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MOTIVATIONAL ENHANCEMENT PARENTING: A NEUROBIOLOGICAL MODEL OF PARENTING

Psychiatry

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ABSTRACT

Parenting is a very emotional, important and difficult process in humans. Parenting models have not yet struck an ideal balance between various dimensions of parenting viz. warmth vs rejection, structure vs chaos, and autonomy support vs coercion. Despite multiple attempts, the path to the ultimate aim of developing self-control in the child is yet to be discovered.

The recent developments in the area of neurobiology of emotional control and decision making processes including underlying motivation may hold the key to this puzzle which couldn't be solved by various psychological theories. Keeping this in mind, the research in the field of neurobiology of emotional control, motivation and decision making is reviewed. The review reveals three basic neurobehavioral systems. Approach system centered on nucleus accumbans, Avoidance system centered on amygdala and Regulatory System centered on Prefrontal Cortex. Review also shows that Regulatory System is the substrate for self-control. Approach and avoidance system are found to influence each other, as well as the regulatory system.

Keeping in mind the findings of the review, a parenting model, **Motivational Enhancement Parenting (MEP)**, is being proposed with the basic aim of strengthening the Regulatory System, in absolute as well as relative terms. The principles of MEP strikes an ideal balance between various parenting dimensions and will pave the way for the development of self-control in the child as well as the parents.

KEYWORDS

Parenting, Emotion Control, Motivation, Decision making, Self-control, Neurobiology.

INTRODUCTION:

Parenting advices till date has been based on one or the other psychological theories. The two theoretical models of parenting i.e. behaviourism and attachment were often presented as a forced choice. [1] Baumrind consolidated these into two dimensions of parenting – 'demandingness' and 'responsiveness' – and gave four parenting styles. Soon third dimension was identified – 'Autonomy Support' – as compliance was conceptualized to be different than self-regulation [2]. Two related but distinct aspects of self-regulation were also delineated, effortful control and internalized conduct. Effortful control has been defined as the ability to suppress inappropriate behaviour and perform required or appropriate behaviour in response to environmental demands [3]. Internalization of rules of conduct has been defined as regulated or appropriate behaviour in response to contextual demands even in the absence of surveillance[4]. An influential paper then summarized the dimensions of parenting.[5] These are warmth vs rejection, structure vs chaos, and autonomy support vs coercion.

Various parenting models were proposed to find a balance in these seemingly conflicting dimensions like STAR Parenting, SFP 10-14 model, PCIT[1], Positive Parenting Programme but failed to address as to how these will develop self-control.

To address these shortcomings, to understand relation between compliance and self-regulation, and to find ways to develop self-regulation, the neurobiology of emotional control and decision-making processes including underlying motivation will be reviewed. As it will be clear from the review, self-control is the function of the Regulatory System (RS). Keeping this in mind, a Parenting Model by the name of "**MOTIVATIONAL ENHANCEMENT PARENTING" (MEP)** is proposed.

The **AIM** of MEP is to enhance emotional and behavioural control through regulation of motivation and decision making, without adversely affecting pleasurable and protective motivational drives.

The GOALS of MEP are:

1. To fine-tune the Approach System (APS) and Avoidance System (AVS) by strengthening the Regulatory System (RS).
2. To enhance the role of Regulatory System (RS) in motivation and decision making.

The key idea is to make the RS strong and well-connected early in life using parenting skills. This can be achieved along the principle of Neuroplasticity i.e. changes in functional and structural connectivity of brain systems and structures in response to their stimulation[6]. To appreciate their underlying basis, the goals and principles of the model will be incorporated in the review itself.

Relationship between Emotional Control, Motivation and Decision Making:

Motivations are typically conceptualized as processes that drive goal-directed behaviours aimed at achieving desired outcomes and avoiding undesired ones[7]. The motivated behaviour is described along a dimensional continuum extending between two poles, i.e., one extreme dominated by approach behaviour vs. the other extreme dominated by avoidance behaviour. Jeffery A. Gray formalized the concept of two separate neurobehavioral systems underlying responses to reward (approach) and responses to punishment (avoidance)[8], which is extensively used in research on personality and temperament [9].

Triadic model of the neurobiology of motivated behaviour

Building on the work of Jeffery Grey, Ernst et al.[10] proposed a triadic model which hypothesizes that motivated behaviour results from the balanced engagement of three neurobehavioral systems: (1) Avoidance (harm-avoidant); (2) Approach (reward-driven); and (3) Regulatory. The dominant role of each of these systems is respectively the processing of avoidance, the processing of approach, and the modulation of avoidance vs. approach.

