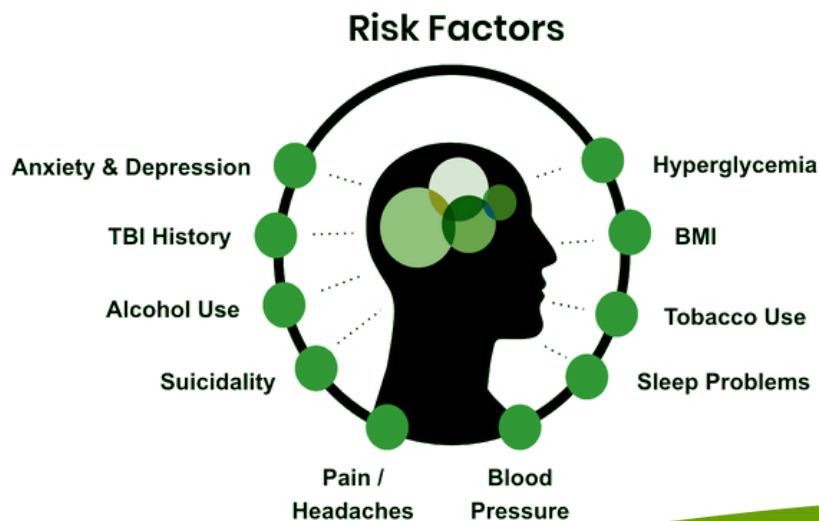


Ceresant BrainDash

An Evidence-Based, Turnkey Behavioral Risk Platform Delivering Real-Time Risk Assessment and Monitoring Linked with AI-Supported Management Options

Dr. David Cifu, M.D.

The dramatic growth in mental health disorders and their impacts on individuals, families and societies are the result of a wide range of both long-standing and contemporary factors. While innovative pharmaceutical agents and holistic management strategies exist and are being developed to address these conditions, early interventions for individuals at risk or with initial signs of stress are universally accepted as the best approach to successful prevention and management. Comprehensively addressing and treating underlying behavioral health risks and active stress before the clinical expression of mental illness offers the most efficacious and cost-effective approach to care. A review of the scientific literature identifies a number of factors that have been demonstrated to be associated with a higher incidence of the development of mental illness, resistance to treatment, likelihood of recurrence and negative outcomes (e.g., homelessness, completed suicide). These factors include demographics, epigenetics, childhood exposures, medical history, current behavioral functioning, clinical status, circulating chemical biomarkers, and active perceived stress and stress-related symptoms. Similarly, this literature also highlights the effectiveness and return on investment for preventative approaches to risk and early evidence of stress-related dysfunction.



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The Ceresant Solutions BrainDash (**B**ringing **A**ctive **I**nterventions by **D**etecting **A**ntecedents of **S**tressor of **H**ealth) tool is a practical tool that provides an automated 1-stop approach for identifying individuals' health and lifestyle factors and perceived stress that can predispose them to the development of later behavioral health difficulties. Moreover, based on the risks and stress symptoms, the tool links each individual with appropriate risk reduction education and training recommendations matched to their personalized needs. BrainDash offers a clinician-friendly, actionable behavioral health risk tool presented in an easy to understand clinical and patient dashboard that can be used to track an individual's risks and active stresses, monitor their usage of preventative treatments and offer a real-time surveillance of status.

The automated, periodic re-assessment of each person's behavioral health risk profile and perceived stress allows for real-time monitoring for clinicians and access to personalized risk and stress management interventions for patients. The behavioral health profile assessments (see Table 1) include a range of items that are often already being collected by clinicians, including 1) baseline factors (e.g. demography, childhood exposures, personal and family mental health history), 2) behavioral health functioning measures (PHQ-9, GAD-7, SWLS, AUDIT), and 3) measures of clinical status (SQS, IPAQ, REAP-S, SDS, ACE-10, metabolic measures). The optional fluid biomarker assessments (NfL, GFAP, alpha-Synuclein, IL-6, BDNF, p-Tau) have been chosen to identify signs of neuronal and systemic stress, injury and degeneration, and can add early, objective measurement of risks and status. The Perceived Stress Scale (PSS; See Figure 1) and Neurobehavioral Symptom Inventory (NSI; See Figure 2) are widely used, validated and practical patient questionnaires that identify both the level of active perceived stress and the range of clinical symptoms that can be manifested by that stress, which offer specific targets for preventative interventions. The data that can be collected at any time, virtually or in-person, are translated by the tool into useful information that allows clinicians a clear understanding of each individual's behavioral health risks and active perceived stress, the ability to monitor changes in those parameters, and feedback on the patient's responses to treatments. The patient is thereby provided a wide range of health and wellness resources based on their identified areas of needs.



