Journal of Abnormal Psychology
1999, Vol. 108, No. 3, 438-445

The Abduction of Disorder in Psychiatry

John E. Richters
National Institute of Mental Health

Stephen P. Hinshaw
University of California at Berkeley

The evolutionary cornerstone of J. C. Wakefield's (1999) harmful dysfunction thesis is a faulty assumption of comparability between mental and biological processes that overlooks the unique plasticity and openness of the brain's functioning design. This omission leads Wakefield to an idealized concept of natural mental functions, illusory interpretations of mental disorders as harmful dysfunctions, and exaggerated claims for the validity of his explanatory and stipulative proposals. The authors argue that there are numerous ways in which evolutionarily intact mental and psychological processes, combined with striking discontinuities within and between evolutionary and contemporary social/cultural environments, may cause *nondysfunction* variants of many widely accepted major mental disorders. These examples undermine many of Wakefield's arguments for adopting a harmful dysfunction concept of mental disorder.

Psychiatrists and clinical psychologists routinely confront circumstances in which the only viable course of action is a carefully executed abduction. Despite their frequency, however, most clinical abductions go unreported, remaining a private matter between clinicians and patients.

More commonly referred to as inference to the best explanation, abduction is the fallible form of reasoning on which humans rely when trying to interpret or explain a given set of facts on the basis of incomplete information and imperfect knowledge (Harman, 1965; Josephson & Josephson, 1996; Pierce, 1903). In contrast to the formal logic of deductive reasoning, there are no absolute standards for establishing the validity or truth value of abductive inferences. They can be evaluated only as more or less justified on the basis of criteria such as consistency with known facts, explanatory coherence, and plausibility relative to rival interpretations. Thus, the plausibility of an abductive inference is always tentative and may change over time as a function of new knowledge, understanding, or the availability of new rival explanations.

It is through this process of abductive reasoning that the clinician will sift initially through all available information about a patient's history and problems in the service of deciding which of many possible interpretations or explanations best fits the pattern of known facts. The initial abduction will include a set of interrelated conclusions about the likely nature and source of the patient's functioning problems, which will weigh prominently in the initial choice of a treatment strategy. Realizing the fallibility of these initial judgments, however, the seasoned clinician will remain open throughout the course of therapy to rejecting them in favor of alternative interpretations based on new information and insights.

There is one abduction, however, that is unlikely to be reconsidered during the course of therapy because it was made on behalf of clinicians by the American Psychiatric Association (APA). According to the APA's (1994) *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV), all syndromes described on Axis I and Axis II of its multiaxial taxonomy are mental disorders stemming from underlying dysfunctions within individuals. The original abduction of mental disease during the Middle Ages was predicated on an enlightened view now taken for granted by most educated people. Namely, the conditions once known as madness and insanity are not penalties levied by the heavens but products of natural, lawful processes that can be understood and treated within the framework used for approaching medical illnesses. Despite its vagueness of meaning-then and now-this original abduction was certainly a more plausible inference about the causes of severe mental suffering than prevailing supernatural explanations.

Over time, however, the concept of mental disease gradually gave way to the broader concept of mental disorder, and during the closing decades of the 20th century its classification boundaries have been extended far beyond the extreme conditions for which it was originally invoked. Mental disorder now serves as a generic label for the wide array of syndromes of mental and psychological suffering for which individuals and their caretakers seek professional help. Ironically, advances in the scientific study of human psychological functioning and behavior during this same period have led to increasingly penetrating questions about whether the mental disorder abduction can be justified any longer as an inference to the best explanation for such a wide variety of conditions (Richters, 1996; Richters & Cicchetti, 1993b; Richters & Hinshaw, 1997).

Not all abductions are inferential. In its more familiar form, abduction is an act of taking away by force. It is in this latter sense that Wakefield has recently attempted to abduct psychiatry's concept of mental disorder using the force of argument and reason-

John E. Richters, Developmental Psychopathology and Prevention Research Branch, National Institute of Mental Health, Rockville, Maryland; Stephen P. Hinshaw, University of California at Berkeley.

Correspondence concerning this article should be addressed to John E. Richters, Developmental Psychopathology and Prevention Research Branch, National Institute of Mental Health, 6001 Executive Boulevard, Room 6200-9617, Rockville, Maryland, 20852. Electronic mail may be sent to jrichter@nih.gov.

ing and with the intention of returning it not only unharmed but in substantially better shape (Wakefield, 1992a, 1992b, 1993, 1996, 1997, 1999). For Wakefield, better shape means aligning mental disorder with the more general concept of disorder used in physical medicine. His specific proposal is for an evolutionary-based harmful dysfunction account of disorder, wherein

> a condition is a disorder if and only if (a) the condition causes some harm or deprivation of benefit to the person as judged by the standards of the person's culture and (b) the condition results from the inability of some internal mechanism to perform its natural function, wherein a natural function is an effect that is part of the evolutionary explanation of the existence and structure of the mechanism. (Wakefield, 1992b, p. 384)

According to Wakefield, the harmful dysfunction concept is consistent with widely shared intuitions about disorder in medicine and psychiatry, justifiable on evolutionary grounds as a unitary scientific standard for conceptualizing and classifying disorders in both domains.

