# The Abductive Theory of Method: Scientific Inquiry and Clinical Practice

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Clinical reasoning is one of the central components of psychological assessment. The identification of a client's psychological difficulties and the subsequent depiction of their onset, development, and interrelationships enables clinicians to plan treatment in a systematic and effective manner. In an article (Ward, Vertue, & Haig, 1999), we outlined the abductive theory of method (ATOM) and argued that it offered a useful framework for highlighting and integrating the major phases of psychological assessment. These phases involve detecting clinical phenomena, postulating psychological mechanisms, developing a case formulation, and evaluating a case formulation. In this article we present a revised version of the adaptation of ATOM and elaborate on the related clinical dimensions of assessment.

■ *Keywords:* abductive method, case formulation, evidence-based practice, clinical reasoning

Clinical psychologists have been trained in the scientist-practitioner model for over 50 years (Nelson-Gray, 1994; Shapiro, 1979). According to this professional model, the aim of clinical reasoning is to produce scientifically grounded explanations of clients' problems and to then select empirically supported interventions specifically designed to address them. Evidence-based practice (EBP) is a model based on this earlier conceptualisation of the clinical psychologist role and similarly directs clinicians to integrate the best available research evidence concerning psychotherapy with clinical expertise and client preferences and values (Lilienfeld, Ritschel, Lynn, Cautin, & Latzman, 2013; Spring & Neville, 2011). Conceptually, the EBP model is usually depicted as a 'three-legged stool'. The first leg consists of the best available research evidence for assessment measures and psychological interventions. Evidence is comprised of research findings derived from the systematic collection of data through observation and experiment, and the formulation and testing of hypotheses (Spring & Neville, 2011). Traditionally, evidence is appraised hierarchically, with data from meta-analyses, randomised controlled trials and systematic within-subject designs at the apex, quasi-experimental studies in the middle, and correlational, as well as uncontrolled case studies, at the base (Lilienfeld et al., 2013).

The second leg of the EBP model consists of the resources required to engage in EBP, such as the clinician's expertise and institutional infrastructure. Resources include the physical, technological, personal, and financial assets needed to deliver treatment, and institutional endorsement and agreement by relevant agencies (Spring & Neville, 2011). In recent models of EBP, practitioner expertise (which has often been misconstrued as opinion or unquestioned intuition) has been operationalised



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as the skills necessary to perform the steps of the EBP process. Categories of skill include *clinical reasoning* or *assessment skills*: the ability to assess in an unbiased manner and to implement techniques and the outcome of those techniques; *evidence-based practice process skills*: the competency to perform the steps of the EBP process (i.e., ask well-formulated questions, acquire, appraise, and apply research evidence, and adjust practice to suit change); *communication and collaboration skills*: the ability to listen, observe, convey information clearly and negotiate so that decisions can be made collaboratively; and *engagement and intervention skills*: the ability to motivate interest, increase constructive involvement, and increase positive change from the clients and wider systems involved, and to obtain the necessary training to implement interventions competently (Spring & Neville, 2011). The final leg of the EBP stool consists of the client's priorities, including their characteristics, needs, values, and preferences. A core challenge for practitioners using the EBP model is to decide how averaged data can be applied to individual clients (Spring & Neville, 2011). Accommodating clients' preferences is critical in shared decision making, as it enables them to more fully engage in self-managing their own recovery process.

Implicit in the EBP model is an expectation that clinicians have the skills to conduct a systematic analysis of their clients' problems. This is an implicit assumption because most descriptions of EBP stress the need to acquire and cultivate *specific* methodological skills and overlook the critical importance of using an explicit general theory of scientific method to guide the whole inquiry process. In previous articles we argued that there are parallels between scientific inquiry and psychological assessment (Vertue & Haig, 2008; Ward et al., 1999). The scientist frequently employs methods to detect empirical phenomena and seeks to explain the occurrence of those phenomena by constructing models or theories of the causal mechanisms responsible for their occurrence. Similarly, in psychological assessment, clinicians characteristically attempt to systematically collect data that enable them to identify a client's difficulties and their causes (Shapiro, 1979). The result of this process is a conceptual model representing the client's various complaints, their causes, and their interrelationships. Thus, the process of psychological assessment can be construed, in part, as systematic inquiry into a client's problems, which is guided by scientific method.

The major goal of this article is to update and further develop the theory of clinical reasoning presented in the Ward et al. (1999) article. We present a general theory of scientific method, the abductive theory of method (ATOM), and demonstrate how it can illuminate the basic idea that psychological assessment is a form of systematic scientific inquiry. Our basic contention is that this general method can provide clinicians with a conceptual framework for identifying and structuring the fundamental tasks of assessment. We use the term 'clinical assessment' in a broad sense to cover the various assessment phases that range from phenomena (symptom or problem) detection through to evaluation of a case formulation. It is important to note that this account of scientific method can be used by clinicians of varying theoretical orientations. The method provides a plan of inquiry that guides clinicians in the gathering of clinically pertinent information and its subsequent integration in a psychological formulation. In this regard, the therapist's theoretical orientation could be cognitive-behavioural, some other form of behavioural therapy, or family systems theory.

The article begins by outlining ATOM as a broad theory of scientific method. Next, we introduce some additional theoretical ideas that are arguably necessary to apply ATOM to contemporary clinical psychology practice; namely, transdiagnositic theory and the Research Domain Criteria psychopathology classification project.





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Following this, ATOM will be systematically applied to the various phases of clinical inquiry. Our overall goal is to construct a methodological framework that will assist clinicians to approach their practice as applied scientists. While there are a number of excellent recent books and articles on assessment and case formulation (e.g., Eells, 2015; Groth-Marnat & Wright, 2016) we believe that ATOM is unique in the literature in supplying a flexible and comprehensive framework for clinical inquiry. We do not pretend that it is the only way to structure clinical reasoning but rather offer it as an alternative method for investigating the psychological world of our clients.

## The Abductive Theory of Method (ATOM)

The dominant theory of scientific method in the behavioural sciences is the hypothetico-deductive method. According to the standard portrayal of this method, hypotheses or theories are arrived at by conjecture and tested indirectly by deriving one or more observational predictions (Hempel, 1966). If a prediction is supported by data then the results are considered to confirm the theory or hypotheses. Likewise, if the predictions are not borne out by data, then the theory or hypothesis is thought to be disconfirmed. Another common scientific method is the inductive method, in which data are collected in a theory-free manner that provides the basis for bottom-up scientific reasoning of hypotheses, laws, or theories. Central to this method is enumerative induction; a form of argument from which conclusions are drawn, typically in the form of empirical generalisations, from observed cases (i.e., if a proportion of As have been observed, under appropriate conditions, to possess quality B, then infer the same proportion of As all to have property B; Chalmers, 2013). Each of these theories of scientific method and their central forms of inference are helpful in achieving important research goals, although they are unable to adequately structure all the various phases of scientific inquiry (Haig, 2005, 2014; Vertue & Haig, 2008; Ward et al., 1999).