braindash



At a glance, the clinician has a snapshot of the patient's range of behavioral health risks and active perceived stress, including rapid identification of active areas of concern, and an overview of the preventative and treatment interventions available. Each patient's risk profile and perceived stress are integrated into their electronic health record by the patient or clinician at regular intervals, at health care visits, or at any time using in-person or virtual portals. Normative data are used to determine an individual's risk based on the measures and with repeated assessments, the patient's own baseline is identified. BrainDash is designed as both a tool for health care clinicians and also for patients, offering a user-friendly profile can be accessed that will provide direct and impactful feedback to encourage patient 1) engagement to actively use the tool and 2) empowerment for self-management with a wide range of wellness resources linked to the specifically identified needs that helps to optimize patient-clinician interactions.

By establishing a comprehensive baseline for each individual patient that can be regularly monitored and integrated into a single, intuitive dashboard available to the provider and patient at the point-of-care, BrainDash enhances the efficiency and effectiveness of service delivery for clinicians and improve overall patient satisfaction. For each relevant behavioral health risk identified and/or active level of stress, BrainDash provides recommendations for and linkage to a range of preventative interventions in the form of targeted education and training tools that address the individual's identified risks and perceived stress.

Individuals with low risks will be linked with overall wellness and lifestyle modification services designed to optimize overall cardiovascular, cerebrovascular and behavioral health by providing education on approaches to optimize and maintain the low risk state (e.g., maintain healthy eating habits, reinforcing stress reducing behavior). Individuals with moderate risk in specific factors will be linked with targeted interventions designed to specifically address the identified factor or symptoms and reduce the risk (e.g., improve activity level, increase sleep quality, headache pain care). Individuals with high risks in specific factors will have a notification made to their primary care clinician on the specific risk factors for appropriate mental health care and treatments. Each individual's utilization of these care options will be recorded, their response to the care identified using the behavior risk profile measures, and a copy of their profile, accessed services, and response to care recorded and available for importation into their health care record. BrainDash offers a consolidated, data-driven, individualized patient metric that will enhance care via real-time surveillance, early and accurate detection, use of accessible preventative strategies and precise application of interventions and management strategies when they are needed based on prospectively identified variations in status.

