Attentional Bias And Well-Being: How The Bias That Feels Best Can Be Bad For Us.

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The attainment of well-being is a goal shared by most people. In a large-scale study involving over 7200 respondents, recruited across 42 countries, optimizing well-being was universally considered to be a vital life objective (Diener, 2000). High levels of well-being are associated with improved physical health and mortality outcomes, enhanced social relationships, and superior work performance and productivity (c.f. Huppert, 2009). Thus, it is not surprising that there has been great interest in identifying the psychological factors that underpin variation in well-being. As we will discuss in this chapter, one such factor concerns patterns of *attentional bias*¹ that operate to favor the processing of particular types of information.

It is important to distinguish two differing dimensions of well-being that are not always closely aligned. The first of these dimensions is *emotional well-being*, which concerns the degree to which one experiences more positive emotion than negative affect. Higher levels of emotional well-being reflect a heightened disposition to experience positive rather than negative affect (Diener, 2000). Some of the attentional research we will review in this chapter has been motivated by hypotheses concerning the possibility that biased attentional responding to *affectively toned information* (i.e. information that is either positive or negative in affective tone) may contribute to variation in emotional well-being. The second dimension we will consider is *situational well-being*, which concerns the degree to which a person successfully achieves objectives, such as good physical health and level of social and occupation functioning. Higher levels of situational well-being result from increased engagement in adaptive behaviors that are conducive to health and good social/occupational function, while situational well-being is compromised by maladaptive behaviors that harm health or impair social/occupational functioning (Diener & Ryan, 2009). We also review research that has sought to address

¹ Italicized terms are formally defined in the glossary that accompanies this chapter.

hypotheses concerning the possibility that biased attentional responding to certain appetitive stimuli, or to information concerning threat, may influence the prospect of engaging in adaptive or maladaptive behaviors that impact situational well-being.

A fortunate subset of the general population demonstrates high levels of both situational and emotional well-being, resulting in robust health and good social/occupational functioning, as well as frequent experience of *positive affect*, which reflects the current subjective experience of positive mood state. A less fortunate subset of the population displays low levels of both situational and emotional well-being, suffering from ill health or poor social/occupational functioning while also frequently experiencing *negative affect*, which reflects the current subjective experience of negative mood state. The alignment between emotional and situational well-being may, in some cases, partly reflect a functional relationship between the two. Positive emotional experiences may sometimes increase the likelihood of certain adaptive behaviors that yield situational benefits, whereas negative emotional experiences may sometimes drive maladaptive patterns of behavior that compromise situational well-being (Barlow, Craske, Cerny, & Klosko, 1989; Watson, 2002). Thus, for example, a heightened tendency to feel good in social situations will commonly be accompanied by an increased tendency to pursue greater social engagement, with the co-occurrence of this emotion and behavior benefitting both emotional well-being, and situational well-being. In contrast, a heightened tendency to feel anxious in social situations is often accompanied by increased likelihood of avoiding social interactions, with the co-occurrence of this negative emotion and maladaptive behavior serving to impair both emotional and situational well-being. However, it is critically important to recognize that emotional and situational well-being are not always aligned, and in many circumstances these two dimensions of well-being are inversely related (Diener & Ryan, 2009).

Thus, for example, a heightened tendency to experience worry in the lead up to important examinations may acutely compromise emotional well-being, but often will be accompanied by an increased tendency to engage in study and revision behaviors that deliver beneficial outcomes for situational well-being. Conversely, a heightened tendency to experience pleasure in situations involving alcohol consumption may inflate emotional well-being in these settings, but may be associated with an inflated risk of consuming alcohol excessively, resulting in negative outcomes for situational well-being. Thus, an elevated tendency to experience negative affect can be associated with increased engagement in adaptive behaviors that ultimately deliver benefits, while an elevated tendency to experience positive affect can be associated with increased engagement in maladaptive behaviors that ultimately cause harm. Put simply, feeling good is not necessarily good for us.

In this chapter, we will review work that has sought to examine how biased patterns of attentional responding to affectively valenced information can contribute to variability in both emotional and situational well-being. We will begin by critically appraising the cognitive-experimental procedures that have most commonly been employed to assess such attentional bias. We will next consider findings from research that has employed these assessment approaches to investigate how individual differences in attentional bias towards either negatively-toned or positively-toned affective information may contribute to variability in emotional disposition. As will be seen, there is growing evidence that heightened tendency to experience positive emotion, and reduced tendency to experience negative emotion, are underpinned by patterns of attentional selectivity that favor the processing of affectively positive information and attenuate the processing of affectively negative information. We will then discuss research that has examined how the selective processing of aversive information

concerning prospective threat, and selective attentional responding to positively-toned appetitive stimulus information, may impact on the prospect of engaging in behaviors that have the capacity to enhance or impair situational well-being. In doing so, we will highlight the possibility that these types of attentional biases may directly contribute to dissociation between emotional and situational well-being, either by evoking negative emotion while also increasing the prospect of adaptive behavior, or by evoking positive emotion while increasing the prospect of maladaptive behavior.

Cognitive-Experimental Procedures Employed to Assess Biased Patterns of Selective Attention

A number of different cognitive-experimental tasks have been developed to assess biased patterns of attentional responding to affectively toned information. In this section, we describe the most commonly used experimental procedures for such research. We first consider approaches that have relied on reaction time (RT) measures, and then discuss the assessment of attentional deployment using eye-tracking measures.

The two most widely used RT-based approaches for assessing attentional bias to affective information are the modified Stroop task (Mathews & MacLeod, 1985), and the attentional probe task (MacLeod, Mathews, & Tata, 1986). The modified Stroop task requires participants to rapidly name the display color of stimuli that differ in their affective tone, or in their appetitive value, while ignoring the semantic content of these stimuli. The degree to which color naming responses are slowed when the stimuli belong to one particular affective or appetitive category is assumed to reflect difficulty ignoring this type of information, and thus such slowing is

considered to index attentional vigilance towards that type of information. Although most investigators have employed word stimuli in the modified Stroop task, some have instead used pictorial stimuli, such as photographs of faces displaying differing emotional expressions, or images of food or drink, displayed in differing colors (c.f. Field, Munafò, Franken, 2009; Werthmann, Jansen, & Roefs, 2015).

Critics of the modified Stroop task have pointed out that slowing to color name a particular category of words or images need not reflect attentional vigilance towards the content of such stimuli. For example, it has been argued that disproportionate slowing to color name an affectively negative stimuli may result from increased behavioral freezing in the presence of emotionally aversive information, rather than from increased attentional vigilance to such information (Peckham, McHugh, & Otto, 2010). Other critics have instead noted that, if a participant were to shift attentional resources entirely away from a particular class of affective stimuli, for example by closing their eyes or moving attention away from the computer display whenever such stimuli were present, then this too would impair apprehension of their color. Thus, rather than reflecting increased attentional vigilance towards a given category of information, slowing to color name such stimuli could, in principle, instead reflect increased attentional avoidance of this type of information (Wilson & MacLeod, 2007).

