The Multimodal Functional Model—Advancing Case Formulation Beyond the “Diagnose and Treat” Paradigm: Improving Outcomes and Reducing Aggression and the Use of Control Procedures in Psychiatric Care

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Improving clinical outcomes, treating aggression, and reducing the use of restraints and seclusion are major concerns to providers of psychiatric services. Devising precise treatments directed by causal hypotheses that address the functional properties of maladaptive behaviors are essential for reducing aggression, increasing understanding of causal factors, and enhancing individual control and adaptive choices. This article describes the Multimodal Functional Model (MFM), a sophisticated case formulation and treatment model that moves beyond the “diagnose and treat” paradigm and provides interventions that address causal factors, reduce aggression, and prevents the use of restraints and seclusion in psychiatric settings.

Keywords: functional behavioral assessment, case formulation, treatment planning, restraints and seclusion, inpatient treatment, multimodal functional model

The Multimodal Functional Model (MFM) evolved as a sophisticated case formulation and treatment model from a rich history of behavior analytic research aimed at assessing and understanding underlying causes of unwanted behaviors. O’Brien and Haynes (1993) stated:

Behavioral assessment, with its empirical and pragmatic emphasis on identifying important causal functional relationships between setting events and biobehavioral responses, is the most appropriate and responsible means of meeting the specialized assessment demands of contemporary inpatient psychiatry. These specialized demands require that a comprehensive assessment be conducted to identify the components of disordered and/or adaptive behaviors and the variables that control them. The assessment information can then be used to (1) design interventions that bring about a modification of patient behavior and (2) monitor treatment effectiveness. (p. 39)

There are many functional assessment approaches and instruments (see Bellack & Hersen, 1998; O’Neill et al., 1997; Sturmey, 1996). The MFM utilizes any number of these approaches as it may apply to a specific individual, situation, or context. The major contribution of the MFM is that it has been designed to integrate a comprehensive array of functional assessment procedures and observation and data collection techniques into an integrated, comprehensive, biopsychosocial case formulation and treatment plan. It is not focused merely on unwanted behaviors. Case formulation using the MFM approach requires attention to both internal (medical, biological, genetic, perceptual, cognitive) areas as well as external (situational, environmental, social, contextual) areas of analysis. The MFM uses empirical analysis to understand the entire array of biological, psychological, and social experiences and integrates this information into an empirical, hypothesis-testing, longitudinal approach that utilizes functional (causal) hypotheses to both drive and evaluate specific treatment interventions.

The major contrast is not between the MFM and the functional assessment/analysis approaches to case formulation but rather the MFM and a typical “diagnose and treat” paradigm that is so pervasive in the medical field today. Many clinicians believe that case formulation is complete when assigning a Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM–IV) diagnosis and identifying the general interventions that are commonly associated with that particular diagnosis. When the patient does not respond to the generic interventions, then consideration is given to finding another diagnosis that permits an additional array of generic interventions. Continual attention to finding “the right” DSM diagnosis and being satisfied with this gross level of etiological information, diverts attention from more sophisticated analytic approaches that can actually lead to the discovery of causative factors that lead to precise interventions directed at those factors. When the MFM is used, the paradigm changes from one that uses generic and primarily pharmacological approaches that manage symptoms, to specific, causally directed interventions that have the potential to lead to enduring change. It is important to understand the difference in these case formulation approaches because at least 40% of people experiencing serious mental illness are not substantially helped with the generic and chemical interventions derived from DSM diagnoses (Ciompi, 1980; Harding & Strauss, 1985; Kane, 1989; Silverstein et al., 2006; Stephens, 1978; Torrey, 2001).

Attention to diagnosis as the end all of case formulation has led to an overdependence on psychiatric medication. Many hospitals today use a “drugs first” approach to all patients regardless of that person’s history related to medication response. Hunter (1999, 2000, 2001) described hospitals whose primary intervention model consists of “drugs and TV therapy.” Many people exposed to these limited case formulation and diagnostic practices experience poor clinical outcomes, high relapse rates, and unnecessary long-term suffering.

Using medication as the only focused intervention to “treat” psychiatric patients with co-occurring behavior disorders leads to poor outcomes as well. Attempting to resolve behavioral problems with drugs also diverts attention from more comprehensive behavioral assessments, analysis and treatment of the actual causative factors.

