The Psychophysiologic Manifestations of Dissociation

Electrodermal Responses in a Multiple Personality Patient

*Joel Osler Brende, M.D.**

During the latter part of the nineteenth century, Pierre Janet's[34, 35, 36] extensive descriptions of hysterical patients, including those of multiple personality patients, led to the development of an important concept, that hysterical behaviors were "dissociated" from the control of the patient. Such behaviors were given the name "psychological automatisms" and thought to be caused by the loosely attached or dissociated symptom complexes that became exaggerated and separated from consciousness, causing contradictory and uncontrollable behavior, fugues, hysterical "fits," motor automatisms, spontaneous trances or catatonic-like states, and even alternate personalities.

"SPLITTING" AND DISSOCIATION OF HEMISPHERES

Janet believed that a lack of unifying energy lay at the root of dissociation in hysterical patients, particularly those with multiple personalities. In so doing, he considered their illnesses to be psychophysiologic disorders. Similarly, other authors[24, 54] have postulated that a psychophysiologic abnormality, related to the "splitting" mechanism associated with borderline personality disorders, could be a functional dissociation between cerebral hemispheres. It follows that the "splitting" mechanism described in patients with multiple personality disorder,[2, 53] like that found in narcissistic[25] or borderline patients,[23] may have such a psychophysiologic basis, specifically a functional impairment of neurotransmission within the corpus callosum. Such an impairment has been previously described[52] in subjects with surgically disconnected hemispheres, whose responses to

*Associate Clinical Professor of Psychiatry, New York Medical College; Staff Psychiatrist, Franklin D. Roosevelt V.A. Medical Center, Montrose, New York

hemisphere-specific stimulation revealed that "the two disconnected hemispheres may be co-conscious in parallel, even in mutually conflicting experiences. Sperry's description is not dissimilar to the description of co-consciousness that exists in multiple personality patients.[56]

Differential Hemisphere Functioning

The significance of functional inter-hemisphere dissociation can be clarified by reviewing some of the pertinent hemisphere specific functions as measured by electrodermal responses (EDR), electroencephalograms, selective visual fields, dichotic listening, and neuropsychologic testing. Evidence of right hemisphere lateralization has been linked to unpleasant imagery,[14] emotional expression,[50] depressive affect,[18, 19] and traumatic imagery.[7] Hemisphere-specific measurement techniques have also suggested that the left hemisphere is associated with an absence of emotion,[50] and regulatory control over the emotional responsiveness of the right hemisphere in some persons.[28]

Specificity of hemisphere functioning in relationship to post-traumatic symptoms has also been suggested.[7] Using lateralization of EDR as an indirect measurement, left hemisphere functioning appeared to be linked with hypervigilance and aggressive outbursts. Right hemisphere functioning appeared to be associated with intrusive imagery and frightening emotions. Furthermore, Chemtob and Hamada[10] have proposed to research the theory that post-traumatic symptoms of detachment and denial are associated with left hemisphere, and intrusive imagery and emotions with right hemisphere functioning accordingly. Such findings gain significance in view of the widely known fact that most multiple personality patients have suffered severe traumatic experiences as children.[23]

Lateralization and Alternate Personalities—Hypotheses

In view of what is known about hemisphere lateralization in normal and post-traumatic syndromes, it could be postulated that alternate personalities are linked to specific hemisphere functions and lateralized in the following hypothetical way:

1. A protective personality whose "role" would be to defend against environmental threat and awareness of disturbing imagery, emotions, and recollections of post-traumatic events would likely be associated with the cognitive, unemotional, and defensive functions of the left hemisphere.
2. A victim personality who experiences repetitive re-enactments of disturbing post-traumatic events would likely be associated with the right hemisphere's non-cognitive functioning and emotionally charged imagery of traumatic events.
3. "Splitting" is a mental mechanism that maintains separation between the defensive qualities of a parental "protective" personality "housed" within the left hemisphere and a child-like victim personality "housed" within the right hemisphere.
4. Dissociation (or switching) is a physiologically based mechanism, resulting from functional disruption of neurotransmitter communication between each of the hemispheres, thus resulting in selective functioning of personalities linked to either hemisphere in response to specific control or expressive needs of the whole organism.

