



*A Short Introduction to the
Concepts and Science behind
Behaviour Analysis*

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From Psychology to Behaviourism or Behaviourology

The science of human thought and emotions has been the forefront of the discussions in early developments in Psychology. The word Psychology as a formal area of knowledge first appeared around the 1600s, where it originated from the Modern Latin word, *psychologia*. The etymology of the word Psychology comes from a combination of the Greek word, *psyche*, which means spirit or soul (sometimes referred to as breath), and *logos*,



which means “the study of”. Thus, as an area of knowledge, Psychology means “the study of the soul”. From the evolution of application, interpretation and meaning, the field of Psychology has been considered a social science, with the main area of discourse about the self, particularly, regarding the mind and the behaviour, as actions arising from what and how one thinks, presumably, and the dynamic interaction of the self with the things around the environment as a token of mental aspects of life.

In 1890, William James, a philosopher, pragmatist and empiricist, defined psychology as the science of the mind, dealing with mental aspects of life, and the social and behaviour phenomena arising from the interactions of human beings with the things in the environment. Considered as a social science, for a long time, social and behavioural psychologists have to a great extent dealt with mentalistic explanations of the interaction between the self and environment. Mentalism takes the presumption that there are intrinsic dimensions that cause behaviours, and we can explain these through an abstract interpretation with no reference to the environmental variables as affecting behaviours.

The challenge against the use of abstractions vis-à-vis empirical or observable factors to study and explain behavior of living organisms gave rise to Behaviourism. In terms of socio-historical circumstance, Behaviourism or Behaviour Analysis is a reaction against mentalistic, abstract approaches to the study of the self or soul, which offers no further explanation and no way of addressing and/or improving behaviours.

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There are four branches of Behaviour Analysis. Apart from Behaviourism as the guiding principle and branch, there are earliest applications of behaviour analysis in laboratory settings, with the study of the behaviours of living organisms such as animals through Experimental Analysis of Behaviour (EAB). After more systematic study of behaviours outside of laboratory settings and with the publication of the article of Baer, Wolf & Risley (1968), the application of Behaviour Analysis has been broadened to many areas and populations. Behaviour Analysis has been applied to any domain that needs behaviour change procedures to produce socially significant behaviours. Applied Behaviour Analysis (ABA) as another branch of Behaviour Analysis centres on the technology of teaching for improving behaviour. The other branch related to ABA is Behaviour Service Delivery, which focuses on implementing ABA with professions and in various industries such as healthcare, education, sports, health and wellness, among many others.



Behaviourism: Classical, Methodological, and Radical

In the middle of the 19th century, a Russian physiologist Ivan Pavlov has intensively worked on the theory of Classical Conditioning. In this theory, Pavlov's work on Respondent Behaviour as elicited or brought out by something that immediately precedes the behaviour called respondent, alters the behavioural reaction of a living organism. Pavlov's greatest contribution is the discussion on the role of antecedent to elicit some kind of behaviour. Respondent Behaviour was also related to the principle set out in Edward Thorndike's theory on cause and effect, where he argues that some consequences strengthen behaviours while others weaken behaviours.

In his theory of classical conditioning, Pavlov also discussed the importance of stimulus-stimulus pairing to expand learning. In this pairing process, a conditioned stimulus as paired with an unconditioned stimulus that elicits an unconditioned response, bring a respondent behaviour. The classic example would be Pavlov's own experiment conducted with his dogs. Pavlov's experiment resulted in the conclusion that objects or events (ringing of the bell, along with serving the food) could trigger a conditioned response. As they show the dogs the bowl of their food, the dogs salivate. The dog food is the stimulus which elicited an unconditioned response, salivating. Later on, after some observation, Pavlov realized how the presence of his laboratory assistant as the server of the bowl of food created a conditioned response through association, i.e., the presence of laboratory assistant may signal the availability of food. To further prove his theory, Pavlov made use of a bell as a neutral stimulus. When a bowl of food is served to the dogs, Pavlov rang the bell. Then, after a certain number of repetitions of pairing, Pavlov rang the bell without the food, and the dogs still salivated. The conclusion that was reached in Pavlov's experiment is that the pairing of the unconditioned stimulus with a neutral stimulus (bell sound) resulted in the unconditioned response of salivation. When the neutral stimulus was the only one presented without the food, there is still salivation, which then becomes a conditioned response. The major contribution of Pavlov's theory of Classical Conditioning is stimulus-stimulus pairing, that broadens learning.

