

# Mental illness and well-being: an affect regulation perspective

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*Mental health crucially depends upon affective states such as emotions, stress responses, impulses and moods. These states shape how we think, feel and behave. Often, they support adaptive functioning. At other times, however, they can become detrimental to mental health via maladaptive affect generation processes and/or maladaptive affect regulation processes. Here, we present an integrative framework for considering the role of affect generation and regulation in mental illness and well-being. Our model views affect generation as an iterative cycle of attending to, appraising and responding to situations. It views affect regulation as an iterative series of decisions aimed at altering affect generation. Affect regulation decisions include identifying what, if anything, should be changed about affect, selecting where to intervene in the affect generation cycle, choosing how to implement this intervention, and monitoring the regulation attempt to decide whether to maintain, switch or stop it. Difficulties with these decisions, often arising from biased inputs to them, can contribute to manifestations of mental illness such as clinical symptoms, syndromes and disorders. The model has a number of implications for clinical assessment and treatment. Specifically, it offers a common set of concepts for characterizing different affective states; it highlights interactions between affect generation and affect regulation; it identifies assessment and treatment targets among the component processes of affect regulation; and it is applicable to prevention and treatment of mental illness as well as to promotion and restoration of psychological well-being.*

**Key words:** Affect, affect regulation, process model, mental illness, well-being, transdiagnostic mechanisms, psychotherapy

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Someone in good mental health enjoys not only freedom from mental illness but also substantial psychological well-being. As the World Health Organization puts it, “mental health is a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”<sup>1</sup>.

These characteristics of mental health depend, among other things, upon affective states such as emotions, stress responses, impulses and moods. An instance of affect can be viewed as more or less healthy, depending on whether its intensity, duration, frequency or type facilitates or threatens mental health in a given context<sup>2,3</sup>. For example, becoming a bit anxious before a job interview can be healthy when it improves motivation and performance. Intense anxiety, by contrast, can be unhealthy when it impairs performance and contributes to avoidance of future social challenges.

Some form of unhealthy affect can be found among the defining features of 40 to 75% of mental disorders<sup>2,4</sup>. It is therefore important to understand how affect becomes unhealthy, and what can be done to prevent or treat unhealthy affect. These questions have long been of interest for psychology and psychiatry<sup>5</sup>. To mention only a few major lines of inquiry, the psychodynamic tradition has related affect to contests between desires and constraints<sup>6</sup>; the stress and coping tradition has elucidated cognitive antecedents and physiological consequences of affect<sup>7,8</sup>; and the affective neuroscience tradition has revealed some of the brain mechanisms underlying affective behaviors<sup>9–11</sup>.

The diversity of literature on affect and mental health has resulted in a large number of poorly integrated accounts. For instance, accounts of affect in mental illness<sup>12</sup> tend to be separate from accounts of affect in well-being<sup>13</sup>. Separate accounts can also be found for similar affective phenomena in different

mental illnesses<sup>14</sup>. Adding to the complexity, different accounts often operate on different levels of analysis, from neurochemical to psychosocial. The fragmented set of explanations for the role of affect in mental health makes it difficult for practitioners and researchers to conceptualize individual cases; to analyze transdiagnostic mechanisms; and to integrate advances from ongoing research.

One way to address these limitations is to construct integrative frameworks that explain different kinds of affect across mental illness as well as well-being. When seeking to understand how unhealthy affect arises, it is important to realize that, once *generated*, an emotion, a stress response, an impulse or a mood need not continue to dominate behavior, because people routinely use affect *regulation* to change these affective states<sup>8,15–21</sup>. Thus, unhealthy affect can result from problematic affect generation, problematic affect regulation, or some combination of the two.

Unhealthy affect may be said to be due to *affect regulation failure* when affect regulation is not successfully engaged to counteract maladaptive affect generation. Unhealthy affect may be said to be due to *affect misregulation* when affect regulation aggravates matters by changing affect in a maladaptive direction. Both affect regulation failure and affect misregulation can increase the risk of mental illness as well as hinder psychological well-being. Conversely, adaptive affect regulation can prevent, reverse or alleviate mental illness as well as promote well-being.

In this paper, we offer an integrative framework for thinking about the interplay between affect generation and affect regulation in mental health. We focus primarily on mental illness, but the principles we discuss are equally relevant for psychological well-being. We also focus primarily on affect regulation but, in order to understand how affect can be regulated, we also need to consider how affect is generated.