Overview

Wakefield makes a compelling case for the virtues of his harmful dysfunction concept as a heuristic for clarifying intuitions about the boundaries between disorder and nondisorder. As we illustrate through an examination of Wakefield's proposal, however, his arguments for adopting the evolutionary-based concept of harmful dysfunction as a standard for conceptualizing and classifying mental disorders are based on a faulty assumption of comparability between mental and biological processes.' Our critique is organized around a deconstmction of Wakefield's thesis into its three constituent claims: (a) mental disorder is a straightforward extension to mental processes of the same general concept of disorder used in physical medicine; (b) the harmful dysfunction concept is consistent with, explains, and justifies noncontroversial mental disorder classifications in psychiatry; and (c) harmful dysfunction should be adopted as a standard for conceptualizing and classifying mental disorders. We examine each of these claims separately in the service of three related conclusions. In the first section, we argue that Wakefield's assumption of comparability between biological and mental processes overlooks, and is undermined by, the unique plasticity of brain design and the special requirements it imposes for conceptualizing the natural functions and dysfunctions of mental and psychological processes. In the second section, we draw on this analysis to show how Wakefield is led by his inadequate consideration of design openness to illusory interpretations of widely accepted mental disorders as harmful evolutionary dysfunctions. In the final section, we elaborate on ways in which the functioning designs of genetically closed as well as open brain processes, alone and in combination with striking discontinuities between evolutionary and contemporary social/cultural environments, may impose considerable limits on the coherence and practical viability of a harmful dysfunction concept of mental disorder.

Are Biological and Mental Processes Functionally Equivalent?

The evolutionary cornerstone of Wakefield's (1992b, 1999) proposal is an unexamined premise that the natural functions and dysfunctions of the brain can be defined exclusively with reference to the evolutionary past. We challenge this premise below and argue that it fails to take into account the design openness and experience-based modifiability of higher-level brain processes associated with cognitive, social, emotional, and personality functioning. The ability of these more recently evolved brain capacities to continue evolving nongenetically in response to environmental contingencies renders the evolutionary past insufficient for conceptualizing their natural functions and dysfunctions. Understanding why this is the case requires a brief detour into the logic behind the natural function concept.

The natural function concept is based on extension to biological structures of the explanatory concept of function used in the analysis of intentionally designed artifacts. Most complex structures are capable of producing many different effects, only a subset of which are relevant to understanding the purposes for which they were designed. Although pens are designed to function as handwriting instruments, as Wakefield notes, they can be used also for a variety of other purposes such as picking teeth, scratching body parts, propping doors open, and defending oneself. However useful or functional these creative exploitations may be, they do not enter properly into an explanatory account of pen design. The function of pens in this explanatory sense refers specifically and exclusively to the handwriting purposes for which they were intentionally designed.

There is, of course, no creative hand or purpose behind the complex designs of biological structures according to evolutionary theory. Rather, they are understood to have evolved through the Darwinian two-step, an iterative process of random mutations and replication errors in genes acted upon by aeons of natural selection pressures. Although the vast majority of genetic errors during evolution were significantly detrimental to survival, those relatively few that happened to confer inclusive fitness advantages were favored by selection pressures, passed on to subsequent generations, and eventually spread throughout the human species. Thus, even though selection pressures are blind in the sense of having no purpose, they are nonetheless ruthlessly systematic in their effects, resulting in complex biological structures that are organized and function as though they had been designed to enhance inclusive fitness. Thus, when biologists speak of the natural functions of biological structures, it is with reference to the beneficial effects for which they were naturally selected rather than intentionally designed. The underlying logic, however, is the same. The functions of intentionally designed artifacts and the natural functions of biological structures are logically equivalent in the sense that both are defined with reference to the causes of their complex structural organization or functioning characteristics.

Natural Selection and the Economics of Biological Designs

Because the functioning designs of all biological structures evolved through processes of natural selection, it follows that

[1] Our distinction between mental and biological processes implies no commitment to Cartesian dualism. Following Wakefield, we assume axiomatically that all characteristics of human cognitive, emotional, and psychological functioning arise from biological processes of the brain and nervous system.

statements about their natural functions must include reference to this causal history. Wakefield, however, reaches beyond this logical requirement by equating evolutionary history with causal history, That is, on the assumption that "natural selection is the only means known by which an effect [of a biological structure] can explain a naturally occurring mechanism that provides it," he assumes that evolution by natural selection is both necessary and sufficient for defining all natural functions (Wakefield, 1992b p. 383). As we illustrate below, however, this assumption overlooks the unique openness and plasticity of the brain's functioning design and its implications for conceptualizing the natural functions of mental and psychological processes.

Genetically Closed Biological Designs

Most biological structures of the human body contribute to fitness by exploiting characteristics of the physical environment that were relatively stable over vast expanses of evolutionary time, such as oxygen, food, water, sunlight, gravity, and temperature. Consequently, their functioning designs were fine-tuned by selection pressures for reliability in producing and maintaining specific beneficial end states in unmodifiable ways under those conditions. The heart, for example, is designed to perform the unique function of pumping blood and to respond adaptively and efficiently in this capacity to changing demands on the body. The evolutionary cost of this efficiency, however, is inflexibility in the heart's functioning design. It is genetically closed in the sense that it cannot modify the ways in which it accomplishes its pumping function; it cannot naturally devise novel structures (other than those encoded in its genotype) to improve pumping efficiency in response to novel environmental conditions, and it is incapable of performing functions other than those for which it is genetically designed. The structural components of the heart and their integrated performance characteristics contribute to pumping blood in ways that are completely determined by a genetically closed blueprint, common to all members of the human species, which can be modified only through subsequent selection pressures acting on random mutations and replication errors.

