THREE PATHWAYS TO IMPULSIVE BEHAVIOUR: IMPLICATIONS FOR VIOLENCE AND AGGRESSION

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Introduction

The term "impulsivity" has been used frequently to describe the behaviour of substance abusers, psychopaths, and violent individuals. In addition, the term is used to describe the behaviour of children with attention deficit hyperactivity disorder, children with conduct disorder, and aggressive children. In each case, the term is used to describe behaviour that is poorly regulated and which may be hurtful to the individual as well as to others. Although the term is widely used, it is not well understood. People who display impulsive behaviour are often regarded as callous, lacking motivation to conform, and worthy of blame. Although this view is sometimes justified, impulsivity often begins at an early age and there appear to be biological and psychological factors that impair a person's ability to regulate their behaviour. If there are, in fact, biological and psychological factors that impair a person's ability to regulate their behaviour, then it may be essential to understand these factors. Only after we recognize that there is a problem and come to understand the factors maintaining it, will we be in a position to develop effective treatment and prevention strategies.

More specifically, we propose that a thorough understanding of impulsive, antisocial, and violent behaviour requires recognizing (a) that many people who chronically display such behaviours have a problem regulating their behaviour; (b) that the self-regulatory problems displayed by such individuals are likely to reflect diverse developmental pathways; and (c) that addressing the persistence of such problems requires a specific understanding of the person by situation interactions that culminate in the maladaptive behaviours.

In this presentation, our goal is to elucidate the diverse factors that contribute to the expression of impulsive behaviour and then to speculate about the implications of these factors for aggressive behaviour. Toward this end, we (a) discuss the nature of impulsive behaviour; (b) present a neuropsychological model which highlights some of the processes that enhance or impair regulation of impulsive behaviour; and (c) discuss selected laboratory findings suggesting that different situations and motivational factors are associated with the inappropriate behaviour of impulsive, psychopathic, and affectively-aggressive individuals.

II. Impulsivity

There is a great deal of vagueness and confusion concerning the nature of impulsive behaviour. The term "impulsive" is used to describe a wide variety of behaviours ranging from whimsical decision making (i.e., leaving one's date at a party to pursue a new acquaintance); to behaviour that reflects a failure to anticipate or comprehend the
consequences of one's behaviour for oneself and others (i.e., quitting a job without another lined up); to explosive behaviours (i.e., killing one's spouse and his or her lover in a moment of rage).

Although it is possible to identify a common thread — in each case there is a lack of deliberate decision making (i.e., a failure to weigh pros and cons) and a concomitant lack of behavioural control (i.e., the behaviour is not clearly intentional) — these examples of impulsive behaviour highlight three distinct processes that contribute to the expression of impulsive responding. The first process involves a strong impetus to respond for the purpose of achieving some immediate and appealing goal (i.e., the excitement of a new romance). The second involves the strength of a person's reaction to punishment cues or the less immediate reasons for resisting inhibiting a response (i.e., problems related to a lack of income). As illustrated in the third example, the third process involves a degree of arousal or emotionality which intensifies behaviour and short-circuits critical evaluation.

Contributing to the confusion in this area, these diverse processes may result in behaviours that are essentially indistinguishable. Consider the example of date rape in which one person, typically a man, persists in unwelcomed sexual advances on another person, typically a woman. In one instance, the strength of a person's desire may cause him to focus on his goal so intensely that he loses perspective on his behaviour, fails to consider his partner's feelings, and consequently, behaves in an inappropriate, coercive manner. In another case, the person may not be especially infatuated with his date, but may nevertheless behave in a coercive manner because he is relatively insensitive to the feelings of others, especially when they conflict with his own. Yet another individual whose sexual interactions have been characterized by lack of skill, failure, and deep-seated conflict may find himself reacting to the dating situation in a manner that is so affectively charged that his processing of interpersonal cues is impaired (see, Lipton, McDonel, & McFall, 1987).

