**EIBI**

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| Acronym | EIBI |
| Name | Early Intensive Behavioral Interventions |
| Group | Psychosocial |
| Link image | https://cdn.pixabay.com/photo/2024/01/05/15/03/ai-generated-8489649\_1280.png |
| History | Early Intensive Behavioral Interventions (EIBI) are behavioral interventions that are widely used in the management of individuals with ASD. They are based on the Applied Behavior Analysis (ABA) model and, historically, they have relied on the Lovaas model (1981, 1987).  §  The foundation of the program developed by Ivar Lovaas is that a behavioral intervention can build positive behaviors and suppress unwanted ones. According to Lovaas, the younger the child, the more effective the generalized learning opportunity will be. This program uses the principles of operant conditioning: positive behaviors are reinforced while negative or aggressive behaviors are ignored (historically, these negative behaviours could have been punished using aversives but this has been criticized and is no longer used, Dixon et al., 2012). The reinforcers are external to the tasks being taught and pre-selected by the adult.  §  The main behavioral technique used in the Lovaas program is Discrete Trial Training (DTT), which consists of (Doehring, 2001) :  + presenting a stimulus in repeated sequences  + then observing the child's response to these presentations  + rewarding expected responses of the child (reinforcement)  §  Progressively, the therapeutic team makes the tasks more complex. The goal of the program is to allow the child to progressively develop skills related to autonomy, receptive language, verbal and non-verbal imitation and to establish the basis for play. A key aspect of this program is teaching the child imitation skills. Once taught, imitation is used as a learning tool. As soon as the child has acquired certain skills, the goal is to help the child generalize these skills at home and then in a school setting. |
| Description | Because many researchers were concerned that the highly-structured and adult-led environment proposed in the Lovaas program could result in an over-reliance on adults' prompts and limit children's ability to generalize learned skills to news contexts, both researchers and clinicians have worked to improve and expand the Lovaas program (Schreibman et al., 2015).  §  Influenced by the work of developmental psychologists, new EIBIs have placed more emphasis on child motivation. In these new approaches, the adult gives the child more control over the choice of materials and the initiative for interactions. Reinforcers are natural, that is, they are directly related to the success of the task. A wider range of responses is accepted and attempts, not only successes, are rewarded.  §  As in the Lovaas program, these new approaches encompass the fundamentals of ABA methodology (such as DTT), take a comprehensive approach to skills development, and maintain a quite structured environment to facilitate initiative. A prominent example of EIBI inspired by these new approaches is the early start Denver model (ESDM).  §  Currently, the critical components of EIBI involve the use of:  + a specific ABA-based teaching procedure (such as DTT)  + a very intensive format for an extended period of time (e.g., 15 hours per week for at least one year)  + a one-to-one adult to child ratio or in very small groups |
| Ressources | ScKlintwall L, Eikeseth S. Early and Intensive Behavioral Intervention (EIBI) in Autism. 2014; In: Patel V, Preedy V, Martin C. (Eds) Comprehensive Guide to Autism. Springer, New York, NY. = [https://link.springer.com/referenceworkentry/10.1007/978-1-4614-4788-7\_129?noAccess=true]  Healy O, Lydon S. Early Intensive Behavioural Intervention in Autism Spectrum Disorders. 2013; In Recent Advances in Autism Spectrum Disorders - Volume I. IntechOpen = [https://www.intechopen.com/chapters/43417] |

**NDBI**

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| Acronym | NDBI |
| Name | Naturalistic Developmental Behavioral Interventions |
| Group | Psychosocial |
| Link image | <https://cdn.pixabay.com/photo/2019/11/19/10/26/mother-4637052_1280.jpg> |
| History | Historically, the applied behavior analysis (ABA) approach has been used extensively in the management of individuals with ASD. Progressively, in concert with the development of ABA-focused programs (e.g., the Lovaas program), numerous models of child development emerged. This leads clinicians and researchers working with individuals with ASD to introduce aspects of these developmental theories to the care of children with ASD. For example, it has been thought to use interventions based on the principle of ABA interventions but in more naturalistic and developmentally sensitive contexts, using rewards linked to the activity performed by the child instead of rewards independent of the activity, or using materials that the child appreciates. Moreover, professionals have began to focus on certain key skills and knowledge that will enable the emergence of other skills or knowledge later in the development (e.g., a focus can be made in improving joint attention to facilitate the future emergence of language).  §  As these interventions have evolved, they have increasingly begun to blend developmental theories and interventions with ABA, and thus, the NDBI approaches were bor With the development of these new, more naturalistic approaches, Schreibman and colleagues (2015) have created the term 'Naturalistic Developmental Behavioral Interventions' (NDBI) to regroup certain interventions integrating the knowledge provided by the developmental theories in ABA-focused interventions. |
| Description | Schreibman et al. (2015) described 13 core principles of NDBIs:  +Teaching incorporates the three-part contingency of antecedent, behaviour, consequence.  +The use of a manual to guide implementation.  +Fidelity checks to ensure the intervention is implemented accurately.  +Individualised intervention goals.  +Ongoing measurement of progress.  +Child-initiated teaching episodes.  +Arranging the environment to promote children's interaction and learning.  +A focus on intrinsic reinforcement and natural contingencies, over external reinforcement.  +Use of prompting and prompt fading to teach skills, leading to children's independent use.  +Helping children to learn to take turns in social and play routines.  +Adults modelling the skills children are being supported to learn.  +Adults imitating children's actions and attempts to communicate to motivate further communication attempts.  +Systematic attempts to broaden children's repertoires of skills and interests |
| Ressources | Bruinsma YEM, Minjarez MB, Schreibman L, Stahmer AC. Naturalistic Developmental Behavioral Interventions for Autism Spectrum Disorder 2019; Brookes Publishing = ['https://products.brookespublishing.com/Naturalistic-Developmental-Behavioral-Interventions-for-Autism-Spectrum-Disorder-P1142.aspx']  Schreibman L, Dawson G, Stahmer AC, Landa R, Rogers SJ, McGee GG, Kasari C, Ingersoll B, Kaiser AP, Bruinsma Y, McNerney E, Wetherby A, Halladay A. Naturalistic Developmental Behavioral Interventions: Empirically Validated Treatments for Autism Spectrum Disorder. J Autism Dev Disord 2015;45(8):2411-28. = [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4513196/pdf/10803\_2015\_Article\_2407.pdf] |

