qualitative descriptions of clients' experiences of their trait. This work suggested these traits likely function as maintenance factors in addictive behaviours even in the context of severe addiction. For example, three of the traits (all but impulsivity) were specifically linked to distinct forms of past month substance use, with AS predicting past month use of tranquilisers (Mahu et al., 2019). This is a particular risky form of substance misuse since combining benzodiazepines with opioids or with OAT medications increases overdose risk (Gudin et al., 2013). When asked, on qualitative interview, to describe experiences of their personality, analyses identified several areas on which OAT clients with differing personality traits were distinguishable (Mahu et al., 2023). Those with high AS reported a profile that was largely characterised by fear, anxiety, and use of avoidance-based coping strategies. Experiences of panic, and tendencies to catastrophize about physical sensations, were frequently mentioned by the high AS OAT clients. They appeared more likely than OAT clients in the other personality groups to discuss the aversiveness of opioid withdrawal symptoms, suggesting use of substances to relieve withdrawal as a maintenance factor for their opioid misuse and use of other substances. They often discussed health concerns which is not surprising given links of AS with health anxiety (Stewart et al., 2008) and interoceptive sensitivity (Stewart, Buffett-Jerrott, et al., 2001). High AS OAT clients more frequently discussed use of prescription tranquilisers, often to cope with feared anxiety experiences. We used the stories provided in the interviews and

the themes identified in our analyses to develop alternative composite scenarios to be used in the adapted PreVenture manuals for use in the OpiVenture trial. These scenarios more accurately reflect the lived experience of OAT clients with elevations on each of the four traits, including AS. We have partnered with four OAT clinics in Nova Scotia, New Brunswick, and Quebec to pilot these adapted personality-targeted interventions with their OAT clients. We will test various aspects of feasibility from the perspective of clients who undergo the intervention as well as the service providers and clinic directors; we will also test pre- to postchanges in substance use and emotional disorder symptoms as a preliminary test of the utility of OpiVenture as a transdiagnostic psychosocial intervention to supplement OAT. Our hope is that the adapted program will be an important addition to the toolkit available for addressing the ongoing toxic drug crisis in Canada where morbidity and mortality only worsened with the COVID-19 pandemic (Public Health Agency of Canada, 2022).

Future Research Directions

I will now review areas where I see questions that still need to be addressed to improve understanding of AS as a transdiagnostic factor in the high comorbidity of emotional disorders with addictive disorders, and as well as gaps in our knowledge about AS-targeted intervention.

We currently select individuals for inclusion in our AS interventions based on elevations on one of several validated measures of AS—typically the ASI-3 (Taylor et al., 2007) or the SURPS AS subscale (Woicik et al., 2009). The degree of elevation is typically set at a relatively arbitrary value of 1 *SD* above the nonclinical norm, making approximately 16% of the population. One area for further research is determining whether there is a specific cutoff that better reflects a likelihood of benefitting from an AS-targeted intervention. I have collaborated on a series of studies that considers whether AS is better considered a dimensional or categorical construct. In other words, is there a high AS taxon? The answer seems to be that both are true: There is a high AS taxon but even among those belonging to the high AS taxon, dimensional differences in AS levels still matter in predicting further increased risk for psychopathology. This work illustrates the need to be cognizant of the heterogeneity that still exists among people with a shared vulnerability. In one such study, we used ASI-3 (Taylor et al., 2007) data and showed that approximately 12% of people fall into the high AS taxon (Bernstein et al., 2010) which is slightly fewer than the cutoff we are currently using. If there truly is a qualitative difference between those with “high AS” and those in the normative class as suggested by our work on AS taxonicity, interventions might be most beneficial for those in the high AS taxon. Alternatively, when interventions are run in groups, having individuals with less severe elevations in AS involved in the group might provide examples of positive coping with anxiety-related sensations that would benefit others in the group. But without at least some degree of elevation in AS, the material in an AS-focused intervention would not appear relevant for a given individual and the individual would be theoretically less likely to benefit. Our work to date (e.g., Conrod, Stewart, et al., 2000; Watt, Stewart, Birch, et al., 2006; Watt, Stewart, Lefavre, et al., 2006) suggests that being elevated on AS is necessary to benefit from an AS-targeted approach, but we do not yet know what degree of elevation is

necessary. We also do not know where the “sweet spot” is for inclusion of people with a moderate degree of elevation that is sufficient to engage with the material and benefit personally, but low enough to allow for some modelling of positive coping within the groups, when the intervention is provided in group format. Anecdotally, there are often requests from schools that the PreVenture approach be offered in a more universal manner where all students can participate. It remains an empirical question as to whether opening up the approach to those with less extreme elevations would have benefits for the group through sharing of positive coping experiences, or if the possible failure of such individuals to engage with the material might risk watering down the effects of the intervention overall.