A common error in the treatment of behavior problems in individuals with psychotic syndromes is to assume a direct link between the psychiatric diagnosis, its primary symptoms, and the disruptive behaviors of concern. This case formulation error is an illustration of diagnostic overshadowing, assuming a major diagnosis or symptom is the direct cause of other treatable problems, conditions, or symptoms and that treatments for the major symptom (e.g., psychosis → antipsychotic drugs) will somehow be expected to resolve the remaining problems, skill deficits, or unwanted behaviors. Another variant of diagnostic overshadowing involves overlooking symptoms of other treatable disorders (e.g., depression) and assuming that those indicators (e.g., withdrawal, sadness, agitation, sleep disturbances, etc.) are components of another, more prominent disorder (e.g., mental retardation) (Reiss, Levitan, & Szyszko, 1982; Reiss & Szyszko, 1983). This case formulation error directs attention away from the assessment of the unique functional properties of the behaviors of concern, the communication intent of the behaviors, and the interactions between the person and the social and physical features of his or her
environment. The “diagnose and treat” paradigm directs clinical attention to psychiatric diagnoses and/or symptoms that may only be minimally linked to the expression of the aggressive or dangerous behaviors that were the cause of the hospitalization or that keep the person from discharge into the community. Furthermore, it has come to represent a system of managing or suppressing symptoms primarily with medications and disregarding the treatment of causal factors and specific antecedents which would result in learning, individual control and empowerment, and a more enduring recovery. Although medication may be critically important in the treatment of one or two of the major psychiatric symptoms, the symptoms most responsive to the medication may not be those most strongly linked to a person’s challenging behaviors and reasons for admission in the first place (Citrome et al., 2001). Hence, it is possible for inpatient programs that rely primarily on medications for treatment of behavior dysfunction in people with serious mental illness to perpetuate a therapeutic regimen that is inadequate for the person. Furthermore, settings that are guided by this restrictive “diagnose and treat” paradigm commonly over rely on restrictive behavioral management and control procedures that include the inappropriate use of chemical and/or physical restraints and seclusion (Donat, 1998, 2002; Paul & Lentz, 1977). Such programs experience unnecessary patient and staff injuries, rely on high-dose medication regimens that produce adverse side effects and discomfort, and have high patient readmission rates (Hunter, 1995, 1999, 2000, 2001).

Appropriate treatment of behavior dysfunction in a person with serious mental illness requires sophisticated behavioral and psychological interventions designed to understand the purpose and meaning of the behavior in the personal and environmental contexts in which it occurs. This involves identifying the stimulus conditions (both internal and external) associated with the behavior. Resulting case formulation strategies would inform both patient and staff of conditions and circumstances that increase the likelihood that the patient would choose aggression or inappropriate behavior as a means of expression. Formal study of the interactions between antecedent conditions (both internal and external) and consequence conditions, and their relationships with psychiatric symptoms, communication styles, medical issues, preferences, and other considerations leads to informed clinical hypotheses about the purpose and meaning of the challenging behaviors and the conditions that both prompt and maintain it. These diagnostic insights offer direction to staff and focus intervention strategies (psychiatric, psychological, social, rehabilitative, etc.) on causative factors. This article suggests that the absence of widespread use of sophisticated psychological assessment and intervention tools designed specifically to identify and treat behavior dysfunction leads to undertreatment and to maintenance of dysfunctional behaviors, that in turn often result in unnecessary distress and to the misuse of restrictive procedures in psychiatric, correctional, and other residential settings (e.g., intermediate care facilities, institutions for mental diseases, community living centers).

Medication selected for treatment of symptoms of mental illness must not inhibit memory, learning potential, or other cognitive functions that mediate responsiveness to rehabilitative interventions (Liberman, Corrigan, & Shade, 1989; Liberman, Falloon, & Wallace, 1984; Storzbach & Corrigan, 1996) and should be continued only when objective evidence reports positive impact. Furthermore, medication should address only those components of a person’s illness responding to that medication as indicated by objective measures of progress and outcome, and not be used to sedate people or to chemically restrain functioning.

The MFM provides an example of how treatment planning becomes a more specific assessment and case formulation process involving an empirically iterative process that results in the generation of causal hypotheses, followed by causally directed interventions, followed by measurements of progress, followed by further functional assessments leading to revised and more sophisticated causal assumptions, leading to treatment interventions specific to these hypotheses, and so on until measurable progress and improved outcomes are achieved. This ongoing multimodal functional case formulation, intervention, and measurement process directly involves the client, associated family members, and all staff interacting in an exploration and investigation aimed at uncovering the multiple and interacting causes of complex behaviors or symptoms and developing and testing interven-
tions, skills training, and other supports required to assist the person in becoming empowered and achieving desired self-agency and successful entry into community life.