**DEV**

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| Acronym | DEV |
| Name | Developmental interventions |
| Group | Psychosocial |
| Link image | https://cdn.pixabay.com/photo/2019/11/13/22/15/family-4624888\_1280.jpg |
| History | Developmental interventions are built upon constructivist theories of learning (Piaget & Inhelder, 1969). These constructivist theories consider that the learner acquires knowledge on the basis of her or his perceptions of reality and experience: we learn by constructing knowledge and reconstructing our perceptions to adapt them to our own contexts. These constructivist theories thus postulate that learners acquire knowledge not by passively absorbing it, but by actively putting it into perspective with their experiences and representations (Elliott et al., 2000). Therefore, learning is intrinsically relative to a learner's stage of cognitive development. |
| Description | In this constructivist perspective, several authors emphasize the role of social interactions in the development (e.g., Vygostsky, 1978). In line with this perspective, developmental interventions aim to support children acquire knowledge and skills through interactions with caregivers or professionals. Developmental interventions seek to elicit skills in children with ASD that should be present but have not been spontaneously acquired. The targeted skills are chosen based on the developmental stage of the child. These skills are critical for learning and are generally related to interacting with others (e.g., imitiation skills, joint attention skills, etc...).  §  Two core features of the developmental interventions are (Sandbank et al., 2020):  +the intervention is implemented according to a typical developmental sequence, so that the aim of the interventions matches with the developmental learning stages of the child.  +the intervention is heavily 'child-led' to rely on the child's intrinsic motivation to engage with the adult |
| Ressources | Vygotsky LS. Mind in society: the development of higher psychological processes. 1978; Cambridge, MA: Harvard University Press.= [https://www.hup.harvard.edu/books/9780674576292]  Aldred C, Green J, Adams C. A new social communication intervention for children with autism: pilot randomised controlled treatment study suggesting effectiveness. Journal of Child Psychology and Psychiatry 2004; 45(8):1420-1430. = [https://pubmed.ncbi.nlm.nih.gov/15482502] |

**SSG**

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| Acronym | SSG |
| Name | Social Skills Groups |
| Group | Psychosocial |
| Link image | <https://cdn.pixabay.com/photo/2020/01/22/09/39/teaching-4784914_1280.jpg> |
| History | Since the first description of ASD by Leo Kanner, difficulties with social skills have remained a cornerstone of the definition of ASD. These difficulties can manifest in very distinct ways for different individuals: some individuals with ASD have a desire to interact with others but do not know how to connect with friends while some others have a desire to avoid social interactions (Chevallier et al., 2012; Mazurek, 2014). Regardless of the manifestation of these social skill difficulties, poor social skills have been shown to be associated with poorer outcomes in daily life (Billstedt et al., 2005; Taylor et al., 2015; Mazurek, 2014).  As a result, interventions for individuals with ASD have historically sought to target these social skill difficulties, with the underlying assumption that improving social skills will reduce difficulties that patients face in their daily lives. |
| Description | Social skills groups (SSG) are a form of behavioral intervention rooted in the learning theory. It is aiming to improve an individual's social functioning by teaching to small groups certain social skills in a theory-based format and immediately associating this teaching with the practice of the newly learned skill.  §  Typically, SSG sessions begin through specific instruction on a social skill, explain how to carry it out and model the skill. Then, the group members practice their use of the skill (e.g., through role-playing). The presence of several members in the group allows individuals with ASD to support each other and to have examples, and the presence of several clinicians allows to provide an individualized feedback. Repetition, practice, as well as behavioral techniques (such as immediate reinforcement) and cognitive strategies are used to increase the likelihood that the skill will be used again outside the context of the intervention.  § A common plan for SSG is: +60 to 90 minutes sessions including both a structured lesson on a specific skill and the concrete practice of this skill +one session per week +for at least 12 weeks |
| Ressources | Matson JL, Matson ML, Rivet TT. Social-skills treatments for children with autism spectrum disorders: An overview Behavior Modification 2007; 31(5):682-707 = [https://pubmed.ncbi.nlm.nih.gov/17699124]  White SW. Social Skills Training Groups 2011; In: White SW. Social skills training for children with Asperger syndrome and high-functioning autism. Guilford Press = [https://www.guilford.com/books/Social-Skills-Training-Children-Asperger-Syndrome-High-Functioning/Susan-Williams-White/9781462515332] |