One distinctive feature of the ATOM is its genuine commitment to the idea that the formulation of problems is of central importance to scientific research. The abductive method adopts a view of problems known as the constraint-composition theory (Haig, 1987, 2005, 2014; Nickles, 1981). Briefly stated, the constraint-composition theory asserts that a problem comprises all the constraints on its solution, along with the demand that the solution be found. On this formulation, the constraints are actually constitutive of the problem itself; they characterise the problem and give it structure. The explicit demand that the solution be found arises from the goals of the research program, the pursuit of which hopefully leads to filling an outstanding gap in the problem's structure. Also, by including all the constraints in the problem's articulation, the problem enables the researcher to direct inquiry effectively by pointing the way to its own solution. In a very real sense, stating the problem is half the solution! By adopting this account of problems, the abductive method is able to explain how inquiry is possible and at the same time provide guidance for the conduct of research. The research problem guides inquiry through the abductive method's various phases by marshalling the appropriate constraints that comprise heuristics and rules.

ATOM is further distinguished by the importance it attaches to the task of detecting empirical phenomena (Woodward, 1989). In understanding this task, phenomena must be distinguished from data. Phenomena are a relatively stable, recurrent general feature of the world that we seek to explain. The more striking of these noteworthy and discernible regularities are often called 'effects'. Phenomena comprise a varied





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ontological (basic components of people and the world) bag that include objects, states, processes, events, and other features that are difficult to classify. Because of this variety, it is more useful to characterise phenomena in terms of their role as the proper objects of explanation (and prediction). Not only do phenomena give scientific explanations their point (without the detection of phenomena it would be difficult to know what to explain), they also, on account of their generality and stability, become the appropriate focus of scientific explanation; systematic explanation of more ephemeral events would be extremely difficult, if not impossible. Examples of general phenomena in clinical psychology include low self-esteem, ruminative thoughts, deviant sexual fantasies, unassertiveness, aggression, and low mood. In clinical contexts these are usefully construed as empirical regularities and inferred from data sources such as behavioural observation, self-report, and psychometric test scores.

Data, by contrast, are idiosyncratic to particular investigative contexts. They are not as stable and general as phenomena. Data are recordings or reports that are perceptually accessible; thus, they are observable and open to public inspection. Phenomena are not, in general, observable. Examples of clinically relevant data include personality test scores, dynamic risk measures, verbal reports, and behavioural observations. The importance of data lies in the fact that they serve as *evidence* for the phenomena under investigation. In extracting phenomena from the data, we often engage in data reduction using statistical or psychometric methods. Generally speaking, these methods are of direct help in the detection of phenomena, but not in the formulation of explanatory theories.

It is important to realise that the reliability of data forms the basis for claiming that phenomena exist. In establishing that data provide reliable evidence for the existence of phenomena, we control variously for confounding factors (experimentally and statistically), use standardised measures, carry out replications, calibrate instruments, and perform statistical analyses for data reduction purposes. While reliability is the basis for justifying claims about phenomena, we will see later that judgments about explanatory coherence are the appropriate grounds for determining theory acceptance.

With the successful detection of one or more phenomena, there is a natural press to generate theories that plausibly explain the phenomena. True to its name, the abductive theory of scientific method maintains that theories are generated through a creative process of abductive reasoning (Haig, 2014; Josephson & Josephson, 1994). Essentially, abductive reasoning is a form of inference that takes us from descriptions of data patterns, or better, phenomena, to one or more plausible explanations of those data patterns. This explanatory move is from presumed effect(s) to underlying causal mechanisms; it is not an inductive move to a regularity or law, nor a deductive inference to, or from, observation statements. A typical characterisation of abductive inference can be given as follows: some observations (phenomena) are encountered that are surprising because they do not follow from any accepted hypothesis (theory); we come to notice that the observations (phenomena) would follow as a matter of course from the truth of a new hypothesis (theory) in conjunction with accepted auxiliary claims; we therefore conclude that the new hypothesis or theory is plausible and thus deserves to be seriously entertained and further investigated. This standard depiction of abductive inference focuses on its logical form only and, as such, is of limited value in understanding the research process unless it is conjoined with a set of regulative constraints that enable us to view abduction as a pattern of inference, not just to any explanations, but to the most *plausible* explanations. Constraints that regulate the abductive generation of scientific theories will comprise a host of heuristics





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(and some rules) having to do with the explanation of phenomena. The constraint composition account of problems outlined earlier is strategically positioned within abductive method to facilitate the operation of such constraints.

The abductive method is also a method for theories in the making. It encourages researchers to look upon their theories as historically developing entities each with their own developmental career. Theories generated abductively are typically nascent theories that stand in clear need of conceptual development. Because we often do not have knowledge of the nature of the causal mechanisms of interest, it is helpful to construct models by imagining something analogous to them whose nature we do know; for example, the depiction of the heart as a pump or the brain as a computer helped cognitive scientists and psychological scientists to further their understanding of the functioning of these organs.

Because science pursues multiple goals, and because theories are underdetermined by the relevant empirical evidence (Harding, 1976), proper theory appraisal has to be undertaken on evaluative dimensions in addition to that of empirical adequacy. The abductive method takes the systematic evaluation of mature theories to be essentially a matter of *inference to the best explanation*, where a theory is accepted when it is judged to provide a better explanation of the evidence than its rivals. Thagard (1989, 1992) has developed an attractive account of theory evaluation that takes inference to the best explanation to be centrally concerned with establishing *explanatory coherence*. The theory of explanatory coherence maintains that the propositions of a theory hold together because of their explanatory relations. Relations of explanatory coherence are established through the operation of seven principles: symmetry, explanation, analogy, data priority, contradiction, competition, and acceptability. The determination of the explanatory coherence of a theory is made in terms of three criteria: explanatory breadth (consilience), simplicity, and analogy. The criterion of explanatory breadth, which is the most important for choosing the best explanation, captures the idea that a theory is more explanatorily coherent than its rivals if it explains a greater range of facts or phenomena. The notion of simplicity deemed most appropriate for theory choice is captured by the idea that preference should be given to theories that make fewer special assumptions. Finally, explanations are judged more coherent if they are supported by analogy to theories that scientists already find credible. The theory of explanatory coherence, then, offers the researcher an integrated account of several of the relevant criteria deemed important for the appraisal of explanatory theories.