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Even though Psychology has dealt with the interactions of the human beings to the world, Watson (1913), in his “Psychology as the Behaviourist views it: The Behaviourist Manifesto”, critiques that Psychology, especially dealing with empirical, observable behaviours must be an experimental branch of science in order to solve the challenges regarding the interaction of the self with the environment. This means that as the goal of Psychology is the prediction and control of behaviour, the approach must be experimental similar to other natural sciences. This position contradicts that view that Psychology must take the approach of thinking about one’s mental states or thinking about feelings in order to solve some real challenges with one’s interaction with the world. If Psychology will limit its approach to introspection, or the examination of one’s mental and emotional processing through mentalism, then there will be no plausible explanation to the causes of behaviours or actions of man. The implication of this, however, is that we may not treat any behaviour or responses that need to be changed for the better through systematic framework because of a lack of mechanism beyond mentalism.



As an example, to further explain Watson's (1913) point about the shift in the method and perspective in looking at human behaviours, let us look at the behaviour of bullying. Bullying is defined as a set of responses or behaviour committed by a person who sees himself to have higher power than or stature compared to another person who is seen as weaker. The function or cause of the bullying behaviour is to inflict harm on the "weaker" person by force, coercion, threat, abuse, violence or intimidation. If we look at bullying in a mentalistic sense, we may explain it as phenomenon arising from the presence of a hierarchy among human beings, and that the powerful does bully because he is in a higher position. However, that kind of mentalistic explanation does not explain the function of the bullying behaviour and does not offer any resolution to improve the conditions of life, i.e., eliminate bullying and challenge the hierarchy that is complicit or supports bullying. If we look at this psychological encounter between the person who is bullying and the person who is being bullied, from a methodological behaviouristic lens, we systematically consider the factors of such bullying behaviour including: the form of bullying behaviour (topography, or what it looks like in observable, clear and concise way) and the function or cause of bullying, which could be maintained by attention: the person who bullies gets the attention or affirmed by the stature that he is powerful. He evokes such behaviour to maintain power and attention. There is also this previous experience of escaping from or avoiding accountability from bullying other people, that may have caused the person who bullies others, repeat this behaviour in the future. If we consider the factors of form and function of the behaviour, we can systematically manipulate variables, such as teaching the attention seeking behaviour other than bullying and also addressing accountability through positive practice or positive punishment of bullying behaviours, i.e., reprimand, correction or overcorrection, response blocking, or negative punishment such as response cost (taking something from the person who is bullying to decrease this behaviour), among others. This means that addressing the function of the behaviour may decrease the frequency of this inappropriate or challenging behaviour. Such is only the case if there is an analysis of behaviour using the lens of science itself, and using the very methods of prediction, experimentation and control.

In Watson's (1913) critique against the lack of the use of experimental analysis in introspection and mentalism, he posits that there is importance in the use behaviour data, wherein as methodologically as possible, analogical reference could be derived to look into behaviours through the science of human behaviour, and manipulate variables in the environment that could affect the behaviour. This means that to inspect and observe behaviour, which are products of the self's interaction with the world, one must use the approach of natural science, its determinism (cause and effect, law and order) and the effort to understand the reasons of one's actions because of the interaction with the world. If we fall into the trap of mentalism, or thinking about actions in so far that they are in our thoughts, the use of mental processes does not create real, measurable improvement. Mental processes need to co-relate with actions that can be experimentally tested and verified. Images or thoughts may prove important, but these do not lead to real, socially significant change.



Following Watson's methodological behaviourism, BF Skinner (1953) argues that that study of human behaviour must be dealt with the principles of natural science to see improvement and change in a self-correcting process. Skinner (1953) espouses the idea that in order to improve behaviour or the self, any behaviour change must be treated systematically through the science of human behaviour. For Skinner, this means all behaviours, either private (those behaviours which the self can only observe) or public (those behaviours which can be observed by others), should be dealt with using science. Thus, while Watson starts the change in framework through a shift in method, Skinner expands by broadening the scope, in a thoroughgoing sense: to study human behaviour, dealing with *all* kinds of behavioural events. Skinner's study of the science of human behaviour is developed within Radical Behaviourism—it is radical in the sense that it is exhaustive in scope, to consider public and private events or behaviours.

