

Towards Action-oriented Criteria in Risk Assessment

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Autonomic measures move beyond self-reports of psychological functioning and may be less prone to bias and measure related errors. This study examined physiological reactions of 64 male offenders diagnosed as personality disorders. According to order by the local court they were subjected to an extensive psychological and neuropsychiatric assessment with regard to release decision making. The results show that violence risk of the PCL-SV, especially Factor 2 (antisocial life style), correlates with the characteristic physiological and cognitive deficits of psychopathy. The predictive relevance of these correlating deficits was also investigated and confirmed in a follow-up study. We conclude that the definition of a personality specific action and life style may be of great assistance in risk assessment. The role of the basal ganglia as neurobiological substrate is also discussed.

“Le style, c’est l’homme”

(Georges-Louis Leclerc, Comte de Buffon, 1707-1788)

Findings from cognitive research and neurosciences are increasingly gaining relevance for the attribution of criminal offences. Every psychological disorder has its neural correlates. Negative life experiences may change the brain to such an extent as to produce psychological dysfunction. Traumatized bonding and controlling needs in early close relations leave distinct traces in the neuronal system. The most important are: excessive stress reactions to even relatively weak emotional strain, dysfunctional regulation of autonomic reactivity, and increased inhibitory reactivity. These changes exert continuous negative influences and diminish the possible range of positive life experiences more than necessary. Psychopathological dispositions such as psychopathy increase the probability of delinquency drastically. In his prominent study, Hare (1993) estimated that psychopaths only make up 1% of the total population, but that they are responsible for more than 50% of all severe crimes committed. These persons are primarily characterized by their lack of guilt and empathy, as well as their inability to learn from punishment. The characteristic ‘personality picture’ of the *psychopath*, also called sociopath or antisocial personality, is of specific relevance in the forensic setting. This serious disorder is mainly attributed to severe disturbances in early relations,

such as the internalization of experienced parental violence and cruelty or negative parental models with regard to moral standards and values. But even an environment extremely lacking in support and consistency may hamper the development of basic skills. Since similar behavioral problems are observed over generations, the importance of the hereditary factor for the development of an antisocial personality disorder is also frequently discussed.

The number of convicted biological fathers shows a clear and linear correlation with the number of convicted adopted sons only for crimes against property, but not for violent crimes (Mednick, Gabrielli, & Hutchings, 1984). It would be expected that violent crimes show the highest genetic predisposition; however, research findings repeatedly point out that different etiologies are involved both in violent and non-violent forms of antisocial behavior. Deviance is certainly also a result from disturbed socialization (Testrot, 1997). Children reared by deviant adults during an early childhood stage also develop deviant behavior at an early age. Changing parental figures as well as direct experiences of violence also correlate with deviant behavior. Generally speaking, a bio-psycho-social feedback control model is gaining growing acceptance. Personality disorders show distinct and deeply rooted traits of cognitive, emotional and behavior patterns manifested by rigid reactions in different personal and social situations. The construct of

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psychopathy links observable personality traits and prior history of delinquency with underlying cognitive style, emotion and psychophysiology. For instance, impaired achievement in differential attention tasks, disturbed lateralization of language function, and deviations in physiological reaction to emotionally relevant stimuli have been reported (Herba et al., 2007, Harpur & Hare, 1990; Patrick, 1994; Hare & Jutai, 1988).

Combined personality disorders are characterized by an extreme “self-orientation” in the sense of narcissism. This is associated with a lack of amenability to “therapeutic” arguments. The main reason is because these persons blame the society for their problems and demand the society to be treated and not themselves. At the same time these patients are usually emotionally unstable and show impoverished affective reactions in interpersonal relations. They tend to manipulate others and society in general, and they are often violent. Although they really lack insight into their disorder, they sometimes give in to societal pressure and accept therapeutic communication on a superficial level (Mitterauer, 2003). In this context, the *narcissism* (of the psychopath) could be functionally defined as the ‘power’ to effectively control the process of maintenance of identity (Mitterauer & Pritz, 1978). Narcissistic pathology “occurs when the employment of narcissistic defenses results in restriction or impairment of ego functions, notably maintenance of object relations, disturbances in identity, or the regulation of self-esteem” (Eisnitz, 1974). Narcissism plays a prominent part in the personality of psychopaths and may be at the root of the physiological response patterns (Kelsey, Ornduff, McCann, & Reiff, 2001).