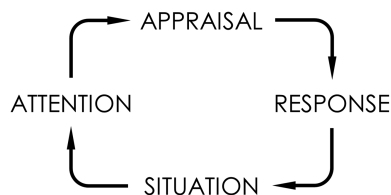
In the first two sections of the paper, we present the *process model of affect regulation*, an integrative framework that views affect generation as a four-stage process that can be altered by another four-stage process of affect regulation<sup>15,22,23</sup>. In the third section of the paper, we use this framework to identify affect regulation difficulties that contribute to mental illnesses, drawing examples from a variety of symptoms, syndromes and disorders. In the final section, we consider several implications of the process model of affect regulation for clinical assessment and treatment.

## AFFECT GENERATION

We use “affect” as an umbrella term to denote emotions such as anxiety or joy; stress responses such as feeling threatened or feeling challenged; impulses such as an urge to flee or to have a drink; and moods such as depression or elation. Despite their differences, what these diverse processes have in common is that they all involve valuation – a good-for-me vs. bad-for-me distinction – that can shape behavior<sup>15,24-27</sup>. For instance, anxiety, feeling threatened, an urge to flee, and depression all signal that something is unpleasant and worth avoiding. Joy, feeling challenged, an urge to drink, and elation all signal that something is pleasant and worth approaching. Valuation reflects what a situation has to offer in relation to what the individual values, needs or wants. The function of affective states is therefore to shape behavior in accordance with the relationship between situation and motivational concerns.

Given their shared function, affective states can be analyzed using common concepts. Following a cybernetic approach<sup>15,28-30</sup>, we view affect as a series of iterative cycles comprising four stages: a) a *situation* that can be experienced or imagined; b) *attention* that shapes how the situation is perceived; c) *appraisal* of the situation in light of motivational concerns; and d) a *response* to the situation that can entail changes in subjective experience, physiology, and/or facial or whole-body behavior (see Figure 1). For instance, an emotion of anxiety may arise when a person experiences or imagines a job interview (situation); pays attention to what could go wrong (attention); appraises the situation as threatening (appraisal); and feels anxious, starts to sweat, and wishes to flee (response).

The affective responses generated on one iteration of this feedback loop may become part of the situation stage of a sub-



**Figure 1** Affect generation. Different affective states such as emotions, stress responses, impulses and moods can be viewed as iterative cycles of attending to, appraising and responding to situations.

sequent iteration. For instance, the person may now realize that he is being interviewed while anxious and perspiring (situation), fixate on increased chances of failure (attention), appraise the situation as even more threatening (appraisal), and experience even stronger anxiety (response). Successive iterations of the affect generation loop can produce increasingly selective attention, elaborate appraisals, and specific responses.

We suggest that the same four iterative stages are involved in different kinds of affective states, although the stages can differ in their automaticity, specificity, duration, and other features. One way to organize different affective states within this framework is to place them on a continuum based on how many affect generation stages are generally part of the conscious experience of the given affective state.

At one end of this continuum are emotions, where all four stages are generally part of the experience. Emotions such as anxiety or joy tend to involve strong feelings directed at a situation that commands attention and is at least in part consciously appraised<sup>27,31</sup>.

At the other end of the continuum are moods such as depression or elation, that tend to be experienced as diffuse feelings and action tendencies (i.e., only the response stage). We argue that the remaining affect generation stages play a role in moods outside of conscious awareness. Thus, moods tend to relate to situations that have been selectively perceived and appraised largely outside of awareness<sup>32,33</sup>.

Between emotions and moods in the continuum are stress responses and impulses. Stress responses, such as feeling threatened or feeling challenged<sup>8,34</sup>, resemble emotions in that the attention, appraisal and response stages are usually part of the experience. However, instead of a single identifiable situation, these experiences revolve around broader circumstances, such as a divorce or a new job, that span several specific situations.

Impulses, such as an urge to flee or to have a drink, can be viewed as affective states experienced as a constellation of the response and the situation stages. Impulses can feel almost like reflexes – strong action tendencies (i.e., response stage) elicited by some threat or opportunity (i.e., situation stage)<sup>17</sup>. We argue that the intermediate stages of selectively perceiving and appraising the situation are often operative in impulses, albeit outside awareness.

The four-stage model of affect generation is a flexible way to appreciate both commonalities and differences among different kinds of affective states. Importantly for current purposes, the model also suggests that unhealthy affect can be traced back to maladaptive unfolding of one or more of the four affect generation stages. Sometimes, unhealthy affect arises simply due to a maladaptive situation, such as being a victim of violence. When unhealthy affect arises from otherwise adaptive situations, however, it may be because of maladaptive unfolding of attention, appraisal or response stages of affect generation. For instance, the mental health consequences of maladaptive attention are illustrated by the role of attention biases in mood and anxiety disorders<sup>35,36</sup>. The consequences of maladaptive appraisal are illustrated by the role of interpretation biases in people with

depressive symptoms<sup>37</sup>. The consequences of maladaptive affective responses are illustrated by the role of low physiological reactivity in externalizing syndromes such as sociopathy<sup>38</sup>.

