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**The Relationship of Adverse Childhood Experiences
to Adult Health, Well-being, Social Function, and Healthcare**

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The Relationship of Adverse Childhood Experiences to Adult Health, Well-being, Social Function, and Healthcare

“In my beginning is my end.”

T.S. Eliot, *Four Quartets*¹

Introduction:

Medicine increasingly recognizes that early life events, including often-unrecognized emotional traumas, have both dramatic and long-lasting effects on the neural and biological systems involved in well-being, biomedical disease, social function, and psychopathology. Our current understanding is relatively new, developing in the twentieth century. The turning point in modern understanding is commonly attributed to the great French neurologist, Jean-Martin Charcot, and his studies of hysteria in the closing years of the nineteenth century. Janet, Freud, and Breuer soon were to explore the role of emotional trauma in human development.² Subsequently, psychoanalysts and poets provided the early general insights into many of these developmental phenomena. These descriptions represented an enormous shift away from Biblical and Renaissance views that mental illness and biomedical disease were god-given, or the result of satanic possession, or of moral failure. Judith Herman provides a chronology of these transformations in her book, *Trauma and Recovery*.³ Harry Harlow⁴ provided in his primate work experimental demonstration of the need in infancy for more than environmental warmth, physical safety, and food if a functional adult rhesus monkey is to emerge. John Bowlby⁵ described the importance of the missing ingredient in his work on human attachment. Neurobiologists are currently discovering and describing the intermediary biomedical mechanisms by which these processes manifest themselves.

The focus of this chapter will be an examination of the relations between early life traumas and the effect they have on nearly all systems of the body. To do this, we will draw on our experience with the Adverse Childhood Experiences (ACE) Study, a major American medical study providing retrospective and prospective analysis in over 17,000 individuals of the effect of traumatic life experiences during the first eighteen years of life on later well-being, social function, health risks, disease burden, healthcare costs, and life expectancy.⁶

The ACE Study is an outgrowth of repeated counterintuitive observations made while operating a weight loss program that uses the technique of supplemented fasting, which allows non-surgical weight reduction of approximately three hundred pounds (135 Kg) per year. Unexpectedly, our Weight Program had a high drop-out rate, limited almost exclusively to patients successfully losing weight. Exploring the reasons underlying the high prevalence of patients inexplicably fleeing their own success in the Weight Program ultimately led us to recognize that certain of the more intractable public health problems like obesity were *also* unconscious, or occasionally conscious, solutions to problems dating back to the earliest years, but hidden by time, by shame, by secrecy, and by social taboos against exploring certain areas of life experience. It became evident that traumatic life experiences during childhood and adolescence were far more common

than generally recognized, were complexly interrelated, and were associated in a strong and proportionate manner to outcomes important to medical practice, public health, and the social fabric of the nation. In the context of everyday medical practice, we came to recognize that the earliest years of infancy and childhood are not lost but, like a child's footprints in wet cement, are often life-long.

The findings from the ACE Study provide a remarkable insight into how we become what we are as individuals and as a nation. They are important medically, socially, and economically. Indeed, they have given us reason to reconsider the very structure of primary care medical practice in America.

Outline of the ACE Study and its setting:

The Adverse Childhood Experiences (ACE) Study was carried out in Kaiser Permanente's Department of Preventive Medicine in San Diego, in collaboration with the US Centers for Disease Control and Prevention (CDC). This particular Department of Preventive Medicine provided an ideal setting for such collaboration because for many years we have carried out at one site detailed biomedical, psychological, and social (biopsychosocial) evaluations of over 50,000 adult Kaiser Health Plan members a year. The CDC contributed the essential skill sets for study design and massive data management required for meaningful interpretation of clinical observations.

Kaiser Health Plan patients are middle-class Americans; all have high quality health insurance. In any 4-year period, 81% of adult Plan members in San Diego choose to come in for comprehensive medical evaluation. We asked 26,000 consecutive adults coming through the Department if they would help us understand how childhood events might affect adult health status. The majority agreed and, after certain exclusions for incomplete data and duplicate participation, the ACE Study cohort had over 17,000 individuals. The Study was carried out in two waves, to allow mid-point correction.

The participants were 80% white including Hispanic, 10% black, and 10% Asian; 74% had attended college; their average age was 57. Almost exactly half were men, half women. This is a solidly middle-class group from the 6th largest city in the nation; it is not a group that can be dismissed as atypical, aberrant, or 'not in my practice'. Disturbingly, it is us – not a point to be overlooked when considering the problems of translating this information into action.

Eight categories of adverse childhood experiences (ACEs) were initially studied in the first wave; two categories of neglect were added in the second wave. We empirically selected these categories because of their discovered high prevalence in the Weight Program. Their prevalence in a general, middle-class population was also unexpectedly high. We created for each individual an ACE Score, a count of the number of *categories* of adverse childhood experience that had occurred during the first eighteen years of life. ACE Score does not tally incidents within a category. The scoring system is simple: exposure during childhood or adolescence to any one category of adverse experience is scored as one point. There is no further scoring within a category; thus, an alcoholic and a drug user within a household score the same as one alcoholic; multiple

sexual molestations by multiple individuals are scored as one point. If anything, this tends to understate our findings. The ACE Score therefore can range from 0 to 8 or 10, depending on the data being from Wave 1 or Wave 2. Specifics of the questions underlying each category are detailed in our original article.⁶

Only one third of this middle-class population had an ACE Score of 0. If any one category was present, there is 87% likelihood that at least one more category will be present. One in six individuals had an ACE Score of 4 or more, and one in ten had an ACE Score of 5 or more. Thus, every physician sees several high ACE Score patients each day. Typically, they are the most difficult patients of the day. Women were 50% more likely than men to have experienced five or more categories. Here is a key to what, in mainstream epidemiology, appears as women's natural proneness to undefined health problems like fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome, and chronic non-malignant pain syndromes. We now see these as medical constructs, artifacts resulting from medical blindness to social realities and ignorance of the impact of gender.

Somewhat surprisingly, the ACE categories turned out to be approximately equal in impact; an ACE Score of 4 consists of *any* four of the categories. The categories do not occur randomly; the number of individuals with high ACE Scores is distinctly higher than if the categories exist independently of each other.⁷ The ten reference categories experienced during childhood or adolescence are as below, with their prevalences in parentheses:

- Abuse
 1. emotional - recurrent humiliation (11%)
 2. physical - beating, not spanking (28%)
 3. contact sexual abuse (28% women, 16% men; 22% overall)

- Household dysfunction
 1. mother treated violently (13%)
 2. household member was alcoholic or drug user (27%)
 3. household member was imprisoned (6%)
 4. household member was chronically depressed, suicidal, mentally ill, in psychiatric hospital (17%)
 5. not raised by both biological parents (23%)

- Neglect
 1. physical (10%)
 2. emotional (15%)

The essence of the ACE Study has been to match retrospectively, approximately a half century after the fact, an individual's current state of health and well-being against adverse events in childhood (the ACE Score), and then to follow the cohort forward to match ACE Score prospectively against doctor office visits, ER visits, hospitalization,

pharmacy costs, and death. We recently have passed the ten-year mark in the prospective arm of the Study.