The attentional probe task was developed to overcome the problems associated with the modified Stroop task (MacLeod et al., 1986). In this assessment approach, participants initially focus their attention on a central fixation cue, before a pair of words or images are briefly displayed (typically for 500 ms). One member of each pair has a particular affective tone, or is an appetitive stimuli of interest, while the other is neutral in content. A small visual probe is then presented in the screen locus where either member of the stimulus pair was just displayed. The

participant must execute a discriminatory response to this probe, and relative speed to respond to probes that appear in the locus of each member of the stimulus pair provides an index of selective attentional response to the affective or appetitive stimuli of interest. Unlike the modified Stroop task, the attentional probe approach reveals where attention is located, and the resulting index of attentional bias is not compromised by variability in general response freezing in the presence of particular types of stimulus information (Grafton & MacLeod, 2016).

Although reaction time (RT) based measures of attention, such as the modified Stroop task and the attentional probe task, remain the most commonly used methods of assessing attentional bias, such approaches provide only a snapshot of attentional distribution at a specific point in time (c.f. Armstrong & Olatunji, 2012). Researchers have turned to eye-movement technology to overcome this limitation. Eye-movement approaches involve continuously recording the participant's eye-gaze while viewing a visual display, and so can reveal the direction of a participant's initial eye gaze when competing stimuli are presented, the subsequent shifts in eye-gaze during the stimulus presentation window, and the proportion of time a participant's eye-gaze is focused on each stimulus across this window (Rayner, 1998). It is important to note that eye movements and attentional shifts are not always entirely synchronous; for example, an attentional shift can occur in the absence of an eye-movement, and eye movements can occur while the focus of attention remains constant (c.f. Klein, 2004). However, the eye movement approach represents a complementary method of inferring attentional distribution, and findings from eye-movement studies have provided powerful converging support for conclusions drawn from RT-based methods of measuring biased attentional responding to affective and appetitive information.

In this chapter, we review research that has employed these different types of attentional assessment approaches. We also discuss variants of these tasks that have been developed with the intention of modifying, rather than assessing, patterns of attentional selectivity to determine whether attentional biases can make a causal contribution to emotional and situation well-being. The review is organized by distinguishing work that has been designed to address four distinct but complementary questions. The first two questions pertain to the role of attentional bias in the determination of emotional well-being (cf., Mathews and MacLeod (2005); MacLeod and Grafton (2016). These questions concern whether attentional bias to negative affective information can compromise emotional well-being by fostering a *negative emotional disposition*, a dimension of personality reflecting individual differences in the tendency to experience negative mood state (Beck, Emery, & Greenberg, 1985; Williams, Watts, MacLeod, & Mathews, 1997), and whether attentional bias to positive affective information can enhance emotional well-being by fostering a *positive emotional disposition*, a dimension of personality reflecting individual differences in the tendency to experience positive mood state (Wadlinger & Isaacowitz, 2010). The next two questions pertain to the possibility that patterns of selective attention that impair or enhance emotional well-being have the potential to, respectively, exert beneficial or detrimental impacts on situational well-being. Specifically, these latter two questions concern whether increased attention to particular types of negative affective information can reduce the prospect of certain maladaptive behaviors and thereby enhance situational well-being, and whether increased attention to particular types of positive affective information can inflate the prospect of certain maladaptive behaviors and thereby compromise situational well-being.

Does Attentional Bias to Affectively Negative Information Contribute to Negative Emotional Disposition?

Negative emotional disposition can be inferred from heightened vulnerability to experience negative emotions such as anxiety (Lee, Watson, & Mineka, 1994). Mathews and MacLeod (1985) tested attentional selectivity in individuals diagnosed with generalized anxiety disorder (GAD), and non-anxious control participants, using a variant of the modified Stroop task that presented affectively negative words (e.g. disease, stupid, hazard) and neutral words. The anxious participants, unlike the control participants, were slowed to color-name negative words relative to neutral words, consistent with an attentional bias towards the affectively negative informational content of such stimuli. Equivalent findings have been obtained in other cohorts with GAD (Martin, Williams, & Clark, 1991), and in people with other anxiety disorders including specific phobias (Lavy, van den Hout, & Arntz, 1993), panic disorder (McNally, Amir, Louro, Lukach, Riemann, & Calamari, 1994), post-traumatic stress disorder (Bryant & Harvey, 1997), social anxiety disorder (Spector, Pecknold, & Libman, 2003), and obsessive compulsive disorder (Lavy, van Oppen, & van den Hout, 1994). This pattern of disproportionate slowing to color-name affectively negative words has also been observed in non-clinical participants who report high levels of trait anxiety (MacLeod & Rutherford, 1992). Such findings have led to the conclusion that negative emotional disposition is characterized by an attentional bias towards affectively negative information.

As previously mentioned, the modified Stroop task has been criticized on methodological grounds, but converging support for this conclusion has been forthcoming from studies that have employed quite different methods of assessing attentional bias. MacLeod, Mathews, and Tata (1986) employed an attentional probe task in which pairs of words comprising one affectively

negative member (e.g. foolish, harm, hated), and one neutral member, were displayed for 500 ms. MacLeod et al. found that, unlike non-anxious control participants, participants diagnosed with GAD were faster to process probes that appeared in the locus of negative words compared to those that appeared in the locus of neutral words, suggesting that they attended selectively towards these stimuli. This finding has been replicated in other samples of GAD patients (e.g. Bradley, Mogg, White, Groom, & Bono, 1999; Mogg & Bradley, 2005), and in participants with other anxiety disorders, including social anxiety disorder (Musa, Lepine, Clark, Mansell, & Ehlers, 2003), post-traumatic stress disorder (Bryant & Harvey, 1997), panic disorder (Kroeze & van den Hout, 2000), and obsessive compulsive disorder (Tata, Leibowitz, Prunty, Cameron, & Pickering, 1996). The same pattern of speeding to process probes in the locus of negative stimuli is also shown by non-clinical participants who report high levels of trait anxiety, indicating that an attentional bias to affectively negative information represents a characteristic of negative emotional disposition (MacLeod & Mathews, 1988).