A theory of functional "splitting" and dissociation between the two hemispheres has not been previously proposed in the literature, although there are reports of differences in cortical evoked potential between personalities[45] and following integration of personalities.[5] However, evidence of cerebral lateralization in relationship to functioning of alternate personalities has been described. Braun and Braun[6] have reported right- and left-handed personalities. Schenk and Bear[49] observed changes in handedness between alternate personalities in patients they studied. They also referred to previous observations by Hall et al.[28] and Taylor and Martin,[56] who had found similar differences in handedness, and referred to Ischlondsky,[33] Condon, Ogston, and Pacoe,[12] and Sutcliffe and Jones,[55] who also found evidence of lateralization and concluded that cerebral dominance may shift as alternate personalities dissociate.

OVER-CONTROL AND UNDER-CONTROL MECHANISMS; AUTONOMIC BALANCES AND ELECTRODERMAL ACTIVITY

The following discussion of control mechanisms in traumatic and stressful conditions can lay the groundwork for hypotheses pertaining to physiologic triggering mechanisms for dissociation.

Horowitz and Becker[32] have described the post-traumatic phenomenon of relative "over-control" of defensive mechanisms (such as amnesia, cognitive constriction, denial, and emotional detachment) alternating with relative under-control of intrusive symptoms (such as disturbing emotions and imagery).

Gellhorn[21] has described "disturbances in autonomic functions and autonomic-somatic relations and alterations in synchronizing and desynchronizing effects on the cortex . . ." which he called a problem in synchronization between excitatory (ergotropic) and inhibitory (trophotropic) systems that could provide a physiologic basis for the post-traumatic under-control/over-control concept. Gellhorn's theory involves the notion of a disturbance in the reciprocal relationship between the ergotropic system, which activates catecholaminergic neurotransmitters during stress, and the trophotropic system involving cholinergic neurotransmitters that function during a reduction of stress.

There has previously been described a reciprocal relationship between catecholaminergic and cholinergic activity in association with the punishment-pleasure axis[46] and the fight-flight response to fear. For example, catecholamines appear to be activated as part of the involuntary reaction to frightening stimulation[31] but also in relationship to heightened emotional arousal during pleasurable states.[17, 21, 46] On the other hand, the acetylcholine-mediated system has been associated with significant depression[37] and with activation of (1) blocking awareness of fear;[22] (2) blocking past memory;[30] and (3) anger and predatory aggression.[47]

Hypotheses for Dissociation

Using a frame of reference based on the aforementioned psychologic and physiologic information, postulations can be made about the following

psychophysiologic over-control/under-control mechanisms that can trigger dissociation in multiple personality patients:

1. It is hypothesized that at least one alternate personality exists in a state of relative over-control in order to serve defensive and protective functions and is housed within the left hemisphere. Furthermore, it is hypothesized that activation of this personality's presence is mediated by cholinergic neurotransmitters within the trophotropic system.
2. It is hypothesized that at least one alternate personality exists in a state of relative under-control over repetitive re-enactments of traumatic experiences and is "housed" within the right hemisphere. Furthermore, it is postulated that activation of this personality's presence is mediated by catecholamine neurotransmitters within the ergotropic system.

RESEARCH FINDINGS

The study to be reported is of bilateral electrodermal response (EDR) measurements in a single multiple personality patient, a clinical report having previously been published.[7] The study's results are consistent with hypotheses already described about cerebral hemisphere lateralization, dissociative mechanisms, and autonomic functioning in relationship to post-traumatic over-control and under-control mechanisms. However, prior to a presentation of the findings, the following summary of the significance of the EDR will be presented.

Bilateral Electrodermal Response Measurements

EDR measurements have generally been taken from a single extremity. Consequently, until recently there has been little or no attention paid to the need for or results from bilateral EDR measurements. Yet there has been considerable research pointing to the fact that the EDR is often asymmetric[11, 13, 15, 16, 17, 57, 58] and that the asymmetry is apparently independent of manual dominance.[9, 16, 62]

Electrodermal asymmetry appears to be frequently related to emotional factors. For example, deBonis and Baque[13] found that an increase in the EDR on the left in normal subjects was related to their exposure to a mild anxiety-producing situation, although a highly stressful situation evoked a bilateral increase. Van Houten and Chemtob[57] found that both EDR and skin temperature were increased unilaterally in a certain percentage of male subjects who were exposed to the viewing of slides of sexual and violent behavior. Gruzelier and Venables[26, 27] made bilateral EDR measurements in psychiatric patients and found "marked bilateral differences in skin conductance levels," with higher levels on the right side in patients with schizophrenia and personality disorders, and higher levels on the left side in patients with depression.