Findings:

We will illustrate with a sampling from our findings in the ACE Study the long-lasting, strongly proportionate, and often profound relationship between adverse childhood experiences and important categories of human well-being, health risks, disease burden, social function, and healthcare costs - decades later.

Well-being:

The relationship between ACE Score and self-acknowledged chronic depression is illustrated in FIG 1A.⁸ Should one not be confident of the reliability of self-acknowledged chronic depression, there is a similar but stronger relationship between ACE Score and later suicide attempts as shown in FIG 1B.⁹ The *p* value of all graphic depictions herein is .001 or better.

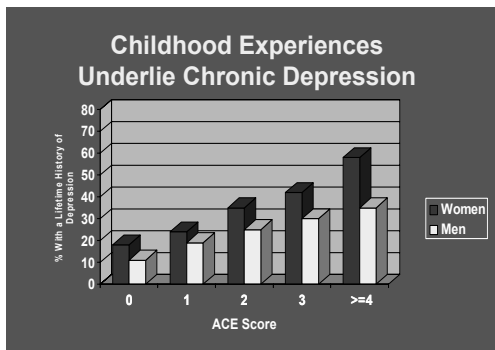


Fig 1A

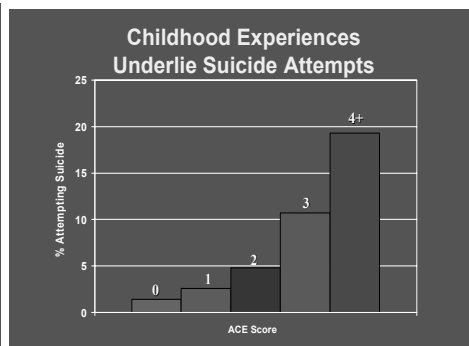


Fig 1B

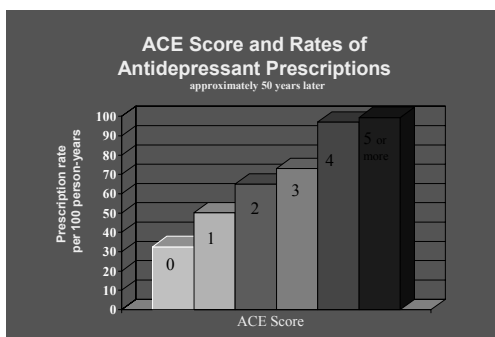


Fig 1C

One continues to see a proportionate relationship between ACE Score and depression by analysis of prescription rates for antidepressant medications after a ten year prospective follow-up, now approximately fifty to sixty years after the fact. (FIG 1C).¹⁰ It would appear that depression, often unrecognized in medical practice, is in fact common and has deep roots, commonly going back to the developmental years of life.

An analysis of population attributable risk (that portion of a problem in the overall population whose prevalence can be attributed to specific risk factors) shows that 54% of current depression and 58% of suicide attempts in women can be attributed to adverse childhood experiences. Whatever later factors might trigger suicide, childhood experiences can not be left out of the equation. McEwen and Singer¹¹ have described this general concept of background burden as allostatic load.

A similar relationship exists between ACE Score and later hallucinations, shown in FIG 1D. Lest one reasonably suspect that, at ACE Score 7 or higher, people will likely be using street drugs or alcohol to modulate their feelings, and that *these* might be the cause of hallucinations, we have corrected for alcohol and drug use and find the same relationship exists.¹²

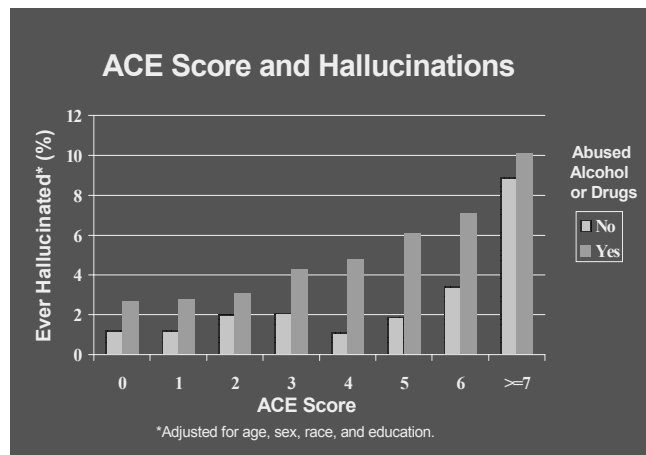


Fig 1D

Physicians dealing with somatization and psychophysiologic disorders, as well as those physicians dreading such patients, will find Figure 1E of special interest. Indeed, this figure exemplifies our observation in the Weight Program that what one sees, the presenting problem, is often only the marker for the real problem, which lies buried in time, concealed by patient shame, secrecy, and physician discomfort – and sometimes amnesia. Amnesia, usually considered a theatrical device of Hollywood movies of the 1940s is in fact alive and well, though unrecognized, in everyday medical practice. In our Weight Program, we found 12% of the participants were partially or totally amnesic for a period of their lives, typically the few years before weight gain began. In the ACE Study, we found that there was a distinct relationship of ACE Score to impaired memory of childhood, and understand this phenomenon to be reflective of dissociative responses. (FIG 1F)