In pointing out that particular processes appear to carry more or less weight in the examples cited above, we do not mean to imply that only one factor is responsible for the different examples of impulsive behaviour. To the contrary, we regard each of these factors as existing on a continuum and suppose that the expression of impulsive behaviour reflects the interaction of all three factors: the urge to respond for immediate gratification, insensitivity to cues that contraindicate the behaviour, and emotional reactivity which diminishes the quality of information processing. In the date rape example, a man who is highly aroused by his date, interpersonally callous, and conflicted about sexual matters would be at particularly high risk to behave inappropriately.

III. Gray's Model and three mechanisms for impulsive responding

Having discussed the idea of multiple pathways to impulsive behaviour at an intuitive level, it is important to become more specific about the nature of these pathways. We have found Gray's (1970, 1987) model to be very useful in this regard (see also Fowles, 1980). Gray's model has three interacting systems, each of which plays a crucial role in regulating behaviour. The behavioural activation system (BAS) is sensitive to cues for reward and active avoidance and functions to initiate approach behaviour. The behavioural inhibition
system (BIS) is sensitive to cues for punishment and nonreward and acts to interrupt motor programs and to direct attention to significant stimuli. The nonspecific arousal system (NAS) receives inputs from both the BAS and the BIS and functions to increase the intensity (speed/force) of behaviour. Although Gray has not been completely consistent in the way that he describes the NAS, he has referred to it as a fight/flight system and indicated that it may be directly stimulated by unconditioned rewards and punishments.

Figure 1 Gray’s 3-Arousal Model

Inspection of the model immediately suggests two separate mechanisms for impulsivity. The first mechanism involves a strong BAS. In fact, Gray equates impulsivity with the absolute strength of the BAS. According to Gray, impulsivity is directly related to sensitivity to reward cues and the strength of the approach motive. A person who is hypersensitive to reward cues (i.e., strong BAS) will react to reward cues with greater arousal, less inhibition, and more certain approach than people possessing a weaker BAS. According to Gray, impulsivity (i.e., sensitivity to reward cues) can be assessed using
Eysenck's personality dimensions of extraversion and neuroticism (Eysenck & Eysenck, 1975). Neurotic extraverts are the most impulsive and stable introverts the least impulsive groups. Like Gray, we view neurotic extraverts as highly impulsive, but rather than identifying neurotic extraverts with the absolute strength of the BAS, we attribute their impulsivity to a combination of their differential sensitivity to reward cues (associated with extraversion) and their highly reactive NAS (which we associate with neuroticism) (see Wallace, Bachorowski, & Newman, 1991).

Figure 2 Gray's Personality Rotation
This framework predicts that neurotic extraverts will be at high risk for displaying rapid, poorly regulated, behaviour (i.e., impulsivity) under conditions involving salient reward cues. In the presence of reward cues, neurotic extraverts should experience stronger motivation to approach, a greater increase in arousal, and a more pronounced reduction in sensitivity to cues for punishment and/or behavioural inhibition in comparison to stable introverts (i.e., nonimpulsives). Although excessive activation by approach cues would, theoretically, be sufficient to engender impulsive behaviour in anyone, neurotic extraverts are particularly susceptible to such activation.

Consistent with this theorizing, we have found that neurotic extraverts behave more impulsively than stable introverts in several experiments involving rewards or salient approach stimuli. Conversely, group differences in impulsivity were not observed on the same tasks under conditions involving salient BIS as opposed to BAS inputs. For example, using a motor inhibition task in which subjects are instructed to trace a circle as slowly as possible, neurotic extraverts displayed significantly poorer motor control than stable introverts while simultaneously playing a game of chance in which they could win $3.00. These groups did not differ on the same task when the game involved the prospect of losing $3.00 (Wallace & Newman, 1990; see also Bachorowski & Newman, 1990; Nichols & Newman, 1986).