**PMI**

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| Acronym | PMI |
| Name | Parent-Mediated Interventions |
| Group | Psychosocial |
| Link image | https://cdn.pixabay.com/photo/2018/01/18/09/42/park-3089907\_1280.jpg |
| History | Since the beginning of the development of interventions for children with ASDs, some authors have given parents a privileged position in the intervention process (e.g., Schopler, 1971). Parents-mediated interventions (PMI) propose to teach intervention techniques to parents so that they can apply these techniques with their child on a regular basis. The objective of involving parents is to implement a first interventions very early in the child's development and, because of the sharing of the daily environment, to improve the generalization of the skills learned by the child during the intervention. |
| Description | The type of intervention that can be mediated by parents is very wide, ranging from application of massages to an early intensive behavioral intervention. Even within PMI that provide psychosocial interventions, some interventions propose to teach parents to implement social-communication interactions, others to use joint attention or to implement an applied behavioral analysis approach. The primary outcome intrinsically targeted by these interventions can be quite variable, with interventions seeking to improve primarily problem behaviors, communication, or parent-child interactions (Oono et al., 2013) |
| Ressources | Siller M, Morgan L. Handbook of Parent-Implemented Interventions for Very Young Children with Autism 2018; Springer Cham = [https://link.springer.com/book/10.1007/978-3-319-90994-3] |

**CBT**

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| Acronym | CBT |
| Name | Cognitive Behavioral Therapy |
| Group | Psychosocial |
| Link image | <https://cdn.pixabay.com/photo/2013/04/03/06/08/counseling-99740_1280.jpg> |
| History | Cognitive Behvioral Therapy (CBT) is a form of interventions positing that certain mental disorders and problem behaviours are maintained by maladaptive cognitions (Beck, 1970). The basic CBT model posits that therapeutic strategies chaging these maladaptive cognitions will lead to changes in emotional distress and problematic behaviors. From this basic principle, a large number of condition-specific CBT protocols have been developed over time, with the treatment of anxiety and depression as the most targeted outcomes for this type of intervention (Dragioti et al., 2017). |
| Description | Currently, core principles of CBT include (American Psychological Association, 2017):  +Psychological problems are based, in part, on faulty or unhelpful ways of thinking.  +Psychological problems are based, in part, on learned patterns of unhelpful behavior  +People suffering from psychological problems can learn better ways of coping with them, thereby relieving their symptoms and becoming more effective in their lives.  §  CBT treatment usually involves efforts to change thinking patterns. These strategies might include:  +Learning to recognize one's distortions in thinking that are creating problems, and then to reevaluate them in light of reality.  +Gaining a better understanding of the behavior and motivation of others.  +Using problem-solving skills to cope with difficult situations.  +Learning to develop a greater sense of confidence in one's own abilities.  CBT treatment also usually involves efforts to change behavioral patterns. These strategies might include:  +Facing one's fears instead of avoiding them.  +Using role playing to prepare for potentially problematic interactions with others.  +Using problem-solving skills to cope with difficult situations.  +Learning to calm one's mind and relax one's body. |
| Ressources | Scarpa A, White SW, Attwood T. CBT for children and adolescents with high-functioning autism spectrum disorders. 2013; Guilford Press.= [https://www.guilford.com/books/CBT-Children-Adolescents-High-Functioning-Autism-Spectrum-Disorders/Scarpa-White-Attwood/9781462527007]  Gaus VL. Cognitive-behavioral therapy for adults with autism spectrum disorder. 2018; Guilford Press.= [https://www.guilford.com/books/Cognitive-Behavioral-Therapy-Adults-Autism-Spectrum-Disorder/Valerie-Gaus/9781462537686] |

**TECH**

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| Acronym | TECH |
| Name | Technology-based interventions |
| Group | Psychosocial |
| Link image | https://cdn.pixabay.com/photo/2018/05/18/15/32/vr-3411378\_1280.jpg |
| History | Technology-based interventions (TECH) use a form of technology as the primary medium to deliver the intervention. Computer software or television (e.g., interactive DVD) have long been one of the main forms of technology used. Progressively, many advanced technologies have been used as intervention tools (such as robots or virtual reality environments). |
| Description | As Gryzspan et al. (2014) point out, using technology as a medium for an intervention has several interests:  +Many people with ASD have a significant interest in technology (Bernard-Opitz et al., 2001; Moore and Calvert, 2000).  +Technologies allow to have very clearly defined task and to provide instructions and guidance based on visual cues (Quill, 1997).  +Technologies help limit sensory stimuli that can cause attentional distractions in people with ASD (Murray, 1997).  +Technologies help limit the social demand that can be disruptive to individuals with ASD (although a limitation of this reduction in social demand is the risk of reinforcing social isolation; e.g., Durkin, 2010). |
| Resources | Grynszpan O, Weiss PL, Perez-Diaz F, Gal E. Innovative technology-based interventions for autism spectrum disorders: a meta-analysis. Autism 2014 May;18(4):346-61. = [https://pubmed.ncbi.nlm.nih.gov/24092843/]  Goldsmith, T. R., & LeBlanc, L. A. Use of technology in interventions for children with autism. Journal of Early and Intensive Behavior Intervention 2004; 1(2):166 = [https://files.eric.ed.gov/fulltext/EJ848688.pdf] |