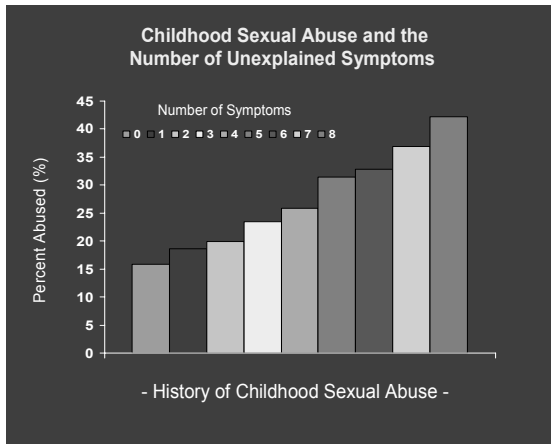


Fig 1E

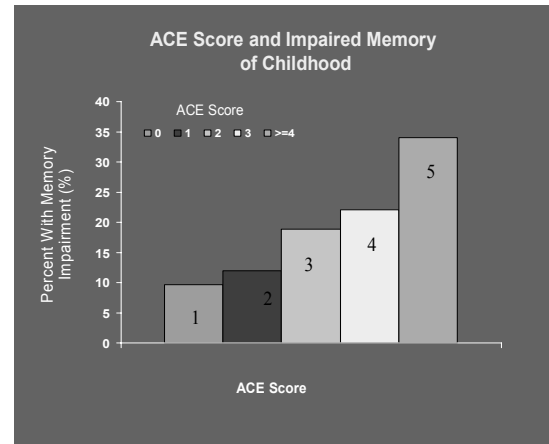


Fig 1F

All told, it is clear that adverse childhood experiences have a profound, proportionate, and long-lasting effect on well-being, whether measured by depression or suicide attempts, by protective unconscious devices like somatization disorders and dissociation, or by self-help attempts that are misguidedly addressed solely as long-term health risks -- perhaps because we physicians are less than comfortable acknowledging the manifest short-term benefits these “health risks” offer to the patient dealing with hidden trauma.

Health risks:

The most common contemporary health risks are smoking, alcoholism, illicit drug use, obesity, and high level promiscuity. Though widely understood to be harmful to health, each is notably difficult to give up. Conventional logic is not particularly useful in understanding this apparent paradox. As though opposing forces are not known to exist commonly in biological systems, little consideration is given to the possibility that many health risks might *also* be personally beneficial. For instance, the psychoactive benefits of nicotine were understood decades before its risks were recognized. We repeatedly hear from patients of the benefits of these “health risks.” Indeed, relevant insights are even built into our language: “Have a smoke, relax.” “Sit down and have something to eat. You’ll feel better.” Or, needing ‘a fix’, referring to iv drug use. Conversely, the popular term “drug abuse” serves to conceal the functionality of such behavior.

In the ACE Study, we found strong, proportionate relationships between the number of categories of adverse childhood experience (ACE Score) and the use of various psychoactive materials or behaviors. The saying, “It’s hard to get enough of something that *almost* works.” provides insight. Three common categories of what are usually termed addictions (the unconscious compulsive use of psychoactive agents) are illustrated in this section. Self-acknowledged current smoking (FIG 2A)^{13, 14}, self-defined alcoholism (FIG 2B)^{6, 15}, and self-acknowledged intravenous drug use (FIG 2C)¹⁶ are strongly related in a proportionate manner to our several specific categories of adverse experiences during childhood.

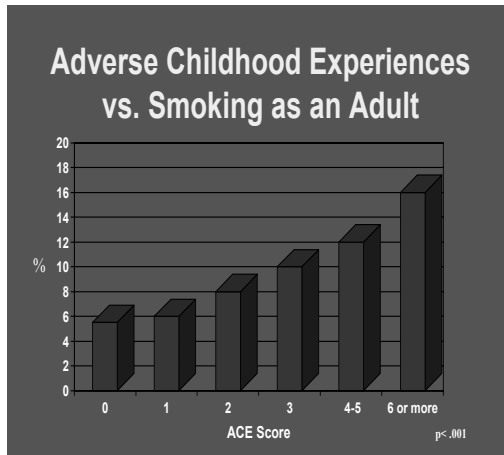


Fig 2A



Fig 2B

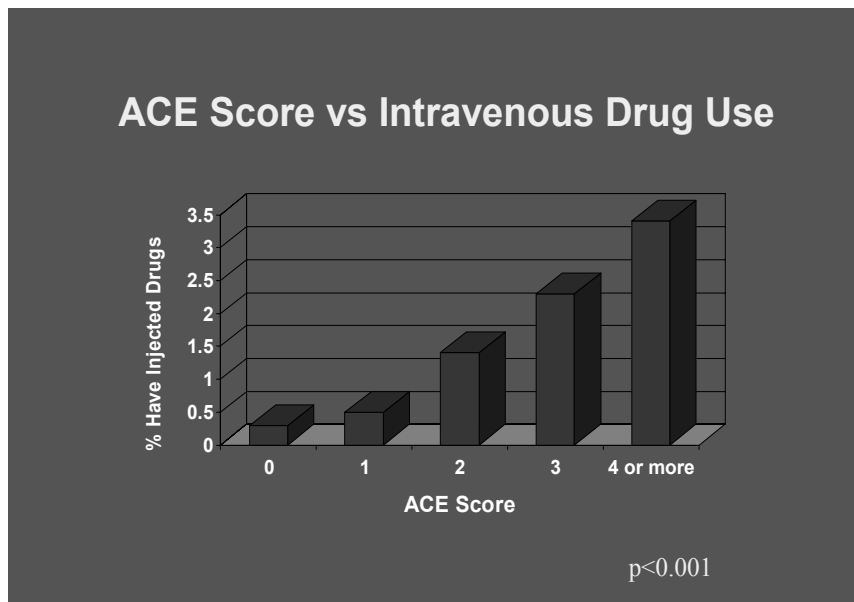


Fig 2C

The relationship of ACE Score to iv drug use is particularly striking, given that male children with ACE Score 6 or more have a 4,600% increased likelihood of later becoming an iv drug user, as contrasted with an ACE Score 0 male; this moves the probability from an arithmetic to an exponential progression. Relationships of this magnitude are rare in Epidemiology. This, coupled with related information, suggests that the basic cause of addiction is predominantly experience-dependent during childhood and not substance-dependent. This challenge to the usual concept of the cause of addictions has significant implications for medical practice and for treatment programs.¹⁷

Social function

Using teen pregnancy and promiscuity as measures of social function, we found that ACE Score has a proportionate relationship to these outcomes. (FIG 3A, 3B.) So

too does miscarriage of pregnancy, indicating the complexity of the relationship of early life psychosocial experience to what are usually considered purely biomedical outcomes.¹⁸ Additionally, we found that self-rated job performance correlated inversely with ACE Score.¹⁹ (FIG 3C). This of course is in addition to previously discussed problems like depression, alcoholism, and iv drug use that often are used as markers of impaired work performance by those studying social function.