The concept of psychopathy is closely related to the publications by Hervey Cleckley and his classical book *The Mask of Sanity* (1976). Based on his extensive clinical experience, Cleckley formulated a list of criteria for the diagnosis of this disorder. Contrary to the DSM criteria for antisocial personality disorder, Cleckley’s psychopathy criteria refer not so much to the antisocial behavior per se, but more to the character of the psychopathic person (see Ogloff, 2006). For example, one of the central characteristics of the psychopath is his impoverished affective reactivity with regard to both negative and positive emotions. Psychopaths have no feelings of

shame, and their seemingly positive feelings for others merely reflect a role they play. The psychopath is extraordinarily charming and he manipulates others to his personal advantage. Due to his lack of negative emotions, the psychopath may be unable to learn from mistakes, whereas the lack of positive emotions may lead to irresponsible behavior towards others. Another behavioral aspect described by Cleckley refers to the inappropriate motivation of the psychopath. For instance, his behavior is not explained by the need for money, but is impulsively directed for the purpose of reducing tension, among other reasons. Several investigations have identified specific personality characteristics which are associated with high recidivism in delinquent behavior.

Physiological Correlates

Gray (1973) stressed the importance of the hypothalamus and the medial prefrontal brain circuit and postulated a “behavioral inhibition system” (BIS) as distinct from the “behavioral activation system” (BAS) serving as key stimuli for reward. Fowles (1980) regarded the antagonistically acting systems BIS and BAS as independent activation systems in contrast to a general arousal system with its primary neurophysiological substrate in the reticular activating system. With regard to this third arousal model, Fowles made no remarks about neurophysiological substrates; however, he attributed cardiovascular activity, especially heart rate, as a primarily peripheral physiological index to the BAS, and electrodermal activity to the BIS. Neurobiologically, the BAS is supposed to be associated with the basal ganglia and their predominantly dopaminergic connections to the midbrain and prefrontal cortex. The regulation of the BIS occurs in the hippocampus-septum-system with its close connections to the prefrontal cortex, the noradrenergic pathways of the locus coeruleus and the limbic system (amygdala).

Psychopaths show reduced electrodermal reactions to aversive stimuli as compared to non-psychopaths. They do not recognize fear in faces and also fail to perceive punishment. Several investigators have demonstrated further psychophysiological discrepancies in these subjects, and meanwhile significant neuroanatomical correlates are reported

as well. In a study by Adrian Raine published in Archives of General Psychiatry in February 2000, a sample of subjects with antisocial personality disorder showed a reduced volume of prefrontal grey matter as well as reduced autonomic activity. In stress situations they showed significantly smaller heart rates and electrodermal responses as well as startle reflexes as compared both to normal controls and patients suffering from psychosis or addiction.

In a SPECT study (Amen, Stubblefield, Carmichael, & Thisted, 1996), aggressive psychiatric patients showed reduced activity in prefrontal cortex as compared to a psychiatric control group, whereas increased activity was found in the regions of the anterior-medial frontal cortex, the left basal ganglia and/or in the limbic system. At the same time abnormalities were registered in the left frontal cortex.

The prefrontal cortex is part of a neural circuit that is central to fear conditioning and response to stress. Poor conditioning is theoretically associated with poor development of conscience. When subjected to social criticism and other aversive stimuli, a person with low arousal could be less susceptible to socialization. Psychological and social factors interact with the multiple brain systems to produce behavior. Deficits in autonomic and central nervous system arousal may make a person seek stimulation and engage in antisocial behavior to compensate for the underarousal.

Low resting heart rate is thought to be the best replicated biological correlate of antisocial and aggressive behavior in child and adolescent populations and may reflect reduced noradrenergic functioning and a fearless, stimulation-seeking temperament. Stimulation-seeking theory argues that low arousal represents an unpleasant physiological state; antisocial individuals seek stimulation in order to increase their arousal levels to an optimal or normal level. (Ogloff & Wong, 1990) Physiological explanations of the heart rate - antisocial relationship involve arousal theory, vagal tone, norepinephrine, and also right hemisphere dysfunction. Poor right hemisphere functioning (particularly the anterior regions) has been associated with deficits in the withdrawal system, a system that promotes retreat from aversive and dangerous situations. Electrodermal hyporeactivity is a highly reliable correlate of diagnosed psychopathy and undersocialized aggressive conduct disorder.

