

# Coping with Bullying: A Computational Emotion-Theoretic Account

Nicholas R. Wilson (nwilson@dscorp.com)

DCS Corporation, 6909 Metro Park Drive, Suite 500  
Alexandria, VA 22310 USA

Ron Sun (rsun@rpi.edu)

Cognitive Science Department, Rensselaer Polytechnic Institute  
110 8<sup>th</sup> Street, Troy, NY 12180 USA

## Abstract

This paper describes a computational emotion-theoretic model (i.e., Clarion-E) used to capture the dynamics of appraisal and coping by victims of school bullying. It provides an overview of recent research concerning bullying appraisals and coping strategies by students who reported themselves as being the victims of school bullying. It also demonstrates how such processes may be expressed computationally.

**Keywords:** Clarion-E; Clarion; bullying; emotion; coping

## Introduction

Perhaps one of the most important variables for understanding the effects of bullying from the perspective of the victim is the notion of *coping* (Hunter & Boyle, 2002; 2004). Several studies have aimed at fleshing-out student coping strategies surrounding bullying at school; with particular attention given to the transactional coping theory (Lazarus & Folkman, 1984). Within this psychological framework, coping strategies are not considered as trait phenomenon, but are instead the result of situation-specific appraisals, with such appraisals themselves being influenced by both situational as well as personal variables (Lazarus & Launier, 1978; Lazarus & Folkman, 1984).

Furthermore, according to Lazarus and Launier (1978), appraisals generally fall under two categories—*primary* and *secondary*. Primary appraisal refers to one's interpretation of an event (i.e., beliefs about how the event affects the individual), while secondary appraisal concerns the evaluations of available coping options (e.g., when faced with situations where bullying is present). In this vein, studies suggest that coping responses may be influenced by more than just the characteristics of stressful situations. In particular, according to Hunter and Boyle (2002; 2004), the means by which an individual appraises a situation appears to have an especially significant influence on coping behavior.

The transactional coping theory accords itself well with computational models of emotion, making it a rich domain from which to assess the link between evaluative appraisal processes and coping behaviors. To that end, this paper develops a detailed computational account of the transactional coping theory that exposes the exact mechanisms by which coping-related phenomena may arise. In particular, we will explore Clarion-E (Wilson, 2012) and demonstrate how it may be utilized for capturing the dynamics of appraisal and coping by victims of bullying (Hunter & Boyle, 2004).

## The Clarion-E Model

The Clarion-E model posits three basic principles of emotion: *affect*, *appraisal*, and *coping* (Wilson, 2012). It was developed within the Clarion Cognitive Architecture. While many emotion models exist (see Wilson, 2012 for an in-depth comparison), Clarion-E represents a novel approach to modeling emotion for two reasons. First, it makes the primary assumption that human cognition can best be captured using a dual-representational design (Sun, 2002; 2003; Sun, Slusarz, & Terry, 2005). Many theorists maintain that key aspects of emotion may be “unconscious” (e.g., the processes underlying *affect* as well as certain parts of *appraisal*; see Wilson, 2012 for details). The second reason that Clarion is appropriate for capturing the basic principles of emotion is that it contains several well-defined constructs that can be utilized to collectively express the mechanisms, processes, and integrative components of the emotional experience. In particular, the motivational aspects of emotion can be expressed using the motivational subsystem (MS), the evaluative nature of appraisal is similar to the reasoning mechanisms within the non-action centered subsystem (NACS), and the dynamics underlying both *reactive affective states* and *coping* (as well as the interactions between *affect*, *appraisal*, and *coping*) can be implemented using the meta-cognitive subsystem (MCS).

In terms of the model itself, the first principle follows from a perspective on *affect* that posits that the process of deriving an affective state (1) is fast, reactive and subconscious (i.e., implicit) in nature, (2) originates from intrinsic physiological processes, and (3) precedes the more conscious (i.e., explicit) aspects of appraisal (see Wilson, 2012 for details). To capture this concept, Clarion-E proposes a meta-cognitive mechanism by which positive and negative affective states can be generated based on the combination of motivational factors (i.e., drive strengths) and a reactive (i.e., implicit) judgment about the potential to act (termed “*action potential*”).