Maladaptive affect generation is therefore an important part of a comprehensive account of unhealthy affect. However, in this paper, our primary focus is affect regulation. This is because maladaptive affect generation manifests in unhealthy affect mostly when affect regulation fails to neutralize – or even further aggravates – the maladaptive affect.

## AFFECT REGULATION

Affect regulation involves intentional (but not necessarily conscious) attempts to change the intensity, duration, frequency or type of current or anticipated affect<sup>39</sup>. We focus in this paper on self-generated or *intrinsic* affect regulation, which can be distinguished from other-generated or *extrinsic* affect regulation<sup>40,41</sup>. The latter – which involves one person's attempt to regulate the affective states of another person – is also important for mental health, but falls beyond the scope of this paper.

Mirroring the four kinds of affective states distinguished earlier, we may distinguish four kinds of affect regulation: a) emotion regulation<sup>15,16,42</sup>; b) regulation of stress, i.e. coping<sup>8,43</sup>; c) regulation of impulses, i.e. self-regulation<sup>17,44</sup>; and d) mood regulation<sup>18,45</sup>. Even though the type of affect targeted by regulation can be important to distinguish, our analysis of common mechanisms of affect generation suggests that there are also common mechanisms of affect regulation.

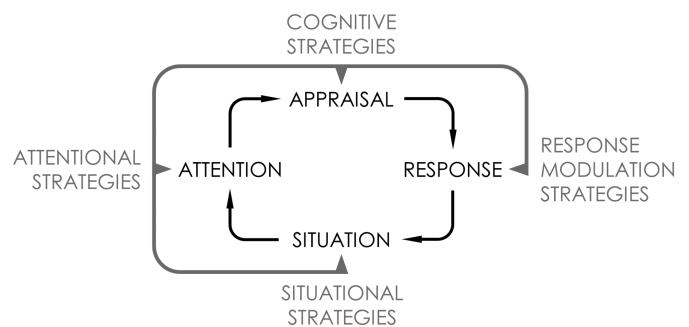
The process model of affect regulation highlights these shared mechanisms by addressing two fundamental questions: a) how can affect be regulated (strategies), and b) what processes underlie affect regulation (stages).

### Affect regulation strategies

To understand how affect can be regulated, it is useful to return to the four stages of the affect generation loop outlined in Figure 1. Given the stages of situation, attention, appraisal and response, we can distinguish four families of affect regulation strategies, based on which affect generation stage they primarily influence (see Figure 2).

*Situational strategies* seek to alter affect generation at the situation stage, by selecting which situations are encountered (*situation selection*) or modifying what is going on in them (*situation modification*)<sup>44</sup>. For instance, people wishing to lift their depressed mood may call a friend (situation selection) or guide an already ongoing conversation to uplifting topics (situation modification).

*Attentional strategies* seek to alter affect generation at the attention stage, by changing what aspects of the situation are attended to<sup>46</sup>. For instance, the person experiencing depressed mood may distract himself from negative thoughts by diverting his attention to a game such as Tetris.



**Figure 2** Affect regulation strategies. Four families of affect regulation strategies can be distinguished based on which stage of affect generation they primarily seek to alter.

*Cognitive strategies* seek to alter affect generation at the appraisal stage, by modifying how the situation is viewed in light of goals, values, and other motivational concerns<sup>47</sup>. For instance, depressed mood could be fought off by considering how things are not as bad as they initially seemed.

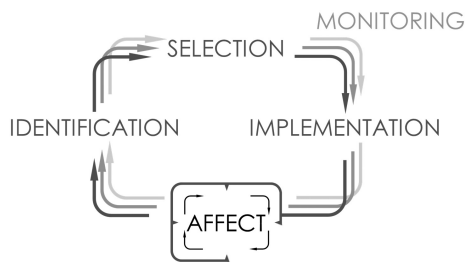
Finally, *response modulation strategies* seek to alter affect at the response stage, by counteracting the affect-related experiential, behavioral or physiological changes. For instance, the person experiencing depressed mood may prepare a cup of coffee to energize his body.

In addition to mood regulation, the same strategy families have been found to be relevant for regulating emotions<sup>42</sup>, stress<sup>22</sup> as well as impulses<sup>44,48</sup>.

Each of the four broad ways of changing affect can be effective, but each has different costs and benefits<sup>49,50</sup>. For instance, strategies that intervene early in the affect generation cycle can provide powerful relief from the affective state<sup>51</sup>, but this may come at the cost of limited learning<sup>52,53</sup>. As researchers have identified different costs and benefits of regulation strategies, it has become clear that adaptive affect regulation requires matching strategies to the characteristics of the affect being regulated, the individual, and the current context<sup>54-56</sup>. For instance, in a context where a frustrating situation can be improved, it is sensible to try to change the situation rather than to use cognitive strategies to change how the situation is appraised. By contrast, in a context where nothing much could be done to improve the situation, it is sensible to use cognitive rather than situational strategies<sup>57-59</sup>.