The intraindividual reaction specificity has been verified in a number of studies. This concept states that physiological reaction patterns (pattern of maximum reaction functions, hierarchical structure of functions according to their reactivity) show a tendency towards stability. An individual person tends to react to different stimuli with his/her specific pattern of physiological changes (Klopf, 1998).

In a meta-analysis of 95 studies (Lorber, 2004), the correlations between heart rate (HR) and skin conductance (EDA) with aggression, psychopathy and behavior disorders were investigated. HR and EDA measures proved to be reliable correlates of aggression, psychopathy/sociopathy and conduct problems in enough cases to suggest that they be taken seriously. According to Lorber, inconsistent research findings can in many cases be attributed to heterogeneous constructs with regard to antisocial spectrum behavior, patterns of physiological response, experimental stimuli, and age. Lorber emphasizes that convincingly demonstrating links between antisocial spectrum behavior and autonomic physiology might elucidate relevant mechanisms and individual differences and potentially lead to treatment innovations.

The Role of Basal Ganglia in Action Regulation

The complex structure and function of basal ganglia has not been completely unraveled by brain research. The basal ganglia consist of many substructures, including the caudate nucleus, globus pallidus, nucleus accumbens, entopeduncular nucleus, ventral tegmentum area, and substantia nigra. Occasionally, the amygdaloid nuclei are included in this category, even though this last structure is now more commonly considered to be part of the limbic system.

With regard to anatomy and function, the basal ganglia are closely connected to the frontal cortex. The ventral loop of the basal ganglia which is mainly associated with areas of the limbic system influences inhibition of action. Via amygdala and the meso-limbic system motives and emotions further influence final decisions of action. In this loop desires, fears and motives are coordinated with situational demands, before being confirmed or rejected. Our frontal brain, the prefrontal cortex, is the seat of planning and intending. However,

respective plans are not directly sent to motor cortex and executed, but first these are transmitted to the unconscious basal ganglia (Roth, 2001).

Our feeling of desire first arises *after* the limbic system has decided what to do. Most essentially, this system carries the final decision as to which action we take or not, with regard to our complete unconscious repertoire of experience stored and subject to recall. Thus, the basal ganglia must first confirm the decisions of the cerebral cortex and then release the corresponding action. This can be made clear by the fact that the amount of excitation necessary to elicit autonomous behavior is only able to pass the critical threshold if the basal ganglia are stimulated as well. When dopamine is available, the basal ganglia conduct their functions efficiently. It is generally thought that the ventral striatal system is one of the major avenues through which affective processes are blended with basic motor tendencies (Panksepp, 1998).

In patients with diseases of the basal ganglia, such as Morbus Parkinson or Chorea Huntington, effects of a reduced electrodermal and/or an accelerated habituation were observed. Several studies point to the importance of frontal brain structures and their subcortical connections for the control of autonomous reactions. As part of the dopaminergic system the basal ganglia both represent an important biological substrate of extraverted behavior and a fundamental basis of a positive emotional state.

METHOD

Internal Structure of the Psychopathy Checklist (PCL-SV)

An important predictor of future violence is psychopathy as defined by Hare (2003). The psychopathic personality is a constellation of personality traits including such features as lack of remorse or sincerity, dishonesty, egocentricity and impoverished affective reactions. Psychopaths are a specific subgroup of antisocial personalities and are characterized by high risk of violence and criminal recidivism. Nowadays, most researchers identify psychopaths with the Checklist developed by Hare and co-workers (Hare, 2003). These questions are aimed at two

important clusters of antisocial behavior. The first cluster describes a selfish and uncompassionate individual who takes advantage of others. Here the focus lies on affective interpersonal behavior characteristics. The second cluster identifies an antisocial life style, i.e. behavior traits associated with an unstable, unsocialized or socially deviant life style.

Factor 1 characteristics correlate with the classical description of the psychopathic personality, those of Factor 2 with antisocial behavior (Ogloff, 2006). Factor 1 is composed of six items covering the interpersonal and affective symptoms. In interpersonal relations the psychopath can be described as: artificial, grandiose, egocentric, fraudulent-manipulative; arrogant and exaggerated in his self-assessment; and refusing to take responsibility for his own actions. With regard to affective reactions, the psychopath shows unstable and superficial feelings; is unable to keep up longer and stable relationships, or to stick to principles and goals; lacks feelings of anxiety, sincere guilt, remorse and empathy and shows impoverished affective reactions.