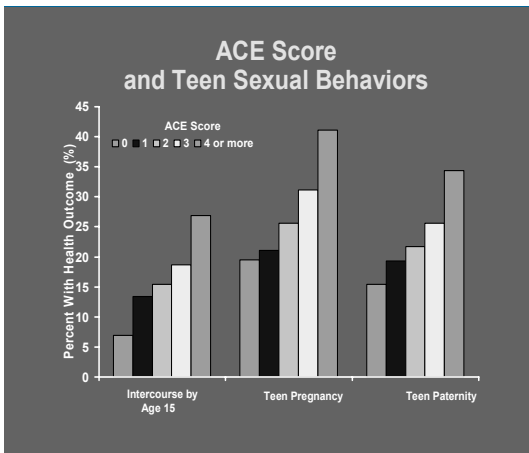


Fig 3A

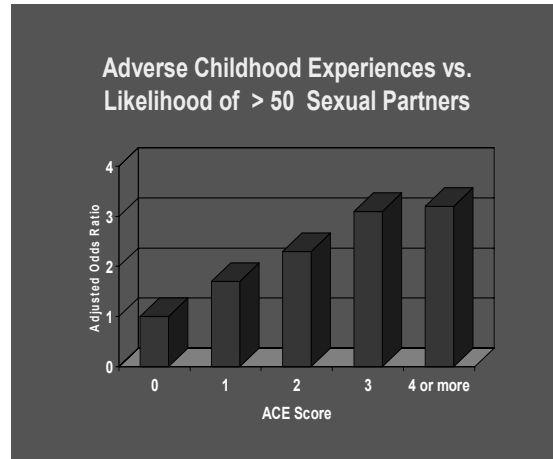


Fig 3B

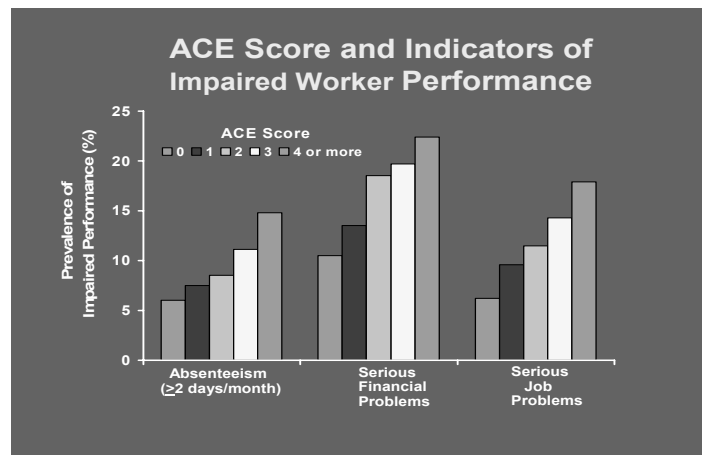


Fig 3C

Biomedical disease

We found in the ACE Study that biomedical disease in adults has a significant relationship to adverse life experiences in childhood. The implication of this observation that life experience can transmute into organic disease over time is a profound change from an earlier era when infectious diseases like rheumatic fever or polio, or nutritional deficiency like pellagra, would come to mind as the main medical link between childhood events and adult disease. In spite of this change in the etiology of biomedical outcomes, we find no evidence that there has been a change in the frequency of overall adverse childhood experiences in various age cohorts spanning the twentieth century.²⁰

Three examples of the links between childhood experience and adult biomedical health are the relationship of ACE Score to liver disease²¹ (FIG 4A), chronic obstructive pulmonary disease or COPD²² (FIG 4B), and coronary artery disease or CAD²³ (FIG 4C). The data for CAD show the effect of ACE Score after correcting for, or in the absence of, the conventional risk factors for coronary disease like hyperlipidemia, smoking, etc.

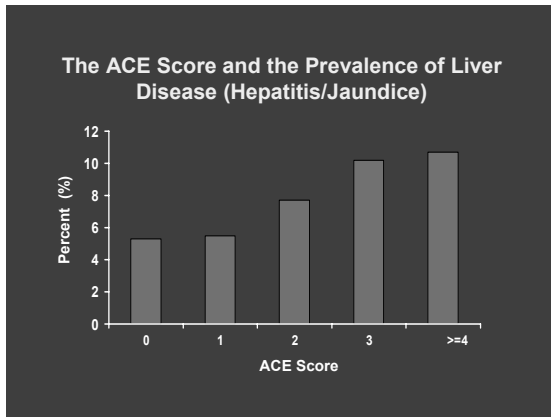


Fig 4A

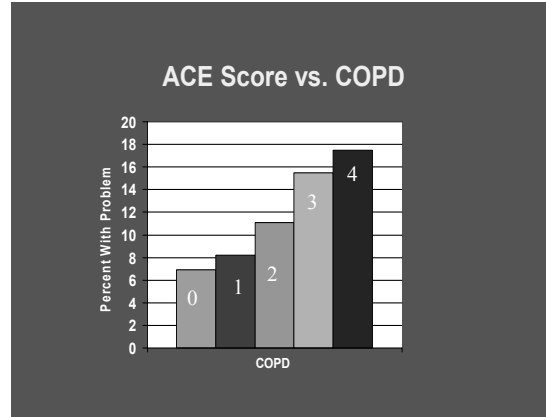


Fig 4B

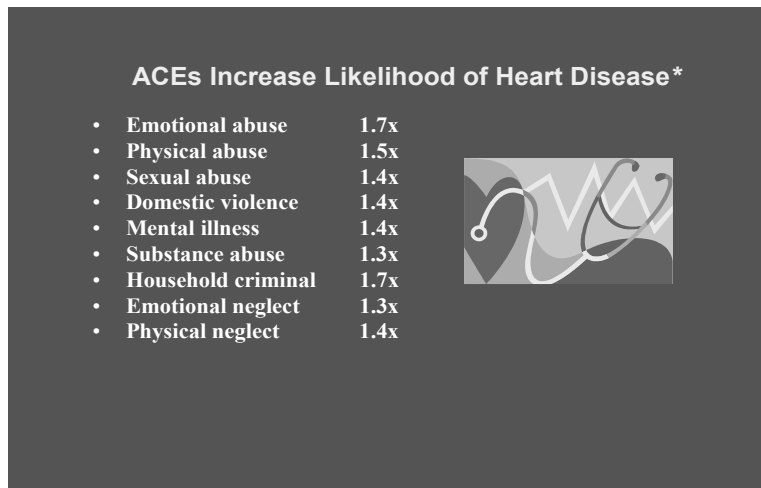


Fig 4C

Certain of these relationships of childhood experience to later biomedical disease might initially be thought to be straight-forward, for instance assuming that COPD or CAD are merely the obvious outcomes of cigarette smoking. In this case, one might reasonably assume that the total relationship of adverse childhood experience to later biomedical disease lies in the observation that stressful early life experience leads to a coping behavior like smoking, which becomes the mechanism of biomedical damage. While this hypothesis is true, it is incomplete; the actual situation is more complex. For instance, in an analysis published in *Circulation*²³, we found that there was a strong relationship of ACE Score to coronary disease, *after* correcting for all the conventional risk factors like smoking, cholesterol, etc. This illustrates the likelihood that adverse experiences in childhood are related to adult disease by two broad etiologic mechanisms:

- conventional risk factors that actually are attempts at self-help through the use of agents like nicotine with its broad psychoactive benefits, in addition to its now well-recognized cardiovascular risks, and
- the effects of chronic stress as mediated through the mechanisms of chronic hypercortisolemia, inflammatory cytokines, and other stress responses on the developing brain and body systems, and sometimes by the total dysregulation of the stress response.