Figure 3
CIRCLE TRACING

Furthermore, as predicted by the model, the presence of reward cues appeared to decrease neurotic extraverts' sensitivity to punishment feedback (BIS activity). Nichols and Newman (1986) had subjects perform a pattern matching task that required them to press one button when two stimulus patterns were the same and to press a second button when the patterns differed. Subjects were provided with noncontingent feedback after every response. Following "correct responses" subjects were awarded 10 cents and following "incorrect responses" subjects lost 10 cents. Although subjects were not informed of the fact, their
response times following monetary rewards and punishments were recorded by computer so that we could assess the extent to which subjects paused after punishment feedback. Neurotic extraverts not only failed to slow down when following punishment, but unlike stable introverts, they actually increased the speed of their responding on trials following negative feedback. This pattern of responding was not apparent in the same task under conditions not involving monetary rewards.

Figure 4

Finally, Patterson, Kosson, and Newman (1987) examined the relation between failing to pause following punishment feedback and learning from experience. Subjects performed a go/no go discrimination task in which they won money for responding when certain numerical stimuli were present and lost money for responding when other numbers were present. Subjects had to learn by trial and error to use the numerical stimuli to know when to respond and when to inhibit responding. As in the preceding task, we surreptitiously measured response times following rewards and punishments. As expected, neurotic extraverts were less successful in inhibiting punished responses, they were less inclined to slow down following punishments and, across groups, shorter pauses following punished errors were associated with poorer learning from punishment feedback as measured by the number of passive avoidance errors committed (see figure 3). Thus, difficulty suspending one’s focus on reward cues in order to process feedback from the environment may interfere
with a person's ability to use such feedback to revise responding and to learn from experience.

Figure 5

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**Summary.** For neurotic extraverts, cues for reward appear to engender rapid, highly focused approach behaviour that is resistant to interruption and that reduces attention to other important cues. Because they are relatively unlikely to interrupt approach behaviour to accommodate negative feedback, neurotic extraverts appear to be less sensitive to punishment cues and, without pausing to process the feedback, they are less likely to learn from their experience (see Newman, 1987; 1990).

The second mechanism or pathway to impulsivity suggested by Gray's model involves the BIS and is associated with weak behavioural inhibition. For instance, Fowles (1980) has proposed that psychopaths are characterized by a weak BIS. Although our research suggests that psychopaths are no less sensitive to cues for punishment than nonpsychopaths, they do appear less likely to interrupt ongoing behaviour in response to punishment cues. These findings have led us to propose that differences between psychopaths and controls in BIS functioning are relatively specific to the inhibitory component of the BIS (i.e., the BIS output that interrupts activity in the BAS). Regardless of which view is accepted, this "BIS mechanism" for impulsivity is quite different from the one. 

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associated with neurotic extraverts. Rather than a strong, rapid increase in arousal stemming from approach motivation (i.e., strong BAS), the impulsive behaviour of psychopaths reflects a problem suspending ongoing behaviour to accommodate information from the BIS. This characterization of the psychopath is consistent with the classic description provided by Cleckley (1941). According to Cleckley, psychopaths are not driven to behave in an antisocial manner by strong urges for money, sex, or violence. However, given a specific inducement to respond, they have little capacity for behavioural inhibition.

During the past 10 years, we have conducted several experiments examining psychopaths' behavioural and attentional responses to punishment cues. In general, these studies provided good support for the hypothesis that psychopaths are less inclined than nonpsychopathic controls to inhibit responding in the presence of cues for punishment (i.e., Newman & Kosson, 1986; Newman et al, 1985; 1987, 1990).

Moreover, a number of investigators, including Gray (1987), have associated BIS activity with the orienting response. Orienting responses involve a brief shift of attention to a novel, unexpected, or otherwise potentially significant stimulus. In Gray's model, when the BIS detects potentially meaningful stimuli it reacts to such cues by interrupting ongoing behaviour and redirecting attention. We recently conducted an experiment to examine whether psychopaths are less inclined to alter attentional, as well as behavioural, responses. The experiment was designed to assess BIS functioning in psychopathic and nonpsychopathic offenders by presenting a stimulus that had been trained as a cue for punishment while they were involved in a speeded reaction time task. The task was comprised of two phases. In phase 1, subjects were instructed to respond as quickly as possible each time that a string of letters was presented unless one of the letters was a "Q". The 150 trials in phase 1 were designed to establish the "Q" as a cue for punishment. In phase 2, subjects were instructed to respond as quickly as possible unless one of the four characters in the rectangular display was a number. Although the "Q" had no relevance for performance in phase 2, it appeared on approximately 20% of the trials. By comparing a subject's response speed on Q-present and Q-absent trials, it was possible to assess the degree to which this punishment cue interrupted a subject's approach behaviour (i.e., BIS functioning).