## Theoretical Resources

In order to successfully import ATOM into clinical contexts it is necessary to draw upon additional sets of ideas from the psychopathology area. In our view, research on transdiagnostic mechanisms and work on the classification of psychopathology are extremely helpful in this respect. The application of aspects of these research projects makes it easier to bridge the gap between traditional diagnostic practices and scientific thinking within clinical contexts.



Vigorous debate has occurred in the area of psychopathology for the last 30 years or so, concerning the nature of mental disorders and their classification (e.g., Borsboom, Epskamp, Kievit, Cramer, & Schmittmann, 2011; Cuthbert & Kozak, 2013; Kincaid & Sullivan, 2014; Lilienfeld, 2014). An important part of this debate has focused on the relationship between signs and symptoms of mental disorders and their underlying causes. In an ideal world, basing psychiatric diagnosis on psychopathology signs and



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symptoms would enable clinicians to infer the existence of underlying causal processes, thereby providing a strong theoretical rationale for treatment. In such a scenario, each disorder would have its own distinct set of symptoms and signs, generated by a unique set of causes, or even a single cause. In essence, it is useful to view the unique cluster of symptoms comprising mental disorders as their causal signatures. Unfortunately, there has been virtually no progress in locating the causes of mental disorders such as depression, schizophrenia or anxiety, and instead clinicians have been forced to rely on diagnostic systems entirely founded on the *manifestations* of hypothesised causes. The worry is that trying to diagnosis mental disorders entirely upon the basis of symptoms such as low mood, insomnia, delusions, or panic attacks is a bit like attempting to identify physical diseases using overlapping and common symptoms such as fever, muscle aches or fatigue. There are multiple diseases capable of causing these symptoms, each with its own underlying set of disease processes. Without the ability to detect these processes, diagnosis will lack validity and therefore be unable to effectively guide treatment.

Because they are not underpinned by knowledge of the relevant causes of mental disorders, psychiatric classification manuals such as the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM–5;* American Psychiatric Association, 2013) suffer from problems of disorder heterogeneity and overlapping diagnostic criteria. There are numerous ways symptoms can co-vary and present within a particular category such as major depression, and different disorders may share a number of symptoms. The upshot of this lack of specificity is that clients with the same diagnosis can present in markedly different ways, and similar symptom patterns may have different causes. The lack of coherency and the existence of porous boundaries between disorders make it extremely difficult to develop effective treatments and valid assessment protocols.

### *Research Domain Criteria Project*

Frustrated by the lack of progress in psychopathology research, in part due to a lack of knowledge of the causal processes generating symptoms, the US National Institute of Mental Health (NIMH) has initiated the Research Domain Criteria project (RDoC; see Cuthbert & Kozak, 2013). According to Morris and Cuthbert (2012) the aim of the RDoC project is to develop new ways of classifying mental disorders based initially on five domains of psychological processes and their instantiation in neurobiology.

The initial five domains were selected because psychological and neuroscience research evidence supported their existence, although they were seen as provisional and were expected to be refined, and even added to, as new research evidence became available. The five functional systems are: *negative valance systems* (systems that function to detect current, sustained, and potential threats, and loss), *positive valance systems* (systems involving approach motivation, reward responsiveness, and habit formation), *cognitive systems* (systems involved with attention, perception, memory, language, and effortful control), *systems for social processes* (systems such as theory of mind, social dominance, attachment, self-representation, and facial expression identification), and *arousal and regulatory systems* (systems involved in arousal and resting state activity). To facilitate research into the causes of mental disorders based on this model, the NIMH created a matrix with the five domain constructs and their associated systems (labelled 'dimensions') on a vertical axis and what is referred to as units of analysis on the horizontal axis (Lilienfeld, 2014; Morris, & Cuthbert, 2012). These units of analysis are as follows: genes, molecules, cells circuits, physiology, behaviour,





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and self-report. The role of the units of analysis is to discover the components and mechanisms that constitute the core psychological systems using data gathered at the different levels. The aim is to work out how normal psychological systems function and what occurs if they are faulty in some way. Thus, the intention is to build a comprehensive picture of a normally functioning mind and to develop hypotheses about mental disorders based on this understanding. In addition, according to RDoC theorists, research into the psychological processes should be undertaken within a developmental context and needs to take into account the relevant social and physical environments. While there is particular interest in researching the neurobiological processes instantiating the five psychological systems, the RDoC project is not considered by its proponents to be reductionist in orientation. Their argument is that while the brain mediates all psychological processes and resulting first-person experiences, the social and developmental contexts bearing on individuals play important roles in the development of normal and abnormal functioning.

### *Transdiagnostic Approaches*

Around the same time the RDoC project was gathering momentum, psychotherapy theorists argued that adopting a *transdiagnostic* approach (i.e., searching for shared mechanisms causing different disorders and their symptoms) to mental health interventions could overcome the conceptual and practical problems of treatment created by classification manuals such as the *DSM-5* (Garland & Howard, 2013; Mansell, Harvey, Watkins, & Shafran, 2009). Problems that had their origin in the well-documented issues of symptom overlap, within-category variability in clinical presentation, and high levels of comorbidity (i.e., co-occurrence of disorders within the same, and between diagnostic categories). Researchers noticed how frequently different mental disorders responded to the same types of interventions and speculated that they might have some causal processes in common. For example, metacognitive interventions seemed to reduce symptoms in individuals diagnosed with a variety of emotional disorders (Mansell et al., 2009). Barlow and colleagues' (2011) unified protocol for the treatment of emotional disorders produced promising preliminary results. However, the fact that the same interventions reduced symptoms in different types of disorders was hard to explain from the standard psychopathology perspective. From the standard viewpoint, each mental disorder had its own set of causal processes and therefore required unique treatment strategies to alter these causes.

Psychological mechanisms identified by researchers as 'transdiagnostic' include: (1) attentional bias to emotionally significant stimuli (e.g., a tendency to overly focus on shape and weight-related cues in eating disorders); (2) memory bias for events that are congruent with individuals' current emotional states (e.g., a bias towards recalling 'failure' experiences when depressed); (3) thought suppression (e.g., suppressing contamination fears in obsessive-compulsive disorder); (4) repetitive negative thinking (e.g., constant self-depreciating thoughts in depression); (5) attentional or behavioural avoidance of internal states or external situations (e.g., avoidance of feared objects in phobia); and (6) overly general memories for self-related events and experiences (e.g., lack of concrete autobiographical memories in depression). A number of different inquiry strategies have been developed by transdiagnostic researchers to aid their search for common causal processes, depending on the particular problems in question. For example, a symptom-based approach sought to identify the mechanisms causing single symptoms, such as elevated mood, irrespective of the specific diagnosis.