The MFM

The MFM provides a structure for clinical case formulation and the implementation of intervention strategies to assist patients and clinical teams in designing treatment for behavior problems and other symptoms associated with mental illness and/or mental retardation (Bedell, Hunter, & Corrigan, 1997; Gardner & Hunter, 1995, 2003; Gardner & Sovner, 1994; Griffiths, Gardner, & Nugent, 1998). The approach reflects an integrative biomedical-psychological-socioenvironmental perspective that stands in contrast to the “diagnose and treat” model typically used in most hospitals today. The emphasis on multimodal, as opposed to multidisciplinary, focuses attention on the various biomedical and psychosocial modalities of influence contributing to behavioral and emotional symptoms rather than on the discrete professional disciplines involved. Functional connotes the assumption that a patient’s symptoms are best viewed as the “final common pathway” of an individual’s functional adaptations to environmental, physical, and social demands as well as disturbances in neurochemical and physiological functioning. Under the model, the initial step toward designing interventions to treat socially inappropriate adaptations and to replace them with more normalized ones involves identification and assessments of these multiple functional relationships. That is, it is first necessary to identify preceding instigating conditions, and consequences of a behavior from the perspective of each modality, and to determine the relative influence of biological, psychosocial, and environmental factors on the initiation, severity, variability, and persistence of the patient’s current behavior problems or symptoms. The resulting interventions will shift from a symptom management (i.e., symptom suppression) focus to one that directly addresses causative factors, including biomedical factors, cognitive, perceptual, psychosocial skills deficits, and ongoing tertiary or vulnerability influences that contribute to the patient’s symptoms and behaviors. The steps in the model also apply to determining functional antecedents for prosocial and replacement behaviors as well. Space did not allow for descriptions of this aspect or for providing charts of prosocial responses in the case example. Clients are active in making choices about replacement behaviors and in formulating causal hypotheses for both unwanted and chosen behaviors.

MFM Diagnostic Formulations

Step 1: Assessing triggering and setting conditions. The treatment planning process begins with the identification of the specific set of target symptoms and/or behaviors of concern. These symptoms and behaviors must be operationally defined so all staff and the patient can readily observe them when they occur and then rate their frequency, intensity, duration and/or variability. Thereafter, the case formulation process focuses on the development of specific causal hypotheses about the functional significance or meaning of the symptoms and behaviors within the larger context in which they occur. Specifically, all staff should be involved in identifying current external (e.g., loss of a loved one; realization that housing options hoped for are not currently possible) and internal (e.g., anxiety, chronic anger, iatrogenic sedation) stimulus conditions. Each stimulus condition is considered to serve either a primary or secondary instigating function (Gardner & Sovner, 1994). Primary influences are those that must be present for symptoms to occur (necessary conditions). That is, they are discriminative events or “trigger” stimuli that are observed to immediately precede (and significantly increase the likelihood of) the behavior. Examples include a task demand in a harsh tone (an environmental psychosocial stimulus) that may set off an episode of aggressive behavior. A loud noise (a stimulus condition in the physical environment) may trigger an anxiety attack; a seizure (a personal/medical condition) may trigger screaming in a patient. Secondary instigating influences are those whose presence either increases or decreases the likelihood that a symptom or behavior will occur in the presence

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of the primary instigator. There are many conditions that serve to "set up" the person, or increase the probability of the behavior given a sufficient "trigger" stimulus. Sleep deprivation, for example (personal/medical condition), may increase the likelihood that a minor trigger stimulus would set off the behavior. The patient may not become aggressive when given a task demand in a harsh tone if they were not sleep deprived. Headaches, physical pain, noise, heightened anxiety, irritability, anger, temperature, and boredom are examples of potential setting stimulus conditions that if controlled or eliminated may reduce the probability of the expression of the maladaptive behavior.

Step 2: Assessing the purpose of the behavior. Following determination of the external and internal stimulus conditions under which the problem symptoms/behaviors occur, staff focus assessment on the purposes or functions being served by the symptoms/behaviors (e.g., modulating pain, avoiding rejection, communicating a need). It should be noted that some symptoms (e.g., command auditory hallucinations) directly reflect underlying neurobiological abnormalities. However, even these symptoms often begin to acquire functional features as they become associated with distinct reinforcing consequences, and one can observe a change in frequency, duration or intensity related to specific consequences (e.g., getting attention, being left alone, etc.).

Step 3: Assessing Vulnerability Influences

The next hypothesis-generating step involves observations regarding how primary and secondary instigators are combined with tertiary or vulnerability influences. Tertiary stimulus conditions are ongoing challenges or deficits that interact with primary (trigger) and secondary (setting) stimuli that increase the probability of the expression of the behavior. Examples include sensory impairments, personality characteristics, cognitive impairment, limited communication skills, limited anger management, impulse control, or conflict resolution skills, chronic low frustration tolerance, and so forth. These tertiary conditions serve as targets for rehabilitation efforts that focus on teaching skills and coping strategies to improve resilience to environmental stressors. Understanding the interplay among primary, secondary, and tertiary stimulus conditions across both external and internal variables leads to a detailed understanding of how abnormal behaviors emerge and provides causal hypotheses that direct the design of interventions focused on outcomes associated directly to these causal hypotheses (see Figure 1).

Collecting data. Collaboration and ongoing dialogue with the patient concerning his or her perceptions of the significant influences on target symptoms and behaviors along with his or her goals and motivations are central to the functional assessments, the causal hypotheses generated, and the measurement process. In addition, collecting baseline data using objective measures is critical to determining instigating events and consequences as well as the dimensions of the behavior (i.e., frequency, intensity, duration, and variability). Any one of several data collection formats may be useful to this end.

Recording target behaviors across time intervals throughout each day, over time (Patterns and Trends Data Sheet, available from first author), results in very helpful cues for studying and understanding many behaviors. Observing behavior over time allows for many functional hypotheses related to cycles, specific days (e.g., structured days vs. unstructured days), periods when certain staff are present or absent, the relationship between the behavior and any number of environmental or programmatic changes, and patterns of expression that may be linked to various biological cycles (e.g., hunger, sleep deprivation, medication changes or administration schedules, premenstrual periods).