Two studies were conducted, one involving university students and one involving incarcerated psychopaths and controls. The first study demonstrated that, in comparison to stable extraverts (nonanxious subjects), neurotic introverts (anxious subjects) responded more slowly on Q-present than on Q-absent trials as predicted by Gray's model (1981). The results of Study 2 demonstrated that whereas nonpsychopathic controls responded more slowly on Q-present than on Q-absent trials, psychopathic prisoners responded more quickly on Q-present trials, although these findings were particularly characteristic of high anxious psychopaths and controls (Newman, Wallace, & Arnett, 1992).
Figure 6A

![Graph showing response time (Rt) in milliseconds (msec) for students (n=62) across Blocks 1 and 2.](image)

Figure 6B

![Graph showing response time (Rt) in milliseconds (msec) for psychopaths and controls across Blocks 1 and 2.](image)
According to Gray, the BAS and the BIS underlie the two basic dimensions of personality: impulsivity or sensitivity to reward on the one hand and anxiety or sensitivity to punishment on the other. Although psychopaths are impulsive in the sense that they respond without adequate regard for the consequences of their actions, in Gray's model their impulsivity is attributed their ineffective BIS. Consistent with this proposal, there is little or no evidence that hypersensitivity to reward cues is sufficient to account for the impulsive behaviour of psychopaths (Newman et al., 1985; 1990; in press). Nevertheless, our findings indicate that once psychopaths commit attention to a particular approach strategy, they are less adept at switching attention or altering their ongoing behaviour (Howland et al., 1992; Newman et al., 1990).

Summary. Although numerous investigators (i.e., Eysenck, 1979; Newman et al., 1985) have attributed the impulsive behaviour of psychopaths and neurotic extravers to the same processes, there is increasing evidence that the impulsive responding of these groups — while appearing the same in many respects — reflects different causal processes. The third mechanism involves the phenomenon of "anxious impulsivity" and is most apparent in neurotic introverts (Wallace et al., 1991). Within Gray's model, neurotic introverts are considered to have a strong BIS and to anchor the high end of his anxiety dimension. Although impulsivity is typically associated with low anxiety as noted above with regard to psychopathy, we believe that much rapid, poorly regulated behaviour is fueled by arousal stemming from aversive events. Moreover, owing to the aversive quality of the situations that elicit this type of impulsivity, we believe that this third pathway is the most important one for understanding the expression of affective aggression.

The empirical basis for this pathway to impulsive behaviour is similar to the data supporting the first mechanism. Whereas neurotic extraverts (impulsives) respond more quickly and display poorer motor inhibition under reward-only conditions, neurotic introverts (anxious subjects) respond more quickly and display poor motor inhibition under punishment-only conditions (Wallace et al., 1991). At present, the data supporting the association between punishment cues and impulsivity in anxious subjects is somewhat weaker than that between reward cues and impulsivity in neurotic extraverts (i.e., Wallace & Newman, 1990). However, when other BIS inputs, such as response uncertainty are used, the potential for impulsive responding in neurotic introverts is more readily apparent (i.e., Bachorowski & Newman, 1990; see Wallace et al., 1991 for discussion of this issue).

Figure 7
CIRCLE TRACING

![Graphs showing data for Goal Condition and No Goal Condition.](image-url)
Summary. The third mechanism involves a punishment (BIS) mediated increase in NAS activity that results in rapid responding and reduced motor control. The phenomenon of anxious impulsivity seems counterintuitive because we generally expect anxious people to withdraw rather than become impulsive when they are aroused. Although anxious people do generally prefer to avoid stimulation and readily suspend approach behaviour, some situations do not readily lend themselves to such responses. In the tracing task, for instance, subjects are not allowed to stop tracing (i.e., they must regulate their response speed as they continue to trace). In social situations, once a person is involved (i.e., in conversation or in an argument) it is very difficult to simply not respond. For anxious individuals, impulsive behaviour is most likely when they do not perceive avoidance or response inhibition as a viable response alternative.