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By way of contrast, a universal, multiple process strategy was employed to discover the various causal processes generating symptoms in a number of mental disorders (Mansell et al., 2009).

### *Implications*

RDoC and transdiagnostic theorists started from different investigation points, with the former hoping to identify the causal processes constituting core psychological systems while the latter were more interested in the development of unified treatment protocols. Despite these separate initial foci of inquiry, both groups were extremely interested in conceptualising and classifying mental disorders in terms of a core set of psychological processes, and to discover what happens when they either malfunction or perform in a suboptimal way. In our view, these distinct although overlapping research projects provide a powerful way of thinking about the causes of clinical phenomena presented by clients (i.e., signs, symptoms, problems): models of clinical inquiry should facilitate the construction of transdiagnostic explanations of signs and symptoms, and in addition, be guided by a scientifically informed understanding of psychological functioning.

## Abductive Method in Clinical Practice

The abductive method portrays scientific research as a problem-oriented endeavour concerned with the detection of empirical phenomena and the subsequent construction of explanatory theories. These theories are generated abductively, developed through analogical extension, and appraised in terms of their explanatory coherence. It is our basic contention that this general account of scientific method can be used to highlight and integrate the five major phases of clinical inquiry: (a) establishing a focus of inquiry; (b) detecting a client's symptoms, signs, or problems (phenomena detection); (c) inferring causes for each of these symptoms, signs, or problems (theory generation); (d) developing an integrated case formulation (theory development); and (e) evaluating the adequacy of the formulation (theory appraisal). Our model differs from others in the literature by making a distinction between data and phenomena, highlighting the distinctness of the descriptive and explanatory phases of inquiry, and viewing hypothesis or theory construction as present at all phases of the clinical assessment process. A key point of difference is that we propose that different types of hypotheses, or more accurately, types of inference (inductive, deductive, abductive), will be more or less prominent at different phases of the inquiry process. A more general advantage of ATOM is that it can function as a conceptual map to assist practitioners in identifying, coordinating, and achieving the multiple tasks of assessment and treatment planning.

### *Phase 1: Establishing a Focus of Inquiry.*

In clinical practice, a case formulation (i.e., clinical explanation) is developed to provide an answer to a question posed by a clinician and/or referral agency. The goals and content of a case formulation will vary depending on the specific focus of inquiry. Determining this focus can be a surprisingly difficult and challenging task, as clients frequently present with vague, ill-defined complaints and multiple problems. It is common for clinicians to find that what they thought were the key issues change as a result of the acquisition of additional assessment data. For example, what at first seems to be an example of substance abuse might turn out to more fundamentally concern





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severe anxiety. The referral information and the client's presenting problems provide a focus of inquiry that helps guide the initial structuring of the problem space. Given the fact that clients may present with ill-formed problems, a primary initial task for the clinician is to structure the problem space in a way that allows for the subsequent formulation of a plausible explanatory theory. It is important that a clinician ensures the focus of inquiry is relevant, ethical, and precise enough to solve. For example, a focus of inquiry might be to explain why 'Peter' consistently experiences feelings of jealousy in his intimate relationships, becomes verbally aggressive, and drinks too much alcohol.

### *Phase 2: Detecting Clinical Phenomena*

Consistent with ATOM, we stress the distinction between data and the clinical phenomena (i.e., symptoms, signs, or problems) for which the data serve as evidence. Clinical phenomena are empirical regularities that a clinician attempts to explain. While psychological symptoms are examples of clinical phenomena, phenomena can cover any cognitive, behavioural, or affective disturbances or deficits that reflect subjective distress and/or adaptational problems. In other words, clinical phenomena are not restricted to the symptoms or signs of psychopathology. Relationship conflict, low self-esteem, deviant sexual arousal or fantasies, intrusive thoughts, low mood, and psychological dependence are all examples of clinical phenomena. For example, the observation that a client constantly makes self-deprecating remarks, devalues his/her achievements, sets very low goals, and is passive in relationships, suggest the presence of the phenomenon of low self-esteem. However, the identification of this phenomenon does not describe its underlying causal mechanisms. Thus, the phenomenon of low self-esteem stands *between* the data and any subsequent explanation of it; that is, description occurs b*efore* explanation.

The dependence of phenomena detection on data serves to emphasise the importance of reliability and validity when collecting information in a clinical context. It reminds practitioners to use multiple methods to gather clinically relevant data; relying on just one source of data — for example, self-report — is risky. While self-report is an important source of information, limitations in cognitive processing and the distorting effects of psychological defences and memory make it likely that exclusive reliance on this source of data might result in a formulation that bears little resemblance to clients' real problems. Thus, it is imperative to ensure that data are gathered in a careful manner and that error variance is minimised as far as possible. In addition to using scales that have sound psychometric properties, clinicians need to ask questions in a skilful and structured manner, and ensure that other information sources are reliable and comparatively free from bias. In short, the existing limitations of the data need to be taken into account when attempting to detect phenomena.

By consciously attempting to detect the clinical phenomena associated with a client's current problems, the therapist automatically adopts a problem-solving style. Simply increasing the database will not on its own improve the quality of clinical decision making or solve the assessment problem. Trying to provide explanations for ill-structured problems based on data alone is likely to be an impossible task, since all that may be possible is a varied description of the different characteristics of the data. The detection of phenomena provides a means for structuring the problem space, such that clinical explanations are actually possible.

Thus, descriptive hypotheses generated in the initial stages of assessment are directed at obtaining a better description of the client's complaints (i.e., phenomena)





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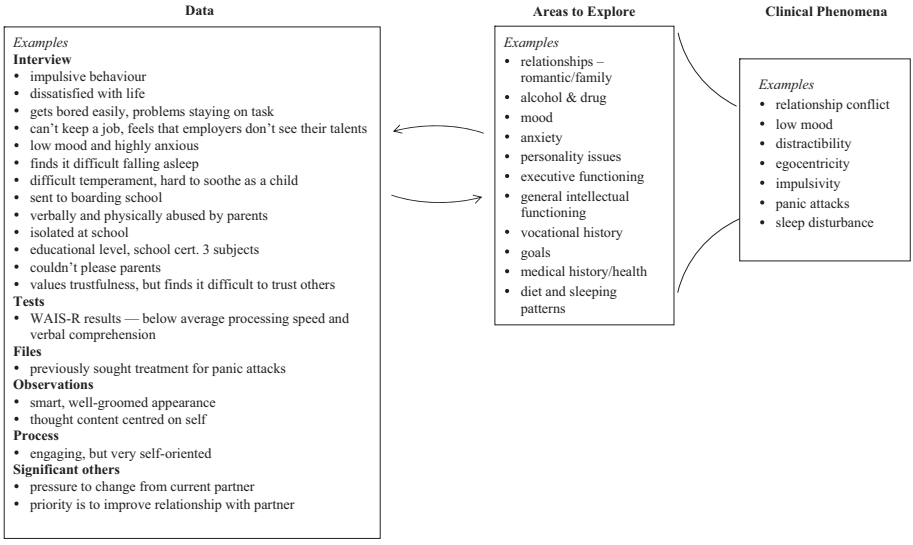