A related question pertains to whether differing cutoffs should be used for men and women (or boys and girls) when selecting individuals for AS-targeted intervention. Women and girls score higher on average than men and boys in overall AS levels both in childhood/adolescence and adulthood (e.g., [Stewart et al., 1997](#); [Walsh et al., 2004](#)) and a higher proportion of girls than boys belong to the high AS taxon ([Bernstein et al., 2006](#)). If we use gender-specific norms in selecting individuals for AS-targeted intervention, the average woman participant has more severe AS than the average man participant which could create artificial gender differences in who benefits most from intervention. Conversely, if we use a single (nongender adjusted) norm for selecting participants, AS groups will be dominated by women participants potentially making the high AS men feel less comfortable in sharing their experiences with the group, for example.

Another gap in the extant literature pertains to the necessity and relative efficacy of different components used in various versions of our AS-targeted interventions. The PreVenture program ([Conrod et al., 2006](#)) utilises a goal setting exercise early on with the rationale that it can help engage students in an early intervention/prevention program where students may not be inherently motivated to change (unlike in a context where an individual is already struggling with an emotional disorder and/or the adverse consequences of a substance use disorder). If students see how their personality (in the current case, their elevated AS) is leading to behaviours that are interfering with them achieving their own goals, it is assumed this helps motivate them to tackle their maladaptive tendencies toward avoidance, distraction, and coping/conformity motivated substance use. This assumption remains to be tested in treatment dismantling studies. Furthermore, the methods for targeting avoidance of arousal-related bodily sensations vary across the two programs. In the program I developed with Margo Watt, Janine Olthuis, and Brigitte Sabourin, we address this directly through repeated interoceptive exposure trials in the form of aerobic exercise (running); in the PreVenture program, this is instead addressed through an exercise where students consider the short- and long-term positive and negative consequences of various coping strategies (e.g., avoidance vs. approach). These two methods have yet to be directly compared and their relative mechanisms of action remain to be determined. It is possible that some high AS individuals may benefit more from each strategy (e.g., interoceptive exposure through running benefitting high AS individuals more if they are highly avoidant of vigorous exercise). Knowledge about who benefits most from each method for reducing avoidance behaviours would be beneficial for additional treatment matching.

In addition, our interoceptive exposure via running module within the [Watt and Stewart's \(2008\)](#) intervention is always applied after the cognitive retraining. We reasoned that the running trials allow high AS individuals the opportunity to practice the decatastrophizing cognitive strategies while they are experiencing arousal-related sensations. It remains to be determined if this specific sequencing is particularly beneficial. Indeed, several studies have now determined that physical exercise alone is sufficient for reducing AS. For example, Janine Olthuis conducted an uncontrolled pre-post pilot study of an 8-week physical activity intervention (running) for high AS women that was conducted in group format ([Olthuis et al., 2020](#)). The intervention significantly reduced AS as well as panic, generalized anxiety, depression, and social anxiety symptom. While the running group was perceived by participants as acceptable and appropriate, and determined to be feasible, there was relatively high attrition. It would be interesting to compare whether cognitive restructuring delivered before the running trials improves retention, perhaps by giving participants an increased sense of self-efficacy in being better equipped to handle the feared sensations elicited by running.

