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Bradley's Benzedrine Studies on Children with Behavioral Disorders

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In 1937, psychiatrist Charles Bradley administered Benzedrine sulfate, an amphetamine, to "problem" children at the Emma Pendleton Bradley Home in Providence, Rhode Island, in an attempt to alleviate headaches; however, Bradley noticed an unexpected effect upon the behavior of the children: improved school performance, social interactions, and emotional responses. Drawing on Bradley's published articles on his experiments, this paper explores the historical context of his experiments and the effect this background had on the emerging field of child psychiatry. Bradley's studies went largely ignored in the field of child psychiatry for nearly 25 years. However, they proved to be an important precursor to studies of amphetamines like Ritalin and their use in conditions such as attention deficit hyperactivity disorder. Bradley's Benzedrine trials were thus highly influential in shaping modern objective understandings of children with behavior disorders.

INTRODUCTION

In 1937, psychiatrist Charles Bradley administered Benzedrine sulfate, a stimulant drug, to his young patients diagnosed with behavioral disorders at the Emma Pendleton Bradley Home for children in Rhode Island. After only a week, Bradley observed:

> The most striking change in behavior occurred in the school activities of many of these patients. There appeared a definite "drive" to accomplish as much as possible. Fifteen of the 30 children responded to Benzedrine by becoming distinctly subdued in their emotional responses. Clinically in all cases, this was an improvement from the social viewpoint [1].

While these observations would have resounding implications in the future treatments of behavioral disorders in children, Bradley sought to place his discovery of these effects within the context of the Emma Pendleton Bradley Home, where he served as director [2]. The home, opened in 1931, was one of the first institutions planned and equipped especially for the

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†Abbreviations: SKF, Smith, Kline & French; ADHD, attention deficit hyperactivity disorder.

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care of children with behavioral disorders [3]. The institution took an approach that integrated both environmental and biological treatments to go beyond simple diagnosis and care. In contrast, the majority of behaviorally disturbed children at the time were limited to either custodial care homes or training schools [3].

Bradley experimented with Benzedrine sulfate, a drug marketed to doctors by the company Smith, Kline & French (SKF†) between 1935 and 1937, and published his first study of amphetamine use for behavioral problems in children in 1937. He hoped that this pharmacological research could advance treatment while still upholding a firm commitment to biological and psychological therapy. Bradley's studies went largely ignored in the field of child psychiatry for nearly 25 years; however, they proved to be an important precursor to studies of Ritalin and attention deficit hyperactivity disorder (ADHD). Predominantly influenced by contemporary social conceptualizations of misbehavior and the booming industry of drug research, Bradley's observations on the role of Benzedrine in children shaped our modern pharmacological understanding of children with behavior problems, despite Bradley's adamant position that drugs should only play a supporting role in treatment.

THE CONCEPTUALIZATION OF MISBEHAVIOR

During the 19th and 20th centuries, a new conceptualization of childhood and how children ought to behave emerged in both popular culture and the medical world. A model child embodied the ideals necessary for the new industrial economy: self-regulated behavior and orderly social relations. Childhood became the critical period for learning restraint and developing a proper social identity in order to grow up to be a successful adult [4]. This prevailing characterization of a good child generated its opposite: the troublesome child. A broad range of social problems fell into this category of misbehavior and could include difficulty in schoolwork, fighting, and failure to obey authority [5]. Because the term "troublesome" was so inclusive, a substantial number of children fell into this category. In response to this classification, the child guidance movement and institutional treatment for misbehavior originated in the early 20th century. The child guidance movement acted as a social reform campaign that advocated for children's mental, material, and physical health through treatments in outpatient clinics that aimed to treat a child's social, scholastic, and familial issues [4]. When children's needs exceeded this clinical care, families turned to physician-run residential institutions where the children with behavior problems were treated alongside children with neurological diseases.