### Affect regulation stages

If deciding how to best regulate affect appears such a complex task, how is it accomplished? The process model of affect regulation addresses this question by envisioning a series of four stages: identification, selection, implementation and monitoring (see Figure 3). Each stage can be thought of as a decision that the person makes, consciously or otherwise<sup>60,61</sup>. Returning to the example of the person experiencing depressed mood, what decisions does he need to make to regulate his mood?



**Figure 3** Affect regulation stages. Affect regulation consists of key decisions that people make, consciously or otherwise, during four stages. At the identification stage, people decide what, if anything, should change about affect. At the selection stage, they decide which affect regulation strategy to use in service of that goal. At the implementation stage, they decide which actions to take as part of the chosen strategy to alter the affect generation process. The monitoring stage consists of iterative updates to the identification, selection and implementation decisions that amounts to a separate decision about whether ongoing efforts should be maintained, switched or stopped.

First, at the *identification* stage, he needs to decide that his current mood should be improved. This decision then activates the *selection* stage, where he needs to decide which affect regulation strategy to use (i.e., where to intervene in the affect generation cycle). For instance, he may select an attentional strategy to keep his mind off ruminative thoughts. Strategy selection triggers the *implementation* stage, where the person needs to decide which specific actions to take. For instance, he may play a game of Tetris.

As the chosen actions intervene in affect generation, all three decisions may need to be updated – whether the affect continues to require regulation, whether an attentional strategy continues to be the best strategy, and whether playing Tetris continues to be the best course of action. The continued iteration of the three decisions can be thought of as a separate *monitoring* stage of affect regulation, where the person needs to decide whether to maintain, switch or stop the ongoing affect regulation attempt.

To better understand the identification, selection, implementation and monitoring stages, it is helpful to consider what information is processed to reach the decisions required at each stage. The process model of affect regulation suggests that each stage makes use of two main inputs, and we now turn to describing the role that these inputs play in each of the four stages.

The identification decision of what, if anything, should change about affect (i.e., what is the regulation goal) relies on: a) a representation of the current affective state together with alternative states, and b) the evaluation of the costs and benefits of these states in the given context.

The first input to the identification decision thus requires representing ongoing affective states together with other states that the person could experience in the given situation. The importance of this input is illustrated by the finding that people who are good at detecting and labelling their affective states tend to also be good at affect regulation<sup>62,63</sup>.

The second input to the identification decision consists of the evaluation of the current and alternative affective states

based on their costs and benefits. Most of the time, people evaluate affective states in light of the hedonic motive to increase pleasant feelings and decrease unpleasant feelings. However, people can also make counter-hedonic (i.e., instrumental) evaluations, for instance when they wish to be angrier than they currently are because they believe that this will help them negotiate<sup>64</sup>.

When the identification stage is working well, the person detects the current affective state together with alternatives, evaluates them appropriately, and decides (consciously or otherwise) what, if anything, should change about the current affective state.

A decision to change affect triggers the *selection* stage, at which point the person decides where to intervene in affect generation (i.e., which regulation strategy to use). The selection decision relies on: a) a representation of available regulation strategies, and b) the evaluation of the costs and benefits of these strategies in the given context.

The availability of strategies can vary between situations as well as individuals. For instance, cognitive strategies are more likely to be considered in situations that have multiple interpretations<sup>65</sup>. Different individuals may consider different strategies based on their skills and abilities. For instance, attentional strategies work better for people with relatively high working memory capacity<sup>66</sup>, suggesting that they are more likely to consider these strategies as a viable regulation option.

The second input to the selection decision is the evaluation of costs and benefits of available strategies<sup>67</sup>. One major benefit of each available strategy is its expected efficacy to change affect. For instance, when attempting to downregulate intense emotions, people tend to prefer distraction (an attentional strategy) over reappraisal (a cognitive strategy), because the former is believed to be more effective<sup>67</sup>. Some of the major costs include the time and effort needed to use the strategy<sup>68</sup>. Other costs and benefits, more specific to different strategies, individuals and contexts, also help to shape the eventual choice of strategy.

When the selection stage is working well, the person represents available strategies, evaluates them appropriately, and decides which regulation strategy to use.

The selection decision triggers the *implementation* stage, where the person decides how to enact the selected strategy in the given context. This stage is needed because the broad strategies of intervening at one of the four stages of affect generation can be enacted in different ways<sup>69</sup>, sometimes referred to as regulation tactics. For instance, having made an identification decision to lift depressed mood, and a selection decision to rely on attentional strategies, the person may decide to play Tetris as a way to get his mind off his negative thoughts. Such an implementation decision relies on: a) a representation of different actions afforded by the situation, and b) the evaluation of the costs and benefits of these actions in the given context.