Healthcare costs

Thus far, at the ten-year point in the prospective arm of the Study, we have only begun to analyze pharmacy data. Given the average age of our cohort, we are looking at prescription drug use fifty to sixty years after the fact. Prescription costs are now an increasingly significant portion of rapidly rising national healthcare expenditures in the United States. The relationship of ACE Score to antidepressant prescription rates has already been shown in FIG 1C. Below, in FIG 5A and FIG 5B, we show the relationship of adverse childhood experiences to the decades-later use of anti-psychotic and anxiolytic medications¹⁰. Analyses of the relationships of ACE Score to doctor office visits, Emergency Department visits, hospitalization, and death are in progress. The economic effect of FIG 1E will be intuitively obvious to practicing physicians who have observed that multi-volume patients typically do not have a unifying diagnosis underlying all the medical attention. Rather, they have a multiplicity of symptoms: illness, but not disease. Kirkengen has more fully discussed the nature, origins, and often unwitting medical creation of this complex phenomenon in her book, *Inscribed Bodies*.²⁴

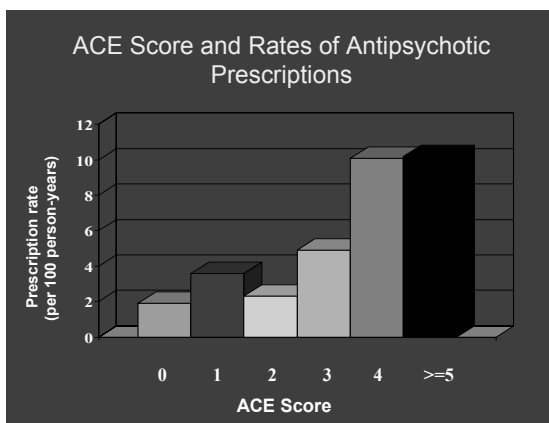


Fig 5A

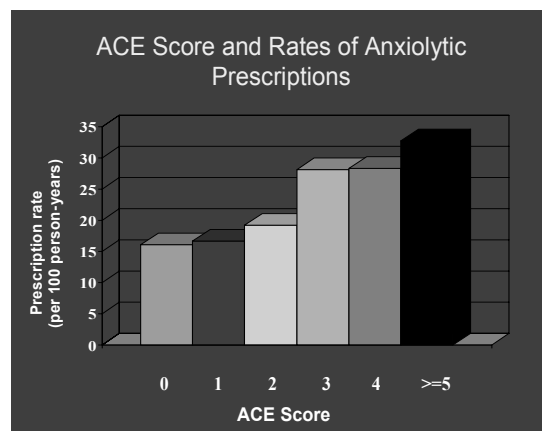


Fig 5B

Life expectancy

Although we have not yet begun our prospective analysis of adult death rates as they may be related to adverse childhood experiences, a suggestive insight can be provided by use of the Null Hypothesis. Using the Null Hypothesis, we might propose that if there is *no* relationship of ACE Score to ultimate mortality, then we ought to be able to predict certain expected findings and consequently test for them. Thus, if there is no relationship of ACE Score to adult mortality, the age distribution of Kaiser Health

Plan members choosing to come in for comprehensive medical evaluation ought to be independent of ACE Score. In FIG 6A, we see that the age distribution for ACE Score 0 individuals is what one would expect: old people are more likely to come in for a complete medical evaluation than are young people, and intermediate age quartiles have the expected relative proportionality. However, at ACE Score 2, what had been the most common age quartile has become the least common, and what had been the least common has become the most common. At ACE Score 4, the initially most common age quartile has almost disappeared. We anticipate that, when our prospective analysis of death rates is completed, it may illustrate convincingly that there is an increasing death rate as the ACE Score increases. Certainly, this would be the expected continuation of our findings that ACE Score is strongly related first to health risks, then to disease, then to one outcome of disease: death.

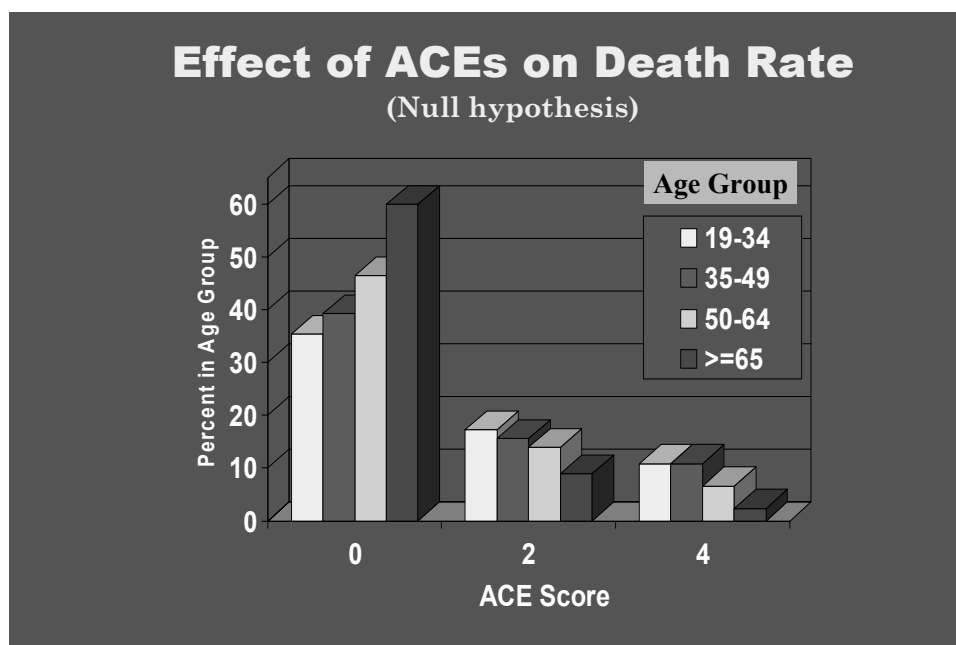


Fig 6A

Reasonably, one might challenge this interpretation of selective attrition by hypothesizing that our patients are progressively so humiliated by exposure of their increasing ACE Scores that they are subsequently avoiding necessary medical care. Such an hypothesis is not supported by our findings. Some years ago we had on site for six months a fully trained psychiatrist-psychoanalyst who saw selected high ACE Score patients immediately after their comprehensive medical evaluation, rather than after referral to Psychiatry. An anonymous questionnaire, returned by 81% of the patients he saw, showed that his hour-long interview was interpreted by patients as highly desirable and appreciated. Talking about the worst secret of one's life with an experienced person, being understood, and coming away feeling still accepted as a human being, seems to be remarkably important and beneficial, perhaps not unlike Confession in the Roman Catholic Church. Indeed, seeking understanding and acceptance is a deep and human need, harkening back at least to the biblical enjoinder, "With all thy getting, get thee understanding."