Other investigators have employed eye-tracking measure to assess attentional selectivity and, once again, the findings indicate that elevated disposition to experience negative emotion is associated with attentional vigilance for negative information. For example, Armstrong, Olatunji, Sarawgi, and Simmons (2010) exposed participants who were high vs. low in contamination fear to stimulus pairs that each comprised one image of a face displaying a negative emotional expression (disgust or fear), and one image of a face displaying a neutral expression. The high fear participants, compared to the low fear participants, demonstrated disproportionately prolonged gaze fixations on faces displaying the negative expressions relative to those displaying neutral expressions, confirming a heightened attentional bias to this affectively negative information. Similar patterns of results have been obtained in eye movement studies carried out

on participants who report other types of anxiety, including social anxiety (e.g. Chen, Clarke, MacLeod, & Guastella, 2012) and post-traumatic stress disorder (Felmingham, Rennie, Manor, & Bryant, 2011).

Such findings provide powerful converging support for the hypothesis that an attentional bias to negative affective information is characteristic of elevated disposition to experience negative emotion (c.f. Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007). However, observing an association between selective attention to negative information, and negative emotional disposition permits the conclusion that such attentional selectivity causally contributes to this disposition. To test this possibility, investigators have sought to directly modify attentional bias to negative affective information, to determine whether this attentional manipulation exerts a subsequent impact on negative emotional disposition, as would be the case if this attentional bias functionally contributes to such disposition. The attentional bias modification (ABM) approach most often used for this purpose involves training variants of the attentional probe task, that introduce a systematic contingency between the negative stimulus position and the probe position. In these ABM tasks, the probes are either consistently displayed in the opposite location to the locus of the each negative stimulus (avoid negative condition), or are consistently displayed in the same location as where the negative stimuli appeared (attend negative condition). MacLeod, Rutherford, Campbell, Ebsworthy, and Holker (2002) exposed participants to a single session of such a training procedure, configured in either one of the two above described training conditions. By subsequently delivering a conventional version of the probe task, from which the training contingency was removed, these researchers were able to confirm that the alternative ABM conditions were effective in inducing the intended patterns of differential attentional responding to negative information. When the participants were

subsequently exposed to a stressful anagram task within the lab session, those individuals who had been exposed to the ABM condition that reduced attentional bias to negative information displayed an attenuated anxiety response to this anagram stressor, relative to individuals who instead had been exposed to the ABM condition that increased attentional vigilance for negative information. Such results confirm that differences in selective attentional responding to negative affective information can make a causal contribution to variation in negative emotional disposition. This pattern of findings has been replicated within other laboratory studies (e.g. Hazen, Vasey, & Schmidt, 2009; Grafton, Mackintosh, Vujic, & MacLeod, 2014), and it has also been demonstrated that reducing attentional bias to negative affective information can significantly attenuate anxiety dysfunction in naturalistic settings (c.f. MacLeod & Mathews, 2012). Thus, there is now compelling evidence supporting the hypothesis that attentional bias to affectively negative information can functionally impair emotional well-being by increasing negative emotional disposition. In the following section, we will review research that has served to broaden this work, by seeking to determine whether attentional bias to affectively positive information serves to enhance emotional well-being by increasing positive emotional disposition.

Does Attentional Bias to Affectively Positive Information Contribute to Positive Emotional Disposition?

Researchers investigating the attentional basis of positive emotional disposition have adopted similar cognitive-experimental methodologies to measure selective attention. Though fewer studies have been carried out to evaluate whether elevated positive emotional disposition is characterized by an attentional bias to affectively positive information, the studies published to date consistently support this hypothesis. Again, the earliest research on this topic assessed

attentional bias using the modified Stroop task. In a pioneering study by Segerstrom (2001), participants who differed in their levels of trait optimism completed a modified Stroop task in which positive or negative words were displayed in differing colors. Higher levels of optimism were associated with relative slowing to color-name positive words compared to negative words, consistent with the idea that increased attention to the affectively positive semantic content of the former stimuli was characteristic of a more positive emotional disposition. Mauer and Borkenau (2007) have reported similar findings, also obtained using the modified Stroop task. Across two studies, these investigators recruited participants who differed in terms of approach temperament, a personality trait on which positive emotional disposition loads heavily, and had them complete a modified Stroop task. In one study, this task involved participants naming the textual colors of positive or neutral words, while in the other study participants named the color hue of photographic faces displaying either positive or neutral emotional expressions. Across both studies, it was found that participants who reported higher levels of approach temperament displayed disproportionate slowing to color-name the positive stimuli compared to the neutral stimuli, again supporting the hypothesis that elevated positive emotional disposition is characterized by an attentional bias to affectively positive information. Conversely, participants who exhibit especially low levels of positive emotional disposition, as indicated by symptoms of depression (Lee, Watson, & Mineka, 1994), display color naming latencies that suggest reduced selective attention to affectively positive information. For example, using a modified Stroop task in which affectively toned images were presented, Shane and Peterson (2007: Study 1) observed that depressed participants displayed relative speeding to color name affectively positive stimuli, compared to non-depressed controls, suggesting that these depressed individuals found it especially easy to inhibit attention to the positive informational content of such stimuli. Given

that the modified Stroop task has been criticized as a measure of attentional bias, as previously noted, it is reassuring that the findings from more recent studies employing the attentional probe task, and eye-tracking measures, also indicate that elevated positive emotional disposition is characterized by an attentional bias to affectively positive information.

Tamir and Robinson (2007) employed an attentional probe task in which word pairs comprising one positive word and one neutral word were displayed for 500 ms. They found that people who tended to experience higher levels of positive affect, as assessed 5 times per day for a 1 week period, demonstrated disproportionately speeded responses to probes appearing in the locus of positive words, relative to those that appeared in the locus of neutral words, indicating an attentional bias towards the positive information. These findings have recently been replicated by Grafton and MacLeod (2016), who recruited participants reporting either high or low levels of positive affectivity, and had them perform a similar attentional probe task. The participants high in positive affectivity displayed greater speeding to process probes in vicinity of the positive information, compared to probes in the vicinity of the neutral information, further supporting the hypothesis that elevated positive emotional disposition is characterized by an attentional bias to affectively positive information. Variants of the attentional probe assessment approach have also provided evidence that depressed individuals, who exhibit unusually low levels of positive emotional disposition, display decreased attention to affectively positive information. For example, using such an assessment task, Gotlib, McLachlan, and Katz (1988) found that clinically depressed participants showed reduced attentional bias to positive information, compared to non-depressed controls, and similar finding have also been reported by Shane and Peterson (2007: Study 2).