The implementation stage is where the regulation process reaches its target, as specific mental or physical actions impact the affect generation process (see Figure 3). For instance,



playing Tetris diverts cognitive resources away from the attention stage involved in generating depressed mood.

When the implementation stage is working well, the person represents actions afforded by the specific context, evaluates them appropriately, and decides how to enact the regulation attempt.

The identification, implementation and selection decisions form an iterative cycle. As the strategy *selected* to serve the *identified* regulation goal is *implemented*, each of these decisions may need to be updated to mirror changes in the regulated affect as well as in the broader context. Iterative updates to the affect regulation decisions can be viewed as a separate *monitoring* stage, involving a decision to either maintain, switch or stop the regulation attempt. Inputs to this decision include: a) changes in affect, which can be spontaneous as well as caused by ongoing regulation, and b) changes in context.

As long as the regulation attempt continues to produce desired changes to affect, and the context also does not change substantially, the person can *maintain* regulation by relying on the latest identification, selection and implementation decisions (e.g., play Tetris to fend off rumination in order to lift depressed mood). However, if affect resists change, or changes in undesired ways, the chosen implementation, strategy or regulation goal can be *switched*, or the regulation attempt can be *stopped* altogether. Switching or stopping may also be mandated by a change in context, such as when a friend calls in the middle of the Tetris game.

To be adaptive, affect regulation should respond with optimal flexibility to changes in affect as well as in context<sup>43,55</sup>. Not enough flexibility can lead to overuse of certain affect regulation behaviors, whereas too much flexibility can lead to lack of persistence.

When the monitoring stage is working well, the person appropriately represents ongoing changes in affect as well as in context, and decides to maintain, switch or stop regulation accordingly.

## MALADAPTIVE AFFECT REGULATION AND MENTAL ILLNESS

The process model of affect regulation outlined in the previous sections can be helpful for considering how maladaptive affect regulation can contribute to mental illness. The identification, selection, implementation and monitoring decisions can be considered maladaptive when they are misaligned with the targeted affective state, the current motives of the person, and/or contextual demands<sup>54-56</sup>. In this section, we consider how each of these decisions can become maladaptive. We use selective examples of manifestations of mental illness such as different symptoms, syndromes and disorders. Note that, even when we discuss a particular mechanism in relation to a particular manifestation, we do not intend to imply that a given manifestation could not be related to other mechanisms nor that a given mechanism could not be involved in other manifestations of mental illness.

## Identification difficulties

Unhealthy affect may arise from the identification stage of affect regulation when the decision of what, if anything, should change about an affective state is maladaptive. This can happen when a person encounters difficulty with at least one of the inputs to the identification decision, i.e., by misrepresenting affective states and/or miscalculating their costs and benefits.

The first kind of difficulty is characteristic of individuals high on trait alexithymia, who struggle to attend to and accurately identify their affective experiences<sup>70</sup>. Compared to healthy controls, these individuals have been found to engage in maladaptive affect regulation patterns<sup>71</sup> which may arise from the low granularity with which they represent affect. Alexithymia is also common among individuals with mental illnesses such as autism spectrum disorder<sup>72</sup> or eating disorders<sup>73</sup>, suggesting that the unhealthy affect characterizing these mental illnesses may also arise in part from misrepresented affective states.

The second difficulty associated with the identification stage involves miscalculation of the costs and benefits of either the current affective state or alternative states that could be experienced. For example, people with panic disorder tend to overestimate the costs of current anxiety<sup>74</sup>. They may interpret a normal anxiety-related increase in heart rate as a sign of imminent heart failure, or anxiety-related thoughts as a sign of imminent loss of their grip on reality. Such overestimation of costs of affect can produce a maladaptive identification decision to launch an unnecessary regulation attempt. In addition to costs, people can also miscalculate the benefits of affective states. For instance, individuals with bipolar disorder often choose not to downregulate maladaptive positive affect, even though they are able to do so when instructed<sup>75</sup>. One reason may be that individuals with bipolar disorder overvalue the hedonic benefits of positive affective states at the expense of the costs of these states as well as the benefits of alternative states<sup>76</sup>.

## Selection difficulties

Unhealthy affect may arise from the selection stage of affect regulation when the decision about which regulation strategy to use in order to accomplish the regulation goal is maladaptive. This can happen when a person encounters difficulty with at least one of the inputs to this decision, i.e., by misrepresenting available strategy options and/or miscalculating the costs and benefits of these strategies.