Integration into clinical practice:

We have made a limited but instructive attempt to integrate the ACE Study findings into clinical practice. At Kaiser Permanente's high-volume Department of Preventive Medicine in San Diego, we have used what we learned to expand radically the nature of our Review of Systems (ROS) questionnaire. We have now asked routinely of over 440,000 adult individuals undergoing our comprehensive medical evaluation a number of questions of newly discovered relevance, the following of which are a sample:

- Have you ever been a combat soldier?
- Have you ever lived in a war zone?
- Have you been physically abused as a child?
- Have you been sexually molested as a child or adolescent?
- Have you ever been raped?
- Who in your family has been murdered?
- Who in your family has had a nervous breakdown?
- Who in your family has been a suicide?
- Who in your family has been alcoholic or a drug user?

Such questions have been accepted by patients in the context of a well-devised ROS questionnaire that is filled out at home. Examiners have learned that the most productive response to a *Yes* answer is, "I see that you have - - - . Tell me how that has affected you later in your life." While not a simple transition for staff, and one requiring an organized training effort, it has been an effective transition with measured benefits. An independent organization carried out for us a neural net analysis of the data from 120,000 patient evaluations (2 years' work) using this new approach, a biopsychosocial approach to comprehensive medical evaluation. Surprisingly, a 35% reduction in doctor office visits (DOVs) was found in the year subsequent to evaluation, compared to the year before. Additionally, analysis showed an 11% reduction in Emergency Department (ED) visits and a 3% reduction in hospitalizations. This change was dramatically and unexpectedly different from a much smaller, 700-patient evaluation carried out 20 years earlier, when we worked in a more usual biomedical mode. That earlier approach provided a net 11% reduction in DOVs compared to the antecedent year, in spite of a 14% referral rate. No evaluation was made then of ED visits or hospitalization. Finally, we found that the recent notable reductions in DOVs and ED visits totally disappeared in the second year after comprehensive evaluation, when there was a reversion to prior baseline. While the underlying information was present in charts with laser-printed clarity, it was almost never integrated into subsequent medical visits.

If these first year results are replicable, and we believe they should be, the implications for primary medical care are those of a paradigm shift. While offering tremendous opportunity, paradigm shifts are resisted. The philosopher, Eric Hoffer, has discussed this problem in his book, *The Ordeal of Change*²⁵. Jeffrey Masson, in *Assault on Truth*²⁶ describes the enormous social pressures on Freud to recant his interpretation of his findings of traumatic sexual experiences in childhood as being valid. Louise DeSalvo points out in *Virginia Woolf*²⁷ how literary commentators almost uniformly

avoid the thematic content (incest) of Woolf's work in favor of erudite discussions of her style and literary techniques.

If the treatment implications of what we found in the ACE Study are far-reaching, the problems of integrating this information into clinical practice are absolutely daunting. Simply put, it is easier for all of us to deal with the presenting symptom of the moment than to attempt to understand it in the full context of the patient. Though the latter approach demonstrably would save time and money in the long run, most of us operate in the short run, and respond to valid forces that are both external and internal.

The very nature of the material in the ACE Study is such as to make most of us uncomfortable. Why would a physician want to leave the familiarity of traditional biomedical disease and enter this area of threatening uncertainty that none of us have been trained to deal with? As physicians, we typically focus our attention on tertiary consequences, far downstream, while the primary causes are well protected by time, social convention, and taboo. We physicians have often limited ourselves to the smallest part of the problem, that part in which we are erudite and comfortable as mere prescribers of medication or users of impressive technologies. Thus, although the ACE Study and its fifty-some publications have generated significant intellectual interest in North America and Europe during the past ten years, its findings have yet to be translated into significant clinical or social action. The reasons for this are important to consider if this information is to be converted into meaningful social and medical opportunity.

Conclusion:

The influence of childhood experience, including often-unrecognized traumatic events, is biomedically, socially, and psychologically as powerful as psychoanalysts originally described it to be. This influence is long-lasting, and neurobiologists are now describing its intermediary mechanisms. Unfortunately, and in spite of this major advance, psychodynamic and biological psychiatry remain at odds, rather than taking advantage of the new discoveries to reinforce each other.

Many of our most intractable public health problems are the result of attempted personal solutions to problems caused by traumatic childhood experiences, which are lost in time and concealed by shame, secrecy, and social taboo against the exploration of certain topics. The findings of the Adverse Childhood Experiences (ACE) Study provide a credible basis for a new paradigm of primary care medical practice that would start with comprehensive biopsychosocial evaluation of all patients at the outset of ongoing medical care. We have demonstrated that this approach is acceptable to patients, affordable, and beneficial in multiple ways. The potential gain is huge. So too is the likelihood of physician and institutional resistance to this change. Actualizing the benefits of this paradigm shift will depend on first identifying and resolving the various bases for resistance to it. In reality, this will require far more planning than would be needed to introduce a purely intellectual or technical advance. However, our experience suggests that it can be done.

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What's My ACE Score?

Prior to your 18th birthday:

1. Did a parent or other adult in the household **often or very often**...
Swear at you, insult you, put you down, or humiliate you?
or
Act in a way that made you afraid that you might be physically hurt?
Yes No If yes enter 1 _____
2. Did a parent or other adult in the household **often or very often**...
Push, grab, slap, or throw something at you?
or
Ever hit you so hard that you had marks or were injured?
Yes No If yes enter 1 _____
3. Did an adult or person at least 5 years older than you **ever**...
Touch or fondle you or have you touch their body in a sexual way?
or
Attempt or actually have oral, anal, or vaginal intercourse with you?
Yes No If yes enter 1 _____
4. Did you **often or very often** feel that ...
No one in your family loved you or thought you were important or special?
or
Your family didn't look out for each other, feel close to each other, or support each other?
Yes No If yes enter 1 _____
5. Did you **often or very often** feel that ...
You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
or
Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
Yes No If yes enter 1 _____
6. Was a biological parent **ever** lost to you through divorced, abandonment, or other reason ?
Yes No If yes enter 1 _____
7. Was your mother or stepmother:
Often or very often pushed, grabbed, slapped, or had something thrown at her?
or
Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?
or
Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
Yes No If yes enter 1 _____
8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
Yes No If yes enter 1 _____
9. Was a household member depressed or mentally ill or did a household member attempt suicide?
Yes No If yes enter 1 _____
10. Did a household member go to prison?
Yes No If yes enter 1 _____