Other biological systems are arguably more complex in their functioning designs. The immune system, for example, has a designed capacity to recognize and respond to foreign cells, to learn from its experiences, and to tailor its subsequent defensive responses accordingly (Koslow et al., 1995). This capacity, in turn, allows it to recognize millions of different foreign enemies and to synthesize matching secretions and cells capable of destroying each of them (Schlindler, 1985). These remarkable functioning feats are accomplished, however, through highly specialized, standardized, hierarchically organized molecular processes of recognition, synthesis, and response that are completely determined by genetic design. Thus, the immune system-like the heart, liver, pancreas, lungs, bowels, and kidneys-is the biological equivalent of a function-specific machine, genetically programmed to produce and maintain particular end states in particular ways.

Genetically Open Mental and Psychological Designs

The human brain, in contrast, contributes to survival by adapting to rapidly changing characteristics of physical, social, and cultural environments- by evading predators, escaping danger, foraging for food, hunting, and so forth. Selection pressures therefore favored genes that conferred flexibility in the brain's ability to adapt to environmental demands that were highly unstable within and across generations. This process rendered the brain unique among biological structures in the variety and range of its functioning capabilities and in its extraordinary capacity for use-dependent and experience-based design modifications during ontogenetic time (Cicchetti & Rogosch, 1996; Richters & Cicchetti, 1993b).

Subcortical brain structures. including those involved in regulating and coordinating internal processes (e.g., respiration, heart rate, sleep, blood pressure, body temperature) are characterized by genetically close functioning designs that are similar to those of other biological structures. At progressively higher levels of brain structure, however, lie hierarchically organized cortical areas of increasing complexity, interconnectedness, and functional design openness from which arise the human capacities for sensation, perception, memory, language, consciousness, personality organization, intentional behavior, reflecting on the past, and anticipating the future. There is considerable speculation among evolutionary theorists about the extent to which these capacities arise from general purpose versus highly specialized domain-specific neural circuits (Cosmides & Tooby, 1987; Edelman, 1987; Tooby & Cosmides, 1990a). Nonetheless, it is generally accepted that these are universal capacities of the human brain that were selected through evolutionary forces for their contributions to survival and reproductive fitness.

In contrast to other biological structures, however, the evolved functions of many higher-level brain systems do not contribute to adaptive functioning by producing and maintaining fixed, task-specific end states. Instead, their functioning designs are genetically predisposed to continue evolving nongenetically during ontogenetic time in response to environmental experiences. Their modifiable end states, as it were, are subservient to the brain's genetic equivalent of a policy instruction: to interact with the environment in ways that maximize the body's chances of survival and inclusive fitness (Eccles, 1991). Moreover, the brain's ability to maintain this ultimate end state-by formulating, evaluating, selecting, implementing, and revising its behavioral strategies based on environmental contingencies-is critically dependent on the openness of its functioning design.

Because design openness is costly in terms of reliability, efficiency, and error potential, natural selection favored it only on an as-needed basis for solving adaptive problems that were highly variable within and across evolutionary generations. Thus, mental and psychological processes are characterized by only limited degrees of design openness; all aspects of their development, functioning, and experience-based modifiability are to varying degrees determined, shaped, and constrained by genetically closed guidance mechanisms of the brain (Cosmides & Tooby, 1987; Damasio, 1994; Tooby & Cosmides, 1990a, 1990b).

It warrants underscoring that the genetically inherited functions of the brain, like those of all biological structures, are (a) universal species characteristics and (b) properly defined solely with reference to the distant evolutionary forces that shaped them. Recall, however, that the logic of functional explanation requires natural functions to be defined with reference to the causal factors that shaped their functioning designs. Because the functioning designs of open mental and psychological processes continue evolving nongenetically in response to each individual's ontogenetic expe-

rience, the natural functions of those processes (a) may vary qualitatively across individuals and (b) must be defined with reference to both the evolutionary history of the species and the ontogenetic shaping influences of each individual's experiences. We devote considerable attention in later discussion to ways in which environmental experiences may give rise to maladaptive yet nonetheless intact natural mental and psychological functions (see our section on *Design Openness, Evolutionary Discontinuities, and Harmful Mental Functions* below). For present purposes, it is sufficient to note that, in principle, design openness introduces considerable potential for divergence between the evolved functions of mental processes and their natural functions.

Are Mental Disorders Harmful Dysfunctions?