Electrodermal Responses and Cortical Activity

The cortical control of electrodermal activity has been described as originating from the ventromedial reticular formation, although inhibitory influence of that system can be overcome by the excitatory influences of

higher cortical structures.[60, 61] Depressing effects on electrodermal activity has also been found to emanate from the lateral frontal cortex.[38]

The limbic system has also been reportedly linked to electrodermal activity.[31] Stimulation of the amygdala has been found to produce an electrodermal response in cats[63] and amygdalectomy a diminution of electrodermal activity.[1] Stimulation of the hippocampus and fornix has been described as having an inhibiting effect,[63] suggesting that the amygdala and hippocampus are reciprocally related to activation or inhibition of electrodermal activity.

The control and modulation of electrodermal activity has been thought to involve both peripheral and central mechanisms. Peripherally, for example, electrical activation of the skin has been described as resulting from the interaction between epidermis and sweat glands.[59] Central modification of electrodermal activity, which has also been called the electrodermal orienting reflex, has been described as originating from the reticular-activating system[4] and includes the non-specific thalamic system, frontal lobes,[40] and the lateral frontal cortex.[38]

The presence of specific emotional and behavioral symptoms in association with EDR lateralization suggests the likelihood of a relationship between cerebral and EDR lateralization. Although some authors[27] have suggested that EDR is associated with unilateral cerebral hemispheric functioning, most[11, 42, 43, 44] have hypothesized that electrodermal responsiveness is a reflection of contralateral cerebral hemispheric functioning. Lecroix and Comper's recent study[39] in normal subjects reported that the stimulus-evoked electrodermal asymmetry was related to the controlling effect of the contralateral hemisphere, the stimulus for right hemisphere–specific spatial tasks producing a decreased left-sided electrodermal response.

Case Study—EDR Measurements

Bilateral EDR measurements were made during several therapy sessions in 1978, 3½ years after the beginning of therapy, at which time there were three alternate personalities. Measurements of skin conductance response were obtained by attaching electrodes from three fingers of both the right and the left hands to two different biofeedback dermographs. Increases in skin conductance response were observed to correspond with the movement of a needle from an upright position (baseline = 0) to the right as far as +10 micromhos (mos). Decreases in skin conductance were observed to correspond with movement of a needle from the upright position (baseline = 0) to the left, as far as −10 micromhos (mos).

Two video cameras were used, one of which was focused on the two dermographs placed on top of each other, the other on the patient, to make a split image video recording for later review. The following EDR testing sessions will be reported.

The first EDR measurements were obtained on one extremity only and were of the three personalities: Jay, Shay, James.

Jay—the protective personality, characterized as verbally fluent and emotionless, was associated with a decreased EDR while he expressed his intent to control emotion.

James—a previously traumatized, frightened, childlike victim personality, characterized as frightened, depressed and traumatized, was associated with an increased EDR.

Shay—who displayed effeminate, verbally fluent, and hysterical qualities, demonstrated paradoxical EDR measurements in relationship to the expression and control of emotion. That is, an increased EDR was associated with the attempt to control emotion and a decreased EDR was associated with the expression of emotion in contrast to patterns found in the other two personalities.

During the next session, bilateral EDR measurements were obtained from both Jay and James. The presence of Jay, the protective personality, was associated with no significant EDR changes as the baseline was observed to be +5 mos in both hands. At the moment of transition from Jay to James, there was a sudden and dramatic increase in the left-sided EDR from +5 to +10 mos, which lasted until the reverse transition from James to Jay. At the moment that Jay replaced James, the left-sided EDR fluctuated unilaterally from +10 to −10 mos and then returned to the previous baseline of +5 mos.

Thus, a unilateral left-sided EDR increase began at the moment of dissociation that evoked James' presence. When James became anxious, another dissociation causing Jay's return prompted a sudden reduction of the left-sided EDR until it returned to the baseline.

Jay was tested during the next EDR session 30 days later. The baseline was a slightly diminished right-sided EDR at −2 mos and slightly increased left-sided EDR at +2 mos. Jay stated that he was intent on controlling his seizures, which prompted the development of a prolonged right-sided EDR decrease from 0 to −10 mos, hypothesized to be contralateral control activity, emanating from the left hemisphere (housing Jay).