Now add up your "Yes" answers: _____ This is your ACE Score

Erasmus MC
University Medical Center Rotterdam

Sophia Children's Hospital

ADHD Symptoms have an Effect on Early-Onset Smoking

Dept. of Child/Adolescent Psychiatry, Erasmus MC, Rotterdam
Anja Huizink, Patricia Vuijk, Frank Verhulst

Dept. of Developmental Psychology, Vrije Universiteit Amsterdam
Pol van Lier

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ADHD symptoms

ADHD = Attention Deficit Hyperactivity Disorder (ADHD)

Inattention

- Often does not give close attention to details or makes careless mistakes in schoolwork, work, or other activities.
- Often has trouble keeping attention on tasks or play activities.
- Often does not seem to listen when spoken to directly.
- Often does not follow instructions and fails to finish schoolwork, chores (not due to oppositional behavior or failure to understand instructions).
- Often has trouble organizing activities.
- Often avoids, dislikes, or doesn't want to do things that take a lot of mental effort for a long period of time (such as schoolwork or homework).
- Often loses things needed for tasks and activities (e.g. toys, school assignments, pencils, books, or tools).
- Is often easily distracted.
- Is often forgetful in daily activities.

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ADHD Symptoms

Hyperactivity

- Often fidgets with hands or feet or squirms in seat.
- Often gets up from seat when remaining in seat is expected.
- Often runs about or climbs when and where it is not appropriate (adolescents or adults may feel very restless).
- Often has trouble playing or enjoying leisure activities quietly.
- Is often "on the go" or often acts as if "driven by a motor".
- Often talks excessively.

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ADHD Symptoms

Impulsivity

- Often blurts out answers before questions have been finished.
- Often has trouble waiting one's turn.
- Often interrupts or intrudes on others (e.g., butts into conversations or games).

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SHOWCASE 2007

Dr. Thomas Insel, M.D., Director
National Institute of Mental Health

Background-I

Symptoms of ADHD: often associated with (early onset) smoking.

- Mostly clinical samples

e.g. 33 – 50% SUD patients (adults and adolescents) have history of ADHD

(Wilson & Levin, 2005)

- Community samples

ADHD inattention symptoms predict “ever having smoked” in 1,066 tenth-grade students

(Tercyak et al, 2002)

→ Evidence of a link between ADHD symptoms and risk for tobacco use

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SHOWCASE 2007

Dr. Thomas Insel, M.D., Director
National Institute of Mental Health

Background- II

Are ADHD symptoms actually causally related to tobacco use, or do they simply coincide?

Some evidence for causal relationship:

among college students using medication to control their ADHD symptoms:

reduced risk of tobacco use (Upadhyaya et al., 2005)

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Dr. Thomas Insel, M.D., Director
National Institute of Mental Health

Background-III

Randomized Controlled Trials (RCT):

- provide the unique capacity to test whether changes in hypothesized risk variables (ADHD) affect outcomes (smoking)
- randomization controls for possible sources of confounding

→ Can provide some evidence for a causal link

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Aim of the present study

Test the link between ADHD symptoms and early onset tobacco use

More specifically, within a RCT:

Do reductions in ADHD symptoms at age 9, mediate the reduced risk of tobacco use at age 10 or 11 years?

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Good Behavior Game - I

- classroom-based preventive intervention
- promotes prosocial behavior
- aims to reduce disruptive behavior, including hyperactive and impulsive behaviour

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Good Behavior Game - II

- well-structured task
- clear behavioral rules (pictograms)
- provides systematic reward
- positive behavior, positive interaction

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Good Behavior Game - III

- Positively formulated behavioral rules
- Visualized rules
- Teams
- Cards
- Rewards

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Good Behavior Game - IV


Three phases:

- 1) Introduction
- 2) Expansion
- 3) Generalization

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GBG – Examples of rules


You are quiet!



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GBG – Examples of rules

You pay attention!

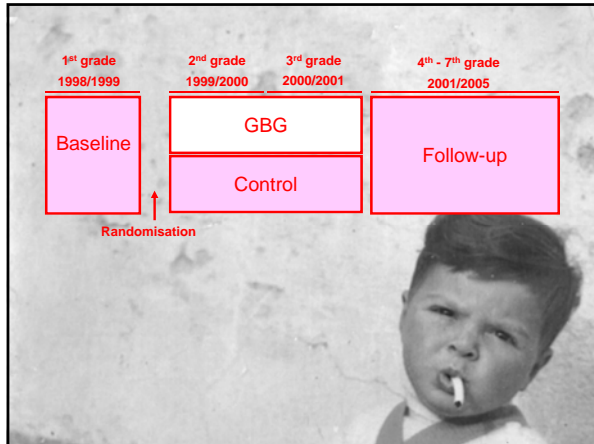


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Participants


- N = 477 first grade boys and girls
- average age 6.9 years
- 51% boys
- Ethnicity: 82% Dutch, 7% Turkish, 7% Moroccan
- Classes were randomly assigned to:
GBG intervention (n= 263) or
Control condition (n= 214)

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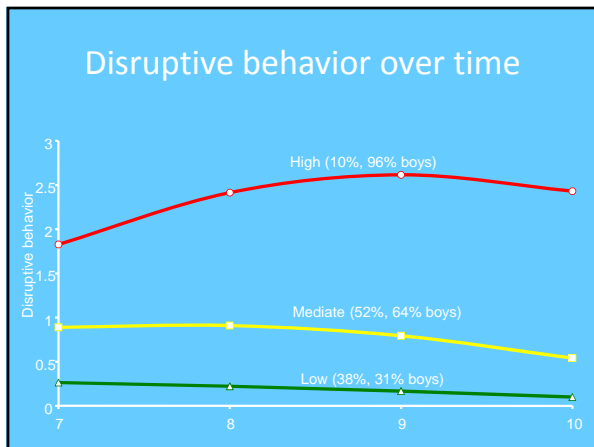