Skinner's Radical Behaviourism is related to two fundamental principles: (1) Darwinism, or selection by consequences, where the most relevant behaviours in terms of outcome and adaptation “survive” as can be extrapolated to more repertoires; and (2) Pragmatism, where the consequence makes the connection between the antecedent and the behaviour relevant. The most important part of Skinner's operant conditioning as an expansion of classical conditioning is that consequences as reinforcement or punishment, increase or decrease the future frequency of the behaviour. Here, operant behaviour is a materialization of Antecedent (A) – Behaviour (B) – Consequence (C) or Stimulus-Response-Stimulus (SRS), where learning results from the living organism's interaction with the environment. From the ABC contingency, the repetition of the behaviour in the future depends on the principles of behaviour through its consequences: reinforcement (increase), punishment (decrease), or extinction (total elimination). This means that the state where behaviour increases or decreases or is eliminated in the future depends on the consequences given after the behaviour is emitted or evoked. The three-term contingency or ABC or SRS is the fundamental unit of analysis in ABA.

The Science of Human Behaviour



Applied Behaviour Analysis or ABA is an approach that takes the method of natural science in manipulating variables in the environment in order to influence socially significant behaviour of any living organism – human beings or animals, among other living beings. Only living organisms like human beings and animals can elicit, evoke or emit behaviours or set of responses.

While, since 1960s when the field of Behaviourism or Behaviourology as termed to be the study of human behaviour as opposed to the larger scope or different approach of Psychology, ABA has been known as an effective, evidence-based intervention for children and adults diagnosed with Autism Spectrum Disorder (ASD), ABA has many other sub-specialties or sub-areas. As long as the subject matter is behaviour, Behaviour Analysis and its application can be related to diverse populations. The following are the subspecialties of ABA: Autism and Intellectual/Developmental Disabilities, Behavioural Gerontology, Behavioural Pediatrics, Sports, Brain Injury Rehabilitation, Prevention/Intervention in Child Maltreatment, Clinical Behaviour Analysis, Education, Health and Fitness, Organizational Behaviour Management (OBM), Sustainability and Treatment of Substance Abuse Disorder, among many other new sub-areas.

Since the principle and *praxis* (theory + action) of ABA is the technology of behaviour change that is practical and applicable, ABA is an evidence-based applied science which can be utilized to diverse populations.

The systematic approach that science has to find and organizing knowledge about the world, is based on determinism: we ask about a phenomenon, predict through a hypothesis, experiment with the manipulation of variables and collect data, in order to arrive at a conclusion, related to the cause and effect, and law and order. This is with the view that every event including behaviours have been necessitated by a cause or prior events, and conditions *a posteriori* (after), such as consequences, happen in succession and abide by the laws of nature. If we consider behaviours to have causes, and as effects of some things from the environment, then we can follow the scientific method of manipulating variables in the environment in order to improve some behaviour or eliminate challenging behaviours. Like any other scientific question or problem, there is phenomena understudy. For ABA, it is socially significant behaviours.

We may have been familiar with the scientific method: we see a phenomenon; we describe what it is (description) and we ask about it. Then we predict or correlate or covariate some events as factors that may occur when a certain event happens (prediction), and finally we engage in some form of experimentation by testing: manipulating the independent variable/s to see if there is an effect in the dependent variable (control). In Behaviour Analysis, the dependent variable is behaviour and the variables in the environment are the independent variables.

A concrete example of this application in Behaviour Analysis in Education: in the Grade Seven virtual classroom, during the remote learning daily educational activities, the students that were given 5-minute breaks (out of their chair and away from their computers) every 30 minutes had evoked no instances of off-task or out of seat behaviour during learning or teaching time. When breaks from virtual remote learning were stretched to 60 minutes or an hour, off task and out of seat behaviour increased by 72%. This “experiment” was repeated several times, and the behaviour data showed almost the same results. This means that changing duration of teaching time as a variable in the learning environment has an effect on students’ learning behaviours.

Apart from the law of cause and effect in determinism, the other philosophical principles or the attitudes of science unto which Behaviour Analysis finds utility in, are: (1) empiricism, dealing with the objective presentation of facts and description of events; (2) experimentation, manipulating the independent variables to consider the effects on the dependent variable; (3) replication of experiments and the systematic change processes used in the previous experiments to determine reliability and to pursue the self-correcting enterprise of Science (Skinner, 1953); (4) parsimony, from Occam’s Razor, which means using the simplest explanation or nearest variable that affects behaviour than considering complexities in terms of explanation; and (6) the use of philosophical doubt, which relies on testing and re-testing, experimenting and even challenging the temporal nature of scientific conclusions, in order to come up with better conclusions and results.



