

The Behaviour Triangle Model: A Framework for Predicting Adolescents' Behaviour

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ABSTRACT

The Behaviour Triangle Model, a mental framework that I developed, which gives a simplified helicopter view of all the main societal determinants of adolescents' health and behaviour, and which highlights the nature and nurture interactions in the dynamics of their development is presented along with descriptions of the model purpose, goal, tenets and major core constructs. Evidence from recent articles and books provide relevant examples to enhance scholarly understanding and application of the model. It is expected that the Behaviour Triangle Model will guide the development of adolescents and young people's courses and curricula to prepare competent parents, adolescent programmer and educators; guide future administrative and leadership policies and procedures; and inform public policies related to adolescents' health.

Keywords: Adolescent; Behaviour Triangle; Brain; Context; Hormones Health; Social Capital; Transformations; Transitions

Introduction

Over the past decades, scientists have conducted research on adolescents and have tried to understand the major factors determining their health and behaviour. The Behaviour Triangle Model (BTM) is marked off from the many existing complex and inconsistent models that explain the operation of the psycho-social determinants of an adolescent's health by a very well structured and easy to understand tenets which are drawn directly from the exhaustive review of brain and social science research literature on factors that predict adolescents' health and health behaviour.

The health and behaviour of adolescents are strongly affected not only by their psychological experiences, but also by the social, cultural, and political influences presented to them. These multisystemic-ecological contexts, in combination with the psychological and social factors that affect adolescents can have both positive influences (protective factors) and negative influences (risk factors) in each of the environments or contexts in which an adolescent develops [1-3].

A systemic review of literature has highlighted more than a dozen of specific predictors of adolescents' behaviour, that may occur simultaneously, or could be logically categorized into a triangular model of three major factors, namely (see Figure 1 [3-5]):

- The Context or the adolescent individual socio-cultural and structural contexts, including culture, religion, and national wealth and income.
- The adolescent individual transformations, including the hormonal changes, the brain development and their personality traits.
- The adolescent social capital transitions, including the Microsystems in which the adolescent thrives, e.g. family bonds, the community bridges and the media.

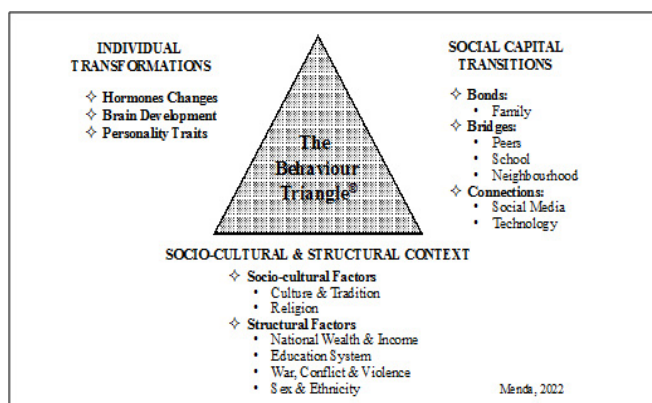


Figure 1: The Menda Behaviour Triangle Model to depict the major factors and subfactors determining adolescents' health and health behaviour.

Purpose and Goal of the Framework

Most of the interventions aiming at preventing and reducing adolescents' vulnerability have been attempting to influence these factors in isolation, hence ignoring the influence of others. The BTM attempts to address this shortcoming by looking at the adolescents' health behaviour with a polyadic perspective.

The purpose of the framework of BTM is to interpret, explain and even predict some of the multiple factors influencing the health and health behaviour of young people (aged 10-24 years) from a social, economic and structural point of view; individual transformations; and social capital transitions view. The framework is meant to help guide the adolescents, parents, educators, health workers, and public health programmers to familiarize themselves with and understand the strongest determinants of a young person's health, e.g. the social, economic, structural, biological and ecological factors that influence their behaviour, which in turn can influence their health and well-being, or assist them in preventing risk behaviours. Ultimately, the goal is to establish a framework that could advise the design and implementation of evidence-based adolescents' programming.

Theoretical Tenets

I have conceptualized and formulated three major tenets for the BTM to identify three main levels at which the determinants of adolescents' health and health behaviour operate: contextual, biological, and proximal.