BRADLEY'S PHILOSOPHY

The conceptualization of misbehavior had a profound influence on Bradley's philosophy and the objectives of the Emma Pendleton Bradley Home. Bradley was trained in pediatrics at Harvard Medical School and practiced at the Babies Hospital in New York and the Pennsylvania Hospital before he arrived at the home in 1933. Bradley believed that "more people needed to be educated in child psychiatry" in order to make progress in treating troubled children [5]. Bradley emphasized a combined biological and psychological approach to the troubled child. This approach matched perfectly with the aims of the home. George Bradley, Bradley's great uncle, had founded the home in 1931 as a therapeutic hospital for children with neuropsychiatric disorders. The home was named after George's daughter, who suffered from disabilities associated with encephalitis. George and his wife had searched worldwide to find treatment for their daughter but found few psychiatrists and neurologists interested in pediatric care. As a result, they willed their Providence estate to be transformed into the Emma Pendleton Bradley Home [6]. The home was situated on a large piece of wooded land with colonial brick buildings and fields for

children's sports. According to Bradley, this "openness" was necessary for treatment so there were no problems of congestion [3]. Doctors and nurses supervised the children during all of their daily activities such as school and sports. While the home still used medical technologies such as extensive physical exams, blood tests, and shock treatments, Bradley emphasized the importance of environment as "security, encouragement, and an outlet for self-expression" [3,5]. This vision set the scene for the revolutionary studies that Bradley would undertake in 1937.

Admit records described patients with both social problems and mental illnesses. The home treated a range of physical disabilities, but Bradley focused on children with behavioral disorders [3]. He described a number of patients with a primary diagnosis of neurological conditions and a secondary diagnosis of a behavioral disorder [3]. The patients, whose hospitalization came as a relief to their families, were described as inattentive, restless, rambunctious, and selfish [5]. From his observations at the home, Bradley formulated the belief that a healthy child's behavior conformed "reasonably well to accepted social standards," while a misbehaving child's behavior deviated from these standards [7]. Bradley's attention to the social narrative of the child's behavioral issues demonstrated his devotion to personal and integrated care.

EMERGENCE OF AMPHETAMINES

The emergence of using amphetamine drugs to treat various conditions in the 1930s appealed to Bradley. In 1935, the pharmaceutical company Smith, Kline & French acquired the amphetamine Benzedrine sulfate. SKF officials provided a free drug supply to any interested doctor and commissioned targeted studies to explore lucrative possibilities such as "adrenaline-like effects" on respiration and stimulating effects on brain function [8]. SKF officials hoped to focus on the drug's use for mental performance enhancement. For example, they funded a 1936 study by Matthew Motlitch at the New Jersey State Home for Boys, a reform school for delinquents, to assess the effect of amphetamine in improving standardized test scores [8]. Bradley was among one of the volunteers who approached SKF for experimental supplies of Benzedrine. However, he did not intend to use amphetamine as a mental performance enhancer, but rather a treatment for severe headaches due to pneumonencephalograms (a visualization technique in which air or gases were introduced into the spinal column) performed on his patients [9]. The drug had no effect on the headaches but caused a striking change in behavior of the children as most showed clear improvement in performance at school [9]. Bradley saw the promise in the idea that Benzedrine could modify behavior and decided to undertake further research into this area.

BRADLEY'S STUDIES

Bradley's discovery of these behavioral effects led to two studies, one in 1937 and another in 1941, testing Benzedrine on children with clinically diagnosed behavioral problems. He intended to use these studies to place the effects of Benzedrine within the larger context of treatment of children with psychiatric problems. In 1937, Bradley selected 30 residents of the hospital diagnosed with behavioral disorders who were and had already been under observation for more than a month and then expanded to 100 patients in 1941 in order to substantiate his observations [1,7]. In order to reflect the demographic of hospital admissions, he studied children aged 5 to 14, with a large proportion of boys. Throughout the three-week study, a nurse observed each child closely. During the first week, the children were not administered any drugs. In the second week, the children were given a dose of Benzedrine each morning. In the third and final week, the drug was withdrawn. The home was "adapted to the observation of children's behavior under controlled conditions" as the patients were unaware of the "constant observation and careful records" that were routinely kept [1]. In this way,

Benzedrine's effects could be observed in a natural community without the influence of an artificial laboratory setting.

Upon drug administration, the children exhibited a range of social and emotional responses. First, the Benzedrine seemed to give the students a "drive" to accomplish as much as possible, in addition to improving comprehension, accuracy, and output [1]. The results reinforced SKF's previous studies of Benzedrine as a mental performance enhancer [8]. Bradley also found it interesting that these effects appeared immediately upon drug administration and disappeared on the first day of drug discontinuation, revealing that this drug could not fundamentally change behavior but only temporarily modify it. Thus, Benzedrine could not cure the underlying cause of behavioral problems.