There are several other methods and formats for data collection that are useful for any given situation. Clinicians experienced in behavioral techniques should assume responsibility for designing effective data collection systems, training direct care staff in collecting data, and analyzing and graphing data for distribution to the patient and other members of the treatment team for further analysis. These data are then used in conducting more formal functional assessments and in the generation of causal hypotheses concerning the interplay of antecedent and consequence conditions on the behavior.

Functional assessments/analysis. There are a variety of functional assessment techniques from simple to complex that improve hypothesis formulation and enrich implementation strat-
### Figure 1. Multimodal functional causal hypotheses worksheet.

<table>
<thead>
<tr>
<th>Client: Gary</th>
<th>Record No.: XXXX</th>
<th>Date: X/XX/200X</th>
<th>Staff: Second Chance staff</th>
</tr>
</thead>
</table>

#### Target Symptoms
1. **Severe movement disorder** (choreiform-like movements of limbs, trunk, neck and tongue)  
2. **Loud moaning, yelling and crying, writhing and crawling on the floor, removing clothing, grabbing and hugging people and begging them to remove/adjust his clothing**  
3. **Using aggressive words or movements**  
4. **Polysubstance dependence**  
5. **Abandonment and loss issues**

<table>
<thead>
<tr>
<th><strong>Instigating Influences</strong></th>
<th><strong>Consequences/Functions</strong></th>
<th><strong>Interventions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental</strong></td>
<td><strong>Primary (Discriminative) Events</strong></td>
<td><strong>Secondary (Setting) Events</strong></td>
</tr>
<tr>
<td>Physical</td>
<td>Three years living in inpatient setting (2,3,5)</td>
<td></td>
</tr>
<tr>
<td>Psychosocial</td>
<td>Not getting his needs met immediately (2,3, increase in 1)</td>
<td>Staff &amp; patients avoiding or helping when he’s out of control (2,3,5)</td>
</tr>
<tr>
<td>Biomedical</td>
<td>Withdrawal symptoms from benzos (1,2,4)</td>
<td>? dependence on benzodiazepine (1,4)</td>
</tr>
<tr>
<td>Affective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceptual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motoric</td>
<td>Discomfort/pain, exacerbation in movement with stress (increase in 1, 2, 3)</td>
<td>Severe movement disorder (1)</td>
</tr>
<tr>
<td>Social/Coping</td>
<td>Not getting needs met from staff/peers (2,3,5, increase in 1)</td>
<td>Prison time and pending court hearing for drug dealing (4,5)</td>
</tr>
<tr>
<td>Communication Skills</td>
<td>Not getting needs met from staff/peers (2,3,5, increase in 1)</td>
<td>Limited skills when agitated - reverts to mainly nonverbal forms of communication (2,3)</td>
</tr>
<tr>
<td>Personality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Positive) can be charming and socially skilled when calm
egies (Haynes & O’Brien, 1990; Nezu & Nezu, 1989; O’Neill et al., 1997). In the MFM, the causal hypothesis-intervention formulation process is case specific and, therefore, does not rely on prior determined assessment protocols that are completed on all clients by separate disciplines. Rather, assessment activities focus on understanding symptoms/behaviors as they relate to the unique personal and environmental influences relevant for that individual. Data collection and functional assessment lead to the formation of functional causal hypotheses that are linked to specific intervention strategies. In the MFM, the Multimodal Functional Causal Hypotheses Worksheet (see Figure 1) allows for causal hypotheses to be formulated for both antecedent conditions (instigating influences) and consequence conditions (consequences/functions) as they may influence both external (environmental) and personal (internal) variables. Understanding how consequences (positive reinforcement, negative reinforcement, sensory feedback and other) are linked to maladaptive behaviors also helps in designing focused intervention strategies. Moreover, utilizing the Causal Hypotheses Worksheet promotes consideration and formulation of testable hypotheses concerning the interplay of these factors.

Intended use of the Causal Hypotheses Worksheet is as follows. For each symptom or behavior, the multidisciplinary team member(s) most skilled in evaluation of a specific modality of influence (e.g., medical, neurological, psychological, socioenvironmental) will develop hypotheses about the instigating and exacerbating conditions specific to that modality purported to be related to the symptom/behavior. In addition, hypotheses about the level of influence of these conditions (i.e., primary, secondary, and tertiary) and the functionality of the presenting symptom/behavior are developed. For example, a patient’s violent outburst may be due to the combined instigating influences of another patient’s excessive staring (primary event) and persecutory delusions that others are trying to recruit him against his will to become a hit man (secondary setting event). In this case, the functional purpose of the violent outburst may be an adaptive response to scare others away from forcing him to be a hit man. Finally, the worksheet is used to formulate ideas about possible interventions (categorized as treatment, management, and control procedures) (Gardner & Cole, 1987; Gardner & Sovner, 1994; Hunter, 2000) related to the clinical impressions.