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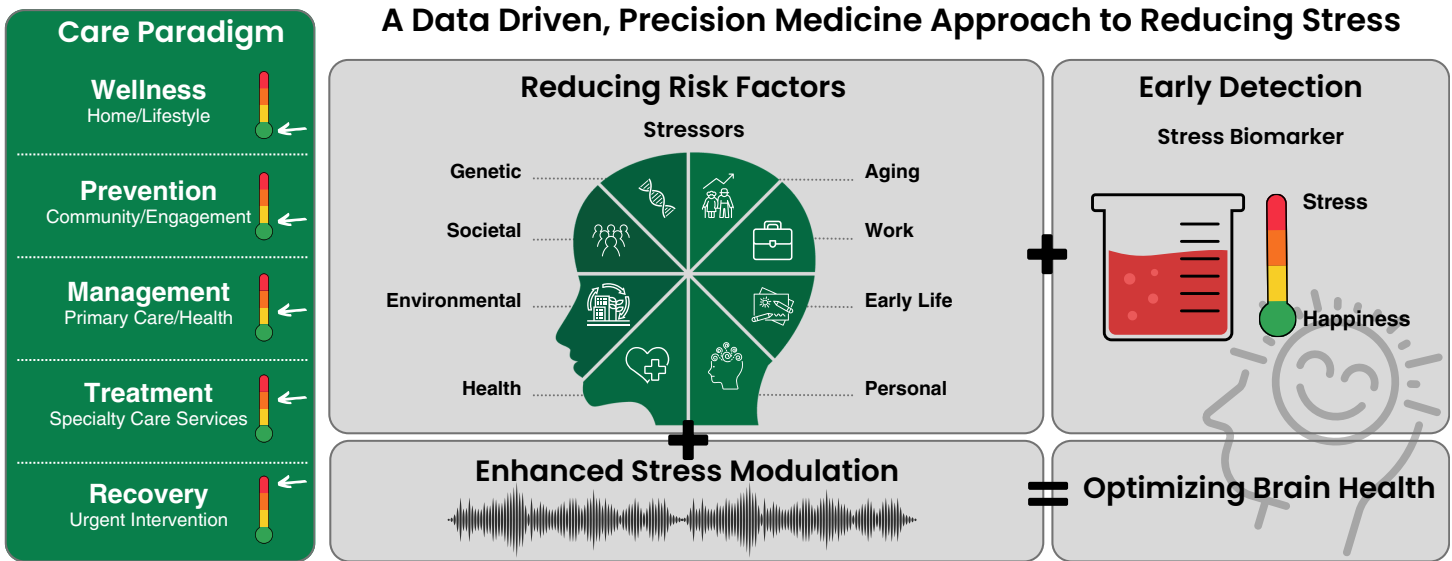


Table 1
BrainDash Risk Factors

Measures	Data Elements	Target Factor	Risk Level	References
A- Non-Modifiable Personal Risk Factors				
<i>Demographics</i>				
Birthdate	Age	<65 Years >65 Years	Low Moderate	60, 80, 108
Childhood SES (Zip Code)	Social Economic Status	>Medium Low	Low Moderate	33
Identified Racial Classification	Ethnicity	Non-White White	Low Moderate	17
Educational Level	Years	>High School <High School	Low Moderate	22
<i>Childhood Exposures</i>				
Adverse Childhood Exposure-10 (ACE-10)	Childhood Trauma	0 1-3 4-10	Low Moderate High	44, 53
Acute Concussion Evaluation	Prior TBI	No Yes	Low Moderate	18, 125

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Table 1 (continued)
BrainDash Risk Factors

<i>Personal and Family Mental Health History</i>				
Personal Depression History	Yes/No	No Yes	Low Moderate	81, 83, 87
Personal Anxiety Disorder History	Yes/No	No Yes	Low Moderate	50, 96
Personal History of Other Mental Health Conditions	Yes/No	No Yes	Low Moderate	81, 83, 87
Family Anxiety Disorder History	Yes/No	No Yes	Low Moderate	50, 96
Family Depression or Suicidality History	Yes/No	No Yes	Low Moderate	81, 83, 87

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Table 1 (continued)
BrainDash Risk Factors

B- Current Behavioral Health Functioning Measures				
Patient Health Questionnaire-9 (PHQ-9)	Depression	0-4 5-14 >15	Low Moderate High	23, 54, 75
Generalized Anxiety Disorder (GAD-7)	Anxiety	0-4 5-14 >15	Low Moderate High	82, 88, 105
Satisfaction With Life Scale (SWLS)	Satisfaction	>15 10-14 <9	Low Moderate High	8, 28, 36
Alcohol Use Disorders Identification Tool (AUDIT-C)	Alcohol Use	0-7 8-14 >15	Low Moderate High	16, 20
Tobacco Use	Yes/No	No Yes	Low Moderate	32, 121

Table 1 (continued)
BrainDash Risk Factors

C- Current Medical Status				
Sleep Quality Scale (SQS)	Sleep	7-10 4-6 1-3	Low Moderate High	103, 124
International Physical Activity Questionnaire (IPAQ)	Aerobic Exercise	High Level Moderate Level Low Level	Low Moderate High	12, 55, 107
Rapid Eating Assessment for Participants-Short Form (REAP-S)	Diet	13-22 23-31 32-39	Low Moderate High	34, 86, 97
Sheehan Disability Scale (SDS)	Work and Social Disability	0-10 11-20 21-30	Low Moderate High	56, 84, 99
Visual Analog Pain Scale (VAS)	Pain Intensity	0-3 4-6 7-10	Low Moderate	10, 47