IV. NAS, information processing, and self-regulation

In our view, this third pathway to impulsive behaviour provides valuable insight into the factors responsible for the breakdown of self-regulation in all forms of impulsivity. In demonstrating that impulsive behaviour is not always most apparent in impulsive individuals, the impulsive responding of anxious individuals indicates that the tendency to behave impulsively reflects the interaction of personality and situational factors. In other words, it is possible to understand impulsive behaviour as the result of some process that potentially can affect a wide variety of individuals.

In particular, the findings suggest the hypothesis that whenever a person experiences high levels of nonspecific arousal in conjunction with motivationally significant stimuli (i.e., reward cues for E+N+; punishment cues for E-N+), s/he is at high risk to respond in an impulsive, poorly regulated fashion (see, Newman et al. in press, for examples related to high anxiety, eating disorders, and discrepant self-concepts).

How does high NAS activity increase a person's risk for displaying impulsive behaviour? To answer the question, we return to Gray's model. According to the model (see also Wallace et al., 1991), the NAS fuels a person's adjustment to motivationally significant stimuli in their environment. The positive arrow from the NAS to the output of the BAS increases the intensity of approach behaviour such that when NAS activity is high responses are initiated rapidly, they are more difficult to interrupt, and there is less deliberation concerning alternative responses (Wallace et al., 1991). The positive arrow from the NAS to the output of the BIS corresponds to the intensity of the interrupt response which we have characterized as the strength of an individual's automatic attention response to significant or meaningful stimuli (Wallace & Newman, 1992). In both cases, high NAS activity strengthens the automatic allocation of attention to motivationally significant stimuli and facilitates the automatic motor response engendered by the stimuli (i.e., to approach or to stop). Although automatic motor responses serve an adaptive function in facilitating rapid adaptation in emergency situations, there is a tradeoff: Because they are relatively automatic, once elicited they are difficult to regulate. Consequently, such responses may be emitted even though they are poorly suited to or contraindicated by the situation. There are also limitations associated with strong automatic attention responses. An important one pertains to the distinction between automatic and controlled processing.
(Shiffrin & Schneider, 1977). According to Schneider, Dumais, and Shiffrin (1984), "Automatic processing is a fast, parallel, fairly effortless process that is not limited by short-term memory (STM) capacity, is not under direct subject control, and is responsible for the performance of well-developed skilled behaviours". Controlled processing, by contrast, "is characterized as a slow, generally serial, effortful, capacity-limited, subject-regulated processing mode that must be used to deal with novel or inconsistent information" (1-2). Of particular relevance to this presentation, a crucial difference between automatic and controlled processing is that controlled processing requires active attention. Because active attention is required for controlled processing, any events or activities that demand attention will, in essence, preclude other control processing. Thus, to the extent that NAS activity increases the strength of a person's automatic attentional responses to motivationally significant cues, it will decrease the attentional resources available for controlled information processing.

What are the consequences of reducing a person's capacity for controlled processing? One way to think about the consequences is to consider a person who has drunk too much alcohol. In fact, Claude Steele (i.e., Steele & Josephs, 1988) has proposed that consumption of alcohol reduces a person's capacity for controlled processing. For our purposes, one of the most important functions of controlled processing involves checking the products of automatic processing. Most of our everyday cognitive processing is carried out using automatic processing primarily (see Hollon & Garber, 1990). We rely heavily on automatic processing for orienting attention to significant stimuli in our environment, for interpreting the meaning of events, drawing inferences about the motives of other people, making attributions for our successes and failures and for generating and selecting response alternatives. While such processing may be relatively effortless, it is certainly not flawless and may be fraught with bias. Redressing these flaws is the responsibility of controlled processing. The process of checking and revising the outputs of automatic processing is typically referred to as self-regulation and is dependent upon controlled processing (Gilbert et al., 1988; Kanfer & Gaeckel, 1986). In the event that control processing resources are insufficient for self-regulation, then a person's behaviour will reflect the unchecked products of automatic processing.