**FIGURE 1**

Detecting phenomena.

and are not invoked to *explain* those complaints. Indeed, assessment should not proceed in the absence of clearly formulated, clinically relevant questions. Early in the assessment process, these questions are typically very general; for example, 'How does the client feel?' or 'What is she having difficulty with?' Such questions greatly constrain the initially ill-formed problem space and help to frame subsequent efforts to formulate the problem (Evans, 1989).

In order to aid the identification of clinical phenomena, clinicians are guided by early problem formulation and follow-up salient cues in looking for patterns in the data. This involves identifying consistencies and similarities of meaning across different kinds of data and should be understood as descriptive hypothesising. We suggest that clinicians summarise data on a worksheet (see Figure 1) and initially attempt to identify pertinent areas to explore, based on a consideration of this information. These identified areas help to refine the subsequent data set and facilitate the search for phenomena. Clinicians need to draw out all the *plausible* meanings or patterns that the data contain. For example, if a client complains of sleep disturbance, areas to explore could include mood, substance abuse, personality issues, and anxiety or physical disorders. We find that it is helpful to list the areas to explore in a separate, adjacent column of the worksheet. At this step in the assessment process, the clinician moves backwards and forwards between these two columns; inferring areas to explore suggests further data that could be gathered and vice versa.

At this point, the characterisation of clinical phenomena and their onset, duration, frequency, and intensity becomes clearer. An early focus on establishing what a client's difficulties are prevents premature case formulation and the conflation of problem (phenomena) detection with causal explanation. For example, once it is clear that a client is depressed (involving a cluster of phenomena), the crucial task is to identify the psychological mechanisms (explanations) hypothesised to cause this





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mood disturbance. Simply cataloguing data is not sufficient to provide a clear set of intervention goals. Both the detection and explanation of psychological phenomena are necessary, and an adequate assessment requires the clinician to attend to both these tasks. Detection of phenomena motivates explanation, and explanation in turn enables us to understand phenomena.

Once the client's phenomena have been detected, they are inserted into the box on the far right of the diagram (see Figure 1). We use bidirectional arrows to represent the transition from data to areas to explore and a funnel shape to represent the identification of clinical phenomena. This captures the idea that the process is one of clarifying, refining, and describing the client's difficulties in a reasonably reduced form. Thus, there is a move from an initial consideration of data (specific, concrete), to patterns or areas to explore (general), and finally to a formulation of the relevant clinical phenomena (explanatory targets). Essentially, the detection of clinical phenomena involves data reduction and makes the subsequent process of theory formulation more manageable. Clinical phenomena function as empirical constraints on any subsequent formulation or clinical explanation, and their detection constitutes an important advance in structuring our problem. For example, evidence that a client is depressed, has a drug and alcohol problem, and displays a number of phobic responses, places constraints on what will count as a satisfactory explanation or formulation. Any plausible clinical explanation (a case formulation) should explicitly focus on these phenomena.

In addition to the data generated by a particular client, practitioners typically use their clinical experience and the relevant psychopathological research literature as sources for hypotheses concerning clinical phenomena (Elstein, Schulman, & Sprafka, 1990). We suggest that the psychological functions identified in the RDoC project and transdiagnostic research can be used to streamline this process. Similarly, metatheoretical assumptions concerning the nature of a mental disorder or problem may also function to constrain the search for phenomena (Haynes, 1992). For example, if a particular disorder is construed as phasic in nature, with symptoms periodically changing in intensity, then clinicians will need to ensure that their assessment tracks this (hypothesised) process.

### *Phase 3: Inferring Psychological Mechanisms*

The next phase involves inferring the psychological mechanisms believed to cause the client's clinical phenomena. References to mechanisms help to explain both normal and maladaptive functioning, and it is expected that psychopathology signs and symptoms (and the psychological and social *problems*) are caused by disrupted or damaged mechanisms and their relevant systems. Bechtel (2008, p. 13) defines mechanism as follows: 'A mechanism is a structure performing a function in virtue of its component parts, component operations, and their organisation. The orchestrated functioning of the mechanism is responsible for one or more phenomena.'



In effect, causal mechanisms may usefully be thought of as vulnerability factors triggered by internal and external events to cause the phenomena identified by the clinician. Thus, a causal mechanism such as an expectation of immediate gratification may produce, as its effect, the phenomenon of exploitation of others. These causal mechanisms have contributing aetiological conditions. Classes of distal factors such as heritability, medical illnesses or injury, and learning history need to be identified, as well as proximal factors from the current social situation. The actual choice



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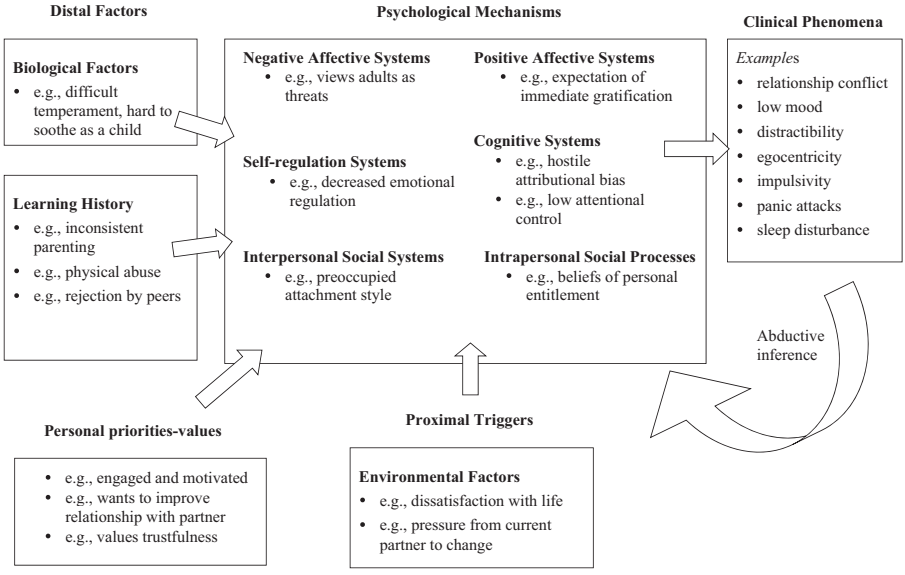


**FIGURE 2**

Inferring psychological mechanisms.

of explanatory hypotheses is guided by the relevant research literature within a particular area and organised within the six types of psychological functions outlined below. This helps the clinician to narrow down the search for plausible causes and to ensure that theories with the most research support are initially considered as possible explanations. This constraint is entirely consistent with one of the core requirements of the EBP model — that clinical inquiry and intervention should be based on existing research findings (Lilienfeld et al., 2013; Nelson-Gray, 1994).