Linking functional causal hypotheses to interventions. In the MFM, it is important to link each intervention (including medication) to specific hypotheses. The Specific Discipline Hypothesis-Intervention Formulations Worksheet (see Figure 2) provides the format for that process. Each formulation (hypothesis) developed from previous worksheets is listed in column A. In column B, the specific intervention is listed that derives from that hypothesis. For example, if one hypothesis is that aggressive behavior is a result of command hallucinations resulting from schizophrenia, then the intervention strategy might be the use of an antipsychotic medication to reduce or eliminate the hallucinations. In this phase of the case formulation process, one would list command hallucinations in column A, the antipsychotic medication in column B. Since all formulations are actually clinical causal hypotheses, all must be tested. In this example, the clinician ordering the medication would be asked to state what would be a successful outcome of the medication regimen within a designated time period. The expected change (column D) might be a statement that successful elimination of the hallucinations would reduce those aggressive episodes instigated by the hallucinations, for example, the frequency of aggression should decline from an average of 7 incidents a week to zero incidents within 6 weeks. This would become the metric for assessing the “hallucination/medication” hypothesis. A data collection system would be designed with staff responsible for recording. The next step (column F) would involve someone being assigned responsibility for analyzing the data and informing the team within the 6-week period of the outcome. If no change were observed or if aggression increased over the course of the evaluation period (6-weeks), the hypothesis would be not be supported and the medication stopped (unless it provided other measurable benefits associated with other clinical hypotheses).

During the completion of the Hypothesis-Intervention Formulations Worksheet, several hypotheses may be developed with several specific intervention strategies. Each would have a measure of outcome associated with it (often the same data system is used to evaluate any number of different interventions). Staff, during the planning session, would agree to a staging plan (column C) whereby they would prioritize
**Figure 2.** Specific discipline hypothesis-intervention formulations worksheet.

<table>
<thead>
<tr>
<th>Medical</th>
<th>Psychiatric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological/Habilitative</td>
<td>Socioenvironmental</td>
</tr>
<tr>
<td>X</td>
<td>Client/Family</td>
</tr>
</tbody>
</table>

- **Client:** Gary
- **Record No:** XXXXX
- **Date:** XX/XX/200X
- **Staff:** Second Chance staff

### Causal Hypotheses (A)

| Severe adjustment/anxiety reaction to changing his residence (1, 2) |
| the observed behaviors are triggered by not having his needs met immediately (2 and exacerbations in 1) |
| the behaviors (1, 2, and increase in 1) result in more attention (both psychosocial and physical) from staff and other patients |
| when prompting others not to attend and prompt Gary to do things on his own, severity of his intolerable behavior increases to include aggression (3) |

### Causally-based Interventions (B)

| Collect data to support/disconfirm hypothesis (1,2), and |
| Create a behavior contract with the patient and treatment team designed to teach him prosocial means of getting his needs met (replacement behaviors) thereby reducing the frequency, duration and intensity of maladaptive target behaviors (2, 3, and exacerbations in 1) |
| Since getting attention/needs met appears to be reinforcing, include types of rewards in behavior plan when the patient engages in prosocial behavior and remove these rewards when engaging in maladaptive behavior (2, 3) |
| Individual and group treatment for polysubstance dependence (4) |

### Causally-based Interventions (B)

| The patient will be evaluated to rule out other diagnoses (e.g., HD) (1,2,3) |
| Data collection and start of the behavior plan will be initiated simultaneously. The plan will be agreed to by staff and patient. (2,3, increase in 1) |
| Simultaneously, medication changes will be implemented (1,2,3) |
| The behavior plan will be utilize the concept of successive approximations toward the target behavior (of 0 hours of the target symptoms other than number 1) and reviewed/updated on a weekly basis (2,3, increase in 1) |
| Substance abuse treatment, individual and group skills training and supportive therapy will be started after successful reduction of 2,3 |

### Expected Change (Type/magnitude/time) (D)

| Behavior may paradoxically escalate at first, due to response burst phenomenon (2,3, increase in 1) |
| Thereafter, it is expected that the behavior will reduce gradually (with some variability) over several months. Target behaviors 2 and 3 should reduce together with target behavior number 1 reducing gradually as well, but plateau with little chance of being eliminated. |

### Data (Type/Schedule) (E)

| Neurological exam and psychiatric workup (1, 2) |
| Data from the Patterns and Trends data sheet (2,3) |
| Unit data on daily behavior ratings (2,3) |

### Responsible Staff: Review Schedule (F)

Staff from all disciplines will carry out the behavior plan and attend weekly review meetings with the patient. Psychology will be responsible for updating the plan.