**TEACCH**

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| Acronym | TEACCH |
| Name | Treatment and Education of Autistic and Communication Handicapped Children |
| Group | Psychosocial |
| Link image | https://cdn.pixabay.com/photo/2018/10/22/18/02/teacher-3765909\_1280.jpg |
| History | During the 1960s, Eric Schopler argued that Autism Spectrum Disorders (ASD) were probably the result of an organic neurological dysfunction, although the precise causes were not yet identified. He adopts a new approach in which parents are trained as co-therapists of their child (Trehin & Durham, 1996). The preliminary results of this approach led the state of North Carolina to commit to helping people with ASD by setting up a program called "Treatment and Education of Autistic and Communication handicapped Children" (TEACCH) created by Eric Schopler. This type of program then spread to other US states and gained popularity around the world (Peerenboom, 2003). |
| Description | The TEACCH program is based on structured teaching and applied behavior analysis, with the core principle of organizing the learning environment to promote the acquisition of new skills. According to Mesibov and Shea (2010), the four essential mechanisms of the TEACCH are:  +structuring the environment and activities in ways that are understandable to the individual  +using individuals' relative strengths in visual skills and interest in visual details to supplement relatively weaker skills  +using individuals' special interests to engage them in learning  +supporting self-initiated use of meaningful communication.  Structuring the environment - in both space and time - is achieved through:  +providing a physical structuration, for example by using clear and concrete visual information (words, pictures, photos, or concrete objects)  +organizing and communicating the sequence of events of the day, by creating schedules adapted to the person  +organizing individual activities, to facilitate, for example, the understanding of what is expected of the person during the activity, the time it will take or the signal that will indicate that the activity is finished  +linking all the activities together into a sequence of activities  §  Once a skill has been established, patients or caregivers are then taught to use that behavior in a less structured and less "accommodating" environment. Generalization of skills and abilities is then achieved by repeating, in new contexts, the exercises performed with professionals. Note that this program is often implanted in classrooms but it has also been used at home or in the community.  §  The long-term goal of the TEACCH program is to promote optimal functioning to facilitate integration into society. Unlike other more specific programs, the TEACCH program offers a continuum of services to patients, their families, and practitioners across the lifespan. |
| Resources | Olley JG. The TEACCH Curriculum for Teaching Social Behavior to Children with Autism. 1986; In: Schopler, E., Mesibov, G.B. (eds) Social Behavior in Autism. Current Issues in Autism. Springer, Boston, MA. = [https://link.springer.com/chapter/10.1007/978-1-4899-2242-7\_17] |

**AAI**

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| Acronym | AAI |
| Name | Animal-Assisted Interventions |
| Group | Complementary |
| Link image | <https://cdn.pixabay.com/photo/2020/11/06/19/12/kid-5718703_1280.jpg> |
| History |  |
| Description | Animal-assisted interventions base rehabilitation on the interaction with animals. In the field of animal mediation, the most represented intervention is equine-assisted therapy, based on interaction with the horse (through riding and care). §  Animal-assisted interventions (AAI) refer to therapeutic practices based on structured human-animal interactions. The main aim of AAI is to improve physical, emotional, behavioral and social well-being and can rely on interactions with various animals, such as dogs, horses or even dolphins. In the context of ASD, the hypothesis on which the use of animal mediation is based is that of a better predictability of animal movements and behaviors, due to their more repetitive nature than in humans. This would promote better detection and interpretation of social cues (Brondino et al., 2015). Sandbank et al. (2019) note the soothing and motivating nature of this type of context, allowing for improvements beyond social functioning to the psychological well-being of the users of AAI.  §  These interventions can be of different types:  +<u>Animal-Assisted Therapy:</u> This type of AAI is highly structured, incorporating animals into a therapeutic setting to achieve specific treatment goals. For example, equine-assisted therapy involves interactions with horses to improve physical coordination, balance and emotional stability. +<u>Animal-Assisted Activities: </u> This type of AAI is less structured than animal-assisted therapy, and focus on improving general well-being and motivation through interactions with animals. Activities may include petting, grooming or simply being in the presence of animals, with the aim of promoting relaxation and reducing stress.  +<u>Animal-Assisted Education: </u> This last type of AAI integrates animals into educational environments to support academic and social learning. |
| Resources | Brondino N, Fusar-Poli L, Rocchetti M, Provenzani U, Barale F, Politi P. Complementary and Alternative Therapies for Autism Spectrum Disorder. Evid Based Complement Alternat Med. 2015:258589. doi: 10.1155/2015/258589. = [https://pubmed.ncbi.nlm.nih.gov/26064157/]  Fine, A. H. (Ed.). (2019). Handbook on animal-assisted therapy: Foundations and guidelines for animal-assisted interventions. Academic press. = [https://www.sciencedirect.com/book/9780128153956/handbook-on-animal-assisted-therapy] |

**ACUP**

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| Acronym | ACUP |
| Name | Acupuncture |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2015/10/31/12/30/massage-1015571\_1280.jpg |
| History |  |
| Description | Acupuncture, a traditional Chinese medicine practice, involves inserting fine needles into specific points on the body, known as acupoints, to regulate the flow of energy (Qi) and restore overall balance. This practice includes various techniques such as body acupuncture, scalp acupuncture, and electroacupuncture. Treatment protocols are typically customized to individual needs and administered by qualified practitioners.  §  The traditional model of acupuncture is based on a holistic approach to human health, aiming to achieve a balance between mind and body (homeostasis). According to this model, Autism Spectrum Disorder (ASD) results from "dysregulation and insufficiency of the brain and mind" (Chen et al., 2008, cited by Cheuk, 2011). Acupuncture is believed to alleviate symptoms by reharmonizing the body and mind. The mechanisms at play may involve the modulation of neurotransmitters, such as glutamate and GABA, which are known to be disrupted in individuals with ASD (Chao 2010, Carlson 2011, cited by Cheuk, 2011).  §  The medical acupuncture paradigm hypothesizes that acupoints are connected to sensory neurons. Stimulation of these points triggers a cascade of neurological responses within the central nervous system, influencing the production of endorphins, serotonin, and endocannabinoids, as well as affecting immunological and endocrinological markers. |
| Resources | Brondino N, Fusar-Poli L, Rocchetti M, Provenzani U, Barale F, Politi P. Complementary and Alternative Therapies for Autism Spectrum Disorder. Evid Based Complement Alternat Med. 2015:258589. doi: 10.1155/2015/258589. = [https://pubmed.ncbi.nlm.nih.gov/26064157/]  Cheuk DK, Wong V, Chen WX. Acupuncture for autism spectrum disorders (ASD). Cochrane Database Syst Rev. 2011 Sep 7;2011(9):CD007849. doi: 10.1002/14651858.CD007849.pub2. PMID: 21901712; PMCID: PMC8939294.= [https://pubmed.ncbi.nlm.nih.gov/21901712/] |