Factor 2 is characterized by a socially deviant behavior and a chronically unstable and antisocial life style. The psychopathic behavior is described as: impulsive, always searching for new sensations; lacking clear goals in line with the principle of immediate satisfaction of needs; lacking in self-control; and violating social rules without hesitation.

Item 8 of the PCL-SV is named *Poor Behavior Controls*. This item describes people who are easily angered or frustrated; this may be exacerbated by the use of alcohol or drugs. They are frequently verbally abusive (e.g., they swear, insult, or make threats) and physically abusive (e.g. they break or throw things; push, slap, or punch others). The abuse may appear to be sudden and unprovoked. These angry outbursts are often short lived. The PCL also has been associated with substance use in four studies (see Hart, Cox, & Hare, 1995). A meta-analysis indicated that Factor 2 had significantly larger correlations with measures of substance use than Factor 1 (Hemphill, Hart, & Hare, 1994).

Participants

In forensic practice there is an urgent need for criteria which separate personalities with a high risk

for violent behavior from those less likely to cause complications upon discharge or relaxed enforcement. A sample of over 138 expert opinions on conditional discharge from imprisonment, especially violent offenders and the diagnostic groups of personality disorders and substance abuse, were investigated (Klopf et al. 2006). Dangerousness and risk assessment was based on the criteria of the Psychopathy-Check-List (PCL-SV). The majority of violent offences occurred under the influence of substances. A strong craving for alcohol and drugs, antisocial personality traits and aggressive outbursts were characteristic of a distinct typology. Impulsivity and suicidality as well as a traumatized childhood hampered further prognosis. Psychopathy had a high correlation with addiction, hyperkinetical disorders and antisocial behavior. The findings in our follow-up-study (after four years time at risk) show that upon discharge especially those offenders who had committed their last crime under the influence of substances (poor behavior control) re-offended more quickly than other participants.

In a sub-sample of 64 male offenders a standardized psychophysiological stress test was administered. According to order by the local court they were subjected to an extensive psychological and neurological-psychiatric assessment at the Salzburg Department of Forensic Neuropsychiatry with regard to release decision making. Nearly all of these offenders came from the Austrian penitentiary in Garsten. In 70 % of the cases the question concerned the decision of preliminary release after 2/3 of imprisonment (according to § 46 StGB). Thirty percent of the cases dealt with conditional release from involuntary psychiatric treatment (according to § 47 StGB). Sixty percent of the offenders committed their last crime under the influence of drugs, 90% were smokers, and 33% had attempted suicide at least once in their lifetime (see Table 1).

Measures

Physiological indices consisted of skin conductance, heart rate, skin temperature and muscle tone (frontalis). The REACT-Stress-Test consists of four test stages, during which physiological activation levels are measured (baseline, warning stage, stress stage, recovery stage). During baseline the habitual resting level is measured. The second

warning stage demonstrates if the subject responds physiologically already in expectation of the stress stimulus. The stress stage itself consists of a short visuo-acoustic startle stimulus. In the recovery phase reduced arousal levels are expected.

The standardized psychodiagnostic assessment contained further tests on intelligence (WIP), attention and concentration (vigilance), personality inventory (FPI-R), proneness to aggressive behavior (FAF), paranoid-depression-scale (PDS). Diagnoses are based on DSM-IV criteria for personality disorders (SKID-II), dangerousness and risk assessment was based on the criteria of the Psychopathy-Check-List (PCL-SV).

RESULTS

The sample of 64 male participants was between 22 and 65 years old, with a mean age of 39 years. Main diagnoses were personality disorders and substance abuse (see Table 2). In 80% of these cases a violent crime was the prime cause for being in custody. With regard to violent offences, homicide (43%) and robbery (29%) were dominant. Based on the PCL-SV scores, the offenders were divided into high risk (33% score 18-24) and low risk (23% score 0-12) sub-groups.

Significant Correlations Between Psychophysiological and Psychometric Data

Higher life satisfaction values (FPI 1) correlate with higher heart rate responses during the warning and stress stages ($r = .25$ and $r = .30$, respectively). Social orientation (FPI 12) corresponds with the amount of change in skin conductance (mental stress resistance) between baseline and stress stage ($r = .25$).