It follows from the preceding section that all inherited deficits in the evolved functions of the brain qualify automatically as dysfunctions, as do acquired deficits in those that are genetically closed. Acquired deficits in open mental and psychological processes, however, may reflect evolutionarily normal design modifications shaped by environmental experience. Wakefield overlooks this possibility by overlooking the implications of design openness for conceptualizing the natural functions and dysfunctions of mental and psychological processes. He does acknowledge the uniqueness of the brain's capacities for equifinal and multifinal functioning, learning, and intentional behavior (Wakefield, 1997). Moreover, he recognizes the requirements imposed by these open capacities for developmental, historical approaches to understanding the causes of each individual's functioning problems. Surprisingly, however, he conceptualizes the natural mental functions of all mental and psychological processes as genetically closed universal characteristics of brain design, thereby equating their evolved functions with their natural functions. According to Wakefield, "the designed function of a mechanism is the same whatever current environment it is in because design is determined by facts about the past shaping of the mechanism, whereas a mechanism's current adaptiveness can vary from environment to environment and offers no explanation of the current nature of the organism" (Wakefield, 1999, p. 384).

The facts about the shaping of the mechanism to which Wakefield refers, of course, are solely the forces of natural selection in the evolutionary past. In discussing anxiety, for example, he concludes that natural selection could have "occurred for a certain adaptive range of intensities [in fear and anxiety responses] but not for responses that are so intense as to be maladaptive," thus concluding that a natural function of anxiety mechanisms is to respond to danger with intensity levels that are roughly proportional to the degree of actual danger present (Wakefield, 1999, p. 395). Similarly, in discussing antisocial personality disorder, he notes that the brain's natural adaptive capacities for deceptiveness and disengaging empathically may be inherited in such high intensities and with such low counterbalancing traits that they result in harmful dysfunctions. Trait combinations such as these, according to Wakefield, may result in "a personality organization that is incapable of adapting to social constraints, thus failing to perform the very function for which the traits were selected" (Wakefield, 1999, p. 389). Note that in both examples Wakefield is equating the evolved functions of anxiety and sociability mechanisms with their natural functions.

Also consistent with his assumption of comparability between mental and biological processes, Wakefield presumes that "most designed responses are in fact adaptive in most current environments" (Wakefield, 1999, p. 384). A dysfunction in mental processes exists, according to Wakefield, when "a person's internal mechanisms are not able to function in the range of environments for which they were designed. if the function fails to be manifested in that environment, there is a likely dysfunction" (Wakefield, 1992b, p. 243). He recognizes, for example, that syndromes of depression, anxiety, emotional suffering, social maladjustment, and so forth may be normal responses to stressful, dangerous, and threatening environments. On the assumption that the functioning designs underlying these processes are genetically closed, however, he also presumes that evolutionarily intact brain mechanisms will cease functioning in maladaptive ways once harmful conditions are lifted. Thus, he interprets the persistence of significantly harmful mental and psychological functioning impairments in the absence of harmful environments as presumptive evidence of an underlying evolutionary dysfunction.

Inevitably, Wakefield is led by his reasoning to harmful dysfunction interpretations of mental disorders that are strikingly consistent with widely shared judgments of disorder in psychiatry. Most experts, for example, tend to use relatively universal standards in conceptualizing what is normal and restrict the disorder category to harmful mental conditions that appear to stem from internal rather than external causes. Moreover, they are most likely to agree that syndromes of depression, anxiety, affect, cognition, personality, and social maladjustment are disorders when the relevant functioning impairments persist in the absence of harmful environments, regardless of whether they believe the functioning impairments are inherited or acquired. As we have discussed, however, Wakefield's harmful dysfunction interpretations of mental disorders arising from acquired functioning deficits are based on a faulty concept of natural mental function. In the section that follows, we examine ways in which nondysfunction variants of many mental disorders may arise from maladaptive yet evolutionarily intact natural mental functions.

Design Openness, Evolutionary Discontinuities, and Harmful Mental Functions

It warrants emphasizing that design openness does not place open mental and psychological processes beyond the logical reach of a harmful dysfunction analysis. In principle, adequate knowledge about the evolved functions of the brain and their parameters of modifiability would allow for meaningful discriminations between evolutionarily normal versus failing mental and psychological functions. As a practical matter, however, the conceptual and inferential burdens of making the necessary distinctions would be considerable for at least two reasons. First, the evolutionary cost of design openness was a dramatic increase in the potential for evolutionarily intact mental and psychological processes to function maladaptively by contemporary standards (see *Evohtionarily Adaptive, Currently Maladaptive Functions*, below). Inevitably, the human capacities for interpreting, evaluating, and learning from experience and for generating, implementing, and revising behavioral strategies are also opportunities for misjudgment and error. Wakefield grants that evolutionarily normal brains are perfectly capable of a considerable degree of imperfect functioning

and recognizes irrational thoughts, foolish judgments, petty jealousies, in-group prejudices, attribution biases, narcissistic tendencies, rigid belief systems, and maladaptive behaviors as reflections of these inherent weaknesses of human nature. He only excludes them as important sources of the kinds of conditions classified as mental disorders by conflating their evolved functions with their natural functions.