**DIET**

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| Acronym | DIET |
| Name | Specific dietary programme |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2024/05/21/09/44/food-8777435\_1280.jpg |
| History |  |
| Description | Specific diets utilize naturally occurring products to target biological effects through nutritional interventions. These mechanisms may involve modulation of the immune system, antioxidant activity, anti-inflammatory processes, and neuromodulation, as well as cognitive functioning. Improving somatic disorders, such as gastrointestinal issues, can have the additional benefit of alleviating certain behavioral disorders, as physiological improvements often lead to enhanced overall well-being.  §  One of the most commonly explored diets is the gluten-free, casein-free (GFCF) diet. This dietary intervention excludes gluten, a protein found in wheat, barley, and rye, and casein, a protein found in dairy products. The GFCF diet involves eliminating all sources of gluten and casein from the individual's diet, including bread, pasta, cereals, and dairy products. Health professionals, such as nutritionists and dietitians, typically supervise the diet to ensure it is nutritionally balanced. The expected benefits of this restrictive diet stem from the removal of potential allergens. |
| Resources | Brondino N, Fusar-Poli L, Rocchetti M, Provenzani U, Barale F, Politi P. Complementary and Alternative Therapies for Autism Spectrum Disorder. Evid Based Complement Alternat Med. 2015:258589. doi: 10.1155/2015/258589. = [https://pubmed.ncbi.nlm.nih.gov/26064157/]  DeFilippis M. The Use of Complementary Alternative Medicine in Children and Adolescents with Autism Spectrum Disorder. Psychopharmacol Bull. 2018 Jan 15;48(1):40-63. PMID: 29382959; PMCID: PMC5765434. = [https://pubmed.ncbi.nlm.nih.gov/29382959/] |

**HERB**

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| Acronym | HERB |
| Name | East Asian Herbal Medicine |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2024/05/20/14/20/ai-generated-8775370\_1280.jpg |
| History |  |
| Description | Asian Herbal Medicine encompasses a range of traditional therapies originating from East Asian countries, primarily China, Japan, and Korea. These therapies utilize blends formulated from plants, roots, and other natural substances to treat various disorders. Herbal formulas are selected based on traditional diagnostic methods and tailored to the patient's individual needs, considering their constitution, specific symptoms, and overall health.  §  The practice of East Asian Herbal Medicine is deeply rooted in ancient philosophies, such as the concepts of Yin and Yang and the Five Elements, which emphasize balance and harmony within the body. Practitioners use a variety of diagnostic tools, including tongue observation, pulse diagnosis, and detailed patient histories, to determine the most appropriate herbal combinations.  §  In China, Traditional Chinese Medicine (TCM) incorporates herbal medicine as a key component, often in conjunction with acupuncture and other modalities. Chinese herbal formulas may include well-known herbs like ginseng, licorice root, and astragalus, each selected for its unique properties and therapeutic effects.  §  East Asian Herbal Medicine is recognized for its holistic approach, which is thought to address not only the symptoms but also the underlying causes of the condition. It aims to enhance the body's natural ability to heal and maintain health, offering a complementary or alternative option to conventional Western medicine. As with any form of treatment, it is essential for patients to consult with qualified practitioners to ensure the safe and effective use of herbal therapies. |
| Resources | Bang M, Lee SH, Cho SH, et al. Herbal Medicine Treatment for Children with Autism Spectrum Disorder: A Systematic Review. Evid Based Complement Alternat Med. 2017;2017:8614680. doi:10.1155/2017/8614680.= [<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5448044/>] |

**L-CARNIT**

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| Acronym | L-CARNIT |
| Name | L-carnitine |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2019/03/31/08/24/bbq-4092636\_1280.jpg |
| History |  |
| Description | L-carnitine is a naturally occurring amino acid derivative that plays a crucial role in energy production. It is synthesized in the body from the amino acids lysine and methionine and is also obtained from dietary sources, particularly meat and dairy products. L-carnitine is essential for the transport of long-chain fatty acids into the mitochondria, where they are oxidized to produce energy.  §  Beyond its primary function in fatty acid metabolism, recent research has highlighted L-carnitine's involvement in various physiological processes, including cellular energy balance, neuroprotection, and muscle function. These functions make L-carnitine a critical component in overall metabolic health and physical performance.  §  Given its role in energy metabolism and cellular health, L-carnitine has been investigated for its potential benefits in various health conditions, including cardiovascular diseases, muscle disorders, and neurodegenerative diseases. It is also explored for its possible therapeutic effects in Autism Spectrum Disorder (ASD). |
| Resources | Wang W, Pan D, Liu Q, Chen X, Wang S. L-Carnitine in the Treatment of Psychiatric and Neurological Manifestations: A Systematic Review. Nutrients. 2024 Apr 20;16(8):1232. doi: 10.3390/nu16081232. PMID: 38674921; PMCID: PMC11055039. = [https://pubmed.ncbi.nlm.nih.gov/38674921/] |