The motivational subsystem (MS) contains drives (on the bottom level) and goals (on the top level) and collectively captures the processes by which an agent is compelled (Sun, 2009). The representations and mechanisms underlying this subsystem are already justified extensively elsewhere (see Sun, 2003; 2009), and thus is not rehashed here. Suffice it to say, though, that the MS meets the necessary criterion (i.e., *sustainability*, *purposefulness*, *focus*, and *adaptivity*) for representing motivational dynamics. Action potential is rep-

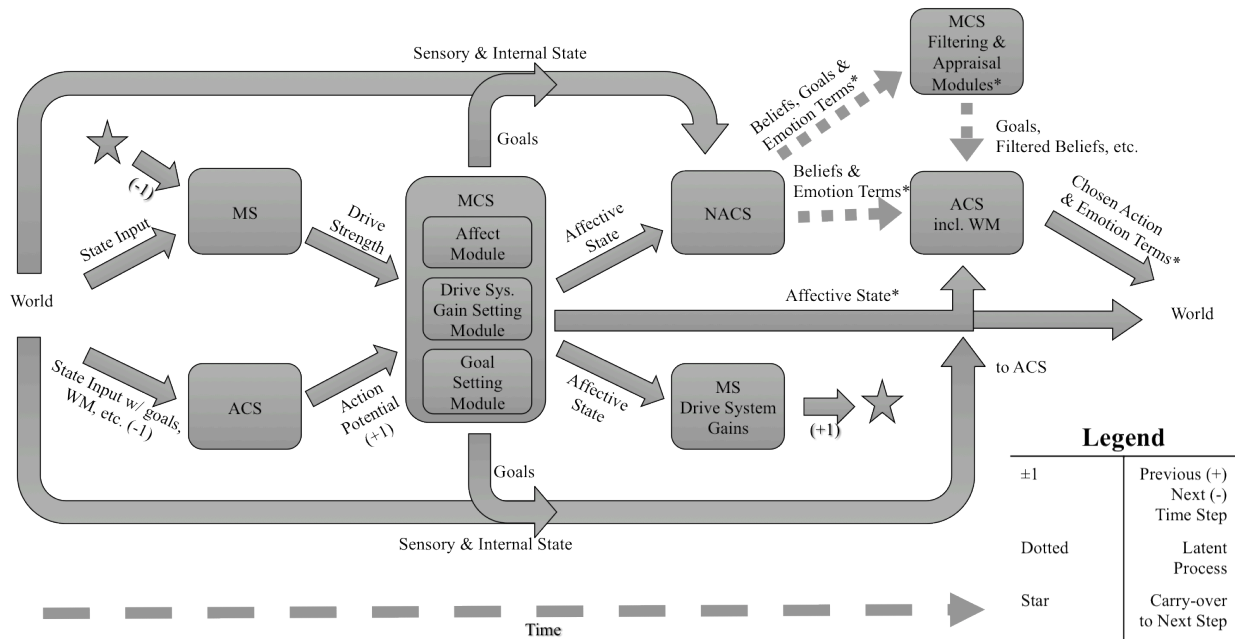


Figure 1: Process flow diagram for the Clarion-E model.

represented by the activations of the nodes on the output layer of the various networks in the bottom level of the action-centered subsystem (ACS). In other words, action potential represents the likelihood that a set of actions, which can be performed in the current state, will be successful in attending to the needs of an agent (Wilson, 2012).

The meta-cognitive subsystem (MCS) is in charge of performing various regulatory processes that facilitate the interactions between the other systems in Clarion (Sun, 2003). Examples of such processes include: goal setting; parameter changing; reinforcement signaling; input and output filtering; etc. It has been argued elsewhere that generating reactive affective states can be considered as being a regulatory process (see Wilson, 2012). Furthermore, such states can be applied (1) to facilitate further meta-cognitive processes or (2) as input into “conscious” (i.e., explicit) appraisal processes.

The second principle is concerned with the role of appraisal within the emotion process. In particular, it accounts for the evaluative nature of such processes that (1) combines fast, reactive and sub-symbolic (i.e., implicit) mechanisms with slower, more deliberate (i.e., explicit) ones, (2) uses physiological, situational, and behavioral inputs, and (3) specifies a series of dimensions by which emotion-related knowledge can be represented. Such an account can be seen as providing an integrative approach to appraisal derivation—combining key aspects of several existing theories (Wilson, 2012).