The First Theoretical Tenet: "The *Context* that is offered to adolescents helps understand the dynamics of their development and social capital transitions".

The *Context* or *Macrosystem* is the cultural and structural environment in which the adolescents growth at permeates their

biological transformation and their social capital transitions. It is the cultural setting that includes social expectations for an individual or group behaviour [1]. The *Context*, constituted by the socio-cultural and structural contexts, include tenets of behaviour; rules (both spoken and unspoken); morals of a particular time, place, generation, and environment; attitudes toward diversity and civil rights; war or conflict and climate change; and cultural factors such as sex and ethnic equality. It also includes the structural factors, e.g. the political and economic systems, wealth and its distribution within a country, the education system including access to education, employment opportunities for young people, health service access, poverty, migration and homelessness [1,2,6]

In this model, factors are purposely equated to the basis or foundation of the triangle, because the society in which the adolescents grow that permeates the culture prevailing in their society; the youth subculture affiliation, which deviate in certain ways from a dominant adult culture in values, beliefs, norms, moral codes, and ways of living with some distinctive features, characterize their unique lifeways; and the national structures, which form the basis or foundation of their individual biological transformations and their social capital transitions [3,7]. A good understanding of the effects of the *Context factors* and the pressure a youth may experience from these effects will help appreciate the adolescents' sense of identity, purpose, and values [1].

Depending on the 'quality' of the *Context*, the socio-cultural and structural factors can become either *assets* or *liabilities* for the adolescents (Table 1 and Table 2);hence, respectively determining their resilience or vulnerability [3,7-9]. Damages caused in any of the elements of the basis of the Behaviour Triangle result in vulnerability which may be very difficult to rectify [7,9].

Table 1: Context as an Asset.

<p>Culture</p> <ul style="list-style-type: none"> Living in <i>collectivistic</i> cultures where the emphasis is put on self-control, emotional restraint, and compliance with social norms [10,11]. <p><u>Religion</u></p> <ul style="list-style-type: none"> The <i>knowledge</i> of religion (the intellectual aspect of religion) [12]. The <i>attendance</i> or participation in religious services (the ritualistic aspect)[12]. The <i>attachment</i> of considerable importance and emotional attachment to religious things (the experiential aspect) [12]. The <i>internalization</i> of the belief system of the religious tradition (the ideological aspect)[12]. <p><u>National Wealth and Income</u></p> <ul style="list-style-type: none"> Greater national wealth [13,14]. <p><u>Education</u></p> <ul style="list-style-type: none"> Completion of secondary school [15-18]. <p><u>War and Conflict</u></p> <ul style="list-style-type: none"> Education and family support [16,17].
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Table 2: Context's as a Liability.

<p><u>Culture</u></p> <ul style="list-style-type: none"> Cultures characterized by a lack of parental acceptance <p><u>National Wealth and Income Inequality</u></p> <ul style="list-style-type: none"> Living in less affluent countries and countries with greater socioeconomic inequalities [6]. Poverty and income inequality [19]. Political and economic systems that produce greater income inequality [3]. Rapid economic development and urbanization [20]. Greater youth unemployment [3,21]. <p><u>War and Conflict</u></p> <ul style="list-style-type: none"> Conflict [22]. Involvement in conflict(s) as a child soldier [3].
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Sex and Ethnicity Inequality

- Girls have poorer wellbeing indicators, such as self-rated health, psychosomatic complaints or symptoms, and life satisfaction [23].
- Boys have higher levels of injury and being overweight [23].
- Being an immigrant [3].
- Having differing cultural and religious norms [3].
- Discrimination [24].

The Second Theoretical Tenet:“The adolescents’ individual transformations, mainly the hormonal changes, the brain development, and their personality traits, lead to new sets of behaviours and capacities that influence their social capital transitions in the family, among peers, among educationalists, and in health behaviours” [3]. In this model, these factors, which are heavily influenced by the socio-cultural and structural context, are purposely equated to the left side of the triangle.

Advances in Neurosciences, disciplines that study the human brain and the nervous system, and which combines the disciplines of biology, physiology, anatomy, psychology, human behavior, and cognition to better understand the brain. Computer imaging and the scanning of the brain is now possible [25], in which it possible to study the different parts of the adolescent brain, to understand its normal trajectories of how it develops over time, and how brain development is affected by both genetics and environment[26-28].