More inhibited subjects (FPI 4) also show higher muscle tension (EMG) during baseline ($r = .24$). A higher subjective excitability (FPI 5, FAF 3) correlates with lower heart rate values during baseline and stress stages ($r = -.25$ and $r = -.35$, respectively), but higher muscle tension values (EMG) at baseline and warning stages ($r = .23$ and $r = .24$, respectively). More emotional subjects (FPI 12) show lower heart rates during warning and stress stages ($r = -.25$ and $r = -.40$, respectively), but higher temperature scores in all 4 stages ($r = .23$ to $r = .25$).

High scores on self-aggressiveness (FAF 4 – “depression”) correlate with low heart rate responses during the warning stage ($r = -.26$), also with less EMG changes between baseline and warning stages ($r = -.23$), but with higher temperature values in all 4 stages ($r = .33$ to $r = .34$). A stronger aggression-inhibition (FAF 5) correlates with higher skin conductance values at all 4 stages ($r = .22$ to $r = .23$). A stronger aggression-potential (FAF 6) is associated with a lower heart rate during stress ($r = -.28$) but with more marked changes in muscle tension (EMG) between baseline and stress stages ($r = .22$).

With regard to the cognitive variables, the strongest correlations were obtained between achievement on the visuo-spatial task “Mosaic Test” (MT) and EMG values ($n = 45$) in all four test stages (EMG1-4, r between $-.31$ and $-.36$).

MT-results correlate negatively with muscle tone (EMG). Thus, better achievement on this visuo-spatial task is associated with lower muscle tone during all stages measured. These effects stay the same even after eliminating artifacts due to age and extreme scores!

In our investigated sample the following differences in dangerousness (PCL-SV) with respect to muscle tone and visuo-spatial task achievement (MT) are postulated: Participants with higher muscle tone (EMG) and lower achievement on the visuo-spatial task (MT) are more dangerous as defined by PCL-scores compared to subjects with less tension and better visuo-spatial achievement.

Statistics

The above postulated differences were tested according to a two-factorial analysis of variance with the dependent variable dangerousness (PCL-SV) and the independent variables muscle tone (EMG) and visuo-spatial task achievement (MT). Both main effects due to tension and visuo-spatial task achievement and the corresponding interaction effects were analyzed.

The risk for violence was measured according to the total PCL:SV score. Additionally, both PCL:SV subscales (Factor 1, 2) as well as single items were included in the analysis. Muscle tension was measured by EMG (frontalis) during all 4 test stages as well as the respective changes between each

stage. All obtained measures were averaged (median), and accordingly, two groups with low versus high muscle tone (EMG low / EMG high) were formed. Visuo-spatial task achievement data (MT) was similarly divided into two groups (MT low / MT high).

The results obtained from our sample confirm our expectations. Accordingly, the muscle tone effects varied in relation to the factor “constructive intelligence” (as measured by the visuospatial task MT). The combination of low constructive intelligence with high muscle tone definitely yielded the highest mean PCL values, whereas higher “intelligence” and tension scores rather corresponded to lower PCL values as compared to subjects with high MT-intelligence and low muscle tension. Generally, most marked differences were obtained for the PCL-SV Factor 2 (items 7 to 12).

The experimental group was further divided into groups according to their heart rate reactivity (reflex bradycardia – „decelerators“) to the stress stimulus. The sub-group with a rigid or diminished reactivity (“accelerators”) was markedly more antisocial according to PCL-SV Factor 2 (items 7 to 12), showed more irresponsibility and a stronger lack of life goals. In a further division (by the median) of these groups into high and low resting heart rate sub-groups, even more significant differences regarding PCL-SV criteria were obtained in the low group also showing a rigid or diminished reactivity (low pulse – accelerators). This sub-group was significantly more frequent in hospital order (§ 47 StGB). In the forensic assessment they were also significantly more often evaluated as high risk offenders. Finally, follow-up data over 4 years showed that this critical group also contained significantly more recidivists.