### Target Symptoms

1. severe movement disorder (choreiform-like movements of limbs, trunk, neck and tongue)
2. loud moaning, yelling and crying, writhing and crawling on the floor, removing clothing, grabbing and hugging others and begging them to remove/adjust his clothing
3. aggressive words or movements
4. polysubstance dependence
5. abandonment and loss issues
which interventions would be implemented and in what order. As the team identified hypotheses that were not useful (i.e., the accompanying intervention strategies did not produce positive outcomes for the individual), other more refined causal hypotheses with more focused intervention strategies would be selected. This evaluation sequence provides valuable information about when to stop an intervention, and can prevent the practices of either adding interventions without knowing what the previous interventions contributed, or of continuing interventions that are ineffective.

The Multimodal Integrated Intervention Plan (see Figure 3) represents a summary compilation from the previous worksheets and includes the multimodal causal hypotheses, hypothesis-based interventions, staging plan, expected change for each intervention, an ongoing data collection system for monitoring change, and a review schedule for each intervention selected. As this system is deployed, there is an ever-increasing database about what works, how much is added or lost with each subsequent intervention, and a record of what has been previously tried along with its effects. This case formulation and intervention model results in streamlined treatment programs that, over time, continue only those interventions that result in measurable benefits to the individual. Further, the inexcusable practice of continuing marginally effective or ineffective interventions for years is challenged by the continuous review of outcome data and the team’s ongoing hypothesis formulation process.

Case Example

A summary of the case of Gary, a pseudonym, represents a patient treated at the Second Chance Program at Weill Medical College of Cornell University/New York Presbyterian Hospital, Westchester Division (Silverstein et al., 2006).

Behavioral description. Gary, a 28-year-old African American man with a history of psychosis (DSM–IV diagnosis of Schizoaffective disorder), history of polysubstance abuse/dependence (cannabis dependence, alcohol and crack cocaine abuse), and a major movement disorder (uncontrollable choreiform-like movements of all four limbs, trunk, neck, and tongue, and dystonia), was referred to the Second Chance Program. It would be helpful here to see Figure 1 and view the first two columns that list personal and environmental attributes (Column 1) and the domains (Column 2) mentioned in subsequent paragraphs concerning relevant stimulus conditions.

Gary was transferred from the state hospital where he had spent 2 years on an inpatient treatment unit (Environment–Physical, secondary setting condition; see Figure 1, Columns 1 and 2) and during which he had little contact with family which he desperately wanted (Environment–Psychosocial, secondary setting condition). Gary’s psychotic symptoms were in remission and affective symptoms and movement disorder were partially managed by the following medication that were prescribed on entry to the Second Chance program: Olanzapine 15 mg qhs (psychosis), Methadone 10 mg, bid (for pain due to movement disorder), Gabapentin, 600 mg bid (mood stabilizer), Baclofen 200 mg qhs (muscle relaxant), Trihexyphenidyl (movement disorder) 22.5 mg qam, Sertraline 100 mg qhs (depression), Lorazepam 2 mg bid (behavior control).

Gary’s behavior dyscontrol was operationally defined as loud moaning, yelling, crying, crawling and writhing on the floor, indiscriminant grabbing and hugging of anyone near him, removing clothing, and begging others to help him remove or adjust clothing. In the early assessment phase, it was unclear what primary events would trigger this set of behaviors. However, it quickly became clear that occurrences of these behaviors appeared to be highly correlated with the severity of his movement disorder (Personal–motor tertiary condition) which, in turn, appeared to cause him more distress (Person–motoric secondary setting). Gary displayed these behaviors immediately on arrival on the unit, and approximately 7 hours per day for the first several days. Initially, he demonstrated such severe writhing, yelling, and crying that he was in restraints or in seclusion much of his first two days on the unit. These behaviors, though initially frightening and confusing to other patients and staff, resulted in mobilizing