Summary. To review briefly: (1) when people encounter motivationally significant cues in their environment, they experience increases in NAS activity; (2) the higher the level of NAS activity, the more likely it is that sufficient attentional resources will not be available to support controlled self-regulatory processes; and (3) to the extent that controlled, self-regulatory processing is compromised, the influence of automatic processes are particularly likely to be manifested (Wallace & Newman, 1992).

V. Implications of curtailed controlled processing resources for impulsivity

The implications of curtailed control processing resources for impulsivity are fairly direct. The breakdown of these monitoring, evaluating, and revising processes that are associated with self-regulation corresponds quite well to the component of impulsivity that is common to all three mechanisms discussed in this presentation. Thus, the breakdown of controlled
processing and self-regulation may be the common denominator underlying the diverse pathways to impulsivity.

In the examples considered, the breakdown of controlled processing in neurotic extraverts is occasioned by the anticipation of reward. This situation will typically involve high drive, rapid approach, and optimistic thoughts related to the person's reward focus. Although the impulsive behaviour of neurotic extraverts may be reckless, in that they are prone to emit goal-directed behaviour without thinking, it is typically good-natured.

The breakdown of controlled processing in psychopaths appears secondary to their difficulty interrupting goal-directed behaviour to accommodate feedback from the environment. In addition, we believe that this problem is exacerbated when their capacity for controlled information processing is limited by high NAS activity. Whereas neurotic extraverts are activated by anticipation of reward, we believe that the impulsive behaviour of psychopaths is more reactive than anticipatory in nature. Psychopaths are prone to display impulsive behaviour when there is a strong instigation to respond, such as when they encounter tangible rewards, immediate frustrations, and concrete aversive events. In response to such events, psychopaths typically approach rewards vigorously, become infuriated when they are frustrated, and respond aggressively or flee when they encounter aversive events. Such stimuli are thought to stimulate the NAS directly (Gray, 1987) and give rise to intense reactions in most individuals, but these reactions gain ready expression in psychopaths owing to their weaker inhibitory control. The hallmark of the psychopath is that such immediate response inclinations are acted upon without regard for the consequences of their behaviour. Thus, the impulsive behaviour of psychopaths is relatively unpredictable and is strongly influenced by the situation: psychopaths are likely to display unrestrained reward seeking when rewards are salient; unrestrained aggression when they are physically threatened; and unrestrained lying and blaming when they are accused of something.

The breakdown of controlled processing in neurotic introverts, or anxious impulsivity, is occasioned by punishment cues and thus tends to be associated with high drive and attention to perceived threats. Associated with their enhanced attention to perceived threats, the impulsive behaviour of these individuals has a "cornered" quality and is tinged with negative affect. In general, neurotic introverts are not inclined to assertive action and would prefer to avoid arousing situations. Nevertheless, when avoidance is impossible, anxious individuals are capable of displaying a wide variety of responses with the apparent goal of coping with anxiety. In contrast to neurotic extraverts, whose actions are, to a large extent, dictated by the reward cues which caused the arousal, the threat cues which increase NAS activity in neurotic introverts may fuel a wide variety of poorly-regulated behaviours, including phobic withdrawal, compulsive rituals, and affective aggression.

The role of dominant responses. To this point in the presentation, I have said very little about factors which influence the nature of impulsive responding. By definition, impulsive behaviour is not planful or carefully thought out. To the contrary, it has a distinctly automatic quality. As noted earlier, impulsive action most likely involves the unchecked products of automatic processing. This means that when people are behaving impulsively
their interpretations of and reactions to situations will depend upon their habitual or dominant reaction to such situations. Dominant responses, in turn, are influenced by a person's biological predisposition or temperament, their learning history (i.e., certain interpretations and responses have been acquired and reinforced), and characteristics of the situation which make certain interpretations or response options particularly salient.