**L-CARNO**

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| Acronym | L-CARNO |
| Name | L-carnosine |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2018/08/29/19/03/steak-3640560\_1280.jpg |
| History |  |
| Description | L-carnosine is a dipeptide molecule composed of the amino acids beta-alanine and histidine. It is found in high concentrations in muscle tissue and the brain, playing a crucial role in cellular health and function. L-carnosine acts as a potent antioxidant, neutralizing harmful free radicals and protecting cells from oxidative stress.  Beyond its antioxidative properties, recent research has highlighted L-carnosine's involvement in various physiological processes, including protein homeostasis, cellular repair, and immune regulation. These functions contribute to its importance in maintaining overall health and preventing age-related decline.  §  Given its role in cellular protection and repair, L-carnosine has been investigated for its potential benefits in a range of health conditions, including neurodegenerative diseases, cardiovascular health, and metabolic disorders. It has also been explored for its possible therapeutic effects in Autism Spectrum Disorder (ASD). |
| Resources | Abraham DA, Undela K, Narasimhan U, Rajanandh MG. Effect of L-Carnosine in children with autism spectrum disorders: a systematic review and meta-analysis of randomised controlled trials. Amino Acids. 2021 Apr;53(4):575-585. doi: 10.1007/s00726-021-02960-6 = [https://pubmed.ncbi.nlm.nih.gov/33704575/] |

**Melatonin**

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| Acronym | MELAT |
| Name | Melatonin |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2016/01/20/11/10/baby-1151348\_1280.jpg |
| History |  |
| Description | Melatonin is a hormone primarily produced by the pineal gland in the brain. It plays a crucial role in regulating the sleep-wake cycle by signaling the body to prepare for sleep when night falls. Melatonin levels typically rise in the evening, remain high throughout the night, and decrease in the morning, helping to synchronize the body's internal clock with the external environment.  §  Melatonin supplementation is commonly used to regulate sleep cycles and promote better rest, particularly in individuals with sleep disorders, jet lag, or irregular sleep patterns. By improving the quality and consistency of sleep, melatonin can have a positive impact on overall health and well-being.  Adequate sleep is essential for cognitive functions such as memory, attention, and problem-solving. Therefore, improving sleep quality through melatonin supplementation is expected to lead to better cognitive performance and behavioral regulation.  §  Melatonin is often used in various therapeutic contexts, including for children with autism spectrum disorder (ASD), where sleep disturbances are common. Dosage, timing, and potential interactions with other medications or health conditions need to be carefully managed with a healthcare professional to ensure optimal benefits and minimize any adverse effects. |
| Resources | Wu ZY, Huang SD, Zou JJ, Wang QX, Naveed M, Bao HN, Wang W, Fukunaga K, Han F. Autism spectrum disorder (ASD): Disturbance of the melatonin system and its implications. Biomed Pharmacother. 2020 Oct;130:110496. doi: 10.1016/j.biopha.2020.110496. = [https://pubmed.ncbi.nlm.nih.gov/32682113/] |

**MUSIC**

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| Acronym | MUSIC |
| Name | Music Therapy |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2017/05/18/15/08/piano-2323844\_1280.jpg |
| History |  |
| Description | Music therapy leverages the emotional, cognitive, and social dimensions of music to promote improvements in these areas and achieve therapeutic goals. Interventions involve structured musical activities such as singing, playing an instrument, improvising, and listening to music. These activities are designed to engage individuals in a motivating and enjoyable way.  §  The World Federation of Music Therapy (WFMT) defines music therapy as '<i>the professional use of music and its elements as an intervention in medical, educational, and everyday environments with individuals, groups, families, or communities who seek to optimize their quality of life and improve their physical, social, communicative, emotional, intellectual, and spiritual health and wellbeing.</i>' Music therapy includes various activities, such as:  +<u>Music listening: </u> Passive engagement with music to induce relaxation or evoke emotional responses.  +<u>Practice: </u> Active engagement through singing, playing instruments, and rhythm training to enhance motor skills and coordination.  +<u>Improvisational music-making:</u> Creating spontaneous music to encourage creativity and expression.  §  In the context of autism, music therapy operates on the premise that music is a universal language that can stimulate communication. It can help individuals with autism by encouraging joint attention, eye contact, and turn-taking, making it accessible to both verbal and non-verbal people. Additionally, musical improvisation provides a structured yet flexible context, offering predictability with room for spontaneity. |
| Resources | Yoder, P. J. (2020). A recent review concluding that brief music therapy is the most effective treatment for preschoolers with ASD is not credible. Evidence-Based Communication Assessment and Intervention, 14(4), 253–255. <https://doi.org/10.1080/17489539.2020.1774104> = [https://www.tandfonline.com/doi/full/10.1080/17489539.2020.1774104]  Geretsegger M, Fusar-Poli L, Elefant C, Mössler KA, Vitale G, Gold C. Music therapy for autistic people. Cochrane Database of Systematic Reviews 2022, Issue 5. Art. No.: CD004381. DOI: 10.1002/14651858.CD004381.pub4. = [https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD004381.pub4/full/es] |

**NAC**

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| Acronym | NAC |
| Name | N-acetylcysteine |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2015/08/02/23/14/acetylcholine-872247\_1280.png |
| History |  |
| Description | N-acetylcysteine (NAC) is a derivative of the amino acid cysteine and serves as a precursor to glutathione, one of the body’s most essential antioxidants. Glutathione plays a critical role in protecting cells from oxidative stress and maintaining overall cellular health. Due to its powerful antioxidant properties and its ability to modulate the glutamatergic and dopaminergic systems, NAC has been explored as a therapeutic option for various psychiatric and neurological conditions. |
| Resources | Bradlow, R.C.J., Berk, M., Kalivas, P.W. et al. The Potential of N-Acetyl-L-Cysteine (NAC) in the Treatment of Psychiatric Disorders. CNS Drugs 36, 451–482 (2022). <https://doi.org/10.1007/s40263-022-00907-3> = [https://link.springer.com/article/10.1007/s40263-022-00907-3] |