Capturing appraisal evaluations can be accomplished using the reasoning mechanisms within the non-action-centered subsystem (NACS). The NACS is used for storing and retrieving general knowledge in various forms (Sun, 2003). It also contains mechanisms by which knowledge can be compared, associated, and otherwise reasoned over (Sun,

2003; Helie & Sun, 2010). It provides both the representational as well mechanistic means by which many aspects of the appraisal process may be actualized. In particular, chunk representations can be used to express appraisal dimensions that are activated using top-down and bottom-up activation as well as similarity-based and rule-based associative processes. By chaining together these reasoning mechanisms, the NACS can demonstrate the basic processes of appraisal (as defined by existing appraisal models; see Wilson, 2012 for a detailed comparison).

The third principle defines the concept of coping as being a method by which a systems orients toward behavioral patterns that (1) are chosen based on state information, appraised feelings (i.e., emotions), and appraised beliefs about the state, (2) are enacted by the selection of goals, which themselves can be derived from appraisals about beliefs and desired end states, and (3) defines a subset of the coping phenomenon with regard to the regulation of lower-level processes. To capture coping, the outcomes of appraisal are applied by the rest of the system to facilitate regulatory and coping behavior. It has been previously argued that certain aspects related to affect and coping may be considered as being related to regulation (see Wilson, 2012). Therefore, it should seem reasonable to use the MCS to capture these dynamics. As this relates specifically to coping, modules in the MCS can be used to filter and direct the conclusions from the NACS.

Taken collectively, the basic principles represent an integrated approach to the process of emotion. Looking at Figure 1, the process generally moves from left-to-right, with drives and action potential feeding into the MCS, which uses this information to derive reactive affective state (as well as goals). Next, the state (including the goals and affective state) is fed to the NACS, initiating the appraisal pro-

cess (in the form of one or more rounds of reasoning). The results of appraisal (which are generally represented as knowledge in the form of emotion terms, beliefs and goals) are then fed back to the MCS and ACS and used to aid in action decision-making.

Clarion-E outlines a means by which the broadly-defined category of Belief-Desire-Intention (Bratman, 1987), or BDI, theories may be computationally expressed in a detailed and psychologically plausible fashion. For instance, using our model, *affect* may be seen as a reactive consequence of one's *desires*, *appraisal* as a process by which *beliefs* and *intentions* are evaluated and derived, and *coping* as the means by which *intentions* are actualized in the service of attending to one's *beliefs* and *desires*.

While the basic mechanisms of the Clarion-E model have been outlined, it should be noted that for the sake of conciseness, this description was intentionally provided at a rather high level. For more detail, see Wilson (2012). At this point, we will move to exploring how Clarion-E can be applied to a study by Hunter and Boyle (2004).

### Hunter and Boyle (2004)

Hunter and Boyle (2004) examined coping strategy use in victims of school bullying. In particular, they used the transactional model of coping (Lazarus & Folkman, 1984) to examine the relationship between control, threat, and challenge appraisals and coping strategy use as reported by the Ways of Coping Checklist (WCCL). The WCCL categorizes coping behaviors into four distinct categories: *problem focused coping*; *seeks social support*; *wishful thinking*; and *avoidance*. This structure was originally proposed by Folkman and Lazarus (1980), Vitaliano et al. (1985), and Halstead et al. (1993), and has been used in a wide array of contexts (Folkman & Lazarus, 1980; Lazarus & Folkman, 1984). Of particular interest, was how the adolescent version of the WCCL (Halstead, Johnson, & Cunningham, 1993) could be used to study coping response within child and adolescent populations, with particular attention paid to how youths responded to stressful situations at school, home, and in other social contexts.

The primary findings from the Hunter and Boyle (2004) study relate to the relationship between the coping strategies in the WCCL and appraisals. For *problem-focused coping* and *seeks social support*, main effects for *challenge* appraisal were found. Further analysis also indicated that more of these types of coping are used when the potential for positive outcomes to bullying situations are clear or ambiguous versus when there is definitely no potential for such an outcome. Second, with respect to *wishful thinking*, both *control* and *challenge* appraisals demonstrated significant (inverse) effects. That is, participants who appraised themselves as having *no* control used more wishful thinking than participants who reported having control over the situation. Conversely, with regard to challenge appraisals, participants who were unsure whether outcomes would be positive or not used significantly less wishful thinking than those who were sure about the possibility of a positive outcome.