As an individual grows and develops, the environment where they reside has a profound effect on how their genes are expressed [27,29]. Therefore, their brain develops with the expression of the genes they have received from their parents, that is, nature, and the environment they are raised in, that is, nurture. Therefore, the health and health behaviour of adolescents are influenced by both their genetic makeup (nature) and their environment (nurture) [1].

The Brain Development

The brain develops from the bottom up, inside out and back to the front [29]. Thus, the front of the brain is the last to develop and does not do so until a person’s mid- to late 20s [29].

During the teenage years, three areas are especially important. One is the Prefrontal Cortex (PFC), associated with thinking, reasoning, problem solving and other intellectual activities. The second is the Amygdala, an area buried deep in the brain and associated with emotion, sensation and reward-seeking. The third is the Hippocampus, the area most associated with memory processes. These areas of the brain undergo major development and change at this time [29,30].

The teenage years are a period when the brain alters more than at any other time, apart from the first three years of life. The experiences that a young person has at this stage will affect brain development to a greater extent than other times of life. This is the period when the brain goes through a major process of maturation. It becomes more efficient, and a variety of new skills and abilities develop. Memory, language, thinking and reasoning all improve[29,30].

Innovations in neuroscience have proposed that adolescent risk taking is a function of two systems of the brain developing at different times. These are the Limbic System and the Prefrontal Cortex. The social-emotional brain, the limbic system, undergoes a change at about the time of puberty, 12–14 years old, which alters the youth’s attentiveness to rewards, sensation seeking, emotional arousal, short-term gratification, and adherence to social norms [31].

However, the cognitive control portion of the brain, the

prefrontal cortex-responsible for impulse control, planning, self-regulation, anticipating future consequences, resistance to peer influences, and fore-thought-does not begin to mature until the mid-teens and does not fully mature until the mid-20s[28,31]. Therefore, the social-emotional maturing brain is left unchecked until the cognitive control portion of the brain can “catch up.” Thus, adolescent risk behaviour can be viewed as a function of timing of the growth of these different portions of the brain (Figure 2)[30]. Therefore, from a neuroscience perspective, cognitive interventions that change the youth’s risk-taking behaviour will not work because the behaviour is a function of an incompletely developed brain. What will work from a neuroscience perspective to reduce risk taking is to change the environment where the youth lives [1].

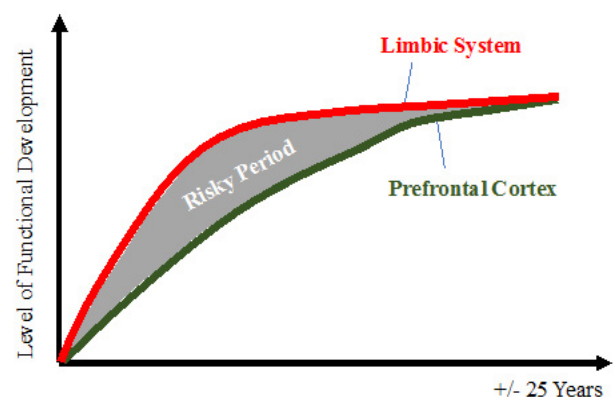


Figure 2: The Limbic System is on a steeper curve than the Prefrontal Cortex. Adapted from Casey, B.J., et al. 2008. [32].

The Hormonal Changes

Sex hormones

The levels of the sex hormones, such as oestrogen and testosterone, increase at puberty, and these hormones have a profound effect on the adolescents’ sexual development and sexual behaviour [30]. Puberty involves changes in all organs of the adolescent’s body, including the lungs, the heart and other organs, such as the brain [30]. During puberty, the composition of the adolescent’s blood is also altered, as does the hormone balance[30]. Below are some basic facts about puberty [30]:

- The beginning of puberty is triggered primarily by the release of sex hormones, such as testosterone in the case of boys and oestrogen in the case of girls.
- All the different changes associated with puberty will last about two years.
- Puberty starts between one year and 18 months earlier for girls than it does for boys.
- There is wide individual variation in the age of puberty and the sequence of changes. This is perfectly normal.
- In spite of the average age being 11 years 10 months, one in five girls will have started their periods while still in primary school.
- Although the age of some aspects of puberty has not changed for decades, it would appear that the start of puberty (e.g. breast bud development for girls and the voice breaking for

boys) is getting earlier. No generally agreed explanation for this has yet to be put forward.