**OXYT**

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| Acronym | OXYT |
| Name | Oxytocin |
| Group | Complementary |
| Link image | https://images.unsplash.com/photo-1610021684483-b06bf8ed5a41?q=80&w=2671&auto=format&fit=crop&ixlib=rb-4.0.3&ixid=M3wxMjA3fDB8MHxwaG90by1wYWdlfHx8fGVufDB8fHx8fA%3D%3D |
| History |  |
| Description | Oxytocin is a neuropeptide hormone that plays a crucial role in social bonding, trust, and emotional regulation. It is naturally produced in the hypothalamus and released into the bloodstream and brain, where it influences various aspects of social behavior. In clinical settings, oxytocin is mainly administered intranasally to target the central nervous system directly.  §  Due to its significant role in social cognition and behavior, oxytocin has been studied as a potential therapeutic agent for Autism Spectrum Disorder (ASD) with the aim of improving social functioning. Nasal administration allows oxytocin to cross the blood-brain barrier more efficiently, facilitating its action on brain regions involved in social cognition.  Interventions based on intranasal oxytocin administration are grounded in its involvement in enhancing social cognition, including theory of mind and empathy (Hammock et al., 2015). The proposed mechanisms of action include:  +<u>Fear Reduction:</u> Oxytocin may reduce fear and anxiety, making social interactions less intimidating and more manageable for individuals with ASD.  +<u>Increased Social Motivation:</u> By enhancing the reward system associated with social interactions, oxytocin may increase the desire to engage in social activities.  +<u>Improved Detection of Social Cues:</u> Oxytocin might enhance the ability to recognize and interpret social signals, such as facial expressions and body language, thereby improving social communication.  §  Commonly, oxytocin is administered in dosages ranging from 18 to 40 international units (IU) per day, divided into multiple doses. It is essential for these interventions to be supervised by healthcare professionals to ensure safety and monitor for any potential side effects, such as nasal irritation or headaches. |
| Resources | Cochran DM, Fallon D, Hill M, Frazier JA. The role of oxytocin in psychiatric disorders: a review of biological and therapeutic research findings. Harv Rev Psychiatry. 2013;21(5):219-247. doi:10.1097/HRP.0b013e3182a75b7d = [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4120070/] |

**PHYS**

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| Acronym | PHYS |
| Name | Physical Activity |
| Group | Complementary |
| Link image | https://images.unsplash.com/photo-1607962837359-5e7e89f86776?q=80&w=2670&auto=format&fit=crop&ixlib=rb-4.0.3&ixid=M3wxMjA3fDB8MHxwaG90by1wYWdlfHx8fGVufDB8fHx8fA%3D%3D |
| History |  |
| Description | Physical activity encompasses any bodily movement produced by skeletal muscles that requires energy expenditure, including exercise, sports, dance, and play. It has been widely studied as a complementary therapy for various conditions. Programs can be structured or unstructured and are tailored to an individual's abilities and preferences. These interventions often include aerobic, strength, and flexibility exercises, as well as activities that promote motor coordination. Group activities, such as team sports or dance classes, are also common, providing opportunities for social interaction and structured environments conducive to skill development.  §  Overall, integrating physical activity into therapeutic programs can offer a holistic approach to enhancing physical, mental, and emotional well-being, making it a valuable component in the management of various conditions, including ASD. |
| Resources | Kandola AA, Osborn DPJ. Physical activity as an intervention in severe mental illness. BJPsych Advances. 2022;28(2):112-121. doi:10.1192/bja.2021.33 = [https://www.cambridge.org/core/journals/bjpsych-advances/article/physical-activity-as-an-intervention-in-severe-mental-illness/710228AD691DFFABE6A6E150CA7F0AE3] |

**PROB**

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| Acronym | PROB |
| Name | Probiotics |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2024/05/15/06/16/abdomen-8762852\_1280.jpg |
| History |  |
| Description | Probiotics are living microorganisms that, when consumed in sufficient quantities, help maintain the microbial balance of the intestine. They achieve this by modulating the activity of the intestinal immune system, reinforcing the intestinal mucosal barrier, and exerting direct antimicrobial effects. By promoting a healthy gut microbiome, probiotics contribute to the overall intestinal health of their host. These beneficial microorganisms are commonly found in fermented foods such as yogurt, kefir, sauerkraut, kimchi, and in dietary supplements.  §  One of the emerging areas of research is the gut-brain axis, a complex two-way communication system between the gastrointestinal tract and the central nervous system. Scientists are exploring how probiotics can influence neurological and psychological conditions through this axis.  The gut-brain axis involves several pathways, including:  +Neural pathways: The vagus nerve plays a crucial role in transmitting signals between the gut and the brain.  +Immune system modulation: Probiotics can influence the production of cytokines and other immune responses that affect brain function.  +Metabolic pathways: Short-chain fatty acids and other metabolites produced by gut bacteria can cross the blood-brain barrier and impact brain activity.  +Endocrine signaling: Gut microbes can affect the production of hormones and neurotransmitters such as serotonin, which is predominantly produced in the gut.  §  Overall, while more research is needed to fully understand the mechanisms and efficacy of probiotics in treating neurological and psychological conditions, the current findings highlight the significant potential of probiotics as a complementary approach to promoting mental and physical health. |
| Resources | Barbosa RSD, Vieira-Coelho MA. Probiotics and prebiotics: focus on psychiatric disorders - a systematic review. Nutr Rev. 2020 Jun 1;78(6):437-450. doi: 10.1093/nutrit/nuz080. PMID: 31769847. = [https://pubmed.ncbi.nlm.nih.gov/31769847/] |