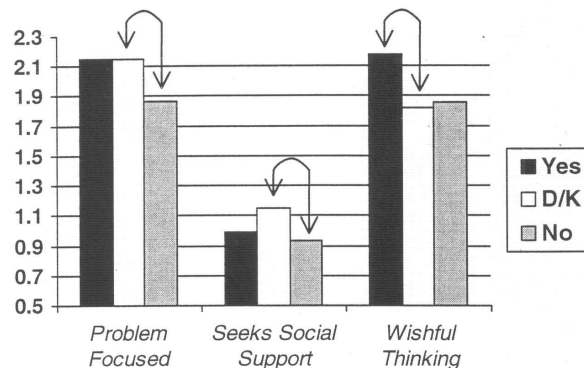


Figure 2: Challenge appraisal and coping strategy use.<sup>1</sup>  
(from Hunter & Boyle, 2004)

Taken in total, the findings indicate a few key things. First, for those coping scales that were reliably confirmed, all were significantly impacted by the presence of challenge appraisals (see Figure 2). Second, wishful thinking was inversely related to control appraisals. Finally, neither avoidance coping nor threat appraisals were significantly related to any of the other factors that were tested.

### Accounting for Coping with Bullying

The Hunter and Boyle (2004) paradigm can be broadly captured in Clarion-E via the following method. First, drive strengths in the MS and “action potential” in the ACS are used to generate a reactive affect state in the MCS. This state is then fed into the NACS to initiate an appraisal. Two rounds of reasoning take place within the NACS and the outcomes of this process are fed back to the MCS and the ACS. Finally, the ACS chooses an action by factoring-in the outcomes from the NACS.

The MS is set up to express the key factors of personality that studies suggest most accurately predict a person's predilection toward becoming the victim of bullying (Karatzias, Power, & Swanson, 2002). In particular, studies indicate that victims usually lack self-assertiveness and have low self-esteem (Olweus, 1991; Smith & Sharp, 1994; Rigby & Cox, 1996). This is especially the case for so-called “passive victims” (Smith & Boulton, 1991), who are not typically disruptive and tend not to start fights with others.

In modeling this victim type, the *similance* drive (i.e., the need to identify with other individuals, to imitate them, and to go along with their actions) would seem to be the most relevant, as it is somewhat more avoidant in nature than other related motivations (Sun, 2009; Sun & Wilson, 2011). In other words, the *similance* drive is about the need to avoid situations where one may be singled-out or otherwise made to feel separated from others. This is similar to the types of bullying behaviors described by Whitney and Smith (1993) and Olweus (1989; 1991; 1993).

<sup>1</sup> Yes, No, D/K (Don't Know) indicates self-reports as to whether a particular coping strategy was used.

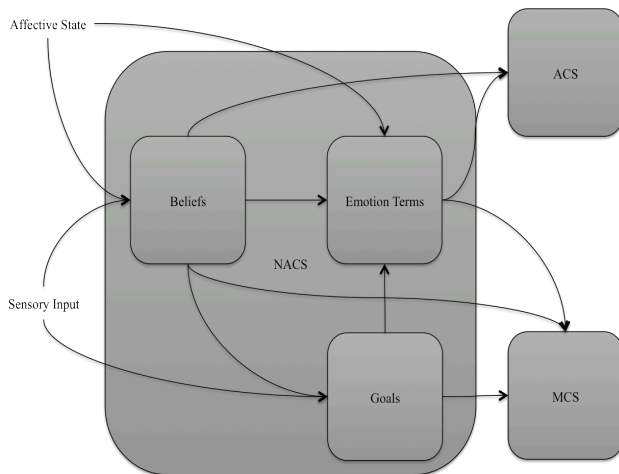


Figure 3: The flow of appraisal in the NACS.

The MS is also set up using the *affiliation and belongingness* drive. This drive is used to address how individual differences in personality lead to different types of appraisal and coping responses. *Affiliation and belongingness* is similar in nature to *similance*, except that it is approach oriented. In other words, it refers to the desire to *seek* associations with others and to be *accepted* as part of a social group (Sun, 2003; 2009; Sun & Wilson, 2011), while *similance* deals more with the need to *avoid* being outcast.