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Table 1 (continued)
BrainDash Risk Factors

D - BioPhysiological				
Body Mass Index (Kg/Cm2; BMI)	Obesity	18.5-24.9 <18.5 or 25-29.9 >30	Low Moderate High	59, 114
Diastolic Blood Pressure	Hypertension	<130/80 130-139/80-89 >140/90	Low Moderate High	57, 95
Serum A1C	Diabetes Mellitus	<5.7% 5.7-6.4% >6.5%	Low Moderate High	42, 94
NfL (Neurofilament Light)	Axonal damage	Normal Elevated	Low Moderate	TBD
GFAP (Glial fibrillary acidic protein)	Neuronal damage	Normal Elevated	Low Moderate	TBD
alpha-Synuclein	Oxidative cell damage	Normal Elevated	Low Moderate	TBD
IL-6 (Interleukin 6)	Inflammation	Normal Elevated	Low Moderate	TBD
BDNF (Brain-derived Neurotrophic factor)	Neural Plasticity	Normal Elevated	Low Moderate	TBD
p-Tau (phosphorylated Tau)	Neurodegeneration	Normal Elevated	Low Moderate	TBD

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Figure 1 Perceived Stress Scale

A more precise measure of personal stress can be determined by using a variety of instruments that have been designed to help measure individual stress levels. The first of these is called the Perceived Stress Scale.

The Perceived Stress Scale (PSS) is a classic stress assessment instrument. The tool, while originally developed in 1983, remains a popular choice for helping us understand how different situations affect our feelings and our perceived stress. The questions in this scale ask about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer fairly quickly. That is, don't try to count up the number of times you felt a particular way; rather indicate the alternative that seems like a reasonable estimate.

For each question choose from the following alternatives: 0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

_____ 1. In the last month, how often have you been upset because of something that happened unexpectedly?

_____ 2. In the last month, how often have you felt that you were unable to control the important things in your life?

_____ 3. In the last month, how often have you felt nervous and stressed?

_____ 4. In the last month, how often have you felt confident about your ability to handle your personal problems?

_____ 5. In the last month, how often have you felt that things were going your way?

_____ 6. In the last month, how often have you found that you could not cope with all the things that you had to do?

_____ 7. In the last month, how often have you been able to control irritations in your life?

_____ 8. In the last month, how often have you felt that you were on top of things?

_____ 9. In the last month, how often have you been angered because of things that happened that were outside of your control?

_____ 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Figure 2 Neurobehavioral Symptom Inventory

Please rate the following symptoms with regard to how much they have disturbed you IN THE LAST 2 Weeks. The purpose of this inventory is to track symptoms over time. Please do not attempt to score.

0 = None – Rarely if ever present; not a problem at all

1 = Mild – Occasionally present, but it does not disrupt my activities; I can usually continue what I’m doing; doesn’t really concern me.

2 = Moderate – Often present, occasionally disrupts my activities; I can usually continue what I’m doing with some effort; I feel somewhat concerned.

3 = Severe – Frequently present and disrupts activities; I can only do things that are fairly simple or take little effort; I feel I need help.

4 = Very Severe – Almost always present

Symptoms	0	1	2	3	4
Feeling Dizzy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of balance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor coordination, clumsy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vision problems, blurring, trouble seeing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sensitivity to light	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hearing difficulty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sensitivity to noise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Numbness or tingling on parts of my body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in taste and/or smell	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of appetite or increased appetite	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor concentration, can’t pay attention, easily distracted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forgetfulness, can’t remember things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty making decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slowed thinking, difficulty getting organized, can’t finish things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fatigue, loss of energy, getting tired easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty falling or staying asleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling anxious or tense	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling depressed or sad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Irritability, easily annoyed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor frustration tolerance, feeling easily overwhelmed by things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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