Review of Neurobiology of Emotional Control, Motivation and Decision Making

I. Neural Correlates of Avoidant System (AVS)

Avoidance signifies sensitivity to potential threats, fear, and shyness. AVS favours behavioural withdrawal and inhibition in response to novelty and challenge [11]. The best-understood region is the amygdala, which learns to mediate conditioned responses through connections with other brain regions[12]. Amygdala neurons mainly carry information about stimulus-outcome associations independent of context[13].

Avoidant system, though necessary for survival, may lead to maladjustment including anxiety and depression, if becomes hyperactive.

II. Neural Correlates of the Approach System (APS)

Approach signifies sensitivity to rewards, emotionally positive anticipation for pleasurable activities, and behavioural approach to novelty and challenge [11]. Many brain regions including the ventral striatum, insula, orbitofrontal cortex, amygdala, hypothalamus, periaqueductal gray and other brainstem nuclei [14] are considered to be the components of the brain's reward system and hence, of approach system. The ventral striatum circuits, particularly the nucleus accumbens, support reward processes and approach behaviour[15].

APS, though essential for reward motivation, may lead to maladjustment including addiction and impulsivity problems, if becomes hyperactive.

III. Relation between Avoidance and Approach Systems

Studies suggest that inhibited and anxious individuals show greater sensitivity not only to avoidance-related aversive cues but also to approach-related appetitive cues[16] i.e. emotions alter reinforcer sensitivity. Other studies[17] demonstrate that experimentally-elicited anxiety selectively reduces pleasure on receiving the reward.

These findings suggest that individuals with hyperactive avoidance system may be more sensitive to pleasure-inducing cues but likely to experience less pleasure while indulging in pleasurable activities. Such individuals may be more prone to various kinds of addictions in the real world, including behavioural addictions.

IV. Neural Correlates of the Regulatory System (RS)

Emotion regulation is a complex skill and is a fundamental aspect of adaptive human behaviour. Emotion regulation is the process by which implicit and explicit goals alters the emotional response[18]. Emotion Regulation including self-regulation requires top-down cognitive control.[19] Extensive evidence suggests the existence of a cortical regulatory system that implements cognitive control.[20] Through the modulation of emotions, RS plays an important role in the control of motivated behaviour[21]. The functioning of RS doesn't only depend upon the age but also on its stimulation. So, in similar age group, RS functions better in those individuals whose RS received more stimulation. Rather than focusing on compliance, parents should concentrate on stimulating RS.

Principle 1: Concentrate On Capacity.

RS has three capacities:

a. Emotional Control
b. Modifying Motivation
c. Rational Decision making

e.g. If the child is unable to regulate the desire of eating the lollipop even after explaining that it will damage his teeth, then it means that the child hasn't developed the capacity to regulate the APS. Rather than forcing compliance, parents should try to strengthen the child's RS by following the principles of MEP.

Valence

The process of regulation of motivation starts with the Valence of the emotional state which provides information about one's disposition toward stimuli[22], with a positive valence promoting approach and negative valence promoting avoidance. From a network standpoint, the reward-processing and decision-making functions of the vmPFC are thought to depend on interactions with the APS and AVS[23].

Thus compliance can be obtained by modifying the contingencies acting on AVS or APS i.e. reward or punishment. This however doesn't strengthen the RS and hence not desirable.

Implicit Emotion Regulation (IR)

Implicit emotion regulation is defined as goal-driven processes without conscious, deliberate control or awareness[19]. Research implicates the vmPFC in regulating negative emotion implicitly. Some examples of IR are fear extinction, fear generalization, and placebo analgesia[23]. It shows that IR gets activated primarily to control hyperactive AVS.

Principle 2: Focus On Future

As in above example, if the parents use threat of punishment, to obtain compliance then they are more likely to succeed initially. But, neurobiologically, the decision will be taken in the child's mind by stimulation of AVS. Whenever AVS is stimulated, IR is activated leading to one of two possible outcomes: -

a. If IR is not effective, AVS will remain hyperactive and will gradually lead to fear conditioning. So the child will start remaining anxious whenever he encounters lollipop. He may start disliking children who eat lollipop and may even fight with them. It may appear as self-control but it is not because it is context independent. Additional consequences include: -

i. Impairment of RS functioning
ii. Increased sensitivity of the APS to pleasurable cues coupled with less than expected pleasure while indulging in the activity.

b. If IR is effective, it will progressively suppress the AVS leading to decrease in its contribution to decision making. As discussed earlier, this will make the individual prone to antisocial behaviour due to unopposed APS in decision making.

Both of the above outcomes will make the individual highly vulnerable to addictions. So it is important for the parents to focus on future goal of self-control rather than immediate compliance.

Explicit Emotion Regulation (ER)

ER strategies are consciously initiated and are supported by controlled processes[24]. Hence they are also known as "cognitive control". Four brain areas have been most strongly implicated in ER: dorsolateral prefrontal cortex (dlPFC), ventrolateral prefrontal cortex (vlPFC), dorsal anterior cingulate cortex (dACC) and dorsal medial prefrontal cortex (dmPFC)[25].