Our AS intervention research has focused on targeting global AS. However, given the hierarchical structure of AS (e.g., [Stewart et al., 1997](#)), it remains to be established whether it is additionally useful to target the lower order dimensions of AS in our interventions. Our previously described study ([Olthuis, Watt, MacKinnon, et al., 2014](#); [Olthuis et al., 2015](#)) in which individuals were community recruited for high AS status and randomised to either a global AS-targeted intervention or a waitlist control showed that the active AS-targeted intervention was effective in reducing levels of all three AS dimensions, but with smaller effects for AS cognitive concerns. While the active intervention produced greater reductions than the waitlist control in panic disorder and PTSD symptoms (disorders most closely tied to AS physical concerns) and in social anxiety disorder symptoms and problem drinking (disorders most closely tied to AS social concerns), the active intervention was not more effective than waitlist control in reducing generalized anxiety or depressive symptoms (disorders most closely tied to AS cognitive concerns). Thus, our intervention was more effective in treating symptoms of some disorders than others, possibly because it was more effective (i.e., had larger effects) in targeting certain lower order AS dimensions than others. Norman (Brad) Schmidt and his collaborators have developed a brief CBT intervention (i.e., cognitive anxiety sensitivity treatment [CAST]) that specifically targets AS cognitive concerns by psychoeducation about this AS domain, cognitive restructuring focused on beliefs that one will lose control when experiencing anxiety, and use of voluntary hyperventilation as an interoceptive exposure exercise which brings on the sensations most feared by individuals with high AS cognitive concerns (e.g., derealization, light-headedness). In a randomized controlled trial, [Schmidt et al. \(2014\)](#) showed that CAST produced greater changes in AS than an active control intervention, with effects on AS cognitive concerns that persisted at follow-up. Moreover, intervention-induced changes in AS cognitive concerns mediated changes in generalized anxiety, depression, and suicidality (important clinical outcomes closely tied to AS cognitive concerns). Recent pilot work suggests that CAST may also be an effective intervention for opioid use disorder ([Raines et al., 2020](#)) pointing to CAST as a useful transdiagnostic treatment beyond emotional disorders. Considering the Olthuis and Schmidt findings together suggests it may be possible

to target specific, more refined AS interventions at the level of the client's most predominant AS concern. Indeed, our most recent work suggests that there are four specific clusters of high AS treatment seeking patients with one cluster showing elevations on all three lower order AS domains, and one each showing specific elevations on only one of the three AS domains (Olthius et al., 2024). Subtyping high AS treatment seeking individuals using this clustering method might help us in further targeting interventions in helpful ways (e.g., those in the AS cognitive concerns only cluster most likely to benefit from Schmidt et al.'s, 2014, CAST). It also would be useful to test whether exercise as an interoceptive exposure is more effective for treatment seeking individuals in the high AS social concerns only cluster if the exercise is practiced in a social context where clients have opportunities to challenge beliefs that they will be socially censured if they display observable arousal-related sensations like sweating in front of others. While this further refining of AS-targeted intervention based on the predominant AS cluster holds promise of increasing the efficacy of our interventions, we must keep in mind whether this further "splitting" might work against the purposes of transdiagnostic interventions. The primary purpose of transdiagnostic interventions is to move away from many diagnosis-specific interventions by targeting broader constructs that underlie several disorders; it also potentially increases the reach of our interventions as clinicians do not need to master multiple distinct therapies for each disorder they treat. A broad AS intervention can accomplish these transdiagnostic treatment goals given that global AS has been linked with several anxiety, mood, stress/trauma, and addictive disorders. However, we have increased specificity in predicting symptoms of various disorders when we consider the lower order AS domains (e.g., AS cognitive concerns predicting generalized anxiety, depression, and suicidality). Do we achieve incremental benefits in terms of outcomes if we target specific AS clusters that outweigh the increased burden on therapists to learn multiple distinct interventions than if we target AS intervention at the global AS level?

A related question is whether it is necessary to provide separate interventions within PreVenture for students high in AS and hopelessness. In two studies by former graduate student Annie Chinneck and former postdoctoral fellow Laura Lambe, we examined chained mediational models from AS and hopelessness to alcohol-related problems through emotional disorder symptoms and in turn coping related drinking (Chinneck, Thompson, Dobson, et al., 2018; Lambe et al., 2023). We had hypothesised a specific pathway from AS to alcohol-related problems through anxiety symptoms and then coping with anxiety drinking motives that was distinct from a separate pathway from hopelessness to alcohol-related problems through depressive symptoms and then coping with depression drinking motives. Results were only partially supportive of the hypothesised-specific pathways which led us to suggest that we should continue to provide separate interventions that target the mediators in each pathway as well as providing some common elements (e.g., managing negative affect more generally) for both internalising traits. However, it remains an empirical question as to whether an AS individual benefits more from an AS-targeted intervention than they do from an intervention intended for an individual with high hopelessness. We partially addressed this in the Conrod, Stewart, et al. (2000) treatment matching study, but our mismatched cell included individuals with three different traits other than the trait for which the intervention was designed. Thus, it is possible that while a high sensation seeker may not benefit at all

from an intervention designed for a high AS individual, someone high in hopelessness may share sufficient similarities with a high AS individual to benefit from an intervention designed for high AS clients. Indeed, David Barlow's Unified Protocol (Barlow et al., 2017) targets neuroticism as a transdiagnostic factor underlying all anxiety disorders and shows benefits without subdividing neuroticism into more anxiety-prone versus more depression-prone traits. Future research could test whether treatment matching matters within the internalising traits of AS and hopelessness.