In addition to a motivational drive, the children also showed distinct emotional responses to Benzedrine. Half of the children in both studies exhibited a "distinctly subdued" response. For example, irritable, aggressive, and noisy children became more placid, easy-going, and interested in their surroundings [8]. Bradley noted that these patients "appeared subdued because they began to spend their leisure time playing quietly or reading, whereas formerly they had wandered aimlessly about antagonizing and annoying others" [7]. For other children, there were different responses, including "a sense of well-being . . . a widening of interest in all things around them, and a diminished tendency to be preoccupied with themselves" [1]. In contrast to those who exhibited a subdued response, a group of "stimulated" children were more alert, showed more initiative, and in general were "more self-sufficient and mature" [7]. Like the motivational effects, these behavior results only occurred when Benzedrine was administered.

From these observations, Bradley concluded that Benzedrine had a significant effect upon the children with behavioral disorders. He felt a positive response meant that the child improved from a social viewpoint [1]. For example, children with isolative tendencies became acceptable community members because they exhibited greater consideration for their peers and engaged in "helpful activities" [7]. As for performance, Bradley observed that these effects had both practical and social significance as the classroom provided an opportunity to observe a child's willingness to conform to a norm [5]. The single daily dose of Benzedrine affected the children's behavior in the classroom more than the efforts of teachers and institutions. Bradley also concluded that the children exhibited more socially appropriate behavior. The children who had become subdued exerted "more conscious control over their activities and the expression of their emotions" and conducted "themselves with increased consideration and regard for the feelings" of others [7]. Bradley classified this remarkable improvement in behavior as conforming to the "modern" ideal of childhood. The improved child had greater interest in contributing to society and more orderly social relations, which allowed the child to become a successful adult.

Despite these positive social effects, Bradley also noticed the drug produced an unexplained range of effects. The stimulant drug produced subdued behavior in half the children and stimulated behavior in the other half. Bradley could not justify the paradox of a stimulant drug producing a subdued response, and he could not explain why the drug had different effects on different children. There appeared to be no correlations between the effect of Benzedrine and the conventional clinical characteristics of sex, age, history, physical condition, and reaction type [1]. Bradley also could not typify a child based on his or her changes in behavior. These paradoxical responses led him to conclude that social behavior had an emotional and unstable nature, which he acknowledged was not a sufficient explanation [7].

Although Benzedrine seemed to play a significant role in behavior modification, Bradley stressed that the drug could only offer a supplementary approach to the treatment of behavioral problems because of its inconsistencies. He reflected: "This ap-

proach in no sense replaces that of modifying a child's surroundings and so removing the sources of conflict . . . Neither can it offer the same assurance of mental health as do forms of psychotherapy which enable a child to work out his emotional problems" [7]. This conclusion followed his model of misbehavior as both social maladjustment and organic disease. Drugs temporarily modified the social maladjustment but did not change the fundamental organic disease. Bradley's findings also supported the role of the home's environment, which produced long-term changes rather than fleeting effects. Ultimately, Bradley concluded that an integrated approach remained superior to treatment.

Despite the lingering paradoxical effect of Benzedrine, Bradley's results had a profound effect on the world of drug research and treatment of children with behavior problems. It opened up two areas of amphetamine research: the calming effect on children's behavior and the stimulating effect on their academic performance. Both produced a child that fit perfectly into the ideals of industrialism. The child became a productive member of society with appropriate social behavior and improved school performance, implying that socially undesirable problems could be treated pharmacologically. While these effects were temporary, the drugs produced pronounced changes in behavior. Furthermore, since the effect was not limited to any one type of behavior problem, a wide range of children could potentially benefit from the medication. This finding implied that Benzedrine had the potential to be marketed to a larger audience, which would attract the attention of pharmaceutical companies constantly in search of the next profitable drug.