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2 Details of this case history were previously published in Sante Mentale au Quebec as: Wilkniss, S. M., Hunter, R. H., & Silverstein, S. M. (2004). Traitement multimodal de l’agressivité et de la violence chez des personnes souffrant de psychose. Sante Mentale au Quebec, 29, 2, 143–175.
<table>
<thead>
<tr>
<th>Formulations</th>
<th>Causal Hypotheses</th>
<th>Causally-based Interventions</th>
<th>Staging Plan</th>
<th>Expected Change (Type/magnitude/time)</th>
<th>Data (Type/Schedule)</th>
<th>Responsible Staff; Review Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>R/O Huntington’s Disease or other neurological condition (e.g., substance-induced)</td>
<td>Neurological work-up and CT scan Pharmacology</td>
<td>R/O Huntington’s and other neurological conditions</td>
<td>Regardless of diagnosis, expect moderate reduction in movement symptoms through pharmacologic intervention</td>
<td>Neurological exam CT scan labs</td>
<td>Psychiatry (ATS) and medical consult</td>
</tr>
<tr>
<td>Psychiatric</td>
<td>Schizoaffective Disorder TD/EPS Comorbid Anxiety Disorder updated hypothesis; Sxs exacerbated by withdrawal from benzodiazepines</td>
<td>Psycho-pharmacology standing dose of Ativan 2 mg p.o. a.m.</td>
<td>Treat pharmacologically for psychosis, movement disorder, and anxiety; PRNs</td>
<td>Sustained stabilization of psychotic symptoms, control of EPS/TD, reduced anxiety, and decreased behavioral dyscontrol Morning episodes of behavioral dyscontrol will decrease in intensity and duration</td>
<td>Labs Patterns and Trends sheet</td>
<td>Psychiatry (ATS) and nursing staff Psychology (SW)</td>
</tr>
<tr>
<td>Psychological</td>
<td>Attention-seeking behavior and socially-maladaptive means to address needs</td>
<td>Behavior plan including differential reinforcement of successive approximations and time-out from reinforcement procedures</td>
<td>Start with allowing 4.5 hours of behavioral dyscontrol per day (slightly below median) And reduce by 0.5-1 hour as soon as successful at that level); continue each week: Sustain reinforcement for replacement behaviors; Making needed changes to maximize reduction of target behaviors</td>
<td>Periods of episodic dyscontrol reduced from 7 hours per day to less than 1 and from daily to less than 4 x per week (change to occur over the course of 1-2 months)</td>
<td>Patterns and Trends sheet and unit behavioral observations sheets Evaluation of Data to inform subsequent behavior plans</td>
<td>All staff Psychology and txt coordinator to coordinate (SW, MK) and all staff to help implement</td>
</tr>
<tr>
<td>Socio-environmental</td>
<td>Other clients drawn in to provide attention and physical contact</td>
<td>Prompt Gary and other patients when this occurs, eliciting, and/or suggesting alternatives or using time-out when unresponsive</td>
<td>Continue as long as behaviors occur</td>
<td>Expert significant reduction in noted behavior both on Gary’s and other client’s part over several weeks.</td>
<td>Examine point losses in behavioral dataset; Examine frequency of prosocial behaviors on behavior sheet</td>
<td>All staff</td>
</tr>
</tbody>
</table>

Figure 3. Multimodal integrated intervention plan.
others to attend to his needs in attempts to reduce his distress (e.g., patients would help adjust his clothing and get him water, staff would talk to and attempt to soothe him). Thus, social attention, which he appeared to enjoy was provided as a consequence of his behavior.

Hypotheses. The initial opinion of several staff was that Gary would not benefit from the program, was “untreatable” using psychological interventions, and needed to be moved as quickly as possible to a medical unit at another hospital to address an unknown neurological disorder (Physical and Psychosocial tertiary conditions). An alternative hypothesis was that he had both a severe movement disorder and was demonstrating severe anxiety/adjustment reactions to the change in his residence (Environment—biomedical tertiary condition). Thus, the observed symptoms (including the increase in severity of his abnormal movements) were mainly psychological in nature. The latter hypothesis was based, in part, on (a) observations of the patient at his former hospital (where the frequency and duration of his behavioral dyscontrol were reportedly less), (b) reports that he recently had spent a day in court without behavioral dyscontrol, and (c) a meeting with several staff in which he remained in good control and lucidly identified his needs and goals. Staff favoring this second view believed that Gary’s behavioral dyscontrol could be accounted for by attention-seeking, immature communication strategy, and a lack of appropriate social skills (Social/coping and communication tertiary stimulus conditions) to get his needs met (e.g., smoking, having contact with family members). It thus was felt that he could learn to meet his needs through more prosocial means. The attention seeking behavior and poor communication/social skill when under distress seemed in part to have its origin in his having been abandoned and his experiencing chaotic circumstances as a child (his mother and father were drug dealers, as he himself later became, and his mother was killed) (Personal—psychosocial/coping tertiary and setting conditions). His current attention-seeking behaviors were clearly triggered when his needs were not immediately met (Personal—social/coping primary discriminate events). Thus, the identified treatment goals were (a) to increase socially skilled, adaptive means of gaining attention and getting needs met, (b) to decrease the frequency, duration, and intensity of behavioral dyscontrol, and (c) to teach ways of coping with the severe movement disorder in adaptive ways. In view of the intensity and long duration of Gary’s episodes of behavioral dyscontrol, it was hypothesized that his behavior could be shaped by positively and successively reinforcing increasingly longer periods of good control combined with immediate time-out from reinforcement at the onset of dyscontrol.

Data collection. Since functional analysis of behavior using the MFM is powered by collection of objective data, staff began to collect data on the frequency and duration of the aforementioned behavioral excesses using a Patterns and Trends Data Sheet (available from the first author) that records observations over each 24-hr period, across days. This allowed staff to determine whether there was a discernable pattern to the periods and duration of behavioral dyscontrol. The pattern that emerged clearly indicated that all of the above operationally defined behaviors occurred together and with the same intensity in each episode of behavioral dyscontrol (rather than separately) and were therefore targeted as a whole. It was observed that the episodes occurred mainly in the morning and evening hours with fewer incidents during hours of more structured activity. Additionally, weekly behavior ratings of over 20 categories of socially intolerable and prosocial behaviors were measured as a standard part of the milieu treatment in the program and allowed for the collection of additional objective data on Gary’s progress.