In addition, there is substantial potential for developing cognitive retraining interventions for high AS individuals based on our findings of automatic attentional, interpretive, and memory association biases discussed in the first section of this article. Indeed, interventions have been developed to tackle each of these types of cognitive bias. Although some findings are not always replicated, promising interventions have been developed to retrain attentional biases away from threat (e.g., MacLeod & Clarke, 2015), to reduce the tendency to catastrophically interpret ambiguous situations (e.g., Rozenman et al., 2020), and to alter automatic memory associations using evaluative conditioning (e.g., Houben et al., 2010). Each of these may have some promise as standalone or adjunct interventions when working with high AS individuals to reduce their risk for various forms of psychopathology. These cognitive tasks could also be used as mediator variables in AS-targeted interventions to tap processes that may help explain intervention efficacy.

There is also considerable basic research that is still needed to increase our understanding of the potential transdiagnostic role of AS across the emotional disorders, addictive disorders, and their comorbidity. One particularly perplexing issue pertains to the apparent disconnect in the lack of evidence for AS as a risk factor for alcohol use and alcohol-related problems from longitudinal studies (Bartel et al., 2018), and yet the clear evidence for the efficacy of interventions targeting AS as a transdiagnostic factor in reducing excessive drinking and alcohol-related problems (e.g., Olthuis et al., 2015; Watt, Stewart, Birch, et al., 2006). Along with former graduate student Sara Bartel and longtime collaborator Simon Sherry, we (Bartel et al., 2018) conducted a meta-analysis across 15 studies (involving 9,459 participants) examining prospective relations of AS to various indices of alcohol misuse. Our meta-analysis failed to establish AS as a longitudinal risk factor for alcohol misuse which is inconsistent with theory (e.g., Stewart et al., 1999). Future work will need to resolve this apparent discrepancy between the longitudinal and intervention studies. Perhaps AS only predicts alcohol misuse indirectly (e.g., through negative reinforcement motives for drinking). Or perhaps the timing between assessments was not optimal for capturing the link between AS and alcohol misuse; for example, perhaps the relation occurs over a shorter or longer timeframe than captured to date (e.g., afternoons characterised by higher levels of state AS could be associated with greater alcohol misuse that evening—a relationship better captured by daily diary methods). Or perhaps there are moderators that were not considered (e.g., AS only predicts increases in alcohol misuse longitudinally among those who are also high in trait anxiety; see Stewart & Kushner, 2001). Finally, perhaps AS has both risk and protective aspects which are working against one another. For example, given their concerns about losing control and about social evaluation, high AS individuals might be relatively protected against heavier consumption of alcohol, yet they may quickly learn to rely on alcohol to cope once they experience its negatively

reinforcing effects. These possibilities are deserving of further study to resolve this important discrepancy.

The fact that only 15 longitudinal studies could be identified after 30+ years of research on this topic suggests that more longitudinal research is sorely needed. Some exciting possibilities for longitudinal research include 3+ wave longitudinal designs to test whether catastrophizing about arousal sensations maintains fear of those sensations over time (see [Gautreau et al., 2015](#), for a sample design). We have made use of a cross-lagged panel design to show that AS is both a risk factor and a complication of PTSD symptoms ([Marshall et al., 2010](#)). This design could be used to better establish links of AS with various forms of substance misuse along with identifying mediators of these links. For example, in one longitudinal study, we showed that AS was linked with longitudinal increases in prescription anxiolytic drug use in teens as mediated through increases in anxiety symptoms ([Stewart et al., 2021](#)). While substantial cross sectional research links AS with arousal-dampening drug use, longitudinal and daily diary research is needed to better establish the temporal precedence needed for truly establishing AS as a transdiagnostic “risk” factor.

There is also potential to expand the reach of AS as a transdiagnostic factor to forms of psychopathology beyond emotional and substance use disorders through basic, and perhaps eventually intervention, research. For example, we showed that AS was indirectly related to excessive gambling through risky solitary gambling behaviour ([Bristow et al., 2018](#)). My current graduate student, Elijah Otis, then examined the links of personality traits from the SURPS ([Woicik et al., 2009](#)) to gambling behaviour prospectively and found that AS and hopelessness were both associated with future problem gambling ([Otis et al., 2021](#)). Most recently, my current graduate student, Andy Kim, showed that AS predicted increases in binge eating as mediated through increases in depressive symptoms over time ([Kim et al., 2024](#)), suggesting the potential of AS-targeted interventions in addressing not only depressive symptoms but also symptoms of eating disorder. This early work on the role of AS in disordered gambling and eating behaviour is most certainly deserving of additional study.