Second, the harm-producing potential of evolutionarily intact mental and psychological functions is further magnified by striking mismatches between the range of environmental conditions under which the brain evolved and those that characterize many modem societies. Whereas natural selection is an inherently slow process, often requiring tens of thousands of years to produce even small modifications in biological design, human culture is capable of producing significant changes in the environment on much smaller time scales. It is widely believed that for much of human history biological and cultural evolution proceeded interactively, as selection pressures sculpted modifications in brain design to match the slowly changing adaptive demands of increasingly social environments brought about by early cultures. As cultural evolution began to proceed more rapidly, however, the relatively slow forces of natural selection lagged farther and farther behind. During the past 20,000 years or so, natural selection has produced relatively few modifications in brain design whereas the rapid pace of cultural evolution has given rise to steady and dramatic changes in sociocultural environments (Tooby & Cosmides, 1990b). As we illustrate below, this lag may place significant evolutionary constraints on the ability of the human brain to adapt successfully to contemporary environmental demands and expectations of its own creation.

In the discussion that follows, we consider a variety of ways in which evolutionarily normal brain mechanisms may give rise to nondysfunction variants of widely accepted mental disorders. Our examples are admittedly speculative and our purpose is not to argue for their validity. Rather, our intention is to underscore the highly speculative nature of all inferences about the natural functions and dysfunctions of mental processes and to establish a case for evolutionary plausibility of our examples as rival alternatives to Wakefield's harmful dysfunction interpretations.

Evolutionarily Adaptive, Currently Maladaptive Traits

The genetic algorithms underlying human responses to hunger, danger, sexual arousal, social interaction, nurturance, and aggression are characterized by numerous universal stimulus preferences, learning biases, and nonlearned response dispositions that were selected early in evolution for their adaptive contributions to the inclusive fitness of distant human ancestors. As the requirements for successful adaptation became increasingly more social during the later stages of evolution, many survival-based mechanisms selected initially for their adaptiveness in earlier environments came under the gradual mediating influences of newly evolved cortical structures associated with abstract thought, planning, social communication, and language. Because this mediation process was interrupted by cultural evolution, however, many of these dispositions continue to exert powerful influences on brain functioning that can be significantly maladaptive by contemporary standards.

A single traumatic event such as mugging or rape, for example, may cause significant and relatively enduring modifications in normal arousal mechanisms resulting in persistent symptoms of anxiety, depression, heightened sensitivities to danger, and avoidant behaviors (Perry, 1995). By contemporary standards, reactions such as these that persist long after a traumatic event has passed appear unnatural and therefore disordered, especially if they translate into significantly maladaptive social, emotional, and personality functioning. There is no obvious reason, however, why mechanisms selected for inclusive fitness advantages should translate in any straightforward way into psychological well-being or freedom from symptoms of anxiety, depression, or social maladaptiveness as judged by contemporary standards. On the contrary, the evolutionary cost of surviving-of adapting successfully to dangerous environmental conditions-may have been exactly the opposite. It seems reasonable to presume, following Wakefield, that proportional-to-danger anxiety responses and susceptibility to social constraints were adaptive under many conditions even on the plains of evolution. Evolutionary adaptiveness, however, is ultimately judged by ruthless standards of inclusive fitness over all other criteria. Thus, under conditions in which the penalty for underestimating future danger might have been death, significant psychological pain and suffering associated with hypervigilance may have served the adaptive function of helping individuals survive long enough to produce viable offspring.

There is also growing evidence from the neurosciences, evolutionary biology, and nonhuman primate research for crucial periods in brain development during which certain types of environmental experience may have prepotent, enduring influences on important characteristics of brain and nervous system functioning (Perry, 1995). Steinberg and others have drawn on these developments to suggest that the human brain may be naturally designed to interpret early experience as a guide for shaping personality development and functioning along the lines of reproductive strategies that would have been evolutionarily adaptive under those conditions. For example, children may naturally respond to early experiences of maltreatment, abuse, or neglect by organizing around what we might call a hostile-world orientation and survival strategies (Belsky, Steinberg, & Draper, 1991; Steinberg, 1987, 1989; Steinberg, Catalano, & Dooley, 1981). On the plains of evolution early hostile environments may have been very reliable predictors of what the environment would be like over the long haul. If so, it is not unreasonable to speculate that natural selection might have favored those whose hostile-world orientations in response to such experiences were relatively resistant to change.

What may have been very adaptive during evolution, however, may be both unnecessary and maladaptive in many contexts of contemporary society. Consider, for example, a young child whose early experiences of abuse or neglect naturally produce relatively enduring changes in nervous system and personality development resulting in heightened vigilance and lowered thresholds of anxiety arousal, wariness of others' intentions, emotional distancing strategies, aggressive tendencies, and so forth. Suppose also the same child is subsequently adopted into a normal, nonthreatening, nurturing environment in which these response biases and behavioral strategies, although no longer required, are naturally resistant to change in the absence of intensive intervention efforts. From an evolutionary standpoint, this would be a child with normally functioning brain mechanisms, living in a normal environment,

who nonetheless suffers from impairment in significant social, emotional, and psychological functioning. It is difficult to imagine an expert clinician, however, who would consider such a child's functioning problems as anything other than a disorder.