Table 1 – Relation Between IR And ER – Inference of Neurobiology[24,26,27]:

S.No	IR	ER
1.	Doesn't involve neocortex to a large extent	Mainly involve neoortex
2.	Dominant form of emotional regulation in animals	More important in primates due to encephalisation esp. humans
3.	Primitive	Advanced
4.	More active in children	Increases with age
5.	More consistent but less flexible	More flexible
6.	Deal with unambiguous emotionally charged stimuli. E.g. Train noise stops reaching consciousness of those living near railway tracks.	Deal with ambiguous stimuli.
7.	Mainly to counter hyperactive AVS	More active when IR is ineffective
8.	Not impaired by hyperactive AVS	Impaired by hyperactive AVS
9.	If effective, lead to rapid resolution of hyperactive AVS	More efficient if supported by IR
10.	Not under conscious control, so may be maladaptive	Under conscious control, so usually not maladaptive
11.	More genetically dependent and not much modifiable by training/learning	More dependent on training/learning
12.	-------	May be made more implicit by practicing

Three explicit-controlled emotion regulation strategies have received the most attention: selective attention, distraction, and reappraisal[24].

Attentional avoidance or distraction, the process of keeping our minds occupied with irrelevant cognitions thereby diminishing the amount of attention devoted to a stimulus, is perhaps the most basic ER mechanism[28]. Reappraisal involves intentionally changing how we think about and describe a stimulus's meaning so as to alter our emotional response to it[18]. Rolls[29] reviews evidence suggesting that reappraisal critically depends on working memory.

Reappraisal involves understanding of: -

a. rules and context[30]
b. other's mental states[31] for making utilitarian decisions in the context of moral dilemmas
c. long-term goals[32] i.e. in delaying gratification.
d. self-image [32,33]

Thus, Reappraisal engages the regulatory system to the greatest extent and hence can be most adaptive.

Regulation of Decision Making:

Cognitive control refers to the ability of a human to intentionally execute a weak response in the face of a dominant but inappropriate response[34]. Inter-temporal choices i.e. prioritizing long-term goals over short-term comforts[35] are intricately tied up with popular notions of self-control. It works by reduced discounting i.e. negatively valuing the excitement associated with immediate pleasurable activity so that the long-term happiness can have a stronger impact on choice[31].

Principle 3: Distract/ Delay/ Substitute

Salient points: -

a. Most basic ER and precursor to more advanced ER like reappraisal.
b. Parents need to provide support initially for their implementation.
c. Best for initial stimulation and strengthening of RS.
d. They can be selected based on age and strength of RS of the child.
e. Distracting stimuli should not be pleasurable.
f. It is different from commonly used term distraction i.e. pleasure or anxiety inducing cues making the attention shift from goal directed thinking.

As in above example when a toddler desires a lollipop, the parents should do any of the following things: -

a. Try to distract the attention of the child to something which is interesting like a bird or how the shopping trolley rotates. (**Distraction**)
b. Tell him that his request will be considered after buying other items. If he still persists then assure him that the lollipop will be given but after shopping. (**Delay**)
c. If the child still persists relentlessly then it means the RS is very weak. Parents should then ask the child to have something else which may be pleasurable but isn't likely to damage the teeth. (**Substitute**)

Principle 4: Concentrate On Context

During reappraisal, context plays a very important role. The benefits are: -

a. Decision making becomes more and more rational.
b. Its use depend more on the strength of RS rather than age of the child.
c. Delay and substitution become more feasible and acceptable.
d. Makes the environment more predictable for the child, as rules and decisions of the parents starts to make sense.
e. Will contribute greatly in the development of RS.

As in above example the parents may explain to the child that the lollipop available is not of good quality or very costly. Also, that the lollipop will be given which will be of good quality or cheaper.

Principle 5: Fostering Farsightedness.

The RS of the child is engaged to a great extent when the child is made aware of the long-term goals. It should be based on the natural consequences. Artificial contingencies like rewards and punishments leads brain to focus on immediate consequences leading to poor development of RS.

As in above example, the parents should give as many long term negative consequences of the eating the lollipop as they can like caries tooth, wastage of money etc.

Principle 6: Don't Deny

Along the principle of reduced discounting, influence of RS on motivation and decision making weakens when the long-term goal is too far away, not of much importance or when the delay is uncertain[35]. Denial will lead to immediate dis-engagement of RS and increased engagement of Approach System (APS). This will tilt the motivation and decision making in favor of the index activity. Executive functions will then be recruited to indulge in that activity irrespective of the consequences.