When people find themselves in situations that engender a high degree of arousal (NAS activity), they are likely to display a variety of behaviours until they hit upon an activity that channels their arousal. Depending upon the person's temperament, the situation, and their experience in similar situations, the behaviour may involve approaching an attractive goal, engaging in compulsive rituals (counting, washing), drinking alcohol, yelling to let off steam, or punching walls. In the event that any of these responses comes to be emitted with some regularity, it will gain in habit strength and may become a relatively automatic response to that situation.

Summary. When NAS activity is high, controlled processing resources are limited and individuals feel compelled to emit some form of vigorous action. Because controlled processing is relatively ineffective at such times, the resulting behaviour relies on automatic processing and well-learned responses. Such responses are influenced by temperament and the inducements of the situation, but they may also be learned or acquired with practice. Thus, motivationally significant stimuli may come to elicit a wide range of automatic responses.

VI. Implications for aggression

The three pathways to impulsive behaviour involve the unchecked expression of dominant responses secondary to a breakdown in self-regulatory processes. To the extent that aggression may be conceptualized as a dominant response, the same factors that contribute to the expression of impulsive behaviour are likely to facilitate the expression of aggression. As noted above, dominant responses may be governed by the situation, acquired by learning, and influenced by temperament. With regard to situational inducements, a large body of literature suggests that aggression is induced by negative affect (see Berkowitz, 1990). In addition, it is safe to assume that the learning of aggressive responses will be facilitated by aggressive role models and by direct reinforcement for aggressive behaviour. Understanding the contribution of temperament, however, would seem to require a more detailed analysis of aggressive behaviour.

Just as there are different forms of impulsivity with different antecedents and manifestations, aggression too is heterogeneous in nature. Investigators in this area frequently distinguish between a calculated or instrumental form of aggression on the one hand and a poorly regulated, affective or hostile form of aggression on the other. Whereas instrumental aggression is planned and purposeful, the affective form of aggression is explosive and lacking in deliberateness. It stands to reason, that these different forms of aggression would be associated with different temperaments or personality styles (see also Megaree, 1966).
Within Gray's model, instrumental aggression is likely to be mediated by the BAS and would be most likely to occur in neurotic extraverts, although it should be noted that psychopaths too may resort to aggression in order to achieve some immediate gratification. By contrast, affective aggression reflects a loss of self-control and tends to arise in response to frustrations, negative affect, and other aversive events. Thus, it is likely that psychopaths will be prone to hostile, affective aggression as well as to instrumental aggression because their instinctive reactions to frustration and other aversive events are unlikely to be inhibited.

Nevertheless, we believe that the majority of hostile aggression is likely to be mediated by the BIS and to occur most regularly in neurotic introverts (the group that displays anxious impulsivity). Again, this proposal may seem counterintuitive because neurotic introverts are, by nature, highly reactive to punishment cues and prone to behavioural inhibition; however, our speculation is supported by several lines of thought.

First, a number of experts in aggression have proposed that there is a direct association between the experience of negative affect and the expression of aggression. Berkowitz (1990), in particular, has proposed that experiencing aversive events such as extreme temperatures, frustration, and punishments appears to trigger a "hard-wired" instigation to aggress and inflict pain. Thus, negative affect may engender an automatic or dominant response to aggress that may be difficult for neurotic introverts to combat. Given that neurotic introverts are hypersensitive to cues associated with aversive events, they would seem to be at "high risk" to react in a manner that would facilitate hostile aggression. For example, neurotic introverts would be both more attentive and more reactive to interpersonal slights, negative evaluations, potential threats, and so forth.

Second, because neurotic introverts are prone to experience high levels of NAS activity in response to BIS inputs, following the logic set out earlier in this presentation, they will tend to suffer the greatest impairment in controlled processing in conjunction with cues for punishment and, therefore, be less able to evaluate and modify inappropriate responses. For example, their reduced reliance on controlled processing resources may contribute to the influence of preexisting response biases such as the hostile attributional bias described by Dodge (Dodge & Newman, 1981; Dodge & Crick, 1990).