Evolutionarily Novel Environments

Evolutionary theorists use the concept of environment of evolutionary adaptiveness (EEA) as a composite reference to the evolutionary history of environmental conditions and selection pressures responsible for shaping biological designs (Tooby & Cosmides, 1990b). Given that the effect of natural selection is to calibrate organisms to the local environments in which they evolved, the EEA provides a rough guide to the range of environments in which they are suited by design to function adaptively. It has been estimated that approximately 99% of the evolutionary history of the brain took place when human ancestors were living on the African plains in hunter-gatherer societies. The environmental conditions and adaptive functioning demands of hunter-gatherer societies as we understand them bear little resemblance to those of modem industrialized societies. It is generally accepted that they were probably characterized by small nomadic groups of closely related members, sparse population densities, relatively infrequent encounters with strangers, stable social ties, simple social hierarchies, and cooperative ventures organized around basic physical survival needs, heavy demands on physical endurance, agility and prowess, and outdoor living. Contemporary sociocultural environments, in contrast, are characterized by loosely knit and frequently changing social ties, high population densities, frequent encounters and interactions with strangers, complex social and organizational hierarchies, heavy demands on abstract thinking, financial planning, mastering large volumes of complex and rapidly changing patterns of information, and indoor living and working.

From an evolutionary biology standpoint, many conditions of modem life may fall far outside the EEA of the human brain and nervous system-that is, the range of conditions for which we assume they were selected. Thus, when individuals living under evolutionarily novel conditions develop maladaptive syndromes of depression, anxiety, personality, social, and cognitive functioning, there is no reason a priori to believe that they are suffering from evolutionary dysfunctions. It is equally plausible-and in some cases more plausible-that their symptoms and maladjustment may be consequences of evolutionarily normal brain mechanisms overtaxed by evolutionarily novel demands.

In addition, novel environmental demands may be the stimulus equivalents of environmental conditions that would have been very unusual in hunter-gatherer societies and thus elicit innate brain and nervous system responses that would have been adaptive under those conditions. Complex organizational structures, for example, may be the evolutionary equivalents of social dominance hierarchies and thus elicit alterations in serotonergic functioning, mood, and self-esteem that were adaptive in earlier environments. Similarly, the frequent formation and breaking of social ties in transient contemporary environments may elicit responses of anxiety, sadness, and depression that would have been adaptive in evolutionary environments.

Evolutionarily adaptive, currently maladaptive responses to novel environments may also have important implications for the cross-generational transmission of maladjustment and disorder from parents to offspring. We know, for example, that conditions of economic deprivation and environmental stress tend to be associated with patterns of parental care characterized by more negative affect and less consistency and sensitivity (Belsky, Steinberg, & Draper, 1991; Steinberg, Catalano, & Dooley, 1981). Moreover, there is equally strong evidence that children exposed to such rearing conditions are at significantly higher than average risk for developing insecure attachment relationships, maladaptive behavior, and numerous forms of social and emotional maladjustment and disorders. If evolutionary theorists are correct, these links between parent and child functioning may to an important extent reflect the reliance of innate brain mechanisms on early experience as a barometer for guiding personality development (Belsky, Steinberg, & Draper, 1991).

Cultural evolution has also transformed early childhood environments in ways that may have a profound influence on the ontogenetic development and organization of the brain. From a developmental standpoint, the human infant is in many important respects still an embryo at birth, with rapid fetal rates of postnatal brain development occurring throughout the first year of life (Gould, 1977; Perry, 1995). Moreover, many developmental brain processes such as neuronal proliferation, migration, and differentiation remain active for much of early childhood, during which massively overproduced neurons, synapses, and dendrites are subsequently pared back, modified, shaped, and selected by environmental experiences through what has been dubbed a form of "neural Darwinism" (Edelman, 1987). The experience-expectant and experience-dependent algorithms that guide this process were selected during evolution for their ability to calibrate brain development and organization according to input from internal and external environmental cues. Thus, they are exquisitely sensitive during early development to the qualitative nature, frequency, intensity, and patterning of early environmental cues.

There is no reason to believe, however, that the evolutionary environments that selected these algorithms included anything remotely approximating the stimuli to which modem children are exposed beginning in early childhood such as routine vicarious experiences of war, violence, death, and loss through electronic media; constant exposure to rapidly changing patterns of intense and complex auditory and visual stimuli of television, videos, and compact disks; and demands beginning in toddlerhood for patience, concentration, self-control, and learning abstract information in classrooms. It would be a mistake therefore to underestimate the potential of evolutionarily novel stimuli such as these for shaping early brain development in ways that may translate into problems of motor hyperactivity, impulsivity, concentration, and distractiveness (Perry, 1995). Moreover, the complex organization and interconnectedness of brain systems is such that early influences on brain development that are initially small or isolated may cascade into significant alterations in cognitive, emotional, social, and personality functioning over time. Ironically, such influences may actually bias brain development in ways that further handicap the ability of modem children to adapt successfully to the evolutionarily novel demands of sitting still and maintaining concentration on abstract information for hours at a time in small classrooms under close supervision.

Should Harmful Dysfunction Be Adopted as a Mental Disorder Classification Standard?

Our critique of Wakefield's evolutionary reasoning does not necessarily lead to the conclusion that mental disorders either are or should be judged and classified according to different standards than those used in physical medicine. In general, the harmful dysfunction concept works far better as a unitary account of disorder classifications in physical medicine than in psychiatry. Contrary to Wakefield's thesis, however, there are significant and very telling exceptions to this general rule-notably, when harmful conditions resulting from evolutionarily novel environmental demands are nonetheless classified as medical disorders.