As already mentioned, RT-based measures such as the attentional probe task index attentional distribution only at a specific moment in time. To enable more continuous assessment of attentional responding to affectively positive information in people with heightened emotional well-being, investigators have employed eye-tracking procedures. Sanchez and Vazquez (2014) exposed participants who differed in terms of well-being to pairs of face images, one displaying a happy emotional expression and the other a neutral emotional expression. Participants were permitted to freely view the face pairs for 3500 ms, and their eye-gaze was continuously tracked across this viewing window. It was found that elevated levels of well-being were associated with an increased tendency to fixate eye-gaze on faces displaying happy expressions. Using a similar assessment approach, Duque and Vazquez (2015) found that participants whose low levels of positive affectivity were indicated by a diagnosis of clinical depression tended to fixate their eye-gaze for shorter periods of time on happy faces than non-depressed participants. Thus, regardless of how attentional bias has been assessed, the findings provide converging evidence that positive emotional disposition is associated with greater attentional bias to positive information.

Grafton, Ang, and MacLeod (2012) have sought to extend this work by investigating whether this attentional bias to positive information causally contributes to positive emotional disposition. They examined whether the direct modification of selective attentional responding to positive information can serve to alter positive affectivity, as predicted by this causal account. Specifically, Grafton et al. recruited participants who initially reported mid-range positive affectivity scores, and exposed half to a probe-based attentional bias modification (ABM) procedure configured to induce an attentional bias towards positive information, and the other half to an ABM procedure configured to induce attentional avoidance of positive information. In

the former ABM condition, all probes were displayed in the same locus as the affectively positive members of the word pairs that appeared on each trial (attend positive condition), and in the latter condition all probes were displayed in the opposite location to the positive words (avoid positive condition). To verify that this ABM manipulation induced the intended group difference in attentional bias, an assessment version of the probe task, in which probes appeared equally often in the locus of each word type, was delivered immediately after completion of the ABM procedure. Grafton et al. found that the two ABM training conditions served to successfully induce the intended group difference in selective attentional responding to positive information. All participants were then exposed to an anagram task designed to provide a success experience, in which anagrams were easy to solve and the participants were given feedback indicating that they had performed very well. The impact of this success experience on positive mood state was recorded. While participants who had just completed the alternative conditions of the ABM procedure did not differ in terms of positive mood state at the beginning of this anagram success task, those who had received the attend positive ABM condition showed an exaggerated elevation of positive mood in response to the success experience, relative to those who had instead received the avoid positive ABM condition. The observation that inducing an attentional bias towards positive information increased disposition to experience positive mood indicates that this pattern of selective attentional responding can causally contribute to positive emotional disposition.

The studies reviewed across these previous two sections provide compelling evidence that an attentional bias to affectively negative information, and an attentional bias to affectively positive information, are respectively associated with elevated negative emotional disposition, and elevated positive emotional disposition. Moreover, the findings demonstrate that each type

of attentional bias can causally contribute to variability in the corresponding dimension of emotional disposition. Thus, selective attentional responding to emotional information appears to play a role in the determination of emotional well-being. However, as we indicated at the outset of this chapter, emotional disposition is only one facet of well-being, and we will now turn to consider how these types of attentional selectivity can impact patterns of adaptive and maladaptive behaviors that have the capacity to influence situational well-being. As we will illustrate, though increased attention to affectively negative information may operate to reduce emotional well-being there are circumstances under which this same pattern of attentional selectivity can drive adaptive behaviors that have beneficial consequences for situational well-being. Conversely, while an attentional bias towards affectively positive information may serve to elevate emotional well-being, this same pattern of attentional selectivity can give rise to maladaptive behaviors that compromise situational well-being.

Can Increased Attention to Affectively Negative Information Serve to Attenuate Maladaptive Patterns of Behavior?

In this section, we will briefly consider research that has investigated whether increased processing of affectively negative information, which may elevate negative mood, nonetheless can reduce the prospect of maladaptive patterns of behavior likely to compromise situational well-being. Much of the evidence in support of this hypothesis comes from the field of health promotion, where researchers have examined whether health safety campaigns, designed to increase the attention paid to emotionally negative visual or verbal information associated with the risks of engaging in behaviors with detrimental health consequences, can reduce the occurrence of such maladaptive behaviors.

For example, in many countries graphically negative information is now presented on cigarette packets, often comprising emotionally aversive images that depict the potential negative health outcomes of smoking. Such images are typically designed to evoke disgust or fear, vividly displaying horrific depictions of smoking-related conditions such as mouth cancer or peripheral vascular disease. The intention of these images is to ensure that smokers cannot easily avoid attending to this negative information, which may reduce the emotional well-being of those who continue to smoke, but improve the probability that they will quit. There is good evidence that the increased processing of this emotionally aversive information can attenuate the maladaptive behavior of smoking by reducing people's intention to smoke, ultimately benefitting situational well-being (Friend & Levy, 2002; White, Webster, & Wakefield, 2008).

Similarly, campaigns to promote safer driving on our roads are designed to increase attention to negative information to the highly aversive negative consequences of maladaptive driving behaviors such as drunk-driving or speeding. This information is conveyed not only as written facts concerning, for example, the risk of being involved in a road accident, but through highly emotive images involving graphic scenes of car accidents and victims of road trauma. Such campaigns are known to evoke negative emotion in the target audience (Lewis, Watson, & White, 2008), and so their proximal consequence may be to reduce emotional well-being in drivers. However, it has been clearly demonstrated that such campaigns also reduce engagement in maladaptive driving behaviors, with outcomes that include decreased rates of drunk-driving and instances of driving over the speed limit (Morrison, Petticrew, & Thomson, 2003; Phillips, Ulleberg, & Vaa, 2011). Therefore, while campaigns that promote increased attention to information concerning the potential negative consequences of unsafe driving behavior may have

immediate negative impact on emotional well-being, this negative impact is accompanied by a beneficial effect on situational well-being.

Some researchers have sought to directly assess selective attention when individuals are exposed to the types of health campaigns described above using eye-tracking measures. For example, Krugman, Fox, Fletcher, Fischer, & Rojas (1994) tracked participants' eye-gaze while they viewed anti-smoking ads that contained written warnings concerning the dangers of smoking. They found that greater attention to this danger-related information, as indicated by the latency to first fixate on this information and the duration of time spent gazing on it, was associated with greater subsequent recall of the warnings. Similarly, Peterson, Thomsen, Lindsay, and John (2010) used eye movement measures to assess selective attentional responding to the information presented on a cigarette packet conveying the dangers of smoking. These researchers found that the average length and number of gaze fixations on this danger-related information predicted more accurate subsequent recall of the risk conveyed, particularly when this information was conveyed in the form of graphically negative images. These studies invite speculation that attentional bias to such negative affective information may increase the prospect of behaviors that enhance situational well-being, despite this attentional bias being accompanied by negative emotion due to the increased representation of aversive information within the cognitive system. This suggests the possibility that attentional bias modification procedures, designed to induce attentional vigilance towards these particular types of negative information, may yield behavioral benefits that outweigh the accompanying negative emotional impact. We suggest that such work represents a potentially fruitful line of future research, with the capacity to advance theoretical understanding while also carrying immediate applied implications.