DISCUSSION

The characteristic physiological and cognitive correlates of psychopathy are closely associated with Factor 2 of the PCL. Thus, the variables action and life style are increasingly brought into focus of prognosis. The lifestyle of this personality group is additionally characterized by drug abuse as well as higher rates of recidivism. The action-specific, mostly unintentional processes are regulated by the basal ganglia, which is exactly where functional

Figure 1
PCL-SV - Interaction: Mosaic-Test/EMG

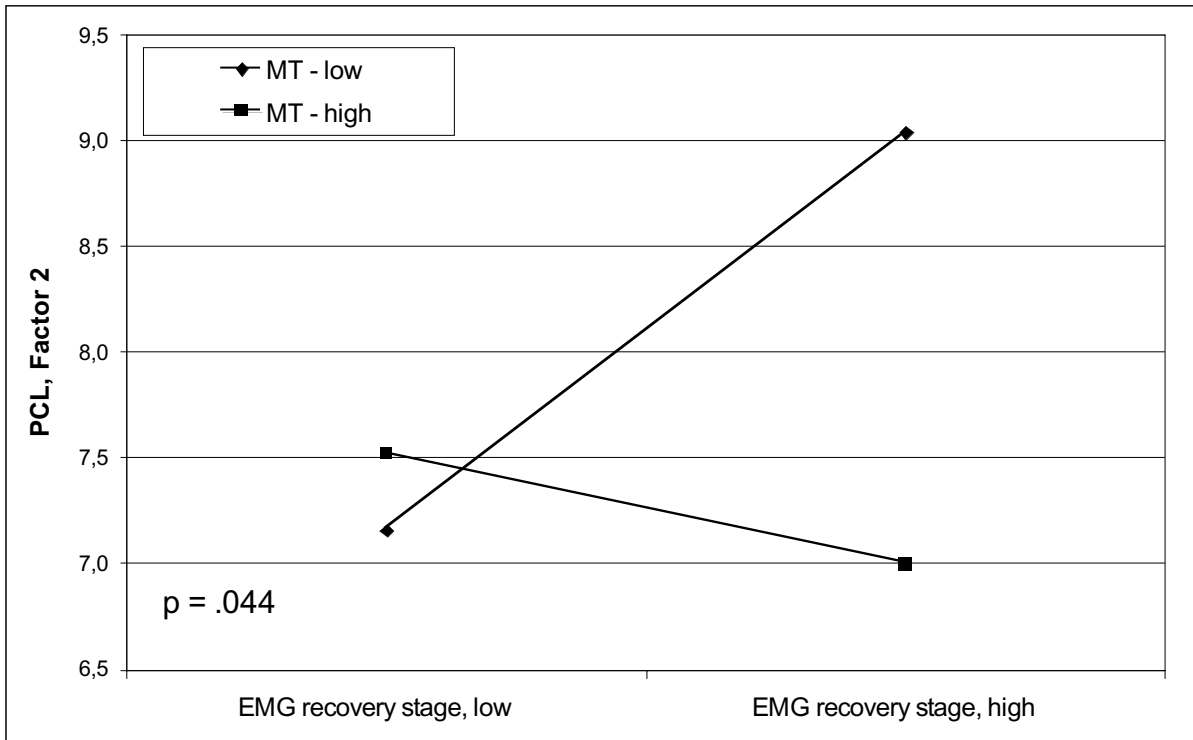


Figure 2
PCL-SV - Heart-rate in Stress

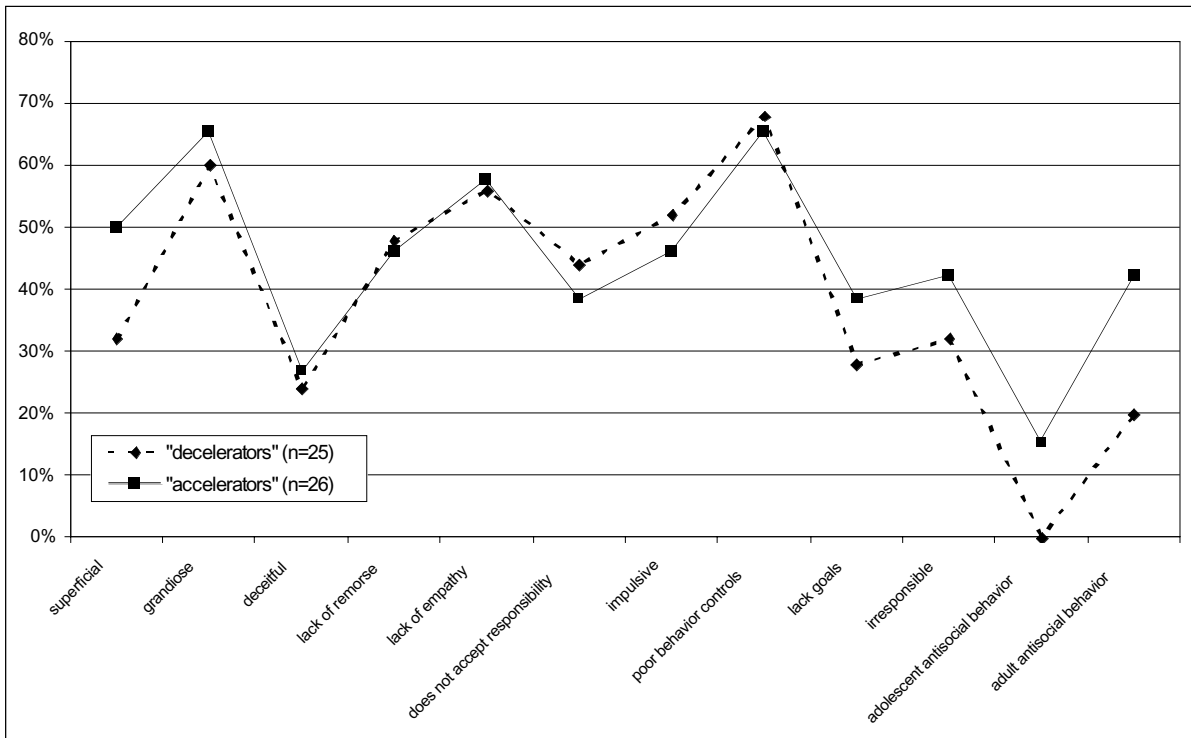


Figure 3
Low Pulse Accelerators in Hospital Order

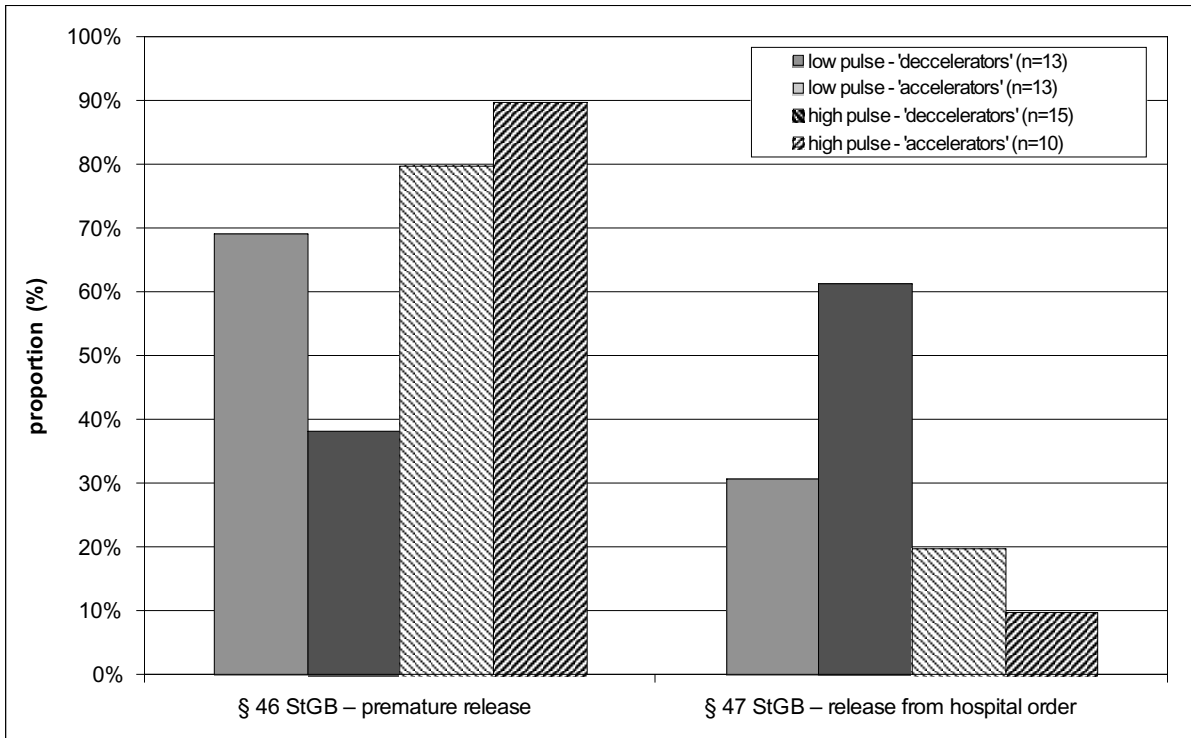
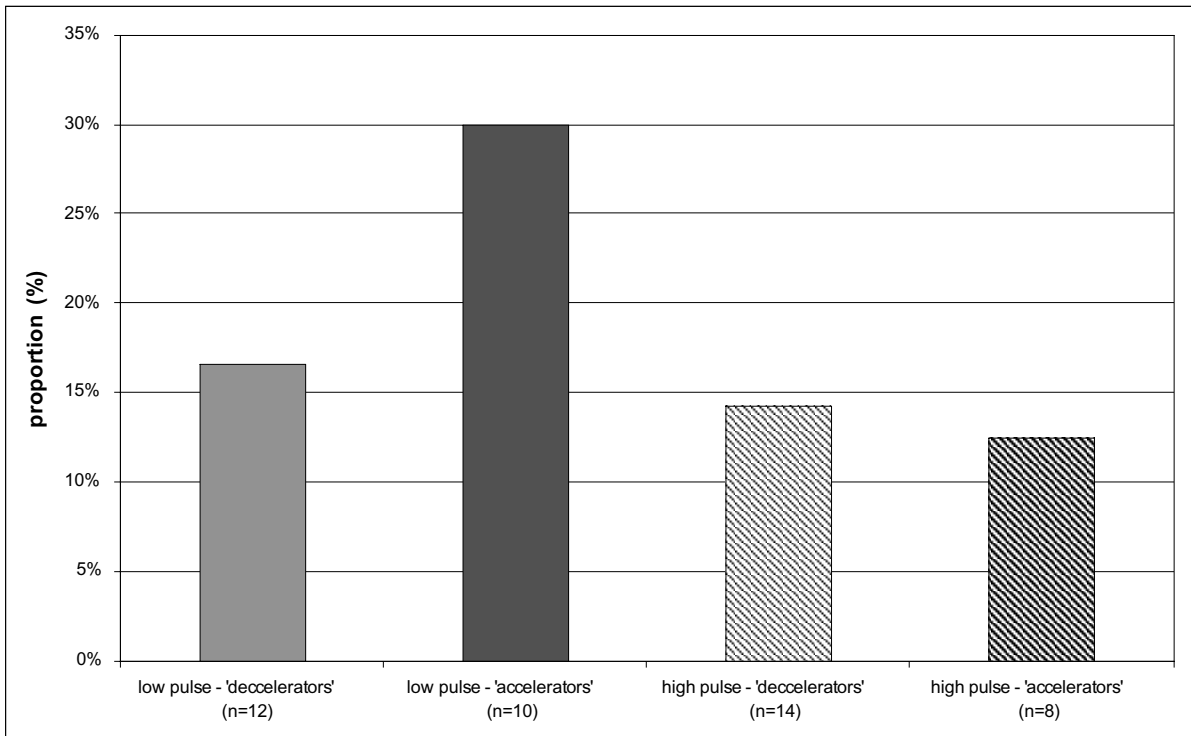


Figure 4
Recidivism of Low Pulse Accelerators