One reason for misrepresenting available strategies may be that the person has limited skills or experiences with different strategies. For instance, people with alcohol use disorder may struggle to consider strategies other than consuming alcohol, which they are most familiar with<sup>77</sup>. A similar limitation may characterize individuals suffering from binge eating disorder, who often engage in unhealthy eating patterns for affect regulatory purposes<sup>78</sup>.

Another way the selection stage may contribute to unhealthy affect is via difficulties with evaluating the costs and benefits of different strategies. Many mental illnesses are associated with misvaluation of maladaptive regulation strategies. For example, engagement in non-suicidal self-injury relies in part on the evaluation of this costly behavior as an effective affect regulation strategy<sup>79,80</sup>. People with generalized anxiety disorder meanwhile view worry, another strategy with negative consequences, as productive (e.g., “Worrying helps me to be prepared and avoid adversities”) or as an indicator of good character (e.g., “Worrying means that I care”)<sup>83</sup>.

Difficulties with the cost-benefit analysis of strategy options may also arise from more general decision biases. For instance, a broad range of mental illnesses are associated with amplified temporal discounting, whereby immediate outcomes are overvalued relative to long-term outcomes even more than in healthy populations<sup>81</sup>. Amplified discounting can bias affect regulation strategy selection towards underestimating long-term costs and benefits relative to short-term ones. For instance, people with social anxiety disorder tend to choose behavioral avoidance to reduce anxiety despite it severely restricting social or professional outlooks for the future<sup>82</sup>.

### Implementation difficulties

Unhealthy affect may arise from the implementation stage of affect regulation when the decision about how to enact the selected strategy in a given situation is maladaptive. This can happen when a person encounters difficulty with at least one of the inputs to this decision, i.e., by misrepresenting available affordances for action and/or misvaluing their costs and benefits.

The first difficulty may arise when a person fails to consider action affordances beyond obvious ones suggested by habit and the environment. For instance, someone looking for ways to implement a situational strategy for increasing excitement may fail to consider options beyond watching the TV that happens to be in the room. Detecting less obvious action affordances often requires cognitive control<sup>84</sup>, a set of processes that tends to be impaired across a range of mental illnesses<sup>85</sup>. Cognitive control impairments are particularly relevant in attention-deficit/hyperactivity disorder (ADHD)<sup>86</sup>, which is also characterized by maladaptive affect regulation<sup>87</sup>. Our analysis suggests that maladaptive affect regulation in ADHD may stem, among other pathways, from difficulties to detect less obvious regulation tactics.

Another difficulty encountered at the implementation stage is the misvaluation of costs and benefits of different action affordances. This suggests that mental illnesses that impair predictions about action outcomes, such as major depressive disorder<sup>88,89</sup>, may contribute to maladaptive affect regulation by making it harder to appropriately evaluate action affordances even if they are detected. For instance, a person may come up with more ways than watching TV to implement an

attentional strategy to feel more excited, but then fail to consider some of their outcomes, leading to a maladaptive choice. According to the present framework, one mechanism through which affect regulation becomes maladaptive in people with depressive symptoms<sup>90</sup> may therefore involve misvaluation of the action affordances that have been detected during the affect regulation process.

### Monitoring difficulties

Unhealthy affect may arise from the monitoring stage of affect regulation, when the decision to maintain, switch or stop regulation is maladaptive. This can happen when the person encounters difficulties with at least one of the inputs to this decision, i.e., by misrepresenting changes to the regulated affect and/or to the relevant context. As the consequences of these difficulties are quite similar, we will not distinguish between them. Instead, we consider two directions of misrepresentations – under-representing changes in affect or context that contributes to insufficient regulation flexibility, and over-representing changes in affect or context that contributes to too high regulation flexibility<sup>55</sup>.

Insufficient flexibility can lead to unnecessary maintenance of regulation efforts that have already succeeded or are unlikely to succeed. Such inertia in regulation has been observed for numerous mental illnesses. For example, people with generalized anxiety disorder continue to worry despite it elevating anxiety and being cognitively costly<sup>91,92</sup>. Similarly, people with major depressive disorder continue to ruminate despite it increasing rather than decreasing depressed mood<sup>93</sup>.

At the other extreme, the monitoring decision can become overly flexible when changes in affect or context are over-represented. This difficulty can manifest in premature switches between strategies and their implementation before they have had a chance to become effective, or premature stopping of regulation altogether<sup>55</sup>. For instance, borderline personality disorder is characterized both by frequent shifts in affective states<sup>94</sup> as well as high levels of impulsivity<sup>95</sup>. This suggests that one reason for the affective lability in individuals suffering from borderline personality disorder may be insufficient persistence in applying affect regulation, i.e. overly high affect regulation flexibility.