Finally, a relatively unexplored area pertains to the role of social factors in the transdiagnostic risk of high AS individuals. For example, the high levels of conformity motivated substance use among high AS individuals (e.g., [Comeau et al., 2001](#)) suggests the importance of social influences on use that can be explored in the lab and incorporated into interventions. Studies of the role of romantic relationship influences on the psychopathology risk of high AS individuals is almost nonexistent. One exception is an early lab-based study by [Benton and Allen \(1996\)](#) who studied the interactive effects of arousal induction (via voluntary hyperventilation) and relationship conflict (enacted scenario with boyfriend who was supportive or disapproving). High (vs. low) AS women who hyperventilated and experienced disapproval were more self-derogatory, more likely to perceive their partners as evaluating them unfavourably, and more likely to influence their partners to devalue them. This suggests that high AS individuals may experience interpersonal difficulties when they are experiencing arousal-related sensations—interpersonal difficulties which are exacerbated by their reactions to those conflicts. Given the known role of conflict in triggering negative affect and addictive behaviours (e.g., [Hagen et al., 2023](#)), these interpersonal

processes in high AS risk deserve further attention through dyadic longitudinal and lab-based studies (e.g., [Kehayes et al., 2019](#)).

Conclusion

In summary, we have learned a great deal in over 3 decades of research on AS as a transdiagnostic risk and maintenance factor for emotional disorders, addictive disorders, and their comorbidity. The basic research reviewed in the first section of this article was instrumental in identifying and refining intervention targets in our applied research reviewed in the second section of this article. Along the way, we have developed or refined useful tools like the ASI-3 ([Taylor et al., 2007](#)) and the SURPS AS subscale ([Woicik et al., 2009](#)) for identifying individuals with elevations in AS who are likely to benefit from an AS-targeted intervention. We now have considerable evidence that targeting AS in a skills-based CBT intervention can reduce AS levels, certain dimensions of emotional disorder symptoms (e.g., panic, social anxiety, PTSD), as well as negative reinforcement motives for drinking (specifically, conformity motives, and coping with anxiety motives) and problematic alcohol use and anxiolytic drug dependence. These intervention effects appear to be evident whether the intervention is delivered individually or in group format, in a distance based or in-person delivery, as an early intervention/prevention program or as a treatment for those with more ingrained problems, and whether it explicitly involves an interoceptive exposure component or a goal setting component. We are also beginning to understand the mechanisms of change involved in these interventions. Nonetheless, there is still substantially more to learn to optimise the interventions we deliver for those suffering from a fear of fear.

Résumé

Le présent article résume notre programme de recherche sur la sensibilité à l'anxiété (SA) – un facteur dispositionnel cognitif et affectif impliquant des craintes de sensations liées à l'anxiété en raison de croyances selon lesquelles ces sensations entraînent des conséquences catastrophiques. La SA et ses dimensions d'ordre inférieur sont considérées comme des facteurs transdiagnostiques de risque ou de maintien des troubles émotionnels et des troubles addictifs. La compréhension des mécanismes par lesquels la SA exerce ses effets peut révéler des cibles d'intervention clés pour les programmes de prévention et de traitement axés sur la SA. Dans le présent article, je passe en revue les recherches fondamentales que nous avons menées pour comprendre les mécanismes qui relient la SA à ces troubles et à leurs symptômes. Je décris également les interventions transdiagnostiques ciblées sur la SA et j'illustre la manière dont la recherche fondamentale a permis d'orienter le contenu de ces interventions. Enfin, je passe en revue les projets en cours dans mon laboratoire et je souligne les orientations futures importantes dans ce domaine. Bien que des progrès considérables aient été réalisés au cours des trois dernières décennies et que la recherche ait considérablement fait avancer notre compréhension de la SA en tant que facteur transdiagnostique, de nombreuses questions restent en suspens. Les réponses devraient nous aider à affiner les interventions afin d'en faire bénéficier au maximum les personnes qui ont une grande peur d'avoir peur.

Mots-clés : sensibilité à l'anxiété, facteur transdiagnostique, trouble émotionnel, trouble addictif, thérapie cognitivo-comportementale

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