Finally, drug therapy had the potential to modify the role both of the institution and the physician in the course of treatment. Bradley noted: "Distressing surroundings cannot always be altered, and lack of facilities frequently make effective psychotherapy impossible. In such situations, the simple administration of a drug that produces an improved social adjustment or accelerated school progress may offer considerable assistance" [7]. While the home's environmental therapy was intensive and lengthy, drugs produced immediate effects in any setting. In cases where quality institutional care was not possible, drug administration would be an efficient alternative. Drug therapy would be the best option for children without the means for institutionalization. However, Bradley did not believe that institutional care should be abandoned in any other circumstance and that it was still the superior approach to treatment [7]. He also recognized that drug treatment distanced the patient from the doctor. Although this therapy could free up important time for the physician and allow him to treat more patients, this came at the cost of a weakened physician-patient relationship.

BRADLEY'S INFLUENCE IN THE SECOND HALF OF THE 20TH CENTURY

While these implications had important consequences for child psychiatry, Bradley's studies went largely unnoticed for several decades. Ultimately, Bradley was unable to identify the organic cause of behavioral problems and failed to define the type of problem child who would best respond to the drug [8]. This ambiguity led other child psychiatrists to ignore the studies while they searched for a clear organic etiology [9]. Meanwhile, tranquilizers flourished as the predominant drug treatment for behavior disorders because they produced distinct and reproducible responses [10]. In contrast, Benzedrine produced a range of unexplained paradoxical effects. Finally, SKF officials ignored Bradley's work because it focused on children with brain defects, and the company wanted to market the drug to a larger audience of healthy schoolchildren. Moreover, in the late 1930s, the use of amphetamine for mental performance enhancement garnered public criticism when newspapers reported student abuse scandals and the medical community reported some people had developed an addiction. Responding to criticism, SKF officials decided to discour-

age new research with Benzedrine, and it was abandoned as a treatment for behavioral disorders for the time being [8].

Nonetheless, Bradley's work did have a significant impact in the world of psychopharmacology and diagnostic classification. Bradley essentially opened up the field of clinical research on children with behavioral disorders by establishing a scientific model for observing and experimenting with stimulant drugs. Children with various emotional and behavioral problems were well-established clinical entities by the late 1950s, and classifications of their behavior led to new standards for diagnosis and treatment [10]. Amphetamines and related stimulant drugs would not be used as a regular treatment of "misbehavior" until the 1950s, when psychiatrists began to focus on the specific behavioral disorder of hyperactivity. At this point, other child psychiatrists such as Maurice W. Laufer, Bradley's successor at the Bradley Home, took up the abandoned studies of amphetamines and sought to understand their mechanism of action on children with behavioral disorders [9]. While scientists could not identify the biological mechanism, the Benzedrine experiments created a scientific model for further research on stimulant drugs to treat hyperactivity. In 1956, psychiatrists began to prescribe Ritalin (methylphenidate), a stimulant drug similar to Benzedrine with known benefits for children's behavior and few side effects [10]. Finally, in 1980, the DSM-III gave the behavioral disorder of hyperactivity its current name: attention deficit hyperactivity disorder [9]. Like Bradley's reports on his patients in the home, the ADHD diagnosis uses both medical and behavioral descriptions. Contemporary treatment of ADHD fundamentally relies on stimulant drugs such as Ritalin and Adderall, confirming the influence of Bradley's work [11].

CONCLUSION

Built upon a new conceptualization of misbehavior and a growing drug industry in the early 20th century, Bradley's studies of Benzedrine and its effect upon children with behavioral problems helped create the modern pharmacological approach to treating misbehavior. However, Bradley's work was important beyond its role in studying and treating troubled children and anticipating the use of Ritalin. Bradley recognized that these drug treatments had the greater implication of distancing the relationship between patient and physician, a problem that challenged his philosophical emphasis on integrated institutional treatment. Furthermore, he noted that Benzedrine only temporarily modified behavior rather than producing permanent change. In light of these observations, Bradley was adamant that drugs should only play a supporting role in a holistic approach to treatment. Bradley did not foresee the extent to which modern psychiatry would focus only on the potential of Benzedrine's effects and ignore Bradley's own conclusions. Instead, he recognized the inherently human nature of psychiatry and the environmental embeddedness of emotions. His observation that pharmacological solutions should always be provided in a supportive environment and within an established doctor-patient relationship is one that appears particularly appealing in our modern context. We would be wise to heed Bradley's call for a more nuanced use of psychopharmacological solutions.

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