## IMPLICATIONS FOR ASSESSMENT AND TREATMENT

Assessment and treatment of unhealthy affect is central to a number of psychotherapeutic approaches, including cognitive-behavioral therapy<sup>96</sup>, dialectical-behavioral therapy<sup>97</sup>, acceptance and mindfulness-based interventions<sup>98-101</sup>, emotion-focused therapy<sup>102</sup>, affect regulation training<sup>103</sup>, and emotion regulation therapy<sup>104</sup>. The present framework complements these approaches by offering four broad insights that have implications for clinical assessment as well as treatment.

First, the framework suggests that problems with different affective states, such as emotions, stress responses, impulses and moods, can be analyzed in common terms. Second, unhealthy affect usually arises from some combination of maladaptive affect generation and maladaptive affect regulation. Third, maladaptive affect regulation can arise from identification, selection, implementation and monitoring decisions. Finally, affective processes are equally relevant for mental illness and psychological well-being. In this final section, we briefly discuss the assessment and treatment implications of each of these insights.

### Common concepts for different affective states

Emotions, stress responses, impulses and moods have often been studied as separate phenomena, leading to separate assessment instruments and treatment approaches. Without denying instances where such distinctions are useful, the process model of affect regulation suggests that it is also reasonable to focus on the similarities rather than differences between affective states.

The framework highlights the iterative stages of situation, attention, appraisal and response, and the ways to regulate them, as a set of concepts that are sufficiently broad to capture different affective states. For instance, take a problematic affect such as generalized anxiety, that is experienced as a diffuse feeling with variable awareness of the situation, attention and appraisal stages of affect generation. Working with a client reporting this affective pattern, a clinician may seek to reveal the contents of these antecedent stages<sup>105</sup>. What are the situational triggers for these states? Are there selective perceptual processes involved? How is the selectively perceived situation appraised? Even though the client may initially lack awareness of these stages, he may provide reliable information through interviewing techniques such as behavioral chain analysis<sup>97</sup>. Relevant information may also be obtained through daily assessment techniques that can recover aspects of situations and cognitions that tend to be less available at later recall<sup>106</sup>.

Focusing on similarities between different affective states can also be useful for selecting and tailoring treatments for specific clients. For example, borrowing an insight from systematic desensitization<sup>107</sup>, a therapist may develop a hierarchy of affective states based on how difficult they are for a client to regulate. For instance, a client may resist unhealthy food with ease, downregulate his anger with moderate success, but almost never overcome a bout of depressed mood. The therapist could incorporate this hierarchy into a program of guided affect regulation practice that introduces different regulation techniques using assignments from the lower end of the hierarchy and gradually moving upwards. For instance, a client could first foster healthier eating habits through situation modification by putting healthy snacks in easily accessible locations. He may then use this experience as a helpful metaphor for finding ways to use situation modification to improve his depressed mood.

### Interplay of affect generation and regulation

The process model of affect regulation suggests that the same manifestation of unhealthy affect may arise from different mixtures of maladaptive affect generation and maladaptive affect regulation<sup>2</sup>.

On the one hand, this suggests that affect generation and affect regulation form an integrated dynamic system that can be analyzed as a single functional unit. For instance, for many clinical purposes, such as initial screening for affective disturbances, it is largely unimportant whether a problematic affective pattern reflects overly strong affect generation or overly weak affect regulation. On the other hand, the process model also exemplifies the value of separating the contributions of affect generation and regulation to unhealthy affect. Teasing these contributions apart can be challenging, as the client may have limited awareness of the functioning of different affective processes. The interviewing techniques discussed above may be adapted to this task. In addition, the research community has started to devise promising combinations of self-report, behavioral and statistical approaches for separating affect generation from affect regulation<sup>39</sup>.

Differentiating affect generation from affect regulation can also be important for designing targeted treatments. In many cases, people suffer from a combination of maladaptive affect generation and maladaptive affect regulation, and thus benefit from simultaneous – or sensibly sequenced – treatments targeting both. For instance, in the case of major depressive disorder, pharmacological interventions can be used to treat maladaptive affect generation, while psychotherapy can be used to improve affect regulation<sup>108</sup>. Omitting one or the other component from the treatment regime would reduce its overall efficacy. There can also be cases where the unhealthy affective pattern can be traced back to a single primary source among affect generation and affect regulation processes. In these instances, adequate targeting of treatment becomes even more important. For instance, consider a client who is already relatively proficient in affect regulation but suffers primarily from maladaptive affect generation. If offered only further affect regulation training, with no help with maladaptive generation, he might experience reduced self-efficacy that could lead to deterioration of the therapeutic relationship and treatment compliance.

### Decomposing affect regulation

The third implication of the process model of affect regulation is that the stages of identification, selection, implementation and monitoring, and their respective inputs, can be used as more specific targets for assessment as well as treatment.