Continuing now to the NACS, the general knowledge store contains chunks relating to: (1) control and challenge appraisals, and (2) coping strategies. The coping categories are used as goal chunks and the control and challenge appraisals are set up as belief-like declarative knowledge chunks. The belief concept is being used somewhat generically in this case. That is, the beliefs themselves are represented simply as appraisals about the situation (e.g., “*the bully will teach me not to bully others*”) that were derived directly from Hunter and Boyle (2004) and linked to “emotion terms” in order facilitate the appraisal process. The justification for the inclusion of these emotion terms are somewhat outside the scope of the current topic (see Wilson, 2012 for more details). Suffice it to say, however, that they have been included in order to (1) provide a link between reactive affective states and bullying appraisals based on a review of the literature (Watson, Clark, & Tellegen, 1988; Karatzias, Power, & Swanson, 2002), and (2) demonstrate a somewhat more complex set up of the appraisal processes within the NACS.

The appraisal process itself begins with the reception of sensory input and affective state information (sent from the MCS). The first round of reasoning activates emotion terms and belief chunks, which subsequently activate goals (in the second round). This “appraised knowledge” (i.e., the beliefs and goals) are then sent to the MCS, which filters them before they are sent to the ACS to be stored in working memory (see Figure 3). The process of goal-setting, using goal appraisal and setting modules in the MCS, is also impacted by operations that compare aspects of the current

motivational and sensory state with the strength of appraised desires (i.e., goals). Once set, these goals act (in conjunction with the appraised knowledge stored in the working memory) to orient decision-making toward appropriate patterns of behavior. In other words, the declarative knowledge from the NACS is used to orient behavior by setting goals, which ultimately guides coping-related decision-making.

The actual behaviors that constitute coping response are represented as the individual items on the WCCL and set up as actions in the ACS (and chosen using rules on the top level). Additionally, using the study by Whitney and Smith (1993) on the nature and extent of school bullying, a series of “bullying scenarios” can be created, which serve as sensory input to the simulated agents. By doing it this way, the agents can be said to actually “experience” the bullying situations. This provides a somewhat more embodied approach to the self-report questionnaires that were used in the human experiments. To associate our alternative approach to the Likert-type scale from the Halstead et al.’s (1993) version of the WCCL, the simulation tracks the frequency that coping behaviors are chosen.

### Simulating Hunter and Boyle (2004)

Ten simulated participants were set up in each of four manipulations: high/low *similance* drive strength (for capturing intrinsic personality differences), and high/low action potential (for capturing bullying frequency). For the drive manipulation, the assumption is that individuals with higher *affiliation and belongingness* drives (in comparison to their *similance* drives) will tend to appraise situations and choose strategies that are more related to seeking positive outcomes, whereas individuals with higher *similance* drives will tend to appraise situations and choose strategies that relate to avoiding negative ones. The action potential manipulation relates to implicit judgments about the likelihood that a bullying event will have a positive outcome. In other words, it impacts whether an agent will appraise a situation as being controllable or not.

Each agent was exposed to ten randomly generated “bullying scenarios” based on the frequencies (as indicated by Whitney & Smith, 1993) by which various features of bullying are said to occur. For each scenario, agents both chose a coping behavior and report on how they appraised the situation. Each scenario was presented ten times and both coping behaviors and appraisals were recorded based on how they related to the coping categories of the WCCL (Folkman & Lazarus, 1980; Halstead, Johnson, & Cunningham, 1993) and the appraisal types (i.e., control vs. challenge) as defined by Hunter and Boyle (2002; 2004).