Medical Disorders of Aging

Although modern medicine allows humans to live far beyond the average life span of their hunter-gatherer ancestors, it has not yet altered the steady biological deterioration and declining physical performance that comes with advancing age. Major organ systems of the body decline at remarkably similar rates over time and become increasingly vulnerable to compromised functioning, infections, accidents, and diseases of all sorts. The generally accepted evolutionary explanation for this decline is that natural selection pressures for inclusive fitness weakened steadily if not precipitously following the years of reproductive maturity because individuals are biologically expendable once they have survived long enough to produce viable offspring.

The universal nature of age-related biological decline raises an interesting question about whether medical disorders in the elderly can be justified within Wakefield's framework as harmful dysfunctions. There is no question that disorders such as cancer, heart failure, stroke, osteoporosis, and so forth are valid examples of harmful dysfunctions when they occur in younger age groups. Moreover, it is obvious on pragmatic and humanitarian grounds why they continue to be classified as disorders when they occur in the elderly. If the human body was not selected by evolutionary pressures for its ability to survive beyond the second or third decade of life, however, it is not obvious that there is anything evolutionarily unnatural about the biological processes that fail beyond this period.

If selection pressures merely ignored fitness requirements beyond reproductive maturity one might argue that age-related disorders reflect a wearing out of natural functions analogous to the natural wear-and-tear of engine parts over time, thus warranting the evolutionarily dysfunction interpretation (Wakefield, personal communication, 1997). This interpretation is difficult to reconcile, however, with evidence that selection pressures actually may have favored age-related biological decline. There are two ways in which this may have come about. First, as a general matter, longevity would have been penalized by evolution at the point at which it detracted from the inclusive fitness of surviving offspring. Second, disorders occurring in senescence may be the consequence of selection pressures operating on pleiotropic genes that enhance early inclusive fitness at the expense of later fitness. Most genes are pleiotropic in the sense of producing more than one effect on biological functioning. Earlier, we noted that most genetic errors are detrimental to fitness and are not passed on to subsequent generations. Others confer both advantages and disadvantages but are not passed on because their net influence is sufficiently maladaptive to be selected against. Those that produce early benefits and later costs, however, would have been passed along to succeeding generations because they do not detract from inclusive fitness.

Pleiotropic theories of senescence, which have attracted considerable interest within the biological community, hold that the net effect of natural selection over time was the accumulation of late-acting genetic defects that were undetectable by evolutionary forces because they exerted their influence only after the important years of reproductive fitness (Charlesworth, 1993). The possibility that selection pressures directly or indirectly may have favored age-related biological decline poses a significant challenge to Wakefield's harmful dysfunction interpretation of medical disorders in the elderly.

Hyperopia

The human visual system was not selected for its capacity to focus on and make detailed discriminations among small black images against bright backgrounds at close range. Nonetheless, the evolutionarily novel demands of contemporary culture for reading newspapers, books, computer printouts, and computer screens often require this ability. Most individuals who need a visual aid to make the necessary discriminations do not suffer from visual problems that would have interfered in any way with adaptive functioning in hunter-gatherer societies. Thus, there is no reason a priori to believe that they suffer from a visual dysfunction in the Wakefieldian sense. Nonetheless, their medical condition is commonly referred to as farsightedness-the inability to focus at close range (i.e., hyperopia) and is commonly classified as an opthalmologic disorder (Berkow, 1992).

The preceding examples do not necessarily invalidate Wakefield's thesis that the harmful dysfunction concept underlies judgments about and classifications of disorder in physical medicine. Nonetheless, counterexamples such as these reveal that disorder classifications in medicine are not always based on unalloyed attributions about design failure and that pragmatic considerations enter into the equation at least under some circumstances. Thus, it is not obvious that retaining nondysfunction variants of mental disorders in a disorder category would represent a departure from the traditions of medicine.

Conclusion

Those familiar with the long history of psychiatry's struggle to develop a coherent, credible, and defensible concept of mental disorder will appreciate the freshening breeze stirred by Wakefield's recent writings. His carefully reasoned conceptual analysis brings into sharp resolution the inadequacy of earlier attempts to defend mental disorder classifications as either pure value judgments or unalloyed scientific facts and provides a powerful antidote to past confusions and tensions surrounding these competing views. Neither alone offers a satisfactory explanation for the logical structure of existing classification practices and neither alone can be justified as a classification standard. The crucial questions concern not whether but how distinctions between facts and values should be conceptualized, linked, and balanced in judgments of disorder.

Wakefield is almost certainly correct that his harmful dysfunction concept is very close to what most experts and laypersons have in mind-if implicitly-when they think about biological and mental disorders. Like all abductions, however, these intuitions must always be evaluated with reference to the shifting sands of new knowledge and competing interpretations. Given that the neurosciences are only beginning to understand the extraordinary nature and complexity of brain plasticity, there is little anyone can say with confidence at this point about its exact implications for conceptualizing natural mental functions and dysfunctions. The knowledge base is already more than sufficient, however, to raise questions about the viability of a harmful dysfunction concept of mental disorder. Our critique of Wakefield's proposal is not intended to bring closure to the rich dialogue stimulated and framed by his heuristically rich analysis but rather to extend and deepen it in light of the advancing knowledge base.