We find it helpful to list the relevant phenomena detected in phase 2 on a separate worksheet (see Figure 2) and to think explicitly and abductively about their possible causes. In the case of well-established psychological symptoms or problems that cluster together, it is possible to summarise them under a descriptive label in order to simplify the task; for example, place the symptoms of a major depressive episode under the heading of 'depressive symptoms'. At this point it is useful to have a visual representation of the contribution different factors make to the emergence of a client's difficulties. Therefore, worksheet 2 has areas where learning events, biological factors, precipitating events, and psychological mechanisms can be included. In the ATOM model of clinical reasoning, the purpose of this third phase is to identify and group the relevant plausible causal factors and suggest how they might be related to the various clinical phenomena. It is only in the fourth phase that the *interrelationships* between the various mechanisms are depicted, at which point it also becomes clearer how these causal factors might interact to generate the clinical phenomena.

We suggest that after listing the clinical phenomena, relevant proximal and distal causal factors should also be noted. Proximal factors might include any recent stresses or relationship problems; for example, marital conflict or loss of a job, or a current medical condition. These proximal factors function as triggers that, in conjunction





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with psychological mechanisms, result in the emergence of clinical phenomena. The proximal factors are placed in the box below the *psychological mechanisms* on the worksheet. Distal factors may include temperamental variables, longstanding disabilities that have enduring psychological consequences, and relevant learning events. Learning events would include any history of abuse, developmental distortions, early family modelling, or experience with peers and siblings. These distal factors are placed in the box to the left of the psychological mechanisms (see Figure 2). The various proximal and distal factors also function as constraints to help the clinician narrow down the search for plausible causal mechanisms that might explain why and how a client's difficulties have developed and been maintained. For example, a history of extensive sexual abuse would alert a practitioner to the possibility of self-regulation and identity deficits (Cole & Putnam, 1992).

During this phase, the clinician is encouraged to consider each phenomenon in turn and formulate a number of plausible hypotheses about the psychological mechanisms that cause them. These hypotheses are explanatory and are distinct from the descriptive hypotheses of the phenomena detection phase. At this point the major problem for the clinician is to understand why the client is having the difficulties he or she reports. Typically, a number of explanatory hypotheses are formulated at this time, with each considered to be a plausible explanation of different aspects of the client's complaints.

It is valuable to give explicit methodological attention to the process of explanatory hypothesis generation, both to streamline assessment and to counter cognitive biases and limitations that often adversely affect therapists' decision making. The literature on clinical decision making suggests that clinicians develop hypotheses very early in the assessment process and frequently become overly attached to them, often failing to revise their thinking about them in the light of fresh data (Dumont, 1993; Haig, 2014; Salovey & Turk, 1991). The stipulation of ATOM that the identification of a client's problems, through phenomena detection, should precede the formation of explanatory hypotheses helps to prevent premature closure. As stated earlier, both of these phases involve the explicit consideration of hypotheses; the first phase involves descriptive hypotheses, while the second phase emphasises hypotheses or theories of an explanatory nature.

Looking back to our earlier discussion, we suggest modifying slightly the list of fundamental psychological systems identified in the RDoC and transdiagnostic research in order to structure clinicians' thinking about possible mechanisms causing psychological distress (Morris & Cuthbert, 2012). The six functional systems we propose are: *negative valance systems* (systems that function to detect current, sustained, and potential threats and loss; e.g., view adults as potential threats), *positive valance systems* (systems involving approach motivation, reward responsiveness, and habit formation; e.g., positive attitudes towards drug addiction), *cognitive systems* (systems involved with attention, perception, memory, language, and effortful control; e.g., attentional bias towards social rejection cue or possible loss), *intrapersonal social processes* (internal: working models, self-conceptions, self-knowledge; e.g., view self as inherently defective and unworthy of love), *self-regulation systems* (e.g., regulation of arousal, coordination of internal systems, construction of action plans; e.g., deficient problem formulation abilities), and *interpersonal social systems* (affiliation and attachment systems, vicarious learning; e.g., social avoidance strategies). Using these six core psychological systems to guide clinicians' judgments concerning phenomena and their causes arguably offers more flexibility than thinking in diagnostic (using *DSM–5*





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diagnostic categories) or clinical treatment terms (e.g., using the headings of *cognitive*, *emotional*, *behavioural* mechanisms to organise clinical reasoning).

The initial plausibility of the explanatory hypotheses is ascertained by reference to a number of heuristics or evaluative criteria such as compatibility with broader psychological knowledge (e.g., social learning theory), explanatory breadth, and fertility. For example, the ability of a hypothesis to explain more than one phenomenon reflects the important epistemic virtue of explanatory breadth. If a client presents with difficulties with self-esteem, work, and socially related anxiety, and a tendency to be critical of his romantic partners, then an explanatory hypothesis based on an underlying perfectionism arguably has more merit than one simply citing obsessional personality traits. Perfectionism may result in a tendency to judge oneself and others in an exacting and unrealistic manner and result in subsequent dysphoria and relationship conflict.

Sometimes when reflecting on likely causes of a particular clinical phenomenon, a clinician may predict the existence of additional phenomena that are suggested by the proposed causal mechanisms. If the additional phenomena prove to be present, claims about the existence of the proposed causal mechanisms receive additional empirical support. For example, a client's difficulties relating to adult females might be explained by a preoccupied attachment style (Hazan & Shaver, 1987). Preoccupied individuals have a low sense of personal worth, which in conjunction with their positive evaluation of other people, leads them to seek the approval of valued others. This style is unlikely to lead to satisfactory relationships and may leave both partners in a relationship feeling unhappy or lead to high levels of loneliness. A clinician might infer that in addition to exhibiting dependent behaviour, her client experiences intense jealousy and has problems modulating negative affect; both are common features of individuals with this attachment style (Hazan & Shaver, 1987). Further investigation will establish whether jealousy and unmodulated negative affect are present.