- Although the physical changes will be the obvious ones that can be seen by the outside world, there are emotional changes that can have a significant impact too. In the physical domain, girls enter adolescence at a very young chronological age, while their cognitive, emotional, moral, language, and social domains are still developing and operating at a childhood level [1]. Thus, outwardly, girls have an adult body, but inwardly they are still a child.

Brain Hormones

Besides the sexual hormones, there are dozens of other

hormones that affect the way the brain functions. There are a few that are particularly important in relation to the teenage years, which are often linked with an upset of the hormone balance. This is the time when “hormones are all over the place”[30]. Even though we all have some degree of daily variation in the balance of hormones in our brains; however, for adolescents, the variation is much greater. In adolescents, the level of any of the key hormones (serotonin, cortisol, melatonin, and dopamine) may be going up and down to a significant extent during any 24-hour period; hence affecting their behaviours and emotions regulation (Table 3) [30].

Table 3: The role of hormones in the brain. Source Coleman, J., 2021.

<p>Serotonin. Serotonin is a hormone that is released when we feel good, happy, relaxed and at ease. This is the hormone that helps keep our mood steady. Low levels of serotonin can be a factor in depression. Variation in serotonin levels may play a part in leaving adolescents at the mercy of feelings of sadness or misery. Adolescents who have extreme reactions to minor setbacks may be experiencing significant variation in levels of serotonin.</p>
<p>Cortisol. Cortisol is one of the major hormones released when we are anxious, stressed or vulnerable. On a short-term basis, cortisol can be useful. When we are under threat it is the hormone that prepares our body to respond appropriately. This is the famous “fight or flight” response. However, too much cortisol has a detrimental effect on our bodies and leads to poor functioning. The emotions of worry, anxiety and other similar feelings are all associated with levels of cortisol in the brain, and research has shown that cortisol levels are somewhat higher in adolescence than in adulthood.</p>
<p>Dopamine. Dopamine plays a big role in the teenage brain. There are more dopamine receptors in the adolescent’s brain than there are in the adult brain. Dopamine has two functions. On the one hand, it encourages behaviour that may lead to a reward or the sensation of pleasure. It also has a separate role, in that dopamine is released following a reward, causing a feeling of well- being and satisfaction.</p>
<p>Melatonin. Melatonin is the hormone that makes us feel sleepy. It is released in the brain at roughly the same time each night, signaling that it is time to go to bed. However, melatonin is released later in teenagers than it is in adults. This means that young people do not necessarily feel sleepy at the same time as others in the family and may find it more difficult to get to sleep.</p>

The Third Theoretical Tenet: “The adolescents’ *Social Capital Transitions* enable or hinder them to trust each other, to trust the people in their ecological system, and so work together or not”[7].

As individuals, we develop in a number of different contexts, which involves the reciprocal interplay among people, objects, and symbols [1]. In adolescence, young people participate in a multitude of microsystems. The *microsystem* has been defined “as a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical and material features and contain the other person’s distinctive characteristics of temperament, personality, and systems of belief”[33].

The adolescents’ Social Capital Transitions start from (1) the family, where they establish *Bonds* with their family, close friends and people who share their culture, and ethnicity;and extends to (2) the school, where they build *Bridges* with distant

friends and acquaintances; and finally to (3) neighbourhood, where they establish *Connections* with people or groups further up or lower down their social ladder, using platforms created by the ‘new media’, e.g. Facebook, WhatsApp, Internet etc. [1,7,34].

In any of these systems, the adolescent’s development is bidirectional; meaning, the family and school influence their development and the adolescent, in turn, influences the family and school. As the adolescent moves from one setting to another, relationships may change. One microsystem, such as their neighbourhood, may be a venue where they flourish; another, such as the school, may be a location where they feel stifled, lost, or stigmatized. Table 4 highlights the protective factors, e.g. beliefs, perceptions, and traits that help the individual adolescent to right themselves during times of turmoil or difficulty. Table 4 also highlights the risk factors that have been evaluated by researchers as having a particularly deleterious impact on the adolescents’ development. [1].