For instance, an assessment approach could be designed to determine difficulties with *identifying* regulation goals, *selecting* regulation strategies, *implementing* them through contextually suitable actions, and *monitoring* the outcomes to make necessary modifications. Parts of these phenomena

can be assessed using existing self-report instruments, such as the Toronto Alexithymia Scale<sup>109</sup>, the Emotion Regulation Questionnaire<sup>110</sup>, the Cognitive Emotion Regulation Questionnaire<sup>111</sup>, the Difficulties in Emotion Regulation Scale<sup>112</sup>, the Coping Flexibility Scale<sup>113</sup>, and many others. However, as these measures assess overlapping but incomplete aspects of the four affect regulation stages, we encourage future efforts to design comprehensive measures of the process model of affect regulation. These efforts may extend beyond self-reports to behavioral and psychophysiological assessments such as measuring affective responses to standardized stimuli using physiological correlates under specific instructions<sup>114</sup>.

Clarifying whether a particular affect regulation problem arises from difficulties during the identification, selection, implementation or monitoring stage can be an important step toward making informed decisions about personalized treatment options. For instance, people who exhibit difficulties during the identification stage due to misrepresentation of current affective states might benefit from mindfulness-based therapy modules and technological aids. People who exhibit difficulties during the selection stage might benefit from learning new adaptive strategies, from increasing strategy specific self-efficacy, as well as from modification of dysfunctional beliefs contributing to misvaluation of strategies. People who struggle with the implementation stage might benefit from external aids such as mobile applications with suggestions on how to execute different strategies. People who struggle with the monitoring stage might benefit from mindfulness interventions to increase awareness about changes in the affective state and context as well as training to switch between strategies according to changing circumstances. In most cases, individual clients may exhibit difficulties with more than one, but not necessarily all, decisions involved in affect regulation.

### From mental illness to well-being

Although this paper has focused primarily on mental illness, the process model of affect regulation is equally relevant when considering the role of affect in psychological well-being<sup>115</sup>. The goals of psychiatry and clinical psychology extend from preventing and reversing maladaptive affect generation and regulation patterns to promoting and restoring their adaptive counterparts. To live up to this ideal, assessment as well as treatment approaches should be designed without forgetting about healthy affect. For instance, assessment approaches should target affective states that are known to improve well-being. These include hedonically positive experiences such as satisfaction, happiness or love, as well as affective states that can be hedonically negative but still add eudaimonic value by providing meaning, elevating experiences, or fostering personal growth<sup>116</sup>.

Psychological well-being is equally relevant for designing interventions. We have seen how the process model of affect regulation can be used to organize regulation techniques aimed at reducing hedonically negative (e.g., depressed mood) and instrumentally harmful affective states (e.g., maladaptive

positive affect in bipolar disorder). However, the process model is an equally useful framework for organizing techniques that promote hedonically positive or instrumentally helpful affective states. For instance, situational strategies such as going for hike can be used to generate pleasant mood<sup>117</sup>. Attentional strategies such as focusing on things that a person is grateful for can be used to promote happiness and a sense of meaning<sup>118</sup>. Cognitive strategies such as contrasting a mental image of a job well done with the current situation where more work is needed can be used to promote feeling challenged and thereby more motivated<sup>119</sup>. Response modulation strategies such as exercising can be used to generate feelings of being relaxed and fulfilled<sup>120</sup>. Promoting each of these behaviors can further benefit from analyzing their antecedents within the identification, selection, implementation and monitoring stages.

### CONCLUSIONS

We have proposed a process model of affect regulation as a common framework for understanding how affect is generated, how it can be regulated, and how both processes jointly contribute to mental health. This framework conceives of affect generation as a four-stage feedback loop, and affect regulation as a coordinated four-stage decision process. Adaptive functioning of each of these stages promotes mental health and well-being, whereas maladaptive functioning of these stages can increase the risk of mental illness.

We believe that the process model of affect regulation offers a useful framework for clinical research as well as practice. The model is in line with broader efforts to reveal the transdiagnostic dimensions underlying mental illnesses<sup>14,121</sup>. It relates complex affective patterns to simple psychological mechanisms such as feedback loops<sup>29</sup> and decision processes<sup>122,123</sup>, which are amenable for computational and neural research.

The model calls for more research, in particular to realize the assessment and treatment avenues it opens up. On the one hand, it is important to provide further evidence that different symptoms, syndromes and disorders are indeed linked to difficulties in different affect generation and affect regulation stages. On the other hand, it is also important to clarify how existing treatments impact these stages as well as to devise novel treatments.

We hope that, by facilitating and scaffolding these important advances, the process model of affect regulation can contribute to the advancement of evidence-based personalized psychiatry and psychotherapy.

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