Taken together, the findings from the above described studies provide evidence that, while manipulations that increase the processing of negative information can reduce emotional well-being, this can be accompanied by reductions in maladaptive patterns of behavior, ultimately enhancing situational well-being. Feeling bad isn't necessarily bad for us when this feeling is accompanied by patterns of behavior that are beneficial. In the following section, we evaluate whether the converse is also true, by considering research that has examined whether attentional bias to affectively positive information, which may increase emotional well-being by elevating positive mood, can drive maladaptive patterns of behavior that adversely impact situational well-being.

Can Increased Attention to Affectively Positive Information Serve to Elicit Maladaptive Patterns of Behavior?

In this section we review research that has investigated whether increased selective attention to certain types of affectively positive information, particularly concerning appetitive stimuli, can contribute to reduced situational well-being by driving maladaptive patterns of consumption. Our focus will be on two of the most widely researched appetitive stimuli, namely alcohol and food, though the general principles we discuss potentially apply to many other types of appetitive stimuli associated with potential harmful patterns of consumption. In this brief review, we will first consider studies that have examined whether maladaptive patterns of alcohol use may be underpinned by attentional bias towards alcohol-related appetitive information. Then, we will review research that has addressed whether the maladaptive patterns of food consumption that lead to obesity could be driven in part by attentional bias to food-related appetitive information.

Alcohol represents an attractive stimulus for many people. A recent survey revealed that over 70% of the US adult population consumed alcohol during the preceding year, and across this period the average respondent drank on an average of 88 days, and ingested over 2 gallons of ethanol (Dawson et al., 2015). This finding indicates that situations involving exposure to alcohol, and alcohol-related cues, are generally associated with increased feelings of emotional well-being, including elevated positive mood and decreased negative mood (Peele & Grant, 1999). However, heavy consumption of alcohol has detrimental health consequences, and severely compromises social and occupational function (World Health Organization, 2014). Thus, excessive alcohol consumption is detrimental to situational well-being. There is good evidence that, while alcohol cues may be affectively positive, attentional bias towards such appetitive cues may be implicated in excessive alcohol consumption that compromises situational well-being. A number of researchers have employed the modified Stroop task to assess attentional bias to alcohol-related appetitive information in individuals who report maladaptive levels of alcohol consumption. Lusher, Chandler, & Ball (2004) recruited participants undergoing treatment for alcohol dependence, and matched control participants without a history of alcohol abuse, to complete a modified Stroop task that presented appetitive words related to alcohol (e.g. pub, booze) and affectively neutral non-alcohol words. It was found that, in contrast to the control participants, the alcohol-dependent participants were disproportionately slow to color-name alcohol-related words compared to neutral non-alcohol words, suggesting that attentional bias to alcohol-related appetitive information characterizes maladaptive patterns of alcohol consumption. Some modified Stroop studies have employed alcohol-related images as stimuli, rather than words, and obtained similar findings. For example, Bruce and Jones (2004) recruited individuals who differed in their levels of habitual alcohol

consumption, and delivered a modified Stroop task that presented appetitive alcohol-related images (e.g. glass of beer, wine bottle), and affectively neutral non-alcohol images, in different color hues. Participants who reported higher levels of alcohol consumption were disproportionately slow to color-name the alcohol images, providing converging evidence that more maladaptive levels of consumption were associated with greater attentional bias to alcohol-related appetitive information. The finding that problematic drinkers show increased Stroop interference when color naming alcohol-related information has frequently been replicated (Cox, Blount, & Rozak, 2000; Johnson, Laberg, Cox, Vaksdal, & Hugdahl, 1994; Stetter, Akermann, Bizer, Straube, & Mann, 1995), and the effect remains evident in individuals who have previously experienced problematic levels of alcohol consumption, but who currently abstain from alcohol (Sharma, Albery, & Cook, 2001; Stormark, Field, Hugdahl, & Horowitz, 1997). Further support for the conclusion that an attentional bias to alcohol-related appetitive information is associated with increased alcohol consumption comes from studies in which investigators have employed the attentional probe task, and eye-movement procedures, to assess selective attentional responding to such information.

For example, Townshend and Duka (2001) used an attentional probe task to assess biased patterns of attentional selectivity to alcohol-related information in individuals reporting high or low levels of alcohol consumption. On each trial, participants were exposed for 500 ms to a stimulus pair comprising either an appetitive alcohol-related word (e.g. beer, wine, whiskey) and a non-alcohol word, or an appetitive alcohol-related image (e.g. bottle of beer, glass of spirits, scene at a pub) and a non-alcohol image. A probe stimulus was then presented in the locus of either stimulus. Participants who reported high levels of alcohol consumption were relatively speeded to process probes that appeared in the locus of alcohol-related appetitive information,

compared to probes that appeared in the locus of non-alcohol-related information, indicating that these individuals attentionally favored the alcohol-related information. Similar findings have been reported by Field, Mogg, Zetteler, and Bradley (2004), who concluded on the basis of attentional probe task data that heavy social drinkers display greater attentional bias to images of alcohol-related appetitive information than is evident in low social drinkers. This pattern of effects has been replicated in a number of subsequent studies employing other variants of the attentional probe assessment approach (Christiansen, Mansfield, Duckworth, Field, & Jones, 2015; Field, Mogg, & Bradley, 2005; Noel et al., 2006).

Researchers have also used eye-tracking measures to assess attentional bias to alcohol-related appetitive information in individuals who differ in terms of their levels of alcohol consumption. For example, Miller and Fillmore (2010) recruited participants who varied widely in terms of habitual alcohol consumption, and tracked their eye gaze while exposing them to pairs of stimuli, each comprising an appetitive alcohol-related image and an affectively neutral non-alcohol image. It was found that higher levels of habitual alcohol consumption were associated with relatively longer fixation times on the alcohol-related images, confirming that high levels of alcohol consumption are characterized by an attentional bias to alcohol-related appetitive stimuli. Weafer and Fillmore (2013) reported similar findings in a sample of participants who differed in terms of the frequency of binge drinking episodes. These participants completed a task in which they were exposed for 1000 ms to stimulus pairs that comprised an appetitive alcohol-related image, and an affectively neutral non-alcohol image, while their eye-gaze was monitored. Individuals who reported more frequent episodes of binge drinking displayed relatively longer fixation times on the alcohol-related images than did participants who reported less frequent binge drinking.