Table 4: Protective Factors. Source: Source: Julie A. Laser&Nicole Nicotera, 2021.

<u>Internal Protective Factors</u>	<u>School Microsystem Protective Factors</u>
<ul style="list-style-type: none"> • Mental flexibility • Sense of humor • Cognitive ability • Spirituality/faith/sense of purpose • Gender • Optimism/hopefulness • Physical beauty • Emotional intelligence • Easy temperament • Creation of a personal myth • Perceive and access social support • Moral development 	<ul style="list-style-type: none"> • School mentor for youth at school • Sense of community/social network at school • Sense of belonging at school/sense of being needed at school • Supportive friends at school • Classroom size and school size • School as an oasis • Enjoyment of school • Extracurricular activities or special talents fostered at school • Physical environment of the school • Ability to access social support at school • Teaching techniques that foster group processes and connection • Creating opportunities for praise and valuing accomplishments

<ul style="list-style-type: none"> • Self-efficacy • Autonomy • Internal locus of control • Stick-to-itiveness <p><u>Family Microsystem Protective Factors</u></p> <ul style="list-style-type: none"> • Mother’s level of education • Parental transfer of positive values • Family economic stability • Required helpfulness/chores • Healthy parental marriage or healthy commitment to each other • Extended family support • Maternal relationship with youth • Paternal relationship with youth • Sense of family belonging • Family’s ability to access social support 	<ul style="list-style-type: none"> • Teaching with an explanatory style • Schools with high expectations for their students • Teachers who take a particular interest in students <p><u>Neighborhood Microsystem Protective Factors</u></p> <ul style="list-style-type: none"> • Sense of community • Community pride • Collective efficacy (watching out for each other) • Social network • Sense of belonging • Safety • Social capital • Ability to access social support
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Table 5: Risk Factors. Source: Julie A. Laser & Nicole Nicotera, 2021.

<p><u>Developmental Risk Factors</u></p> <ul style="list-style-type: none"> • Gender • Age • History of physical abuse • History of sexual abuse • Severe or chronic illness in childhood • Loss of parent/primary caretaker before 10 years old • Difficult temperament • Substance addiction • Untreated mental illness • Lack of attachment relationship with caring adult <p><u>Family Microsystem Risk Factors</u></p> <ul style="list-style-type: none"> • Chronic parental neglect • Lack of ability of parent(s) to support family • Untreated parental depression or mental illness • Personality differences with parents • Maternal level of education • Parent(s) not physically present • Parent(s) not emotionally present • Lack of attached parental role • Parent(s) not aware of youth’s activities • Severe marital/partner discord • Witness to domestic violence • Family size • Sibling spacing • Living in a home that is overcrowded • Parental substance abuse • Frequency of moving • Parental favoritism of sibling • Lack of parenting consistency 	<p><u>School Microsystem Protective Factors</u></p> <ul style="list-style-type: none"> • Nonattendance at school/truancy • Poor academic success • Attention difficulties due to trauma or ADHD • Difficulty making or keeping friends • Scapegoating by teacher or administrator • Being bullied/intimidated by peers • Feeling isolated or unnoticed by peers or teachers • Aggressive/inappropriate behavior in school • Broken-down schools • Poorly trained teachers • Lack of parent–school interface • Feeling stupid in front of peers <p><u>Neighborhood Microsystem Risk Factors</u></p> <ul style="list-style-type: none"> • Violence in the neighbourhood • Gang activity in the neighbourhood • Lack of repair and upkeep of homes/buildings • Lack of role models in the neighbourhood • Lack of safety in the neighbourhood • High rate of abandoned homes/buildings • Distrust of police • Distrust of neighbours • Distrust of mechanism of support
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Summation

This article provided an evidence-based overview of the current research findings on the societal determinants of an adolescent’s health and behaviour. The purpose, goal, tenets and the major core constructs were described. Articles and books on adolescents and young people’s bio-psycho-social and spiritual research were cited as relevant exemplars that enhance the understanding of an adolescent’s behaviour major

core constructs. It is the expectation of the author that the BTM will help develop an adolescent’s subcultural competent parents, educators, administrative and leadership policies and interventions.

Declaration of Conflicting Interests

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