Integrating treatment and behavioral incentives. As part of treatment plan, medication changes were made to attempt to reduce the severity of his movements (Trihexyphenidyl was lowered ultimately to 2.5 mg, as it increases movements at the higher dose, Sertraline was discontinued and Nortryptyline added, as Selective Serotonin reuptake inhibitors may contribute to movement disorders in some individuals). According to the second hypothesis, that Gary’s behavioral dyscontrol could be reduced and prosocial behavior could be increased, a behavior contract involving differential reinforcement was implemented. Subsequent behavior plans reflected Gary’s demonstration of greater control over his behavior by increasing the amount of time in good control required for reward.
This change occurred in small increments of decreasing the amount of time allowed for behavioral dyscontrol, at the rate of approximately 0.5–1 hour each week (i.e., plan 1 allowed for 4.5 hours of dyscontrol, plan 2 = 4 hours, plan 3 = 3 hours; plan 4 = 2 hours; and plan 5 = 0.5 hours). This succession of behavior plans represents a procedure in which the person’s behavior is shaped toward a specified optimal goal of more socially appropriate behaviors to replace the maladaptive ones. After reaching the optimal goal, the behavior plan is discontinued.

**Implementation and response.** Figure 4 shows the change in behavioral excesses (as defined above) over time as recorded by staff using the Patterns and Trends Data Sheet over a 6-week period. Note the trend line (dashed line) has a significant negative slope indicating a significant reduction in duration of behavioral dyscontrol over time. Some variability is evident which can, in part, be explained by various “triggering” stimuli (examples follow). Important events (e.g., when behavior plans were implemented, triggering events) are indicated on the graph. Of note, a documented break in the consistent administration of the initial contract had a noticeable effect on Gary’s behavior, resulting in a response burst. Even though Gary’s frequency of inappropriate behaviors had decreased from approximately seven hours per day to close to one hour per day, nursing staff felt that they “couldn’t take it anymore” during one of his behavioral dyscontrol episodes and gave in to his request for a cigarette (a break in the treatment contract). As might be expected under this condition of intermittent reinforcement, Gary’s frequency of inappropriate behaviors immediately increased to near baseline levels. Similarly, the day of his birthday (also, reportedly the day his mother was shot and killed in front of him), seemed to serve as a triggering event, resulting in a significant increase in behavioral dyscontrol for two days.

![Figure 4. Number of hours of Gary’s behavioral excesses.](image-url)
After more consistent implementation of the plan and further data collection (Patterns and Trends Data Sheet), it became evident that Gary’s behavioral dyscontrol occurred in the morning hours (previously it was in the morning and early evening). This, along with concerns about heavy self-requested use of prn benzodiazepines led to the hypothesis that his behavior might be, in part, due to withdrawal from these medications in the early morning hours. The new hypothesis was tested by giving him a standing dose of 2 mg of Lorazepam upon waking. In addition, the contract was modified to include additional positive reinforcement for controlled behavior in the morning in the form of earning rewards for him and his fellow group members by staying in good control. As can be seen in Figure 4 (see sections marked plans 4 and 5), this combined intervention significantly reduced the duration and frequency of morning behavioral dyscontrol episodes. Moreover, during this treatment phase, Gary’s behavioral excesses were of significantly reduced intensity; he would either take himself to the quiet room or engage in other self-soothing behaviors, for example, relaxation exercises that he was learning from meetings with a psychologist, or interacting with peers. Figure 5 depicts this decrease in intensity and frequency of socially intolerable behaviors over time. Also, observation of Gary’s behavior revealed that motor dyscontrol was highly correlated with emotional dysregulation. In the later phase of treatment (with morning Lorazepam), Gary’s motor control was dramatically improved during the entirety of waking hours.

Summary
Effective multimodal treatment, informed by functional properties of individual symptoms

Frequency of Gary’s Socially Intolerable Behaviors since Admission

![Figure 5. Frequency of Gary’s socially intolerable behaviors since admission.](image-url)
and behaviors, leads to ongoing refinements in clinical hypotheses and choices of interventions (medical, psychiatric, behavioral, psychotherapeutic, psychoeducational, rehabilitation-related, etc.). Identification of the functional properties of behaviors leads to interventions that (a) teach the patient adaptive means of expression, (b) provide prosocial replacement behaviors, and (c) encourage development and use of coping strategies that increase immunities to the ongoing tertiary conditions associated with the behavior disorder. These include stress reduction strategies and effective coping mechanisms related to specific environmental stressors. In sum, a case formulation model that emphasize multimodal comprehensive treatment of behavior dysfunction leads to an improved understanding of behaviors both for the patient and the staff, leads to precise intervention strategies, including environmental changes and modifications, and teaches adaptive coping mechanisms that may lead to long term adaptive strategies. Furthermore, an understanding of the functional properties of behaviors opens up new venues for approaching treatment involving interventions directed at specific triggering stimulus conditions, secondary “setting” stimulus conditions, tertiary influences, and the various reinforcement consequences that strengthen behavior.

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