As with phenomena detection, current knowledge of a disorder and its association with other problems can also help to suggest additional and competing hypotheses (Elstein et al, 1990). For example, the close relationship between bulimia nervosa and substance abuse disorders provides clinicians with some areas for further exploration (Brisman & Siegal, 1984; Pike, Gianini, Loeb, & Grange, 2015). This relationship might lead to a consideration of problems regulating negative affect, poor impulse control, and the presence of overlapping cravings for psychoactive substances. The cluster of problems associated with bulimia nervosa might also lead to an exploration of the client's developmental history, with particular emphasis on the nature of family dynamics and their impact on self-esteem and identity formulation (Hsu, 1990). In effect, the different kinds of theories and criteria of theory goodness serve as conceptual constraints on any future explanation of the clinical problem. The possible number of alternative hypotheses is potentially large, and therefore some identification of those hypotheses worthy of further pursuit is desirable (Curd, 1980). Thus, any hypothesis will have to satisfy the clinician that it has sufficient initial plausibility before it deserves further development and appraisal.

Finally, following the suggestions of the EBP model, it is crucial to explicitly consider clients' preferences and core values and to ascertain how they: (1) are implicated in the onset and perpetuation of a person's psychological difficulties, and (2) point to ways that could be utilised in an intervention plan (see Figure 2). We have not used the term 'protective factors', as is more often the case in clinical psychology,





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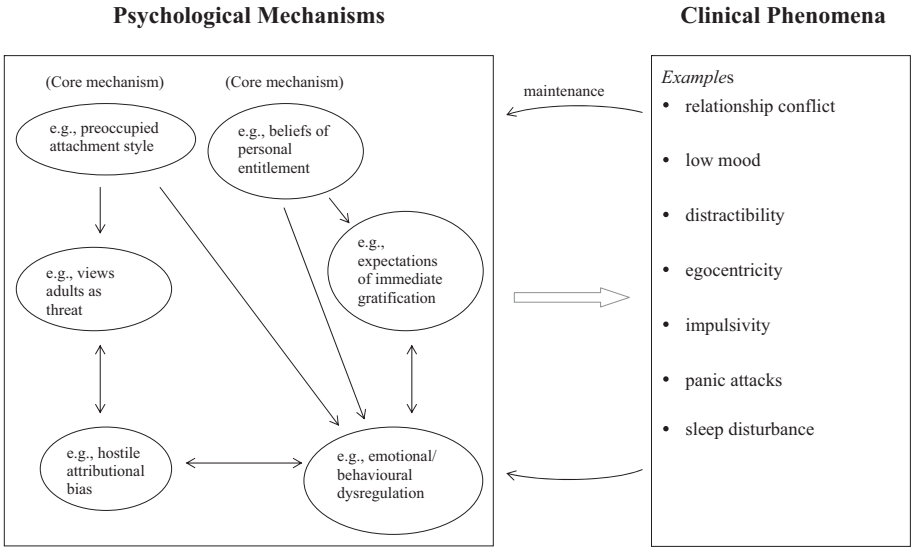


**FIGURE 3**
Integrated case formulation.

because of concerns over their conceptual integrity (see Ward, 2017). In short, protective factors are *conceptually heterogeneous* and refer to a diverse range of entities and processes. They may be possible causes (e.g., preference for intimacy with an adult), contextual factors (e.g., one or more emotional confidantes), or mental states (e.g. seeing another's point of view at a particular time). They *lack specificity*, and therefore it is hard to know what particular cause is being referred to by a protective factor. For example, a capacity for emotional intimacy could refer to trustfulness, honest and respectful attitudes, or the ability to communicate openly and honestly with others. In addition, protective factors are partly normative in nature and therefore are not scientific categories in any straightforward sense.

### *Phase 4: Developing a Case Formulation*

Once the client's problems and symptoms have been clearly described and appropriate mechanisms suggested for the clinical phenomena, the task is to develop an integrated case formulation representing the interrelationships between the causal mechanisms and the various contributing factors (see Figure 3). This aim represents a guiding ideal, and it may not always be possible to develop a tightly integrated clinical explanation. However, we suggest that the attempt to develop a coherent case formulation will result in a better explanation of a client's symptoms than would otherwise be the case. Developing a case formulation requires that each mechanism's relationship with the others is ascertained and represented in a simplified (but not simplistic) causal model.

The subsequent development of a case formulation leads to a more accurate depiction of the relevant psychological mechanisms and their onset, development and interrelationship(s). This constitutes an idiographic strategy (Allport, 1937), for at this point the clinician has constructed a unique conceptualisation of the individual client. At this phase in the inquiry process, descriptive and explanatory hypotheses





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are combined to develop a comprehensive case formulation. For example, the hypotheses that a client has identity issues (causal mechanism), difficulty regulating emotions (causal mechanism), is distrustful of others (causal mechanism), dissociates when under stress (phenomenon), and abuses alcohol and other drugs (phenomenon), all need to be integrated into a coherent model. Rather than simply diagnosing this individual as having a borderline personality disorder, the clinician should develop a case formulation in which the hypothesised causal or functional relationships are modelled. This reflects the transdiagnostic nature of ATOM-guided clinical inquiry. In the above example, the tendency to abuse alcohol and drugs could be strongly related to a tendency to distrust people (resulting in frequent episodes of perceived rejection) and subsequent dysphoria. The client's emotional regulation deficits would function to amplify negative affect, create further relationship turmoil, and result in increased alcohol use as an escape and avoidance strategy.

It is helpful to develop a visual model to clarify the causal relationships between the different psychological mechanisms, and we suggest that each psychological mechanism be placed in a separate area on a page (see Figure 3). In the third worksheet, clinical phenomena are grouped on the right, and the psychological mechanisms on the left. Our clinical experience using the abductive method indicates that usually no more than 4–6 psychological mechanisms are needed to account for the various clinical phenomena exhibited by clients. The clinician considers each mechanism in turn and considers its relationship to all the others, asking her/himself whether there is a strong relationship or no relationship at all between them. Both previous clinical experience and psychopathological theories, and empirical research findings function to constrain this process. These relationships are visually depicted using a bold arrow (relationship) and no arrow (absence of a relationship). It is also important to note whether or not the relationship is unidirectional or bidirectional, using single or double-headed arrows. For example, an insecure attachment style can lead to intimacy skill deficits, and intimacy deficits may result in further social isolation and strengthen the belief that other people are inherently untrustworthy (Hazan & Shaver, 1987). There is also scope for considering bidirectional relationships between the psychological mechanisms and the clinical phenomena. For example, current research on dysfunctional cognitions in the domain of depression suggests that negative core beliefs can elicit social withdrawal, and the resulting social isolation in turn can serve to maintain dysfunctional assumptions about the self and the world (Beck, 1996).