Dimensions of Applied Behaviour Analysis

From the use of the method of natural science to ABA, in 1968, in the inaugural issue of the Journal of Applied Behaviour Analysis (JABA), Baer, Wolf & Risley presented the seven dimensions of ABA. They also term these dimensions as elements, which are salient to the consider in using ABA as evidence-based applied science. The primary objective of presenting these dimensions is to bring the science of Behaviour Analysis beyond the laboratory settings. And to deal with the actual world, real-life problems, socially significant behaviours that will benefit the learner and change the world for the better.

A robust understanding of the (1) Concept System or Philosophy of Behaviourism is imperative to pursue the application of the field through Science. Understanding the philosophy of behaviourism is seen through the conceptually systematic relations and application of the basic principles of the study of behaviour, such as examining the form or topography of behaviours and being able to define target behaviours in observable, clear and concise ways. More significantly, looking at the functions or causes of the behaviour. This then leads to the dimensions of (2) Applied and (3) Behavioural – defining behaviours as the movement and actions of living organisms in relation to the environment, and being able to observe this movement and actions change or improve, as the variables in the environment are manipulated. Because we describe behaviours in observable and objective ways, behaviours and behaviour change are measurable. Any target behaviour to be changed, i.e., increase in skills or decrease in challenging behaviours should fit the criteria that these are socially significant to the learner – in line with the Applied dimension. All behaviour change procedures must also be (4) Technological, with the possibility of repeating the technology of teaching and testing the results so that there is reliability.

To measure behaviour and behaviour change as the variables in the environment are manipulated, the use of visual analysis of behaviour data is significant to fulfill the (5) Analytic and (6) Effective dimensions. If there are variables in the environment that are manipulated to evoke the target behaviour to be changed according to what we deem appropriate or acceptable, but this case does not happen, then there is something that is happening in the teaching process where the learner does not gain learning. *If the learner does not learn the way we teach, it is our responsibility to change the way we teach.* We will know this by the behaviour data and skills data that we collect and measure while the teaching and learning processes are happening. One way to see if there is effective teaching is not only to see the behaviour improves but also the behaviour expands, and this relates to the dimension of (7) Generality: generalizing the things learned in teaching settings into other circumstances outside of the instructional environment.

Although ABA is more “famous” for the utility its methods as an intervention for children and adults diagnosed with Autism Spectrum Disorder, there are other areas, disciplines, industries and fields which will certainly benefit from the application of Behaviour Analysis. We should reiterate it that as long as the subject matter is human behaviour, which could be any dynamic by-product of a living organism’s interaction with his environment, then Behaviourism or Behaviour Analysis is relevant.

Conclusion: Behaviour Analysis in Education

In education, we consider how positive behavioural tactics and strategies can contribute not only to an individual learner but also to school communities. Usually, behavioural technology of teaching is utilized for the behaviour change of students or learners. However, in using Behaviour Analysis in Education, the teachers and other significant adults in the learning community and their behaviour are also considered as important, and as variables in the environment. Behaviour Analysis in Education can use the scientific approach to learning and teaching, based on analyzing teaching as a variable in the learning environment. Behavioural strategies for the school staff, teachers, school administrators, teaching assistants and educational assistants are necessary for these staff to consider developing some skill set or behaviours that contribute to success in learning and to evoke socially important behaviours in the systems of schooling. The application of Behaviour Analysis in Education may be applied to classroom management, curriculum and instruction, educational technology, evidence-based education, streams of education, positive behavioural support through group contingencies within the school communities, behaviour change in the administration and policy dimensions of systems of schooling and teacher education.

On systems of schooling view, the use of Behaviour Analysis in Education to improve the art of teaching while pursuing the science of learning addresses the germane goals of education, which are, while utilizing the strengths of a learner to address his or her needs, offer evidence-based, individualized teaching and accessible forms of learning, to make effective education, a reality to diverse learners.

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A short introduction to the Concepts and Science behind Behaviour Analysis

In this book, the author presents the short history of Behaviourism, the principle and philosophy behind Applied Behaviour Analysis. The discussion also highlights the relevance of the rule of science and its methods as the fundamental approach in ABA. The dimensions or elements of ABA as the study of socially significant behaviours are discussed along with respondent and operant behaviours, classical and operant conditioning as important terms and concepts. The book ends with the discussion of the relevance and social validity of the application of Behaviour Analysis in Education.