References

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62, 647-670.*

Berkow, R. (Ed.). (1992). *The Merck manual of diagnosis and therapy* (16th ed.). Princeton, NJ: Merck.

Charlesworth, B. (1993). Evolutionary mechanisms of senescence. *Genetica, 91,* 11-19.

Cicchetti, D., & Rogosch, F. A. (1996). Equifinality and multifinality in developmental psychopathology. *Development and Psychopathology, 8, 597-600.*

Cosmides, L., & Tooby, J. (1987). From evolution to behavior: Evolutionary psychology as the missing link. In J. Dupre (Ed.), *The latest on the best: Essays on evolution and optimality.* Cambridge, MA: MIT Press.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain. New* York: Putnam.

Eccles, J. C. (1991). *Evolution of the brain: Creation of the self New* York: Routledge.

Edelman, G. M. (1987). *Neural Darwinism: A theory of neuronal group selection. New York:* Basic Books.

Gould, S. J. (1977). *Ontogeny and phylogeny.* Cambridge, MA: Harvard University Press.

Harman, G. (1965). The inference to the best explanation. *Philosophical Review, 74, 88-95.*

Josephson, J. R., & Josephson, S. G. (Eds.). (1996). *Abductive inference: Computation, philosophy, technology. New* York: Cambridge University Press.

Koslow, S. H., Meinecke, D. L., Lederhendler, I. I., Khachaturian, H., Nakamura, R. K., Karp, D., Vitkovic, L., Glanzman, D. L., & Zalcman, S. (Eds.). (1995). *The neuroscience of mental health* (Vol. II). Rockville, MD: National Institutes of Health.

Perry, B. D. (1995). Incubated in terror: Nemodevelopmental factors in the "cycle of violence." In J. D. Osofsky (Ed.), *Children, youth, and violence: Searching for solutions. New* York: Guilford Press.

Pierce, C. S. (1903). Abduction and induction. In J. Buchler (Ed.), *Philosophical writings of Pierce* (pp. 150-156). New York: Dover Publications.

Richters, J. E. (1996). Disordered views of antisocial children: A late 20th century perspective. In C. Ferris & T. Grisso (Eds), *Understanding aggressive behavior in children: Annals of the New York Academy of Science* (pp. 208-223). New York New York Academy of Sciences.

Richters, J. E., & Cicchetti, D. (1993a). Editorial: Toward a developmental perspective on conduct disorder. *Development and Psychopathology, 5, 1-4.*

Richters, J. E., & Cicchetti, D. (1993b). Mark Twain meets DSM-III-R: Conduct disorder, development, and the concept of harmful dysfunction. *Development and Psychopathology, 5, 5-29.*

Richters, J. E., & Hinshaw, S. P. (1997). Psychiatry's turbid solution. *Clinical Psychology: Science and Practice, 4, 248-254.*

Schlindler, B. A. (1985). Stress, affective disorders, and immune function. *Medical Clinics of North America, 69, 585-597.*

Steinberg, L. (1987). The impact of puberty on family relations: Effects of pubertal status and timing. *Developmental Psychology, 23, 451-460.*

Steinberg, L. (1989). Pubertal maturation and parent-adolescent distance: An evolutionary perspective. In G. Adams, R. Montemayor, & T. Gullotta (Eds.), *Advances in adolescent development* (Vol. 1, pp. 82-114). Beverly Hills, CA: Sage.

Steinberg, L., Catalano, R., & Dooley, D. (1981). Economic antecedents of child abuse and neglect. *Child Development, 52, 975-985.*

Tooby, J., & Cosmides, L. (1990a). On the universality of human nature and the uniqueness of the individual: The role of genetics and adaptation. Journal *of Personality, 58, 17-67.*

Tooby, J., & Cosmides, L. (1990b). The past explains the present: Emotional adaptations and the structure of ancestral environments. *Ethology and Sociobiology, 1 I, 375-424.*

Wakefield, J. C. (1992a). Disorder as harmful dysfunction: A conceptual critique of *DSM-III-R's* definition of mental disorder. *Psychological Review, 99, 232-247.*

Wakefield, J. C. (1992b). The concept of mental disorder: On the boundary between biological facts and social values. *American Psychologist, 47, 373-388.*

Wakefield, J. C. (1993). Limits of operationalism: A critique of Spitzer and Endicott's (1978) proposed operational criteria for mental disorder. *Journal of Abnormal Psychology, 102, 160-172.*

Wakefield, J. C. (1996). *DSM-IV:* Are we making diagnostic progress? *Contemporary Psychology, 41, 646-651.*

Wakefield, J. C. (1997). When is development disordered? Developmental psychopathology and the harmful dysfunction analysis of mental disorder. *Development and Psychopathology, 9, 269-290.*

Wakefield, J. C. (1999). Evolutionary versus prototype analyses of the concept of disorder. *Journal of Abnormal Psychology, 108, 374-399.*

Received September 16, 1997
Revision received August 24, 1998
Accepted August 25, 1998