The results of the simulation mostly support the human data. First, as a matter of confirming the application of the child and adolescent version of the WCCL (Halstead, Johnson, & Cunningham, 1993) within the bullying context, the drive strength manipulation had an impact on coping behavior. In other words, simulated participants’ *similance* drive activations seemed to correctly suggest the direction

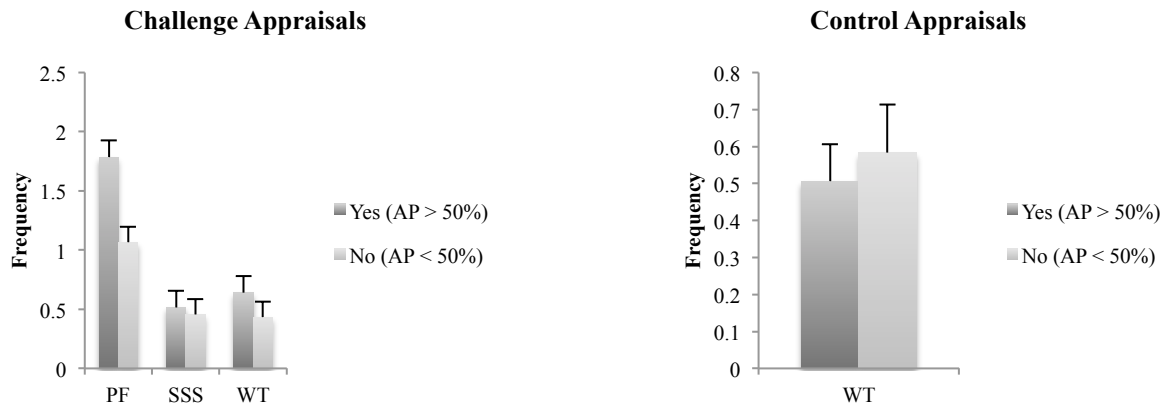


Figure 4: Appraisal x coping strategy use in simulated participants.

of coping behavior that was chosen. To that end, agents set up with high *similance* activations tended to choose more wishful-thinking behavior, whereas agents with low activations tended to choose more problem-focused and seeks social support behavior. This is significant as it predicts how victims of bullying will react to bullying scenarios. That is, the findings confirm that those victims who approach the situation positively (i.e., rely more on their approach-oriented motivations) will tend to use coping strategies that are generally thought to be more effective at stopping bullying. Conversely, those victims who view the situation negatively (i.e., rely more on the avoidance-oriented motivations) will tend to use less effective strategies (i.e., wishful thinking).

Continuing to the action potential manipulation, the manipulation was somewhat correlated with appraisal. That is, agents with higher action potential more often saw the situation as controllable, whereas agents with lower action potential tended to see the situation as somewhat less so. In addition, action potential was negatively associated with problem-focused and seeks social support coping. In other words, the lower the action potential (i.e., the less positive the outcome prediction), the lower the frequency problem-focused and seek-social support behaviors were chosen. This is significant because it (1) predicts the correlation between wishful thinking and control appraisals, and (2) provides a useful context for understanding why some victims may choose less effective forms of coping with bullying. In other words, the findings suggest that those victims who have attempted to use the more effective forms of coping, but have had little success will tend to see bullying situations as being less controllable, causing them to rely on less effective (but perhaps “easier”) strategies (i.e., coping).

Finally, with regard to the coping  $\times$  appraisal interaction, just like in the human findings, simulated participants more frequently chose coping-related behaviors (as opposed to other types of behavior) when the situation was appraised as a challenge. Furthermore, wishful-thinking type behaviors were more frequently used in those situations where no control was reported. A graphical representation of these find-

ings can be found in Figure 4. At this point, though, it would appear that Clarion-E mostly captures the findings from Hunter and Boyle (2002; 2004). Further discussion of these finding follow below.

## Discussion

The model outlined herein provides a computational account for how *affect*, *appraisal*, and *coping* processes interact. Furthermore, the simulation presented provides a clear demonstration of how this interaction can capture the phenomenon of coping within the bully-victim paradigm. In other words, the Clarion-E model provides a comprehensive computational cognitive and emotion-based interpretation for how self-reported appraisals and coping strategies may be embodied within the context of coping with bullying. In this regard, the simulated findings provide some support for the Ways of Coping Checklist (Folkman & Lazarus, 1980; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985; Halstead, Johnson, & Cunningham, 1993). In addition, by corroborating their findings, the simulation also provides some support for the appraisal reporting methods developed by Hunter and Boyle (2002; 2004).

As others have suggested (Hunter, Boyle, & Warden, 2002), research on coping with bullying improves anti-bullying intervention programs and other support systems because such work provides a clearer picture of both the *how* and *why* of child and adolescent coping strategies. The research presented herein is intended to extend this notion by further clarifying the picture mechanistically.

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