Given their appetitive nature, alcohol-related stimuli will be affectively positive in emotional tone for most people who drink alcohol. Thus, an attentional bias to such positive appetitive information may evoke a positive emotional response, but the above reported findings suggest that such an attentional bias may also drive increased consumption, which carries the potential to impair situational well-being. Of course, the observation that people who engage in excessive alcohol consumption also exhibit an attentional bias to alcohol-related information does not permit the conclusion that this attentional bias makes a functional contribution to such maladaptive patterns of consumption. Once again, however, the attentional bias modification (ABM) approach has been employed to illuminate the causal nature of this relationship by determining whether the direct manipulation of elective attentional responding to alcohol-related information can alter patterns of alcohol consumption. In an early study of this type, Field and Eastwood (2005) recruited heavy social drinkers, and exposed them to a probe-based ABM procedure configured to either increase or decrease their attention bias to alcohol-related information. This ABM procedure was effective in altering attentional bias in the intended manner. The participants were subsequently required to complete a taste test in which they made judgements about an alcoholic drink (beer), and a non-alcoholic drink (orange juice), on different dimensions such as taste and appearance. Unknown to participants, the amount of each drink consumed was recorded, and this served as the key measure of interest, indexing behavioral consumption of alcohol. Participants who had received the attend alcohol ABM condition subsequently consumed greater amounts of alcohol during the taste test than did participants who instead had received the avoid alcohol ABM condition. The former participants also reported increased levels of alcohol craving after the taste test, which was not the case for the latter participants. These findings represent firm evidence that biased attentional responding to

alcohol-related information can make a causal contribution not only to alcohol consumption behavior, but also to the subjective experience of craving.

Studies employing extended delivery of multiple ABM sessions have demonstrated that the causal impact of selective attentional responding to alcohol-related information on maladaptive patterns of alcohol consumption remains evident in naturalistic settings. For example, Fadardi and Cox (2009) gave participants who reported engaging in harmful levels of alcohol consumption multiple ABM sessions designed to reduce attentional bias to alcohol-related information. Participants' attentional bias to such information was successfully decreased by this ABM procedure, and this attentional change was accompanied by a corresponding reduction in their real world alcohol consumption. Schoenmakers et al. (2010) exposed alcohol-dependent in-patients undergoing CBT either to an ABM procedure configured to reduce attentional bias to alcohol-related information, or to a control condition in which participants simply had to categorize alcohol and non-alcohol images. As intended, participants in the ABM condition displayed a reduction in their attentional bias to alcohol-related information, relative to participants in the control condition. Following subsequent discharge, participants in this ABM condition maintained treatment gains more than participants in the control condition.

It is important to note that some studies in which ABM procedures have been delivered with the aim of reducing attentional bias to alcohol-related information have failed to observe a subsequent decline in alcohol consumption behavior (e.g. Field et al. 2007; Schoenmakers, Wiers, Jones, Bruce, & Jansen, 2007). It has been suggested that such variability may reflect cross-study differences in the approaches taken to assess alcohol consumption, in the motivations of participants to reduce their drinking, and/or in the levels of alcohol dependency reported by participants (Christiansen, Schoenmakers, & Field, 2015). Undoubtedly, variability in alcohol

consumption reflects a complex array of causal factors, rather than a simple function of attentional vigilance for alcohol-related information. Nevertheless, the above reviewed work provides compelling evidence that elevated levels of alcohol consumption are strongly characterized by an attentional bias to alcohol-related information, and suggests that attentional bias to this type of appetitive information may make a causal contribution to such maladaptive patterns of consumption. Attending to affectively positive information may make us feel good, but when this information concerns appetitive stimuli associated with potential health risks, then such an attentional bias may also contribute to patterns of excessive consumption that have negative consequences for our physical and mental health.

Of course, alcohol is not the only appetitive stimulus that can have a detrimental impact on our physical well-being when consumption becomes excessive. Many types of addiction reflect excessive engagement in approach-related behaviors to appetitive stimuli, and frequently such maladaptive behaviors have been found to be associated with attentional bias towards appetitive information, as observed in opiate dependency (Frankland, Bradley & Mogg, 2016), gambling (Hønsi et al., 2013) and internet addiction (Franziska & Barke, 2015). Perhaps the most ubiquitous type of appetitive stimulus regularly encountered in our everyday environments is food itself, and there is evidence that excessive consumption is characterized by an attentional bias to appetitive food-related information. Attending to such information can enhance emotional well-being by evoking positive mood, as is evident from the popularity of cooking shows, the high sales of recipe books displaying attractive images of well-prepared meals, and the sharing of food photographs on the burgeoning range of foodie websites. However, excessive consumption, particularly of junk foods that are high in sensory appeal but low in nutritional value, is driving an obesity epidemic that threatens the physical well-being of many members of

our communities. More than 35% of the world's adult population, and over 20% of children, are now overweight or obese, and these rates are rapidly increasing in both developed and developing countries (Ng et al., 2014). People who are overweight or obese are at increased risk of many physical ailments, including cardiovascular disease, diabetes, cancer and osteoarthritis (Ahima & Lazar, 2013), and experience elevated rates of social exclusion and compromised occupational achievement (Nutter et al., 2016). Hence, the need to illuminate the factors that contribute to overeating represents a major public health priority. There is evidence to suggest that attentional bias to appetitive foods may contribute to such maladaptive consumption.

Research employing the modified Stroop task to assess attentional bias to appetitive food information in individuals who exhibit excessive food consumption has yielded mixed findings. Braet and Crombez (2003) exposed obese children and adolescents, and normal weight controls, to a modified Stroop task that involved the presentation of words describing appetitive but unhealthy foods (e.g. ice-cream, pizza, chocolate), and words that were unrelated to food. They found that the obese children and adolescents demonstrated a relative slowing to color-name the food words compared to the non-food words, consistent with the idea that maladaptive behavior involving excessive of food consumption may be driven by attentional bias to such appetitive information. However, this finding did not replicate in a study by Phelan et al. (2011). These researchers recruited currently obese and normal weight participants, and exposed them to a modified Stroop task in which words referring to high calorie foods or low calorie foods were presented. They found that the obese participants did not differ from the normal weight controls in terms of their RTs to color-name the food words. Nijs, Ingmar, and Muris (2010) recruited obese and normal weight control participants, and had them complete a similar modified Stroop task in which words referring to high-calorie foods (e.g. cake, ice-cream, kebab), or affectively

neutral control words unrelated to food, were presented. The obese participants did not display disproportionate slowing to color name the food-related words compared to non-food words. However, Nijs et al. found that higher levels of food craving in the obese participants were associated with greater slowing to color-name the appetitive food-related words compared to non-food words, suggesting that an attentional bias to such food-related information may underpin their motivation to engage in consumption. No such association was observed in the normal weight control group. This finding invites the potential inference that when motivation to consume high calorie food is driven by the degree to which selective attention is captured by unhealthy food, this may drive the maladaptive patterns of consumption that lead to obesity.