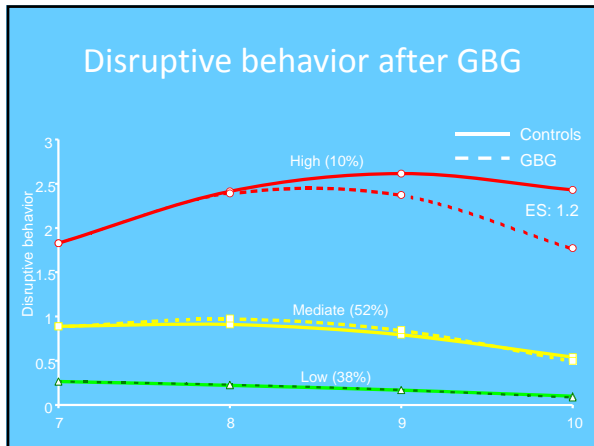
Assessments

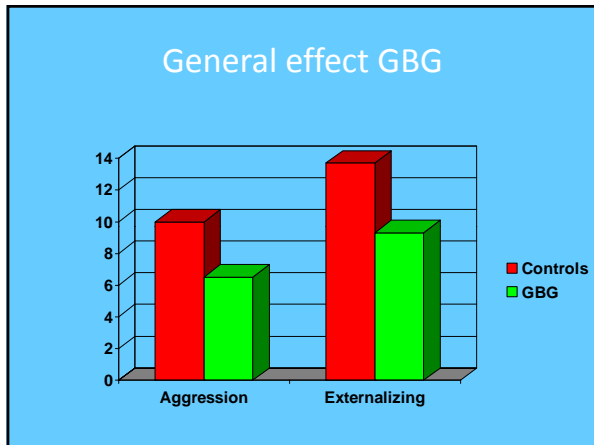
- **ADHD symptoms:** Teacher reports
TRF: Teacher's Report Form/6-18, 13 items ADHD
PBSI: Problem Behavior at School Interview, 8 items ADHD
- **Early onset smoking:**
self – report: 10 and 11 years old

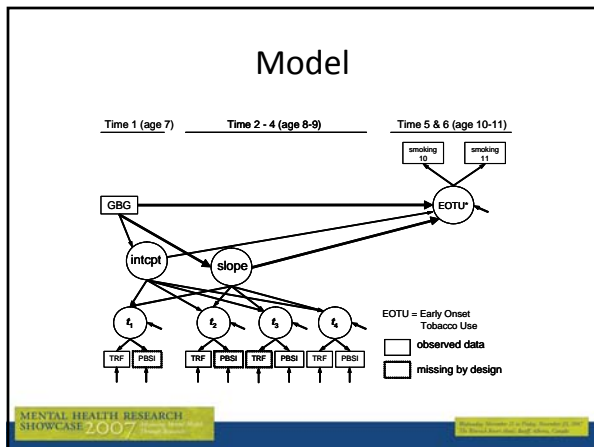


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Statistical analyses

Mplus 4.2: Mediation model

- Latent variables for each time point (t1 – t4)
- Growth of ADHD symptoms over time

Tests:

- GBG: direct effect on slope of ADHD symptoms
- GBG: direct effect on early onset smoking
- GBG: indirect effect on early onset smoking via mediator

Adjusted for: gender, SES, parental smoking, prenatal maternal smoking

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Prenatal smoking?

- Higher ADHD scores at age 7
- GBG intervention: no effect on course of ADHD symptoms
- GBG intervention: no effect on early onset smoking
- In contrast: in non-exposed children: GBG positive effect

Vujjk et al., JCPP, 2006, 47: 891 - 901

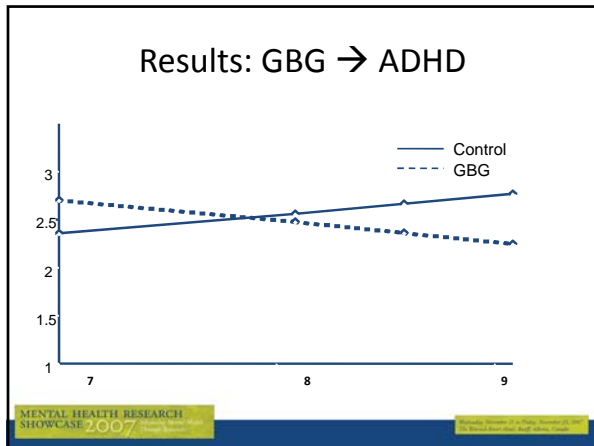
MENTAL HEALTH RESEARCH SHOWCASE 2007

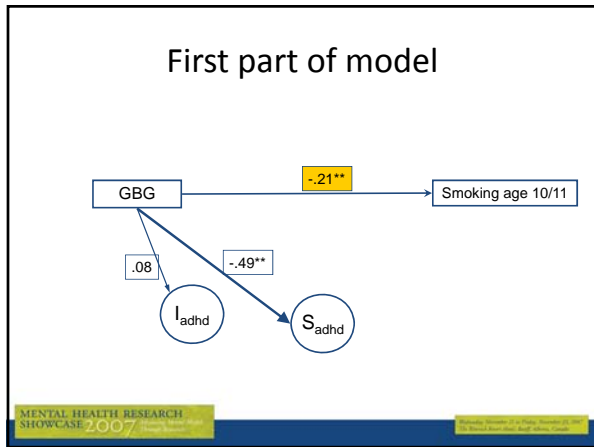
Descriptive results

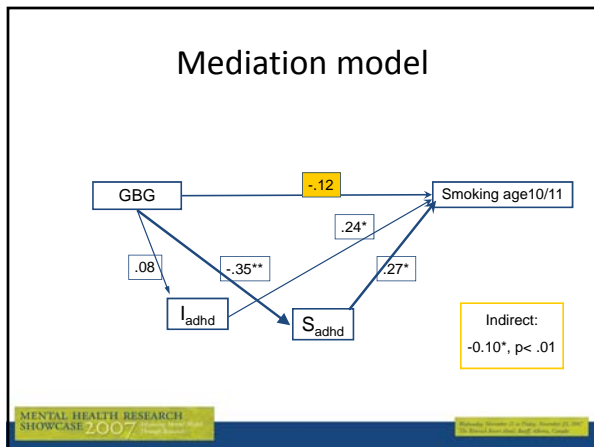
- 12.8 % of the children (n= 61) reported tobacco use at age 10-11
- GBG: 9.9 % versus Control: 16.4%

→ $\chi^2(1, 477) = 4.43, p < .05$

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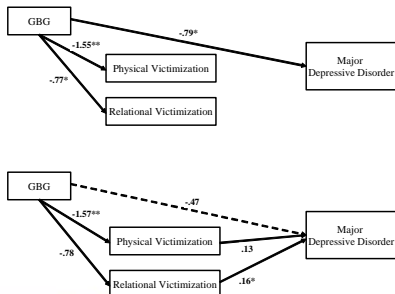
Discussion

- Evidence for a mediating effect of ADHD symptoms on early onset smoking
- ADHD behavior is somehow involved in the pathway towards early onset smoking
 - No such effect for Conduct Disorder

Pathways?

- Inability to oversee consequences (impulsivity?)
- Self-medication to enhance cognitive functioning?
- More antisocial friends?

Other findings



More information



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