During the next session a year later, James, the victim personality, demonstrated considerable anxiety and said, "I was just ready to burst out in crying." This was associated with extreme fluctuations in the left-sided EDR ranging from −5 mos to +10 mos. When he regained control there was a sudden drop in the left-sided EDR to −5 mos while simultaneously having a slight right-sided EDR increase.

During the next session, Jay's capacity to control autonomic activity was demonstrated when he said, "I am in control of what goes to the fingers. Now I released it." Simultaneously, there was an EDR shift bilaterally manifested in a right-sided increase from 0 to +5 mos and a greater left-sided increase of 0 to +10 mos.

EDR measurements were made when hypnosis was used on Jay to evoke James' presence. At the moment of the personality transition there was an increase in the left-sided EDR from 0 to +2 mos. James became very anxious and triggered a gradual unilateral increase in the left-sided EDR to +7, without simultaneous change in the right-sided EDR. Suddenly a personality transition, which prompted the return of Jay, caused a rapid increase in the same left-sided EDR to +12. This response was unlike those previously observed with Jay's presence and seemed to reflect James' sudden loss of control rather than Jay's protective and controlling actions.

During this testing session, James initially attempted to control his emotions and prompted a gradual left-sided EDR increase from 0 to +2 mos while the right-sided EDR remained at the baseline of −2 mos. A therapeutic intervention brought about a personality transition from James to Jay. At the moment of transition, Jay's return was associated with a return of the left-sided EDR from +2 mos to the baseline 0 while there was a concomitant increase in the right-sided EDR from −1 mos to the baseline 0. As Jay actively controlled the expression of emotion, there was a gradual left-sided EDR decrease from 0 to −5 mos.

Further testing was made when James became very emotionally upset while crying and yelling. This was associated with extreme bilateral EDR fluctuations between −10 and +10 most and desynchronization between right and left sides. However, at the moment of Jay's return, there was a sudden EDR stabilization and bilateral return to the baseline 0 with a gradual right-sided decrease below the baseline and a stabilization of the left-sided EDR above the baseline at +1 mos.

The final test again demonstrated the left-sided fluctuations associated with James' expression of emotion and Jay's role as controlling emotion. When James suddenly described the feeling that he was about to lose control, left the body and was replaced by Jay, there was a dramatic reduction of the leftsided EDR from +7 to −10 mos.

Summary. The EDR measurements revealed evidence of autonomic lability and lateralization, from which hypotheses can be made pertaining to over-control/under-control mechanisms and associated cholinergic/catecholinergic neurotransmitter balances, and EDR lateralization, from which hypotheses can be made pertaining to hemisphere specific personality functioning.

Jay, the unemotional protective personality, presumed to be linked to the controlling and cognitive functioning of the left hemisphere, was at times actively able to control the distressing emotions expressed by James. Jay's presence was sometimes linked to decreased left-sided EDRs. This activity appeared to be centrally and possibly cholinergically mediated, and consistent with previously published research that has pointed to the inhibiting action of the right hemisphere, including the hippocampus and lateral frontal cortex, and cholinergically mediated awareness of fear and past memory.

James, the childlike, emotional, victim personality associated with the presence of intrusive imagery and emotional expression typical of right hemisphere functioning, was associated with left-sided EDR increases and fluctuations, at times extreme and without synchronization with left-sided EDR changes. This activity appeared to be linked with right hemisphere functioning and catecholamine activation and consisent with previous research publications which point to the relationship between EDR and contra-lateral hemisphere functioning and to catecholamine mediated arousal.

Thus, states of dissociation marked the transition between the two alternate personalities, Jay and James, and were observed to be linked with EDR desynchronization and presumed hemisphere dissociation. That is, each of the two cerebral hemispheres, hypothesized as "housing" each of

two alternate personalities, seemed to function as if "split" apart from the other. The two personalities, one a protector and one a victim, were associated with different ego functions and affective qualities. As these two personalities remained clearly differentiated from each other, the lack of integration of cognitive and emotional "roles" continued to promote frequent dissociations, revealed in this study to be not only between personalities, but almost certainly between cerebral hemispheres as well.

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Franklin D. Roosevelt V.A. Hospital
Montrose, New York 10548