deficits often have been demonstrated. This brings up the important question concerning the degree of culpability of offenders suffering from severe personality disorders. The interaction between cortical and sub-cortical excitatory circuits is mainly characterized by reduced cognitive inhibitory mechanisms. The unconscious, impulsive action potential is mostly expressed by a delinquent action style as a personality trait with high determination. Thus, antisocial life style according to prior history data plays a central predictive role in prognosis, with the risk variables of the past determining outcome of the expert opinion. Frequently, predicted risk can only be constrained by legal directives such as stringent treatment settings, strict alcohol and drug abstinence, and even attended living.

Different research groups have shown that common therapeutic approaches hardly produce any changes in the delinquent behavior of psychopaths (Hare 2003). Psychological disorders in general represent reactions to severely violated basic human needs. Their neural correlates are more far reaching than the disorder itself and need to be treated as well in order to achieve the most effective therapy possible (Neuropsychotherapy, Grawe 2004). The pertinent literature within the scope of neuropsychology, psychophysiology and psychology of emotions points to rather distinct characteristics of the antisocial personality. Their reduced treatment adherence may at least be attributed to the lack of really effective methods of therapy. In our view, approaches that consider neural facts of the individual case and attempt to change the “*internal environment*” in addition to behavioral and psychodynamic therapy seem feasible.

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