Studies that have employed the attentional probe task to assess selective attentional responding to appetitive food information have also obtained evidence of an association between attentional bias to affectively positive information and obesity, though again there has been some inconsistency. Kemps, Tiggemann, and Hollitt (2014) had participants who were either obese or within the normal weight range complete an attentional probe task in which word pairs, exposed for 500ms, each comprised one appetitive food word (e.g. pizza, yoghurt, cake), and one word unrelated to food. These investigators found that obese participants were relatively speeded to process probes that appeared in the locus of the appetitive food words compared to probes appearing in the locus of words unrelated to food, indicating that the tendency to engage in excessive food consumption is characterized by an attentional bias to appetitive information concerning food. Similar findings have been reported by Nijs, Muris, Euser, and Franken (2010), who gave obese and normal weight participants an attentional probe task in which image pairs, each comprising one image of appetitive food (e.g., donut, chocolate) and one affectively neutral image (e.g., paperclip, stapler), were exposed for 100 ms. The resulting pattern of probe response

latencies indicated that the attention of the obese participants tended to be captured by the appetitive food-related information to a greater degree than was the case for the normal weight controls. Not all studies using the attentional probe task have obtained evidence of such an attentional bias in obese participants. Loeber et al. (2012) gave obese participants and normal weight controls an attentional probe task variant in which images of food, paired with images of objects, were very briefly displayed for only 50 ms before probe onset. These researchers found no evidence that the obese participants were relatively speeded to process probes appearing in the location of the food images. It may be that 50 ms permitted insufficient time for a selective attentional shift towards the food-related information to take place. By enabling continuous assessment of attentional distribution measurement, eye movement studies have shed further light on the patterns of selective attentional responding to food-related information associated with obesity.

Werthmann et al. (2011) tracked the eye-gaze of obese and normal weight participants during 2000 ms exposures to stimulus pairs that each comprised one image of a highly palatable high-fat food, and one image of an affectively neutral object unrelated to food. These researchers found that obese participants directed their first gaze fixation more often to the food images than to the non-food images, as compared to the normal weight controls. It is interesting to note that the differential pattern of attentional responding to appetitive food stimuli shown by obese and healthy weight individuals does not appear to increase from hunger, but instead may be more evident in the wake of consumption. Castellanos et al. (2009) recruited obese and normal weight participants, and used eye gaze measures to assess their attentional response during 2000 ms exposures to stimulus pairs that each comprised one food image and one non-food image. In one condition, participants were required to fast before completing the attentional assessment task,

and in this condition the obese and normal weight participants both displayed an equivalent gaze bias towards the food stimuli. In a second condition, participants ate immediately before attentional assessment. This condition eliminated gaze bias towards the food stimuli in the normal weight participants, but left gaze bias to food stimuli unchanged in the obese participants, giving rise to a group difference that reflected heightened attention to the food stimuli in the obese participants compared to the normal weight controls. On the basis of these findings, Castellanos et al. suggest that obesity may result from impaired satiety-linked regulation of attentional vigilance to food. Individuals who continue to display an attentional bias for appetitive food-related information when their hunger has been satiated by eating may consequently be disproportionately inclined to engage in levels of consumption that exceed biological need.

Of course, the above argument presupposes that selective attentional responding to food-related information can causally influence behavioral patterns of food consumption. This putative causal relationship cannot be inferred from observed associations between attentional selectivity and behavioral consumption. However, research that has employed attentional bias modification (ABM) procedures to directly manipulate selective attentional responding to food-related information lends weight to the contention that such attentional selectivity can causally impact on consumption. Boutelle, Kuckertz, Carlson, and Amir (2014) exposed overweight and obese children to a probe-based procedure, delivered either in an ABM training condition configured to reduce attentional bias to appetitive food stimuli (e.g., cake), or in a control condition configured to leave attentional responding to food stimuli unchanged. All children were then given unrestricted access to a range of sweet and savory snack foods (popcorn, Cheez-its, Cheetos, potato chips, pretzels, Skittles, Hershey bars, chocolate chip cookies, Fig Newtons,

jelly beans, M&M's), and the caloric value of the food they consumed was measured. It was found that the children who had completed the ABM condition designed to reduce attentional bias to appetitive food stimuli subsequently tended to consume fewer calories than the participants in the control condition. Thus, directly targeting the reduction of attentional bias to appetitive food served to reduce the behavioral consumption of such food, suggesting that selective attentional responding to food-related information can causally impact eating behavior. Similar findings have been obtained in studies that have employed ABM procedures specifically designed to reduce attention to chocolate, which have been shown to also reduce subsequent consumption of chocolate (Kemps, Tiggemann, Orr, & Gear, 2014; Werthmann, Field, Roefs, Nederkoorn, & Jansen, 2014). Moreover, evidence from ABM studies indicated that attentional bias to one particular subtype of food causally influenced the degree to which that specific type of food was likely to be consumed. Kakoschke, Kemps, and Tiggemann (2014) exposed participants in the healthy weight range to an ABM procedure configured to induce either an attentional bias away from unhealthy food images and towards healthy food images (attend health food), or an attentional bias towards unhealthy food and away from unhealthy food images (attend unhealthy food). A conventional version of the probe task, from which the ABM contingencies were removed, demonstrated that the alternative ABM conditions were effective in inducing the intended differential attentional response to the healthy vs unhealthy food information. Participants then underwent a taste test procedure in which they were asked to rate different snack foods, which were either healthy (i.e. strawberries and unsalted nuts) or unhealthy (i.e. chocolates and potato crisps), on different taste dimensions. The total amount of each food type the participant consumed during this taste test was recorded. It was found that the participants who had received the attend healthy food ABM procedure consumed significantly

more healthy snack food relative to unhealthy snack food than participants who instead had received the avoid healthy food ABM procedure.

As the evidence reviewed in this section demonstrates, while an attentional bias to affectively positive information may enhance emotional well-being, such a pattern of attentional selectivity also has the capacity to drive maladaptive patterns of behavior that compromise situational well-being. Attentional bias to attractive appetitive substances such as alcohol may be accompanied by positive affect that is sustained by the pleasurable experience of drinking, but this same pattern of attentional selectivity may also increase the risk of excessive alcohol consumption, which significantly compromises situational well-being. Likewise, an attentional bias to tasty but unhealthy foods, and the recreational eating that often accompanies this pattern of attentional selectivity, may serve to elevate positive affect and attenuate negative mood, but also may drive the increased consumption of such foods that leads to obesity, which has a severely detrimental impact on situational well-being. Although attentional bias to these types of appetitive information may have a positive emotional impact, feeling good isn't necessarily good for us when this feeling is accompanied by patterns of behavior that impair health and compromise social and occupational functioning.