As in above example denying the child of lollipop is not desirable. That may lead to precipitation of tantrum. So, the desire of the child should be acknowledged and taken into consideration. This is also important as it will not inhibit the reward system which is essential for and the main driving force behind motivation.

Principle 7: Self-Image Supplementation

The most advanced and most complex of all the variables taken into consideration by RS is self-image. Self-image is taken into consideration during reappraisal. This is slowest to develop and most difficult to change. This includes our likes and dislikes as well as our priorities while taking decisions.

To build a healthy self-image the parents should emphasize to the child that: -

a. He is more than his desires and fears.
b. Self-control is the only way to achieve happiness and should be the topmost priority.
c. The child's intentions should never be questioned as the problem is lack of self-control.
d. Mistakes are part of learning and they do not make him a bad person.

V. Influence of Avoidance System on Regulatory System

Emotions can lead to maladaptive decisions and behaviour [36]. Emotional information, once in working memory, can impair top-down control mechanisms. Anxious individuals interpret ambiguous information and situations negatively, known as interpretation bias[37]. Individuals with anxiety exhibit decreased PFC recruitment during emotion regulation tasks, suggesting that they have faulty regulation system especially process of reappraisal[38].

Thus, a hyperactive AVS negatively influences the functioning of the RS leading to maladaptive decision making. Further, a hyperactive avoidance system will tilt the scales in favor of implicit emotional control.

Principle 8: **Providing Predictability**

Humans decrease their anxiety by increasing their control on their environment. If that's not possible, then predictability prevents AVS from becoming hyperactive"[39]. Hence providing predictability is essential for development of self-control.

Neurobiological underpinnings: -

a. Prevents AVS from being hyperactive thereby strengthening RS.
b. Prevents unrestrained application of IR with consequences as explained in Principle 3.

It can be achieved by: -

a. Framing the **rules of life/house** through a **reason/principle based negotiation** rather than power based negotiation. This is especially important when the conflict is between parents' interest and child's interests.
b. Consistent **feedback** from as many people as possible.

Avoiding artificial contingencies, like rewards and punishments, as they increase unpredictability more than the natural contingencies.

As in above example, after telling the child about the poor quality and of unreasonably high cost, he should be told about the reasonable cost and the good brand. It will help the child to anticipate when and where he can buy the lollipop.

VI. Influence of Approach System on Regulatory System

As per preliminary findings, monetary incentives potentiates various EFs, including cognitive control, attention, set-shifting, and working-memory[40]. This, as per the common currency model, can be due to increased valence towards APS (immediate rewards) rather than utilizing the regulatory system. It may weaken RS as the decision is made by stimulating APS rather than recruitment of RS i.e. by delaying gratification. So, offering reward may be effective for obtaining compliance but is a hindrance in development of self-control.

Principle 9: Repair Relationship

Irrespective of how every conflict is resolved, in the end, the parents should make every effort to repair the relationship. As in above example, after providing feedback regarding correctness of the final decision of the child, the parents should make sure that the child should feel that he is in a secure relationship despite the mistakes made by his mind during practice. The emotions of happiness or disappointment should be expressed only to convey concern towards the child, which is essential for any relationship. They should not be used/seen as rewards or punishments.

This is due to the following reasons:-

a. It will disengage the AVS leading to better functioning of RS.
b. This will enhance the role of RS in motivation and decision making.

Strengths of the Model:

1. Addresses all the dimension of parenting:

The MEP principles are very comprehensive. It is clear from the examples that it addresses all the dimensions of parenting in a well-balanced way.

2. Differentiation of contingencies:
Another strength of MEP model is that it differentiates between various contingencies, based on their impact on APS, AVS, or RS. In MEP, only those contingencies are encouraged which stimulate RS and not those which stimulate APS or AVS. Various contingencies are thus classified according to the brain areas it stimulates, rather than in two dimensions of reward and punishment.

3. Strengthening self-control of the parents/care givers:
The three neurobehavioral systems, i.e. APS, AVS and RS, also exist in parents. Parents experience loss of control and unpredictability when the child starts to show autonomy. This leads to intense desire to ensure compliance from the child. The MEP, right from the rationale to various principles, will stimulate the RS of the parents. This will ensure that the interests of parents as well as the child are met.

CONCLUSION:

The Parenting advises to date have been based on one or the other psychological theories. Many times the parenting advices contradict each other. They effectively ignored the basic unit of the behavioural modification i.e. brain. The MEP is proposed with the aim of being the comprehensive parenting model which will enable everyone in general and parents, in particular, to have motivated, self-regulated children. Theoretical models, however, are not end in themselves. So, further research is needed to assess the effectiveness of this model in real life scenario. This will ensure that the benefits of these principles reach the population at large. If its effectiveness is proved scientifically, it will have an impact not only at the individual level but also at the level of family, society, nation, and world.

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