Once this process is completed, it usually becomes apparent that some mechanisms are more centrally involved in generating a client's cluster of clinical phenomena than others. These are called *core mechanisms* and may involve dysfunction in any of the six psychological systems noted above; for example, attentional biases or problematic attitudes. Typically, core mechanisms can be identified in the causal model as those extending the most causal arrows. We usually find that core mechanisms are also accompanied by less central, but still causally influential, mechanisms. For example, a core belief that other people will inevitably be rejecting may result in a failure to acquire important social skills, which in turn may lead to loneliness and subsequent depression. In turn, the lack of social or intimacy skills may result in unpleasant interpersonal experiences, thus strengthening the core belief itself. Figure 3 provides an example of a worksheet depicting this and other aspects of the case formulation.

Once the various relationships are depicted, the clinician considers the most explanatorily coherent way of conceptualising the client's situation. The information





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from phases 3 and 4, depicted by the worksheets and causal model, is utilised to write a verbal narrative outlining the case formulation. A formulation is the culmination of the clinical reasoning process and is a comprehensive and, hopefully, integrated 'mini' theory of a case encompassing phenomenology, aetiology, causal mechanisms, management, and prognosis. It is a set of descriptive and explanatory hypotheses that attempts to explain why a client developed his/her problems at a particular time and what is maintaining them (Haig, 2014; Ward et al., 1999). It should demonstrate an understanding of a unique individual, with his/her vulnerabilities and resources, and explain how he/she comes to be in the current predicament. The essential task in case formulation is to highlight possible linkages or connections between different aspects of the case. The focus upon these interrelationships adds something new to what has already been presented.

### *Phase 5: Evaluating the Case Formulation*

The process of evaluating the products of clinical reasoning occurring in two of the earlier phases employ different criteria. The key issue at phase 2 is to ensure that the data collection and analysis is done in a reliable and valid way, while at phase 3, the major task is to generate plausible explanations for the identified phenomena. In phase 4, integrative reasoning is employed to link claims about the relevant phenomena and causal mechanisms (including proximal and distal factors), with the purpose of providing a coherent account of the client's present problems. In the fifth phase, the proposed formulation is evaluated according to its ability to account for the interrelationships between the psychological mechanisms and their phenomena in an explanatorily coherent manner. This is a particularly crucial part of the clinical reasoning process, which in our experience is frequently underemphasised.

According to ATOM, evaluation of a case formulation should be based on more than its empirical adequacy. Just as scientific theories in general are underdetermined by the relevant empirical evidence (Chalmers, 2013; Harding, 1976), so are psychological formulations. In any practice situation there will arguably be a number of plausible case conceptualisations consistent with the clinical evidence. The clinician should consider which of the number of competing case formulations provides the best explanation of a client's symptoms or problems. As with a scientific theory, the evaluation of a case formulation involves the determination of its explanatory coherence in terms of explanatory breadth, simplicity, and analogy (Thagard, 1992).

First, in the clinical domain, a well-supported clinical formulation will have greater explanatory breadth than its competitors. Central to this criterion is the ability to explain a greater range of phenomena than a rival formulation. This will involve being able to account satisfactorily for all of a client's identified problems, their onset, development, and interrelationship(s). For example, a formulation that could explain the onset and development of substance abuse but failed to address a client's fear of intimacy would be inadequate in that respect. Second, in accordance with Thagard's criterion of simplicity, preference should be given to case conceptualisations that make fewer special assumptions. In the case described above, a formulation that utilised social learning theory might be favoured over a psychodynamic interpretation with its emphasis on unconscious conflicts and drives. It should be noted here that this is not the only feature of simplicity to which science attends. For example, Occam's well-known razor stipulates that science should not multiply entities beyond necessity. In a clinical context, this directive would lead to a preference for formulations that include





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fewer causal factors. However, such formulations also need to be consistent with the relevant background knowledge and be able to provide a plausible explanation of the phenomena in question. It is also important to keep in mind that sometimes the best explanation will in fact be a complex one, but one that is judged best because it rates highly on the other evaluative criteria.

Finally, a formulation that is analogous to an earlier successful formulation should be preferred to one that is not analogous in this way. For example, if the construct of preoccupied attachment has been helpful in explaining a similar client's history of dependent and erratic relationships, its inclusion in a current formulation (other things being equal) would count in its favour. That is, it would be evaluated as more coherent than a competing formulation that did not include this construct.

## Conclusions

ATOM is a broad, coherent theory of scientific method that brings together the three legs of the EBP model by virtue of its stress on the importance of engaging in a systematic reasoning process. It is sensitive to the complexities of clinical inquiry and appreciates that different types of inference have crucial roles to play in the various phases of assessment, and that description should always precede explanation. The identification of clients' problems and symptoms, and subsequent depiction of their onset, development, and interrelationships, enables clinicians to plan assessment and treatment in a systematic and effective manner. In our view, the cognitive effort put into producing a good case formulation is repaid by its ability to provide comprehensive guidelines for practice.

The methodological nature of ATOM means that it can be used by clinicians with varying theoretical orientations. Furthermore, it is able to integrate different case formulation methods such as the 5P model (i.e., predisposing factors, problems, precipitating factors, perpetuating factors, and protective factors) while offering a lot more clinically. For example, it separates predisposing factors into distal factors and psychological mechanisms, and provides a dynamic representation (causal model) of the relationship between distal factors and psychological mechanisms. Importantly, it also asks clinicians to consider how causal mechanisms interact to produce clinical phenomena. Furthermore, ATOM assists clinicians to detect clinically relevant problems, in part by making a distinction between data and phenomena. Effectively, it supplies a 'logic of discovery', and does not leave practitioners to rely primarily on intuition to identify clinical problems that, arguably, the 5P model does (Haig, 2014).

On a final note, ATOM accepts that the relationship between the practice of psychology and the science underpinning it should be methodological as well as substantive. However, it goes beyond simply prescribing the use of psychometrically reliable and valid measures, and empirically supported interventions. Rather, it weaves the methodological skills of a scientist into the daily practice of clinicians. While the explanatory focus of a psychological explanation is specific people, rather than general effects, it is still a theoretical enterprise. And good clinical theory generation, development, and evaluation ultimately relies on the availability of an integrated and comprehensive inquiry framework. In our view, ATOM provides this.



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