Conclusions and Future Directions

The external world exposes us continuously to complex arrays of constantly changing information, the scale and volume of which far exceed the limited processing capacity of our cognitive systems. Hence, the internal worlds that we construct to represent the external world are necessarily incomplete. But it is our simplified internal cognitive model of external reality, and this alone, that shapes how we feel and how we behave. The operation of selective attention

plays a major role in determining the content of our internal representation of the world. The evidence we review in this chapter indicates that when selective attention operates in a manner that favors the encoding of emotionally negative information, consequently giving rise to internal cognitive models of our world that over-represent negative aspects of the external environment, then this increases our tendency to experience negative emotion. In contrast, when selective attention instead operates in a manner that favors the encoding of emotionally positive information, consequently giving rise to internal cognitive models of our world that over-represent its more positive aspects, then this elevates our tendency to experience positive emotion. We have seen that such biases in attentional responses to affectively toned information shape emotional disposition, and so interventions designed to reduce attentional bias to negative information and/or to increase attentional bias to positive information can exert a beneficial impact on emotional well-being. We also have reviewed evidence concerning the potential behavioral impact of biases in selective attention that highlights the potential risks associated with indiscriminately training people to adopt the patterns of attentional selectivity likely to optimize their emotional well-being in the short term. Some negative aspects of the world concern unpleasantness that is beyond our ability to control, and so the emotional benefits potentially gained by reducing attention to such unpleasantness come with no cost to our situational well-being. But in many cases, negative aspects of the world concern dangers that, by taking appropriate action, we can substantially mitigate. Attentionally avoiding such negative information may attenuate anxiety and worry, but it is also likely to reduce the prospect of engaging in the behaviors that could reduce such dangers. We have reviewed evidence that heightening attention to this type of negative information can promote engagement in adaptive behaviors, and thereby protect against potential harm. Conversely, we are frequently exposed to

affectively positive information concerning appetitive stimuli that have the capacity to cause harm, and in some cases this exposure takes place within the context of advertising campaigns designed to enhance their emotional positivity and promote their consumption. While an attentional bias towards such affectively positive information may elevate positive mood, we have reviewed evidence that this pattern of attentional selectivity may also drive elevated levels of consumption that have detrimental consequences for situational well-being. Ultimately, overall well-being is likely to be optimized not by maximizing positive affectivity, but by maintaining an appropriate balance between emotional and situational facets of well-being.

The issues raised in this chapter highlight several important directions for future research. First, they indicate the need for theorists to develop more sophisticated concepts of resilience. We suggest that individual differences in resilience should be construed exclusively neither in terms of variability in people's emotional reactivity, or variability in people's capacity to overcome practical problems, but instead should implicate balance between emotional and situational well-being. The person who rarely experiences negative emotion cannot be considered truly resilient if their lack of appropriate negative emotion leads them to experience inflated rates of avoidable harm. Likewise, the person who endlessly but successfully engages in harm avoidance cannot be considered truly resilient if this comes at the cost of chronic negative emotion. Hence, there is a pressing need for the two dimensions of emotional well-being and situational well-being to be integrated within future models of resilience.

We encourage future researchers to directly evaluate the proposal that resilience, reflecting optimal balance between emotional and situational well-being, will depend upon sustaining a very particular balance between attentional vigilance and avoidance of negative and positive information. Specifically, we have proposed that overall well-being will best be served

when people display attentional vigilance for negative information concerning dangers that can be mitigated through appropriate action, while attentionally avoiding of other types of negative information; and display attentional vigilance for positive information that carries little risk of harm, while inhibiting attention to positive information when this has detrimental consequences (as is the case, for example, when attention is paid to appetitive stimuli implicated in maladaptive patterns of consumption detrimental to health, social functioning or occupational achievement). We suggest that future research should seek to test these theoretical ideas within the laboratory. For example, this could be achieved by presenting participants with emotionally-negative cues that predict aversive consequences at the end of each trial (e.g. noise bursts or monetary loss), under circumstances where adaptive action in response to these cues (e.g. completing particular sequences of key presses) either can or cannot influence the probability of these future aversive consequences. Our position predicts that people who display optimal overall well-being will display attentional vigilance for emotionally negative cues only under the condition where the processing of such cues enables them to effectively negate the aversive outcomes they signal, and will instead display attentional avoidance of emotionally negative cues when this is not the case. Our position also predicts that these people will display attentional vigilance for positive information in such tasks, unless doing so incurs costs in terms of inflating the probability of a subsequent aversive events occurring, in which case they will display attentional avoidance of such positive information. That is, we predict that optimal resilience will reflect the alignment of selective attentional responding to emotional information with contextual factors that determine whether the selective processing of such information is likely to yield situational benefits.

It follows from this reasoning that overall well-being could potentially be optimized by directly training these contextually sensitive patterns of attentional selectivity. Hence, we suggest that a third important line of future research should involve the development and evaluation of training procedures capable of inducing such attentional selectivity. We envisage that such training approaches will likely incorporate existing cognitive bias modification approaches into tasks where attentional vigilance for negative information and attentional avoidance of positive information can, in some contexts but not others, serve to enhance situational outcomes. We anticipate that the optimal balance between emotional and situational well-being may result from bias modification procedures that induce attentional avoidance of negative information unless this signals dangers that can be mitigated through action, and attentional vigilance for positive information unless this elicits detrimental consequences. The creation of such sophisticated training procedures, to induce contextually sensitive patterns of attentional selectivity, represents an exciting new challenge for researchers working in the field of attentional bias modification.

While the outcomes of such future work will further advance knowledge and understanding, the research reviewed in the present chapter clearly indicates the need to differentiate the impact that biased attentional responding to emotional information exerts upon our emotional and situational well-being. Sometimes attending to things that make us feel bad can be good for us. Sometimes attending to things that make us feel good can be bad for us. And this, we believe, is something very much worth attending to.

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Glossary of Key Terms

Attentional bias: a systematic pattern of selective attention operating to favour one type of information over another.

Emotional well-being: a dimension of individual difference reflecting the degree to which a person experiences predominantly positive as opposed to negative affect.

Situational well-being: the degree to which a person successfully achieves objectives, such as fulfilment of occupational goals and maintenance of good physical health and social relationships.

Positive affect: the current subjective experience of positive mood state.

Negative affect: the current subjective experience of negative mood state.

Affectively toned information: stimulus information that is either positive or negative, but not neutral, in emotional tone.

Appetitive stimuli: information that is related to stimuli that commonly evoke approach and consummatory behaviour, such as food, alcohol, or drugs.

Positive emotional disposition: a dimension of personality reflecting individual differences in the tendency to experience positive mood state.

Negative emotional disposition: a dimension of personality reflecting individual differences in the tendency to experience negative mood state.