A third factor promoting the expression of aggression in neurotic introverts involves what I will call the "vicious circle phenomenon". This phenomenon has been described in several domains of psychology (i.e., Marlatt's abstinence violation effect), and occurs when a person who is attempting to control their anxiety does so in a manner that they find personally abhorrent. For instance, in Marlatt's abstinence violation scenario (Marlatt & Gordon, 1985), a recovering alcoholic who has a long history of using alcohol to relieve negative affect may slip and have a drink. This behaviour itself now engenders negative affect and, because negative affect is a well learned cue for drinking, the individual reacts by drinking and so on. Behaviour associated with the vicious circle phenomenon has a distinctive, compulsive quality owing to the conflict that exists between a person's dominant response and their evaluation of the behaviour. Their attempts to inhibit the behaviour may serve to increase their NAS activity which, paradoxically, enhances their drive to emit the dominant response.
and reduces their capacity to regulate behaviour. This process appears to match the characteristics of affective aggression very well and may help us to understand the type of compulsive aggression seen in many spouse abusers, child abusers, and sex offenders. Because the vicious circle phenomenon is initiated when a person's behaviour violates his or her own standards, and is therefore a cue for punishment (i.e., a BIS input), we would expect this reaction to be most pronounced in neurotic introverts.

As noted earlier, affective aggression is probably common in psychopaths as well as in neurotic introverts. However, the processes mediating aggression in these two groups is apt to be different. We assume that aversive events automatically engender an inclination to respond aggressively in everyone, but that such urges are resisted by most people most of the time. Psychopaths, however, are notorious for their inability to resist inappropriate urges. As noted earlier, once a dominant response set is formed, psychopaths are relatively unable to shift controlled processing resources or alter a dominant response set. Unlike neurotic introverts, psychopaths are not especially sensitive to punishment cues. Thus, it is not cues for punishment but actual aversive events (i.e., frustration, others' aggression and other UCSs) that trigger aggression in psychopaths. Conversely, we assume that neurotic introverts are particularly prone to aggressive responses in response to BIS inputs. That is, we would expect them to display aggression in circumstances involving negative evaluation and, in general, whenever they perceive a situation as exceeding their capacity for coping. Whereas psychopaths are inclined to commit violence against strangers (Williamson et al., 1987); we suspect that aggressive responses of neurotic introverts would develop in response to long standing, personal conflicts.

VII. Implications for treatment

As noted several times in this symposium, identifying diverse pathways to violence and aggression may have important implications for managing such cases. The framework laid out in this presentation suggests that the factors which elicit aggression in different individuals may vary considerably (i.e., approach stimuli, frustration, negative affect). Furthermore, different factors may underlie an individual's failure to inhibit aggression. For example, the breakdown of self-regulation may result from exaggerated reward focus, difficulty modulating dominant responses, or affective reactions that curtail controlled processing. As noted above, it seems likely that people develop their repertoire of aggressive behaviours via different pathways and that depending upon the particular pathway, their aggressive behaviour may be serving very different functions.

Thus, the person responsible for managing cases of violent or aggressive behaviour may benefit from making such distinctions. When aggressive behaviour is motivated by the benefit that a person derives by behaving aggressively, it will be important to alter the reinforcement contingencies that are maintaining the behaviour. Just as neurotic extraverts appear predisposed to learn aggressive behaviours that achieve desired goals, they are likely to be guided by other contingencies that provide incentives for controlling aggression. On the other hand, aggressive behaviour stemming from negative affect and impaired self-regulation will require a different strategy. We have argued that such behaviour reflects the disinhibition of over-learned, dominant responses that escape behavioural control. In such
cases, it is essential to "deautomatize" the maladaptive dominant response and "reatomatize" a more adaptive one (i.e., change the automatic interpretations or responses; see Kanfer & Galick, 1986). Because such individuals may be incapable of modifying their behaviour in highly charged situations, alternative responses must be practiced in less charged situations. In addition, it is essential to assess and address the situational cues that are engendering their high arousal and negative affect. The factors underlying aggression in psychopaths are less well understood. It is our hope that distinguishing between the processes that contribute to the self-regulatory problems of anxious, impulsive, and psychopathic individuals will facilitate further research designed to clarify and modify the biopsychological processes contributing to psychopathic behaviour.

References