**PUFA**

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| Acronym | PUFA |
| Name | Polyunsaturated fatty acids |
| Group | Complementary |
| Link image | https://images.unsplash.com/photo-1624362772755-4d5843e67047?q=80&w=2670&auto=format&fit=crop&ixlib=rb-4.0.3&ixid=M3wxMjA3fDB8MHxwaG90by1wYWdlfHx8fGVufDB8fHx8fA%3D%3D |
| History |  |
| Description | Omega-3 polyunsaturated fatty acids (PUFAs) are essential fatty acids that play a crucial role in brain function and development. These fatty acids cannot be synthesized by the human body and must be obtained through diet or supplementation. They are found in high concentrations in fish oil, flaxseed oil, and certain types of seaweed.  §  The primary types of omega-3 fatty acids important for human health include: +Eicosapentaenoic acid (EPA): Primarily found in fish and fish oil, EPA is known for its anti-inflammatory properties.  +Docosahexaenoic acid (DHA): Also found in fish and fish oil, DHA is a major structural component of the brain and retina.  +Alpha-linolenic acid (ALA): Found in plant oils such as flaxseed, chia seeds, and walnuts, ALA can be converted in small amounts to EPA and DHA in the body.  §  Given their critical role in brain health, ensuring sufficient intake of omega-3 fatty acids through diet or supplementation is important. Fatty fish such as salmon, mackerel, and sardines are excellent dietary sources of EPA and DHA. For those who do not consume fish, flaxseed oil, chia seeds, and walnuts are good sources of ALA, although they are less efficiently converted to EPA and DHA.  §  Overall, omega-3 PUFAs are indispensable for maintaining optimal brain function and development throughout life. Their broad range of benefits underscores the importance of including these essential fatty acids in a balanced diet. |
| Resources | Bozzatello P, Rocca P, Mantelli E, Bellino S. Polyunsaturated Fatty Acids: What is Their Role in Treatment of Psychiatric Disorders?. Int J Mol Sci. 2019;20(21):5257. Published 2019 Oct 23. doi:10.3390/ijms20215257 = [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6862261/] |

**rTMS**

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| Acronym | rTMS |
| Name | Repetitive Transcranial Magnetic Stimulation |
| Group | Complementary |
| Link image | https://www.researchgate.net/publication/348996063/figure/fig1/AS:987583278497792@1612469610054/rTMS--a-noninvasive-therapy-where-magnetic-fields-are-applied-on-the-scalp-to-create-an.png |
| History |  |
| Description | Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive neuromodulation technique that uses electromagnetic fields to induce electrical currents in specific brain regions. The technique involves delivering repetitive magnetic pulses to the scalp, which can stimulate or inhibit neuronal activity depending on the frequency and pattern of the pulses.  Low-frequency rTMS (typically 1 Hz) is generally used to inhibit neuronal activity, whereas high-frequency rTMS (typically 10-20 Hz) is used to stimulate neuronal activity. This ability to modulate brain activity makes rTMS a versatile tool in the treatment of various neurological and psychiatric conditions.  rTMS is typically administered in an outpatient setting, with each session lasting about 30-60 minutes. Treatment protocols often involve daily sessions over several weeks. It is essential for this intervention to be supervised by healthcare professionals to ensure safety and monitor for any potential side effects. |
| Resources | Fitzsimmons SMDD, Oostra E, Postma TS, van der Werf YD, van den Heuvel OA. Repetitive Transcranial Magnetic Stimulation-Induced Neuroplasticity and the Treatment of Psychiatric Disorders: State of the Evidence and Future Opportunities. Biol Psychiatry. 2024 Mar 15;95(6):592-600. doi: 10.1016/j.biopsych.2023.11.016. Epub 2023 Nov 30. PMID: 38040046 = [https://www.sciencedirect.com/science/article/pii/S0006322323017456] |

**SECRET**

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| Acronym | SECRET |
| Name | Secretin |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2017/10/30/03/58/testosterone-2901425\_1280.png |
| History |  |
| Description | Secretin is a peptide hormone produced in the small intestine, playing a crucial role in the digestive system by regulating the pH of the small intestine and stimulating the secretion of bicarbonate by the pancreas. This bicarbonate neutralizes stomach acid, creating an optimal environment for digestive enzymes to function.  §  Interest in secretin as a treatment for Autism Spectrum Disorder (ASD) was sparked by a report suggesting that a child with ASD showed marked improvements in language and behavior following an infusion of secretin during an endoscopy procedure. This observation led to further exploration of secretin's potential therapeutic effects for individuals with ASD. |
| Resources | Williams K, Wray JA, Wheeler DM. Intravenous secretin for autism spectrum disorders (ASD). Cochrane Database Syst Rev. 2012 Apr 18;2012(4):CD003495. doi: 10.1002/14651858.CD003495.pub3. PMID: 22513913; PMCID: PMC7154585. = [https://pubmed.ncbi.nlm.nih.gov/22513913/] |

**SENS**

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| Acronym | SENS |
| Name | Sensory Integration Therapy |
| Group | Complementary |
| Link image | https://www.researchgate.net/profile/Nergis-Ramo-Akguen/publication/345939574/figure/fig8/AS:958450032967684@1605523703940/Auditory-Integration-Training.ppm |
| History |  |
| Description | Sensory Integration Therapy (SENS) is an intervention designed to help individuals with sensory processing problems, which are common in Autism Spectrum Disorder (ASD). Developed by occupational therapist Anna Jean Ayres, SIT is based on the principle that difficulties in processing and integrating sensory information can lead to challenges in daily functioning, behavior, and social interactions. The goal of SIT is to enhance the brain's ability to process sensory information from the body and the environment, enabling individuals to respond to sensory stimuli more appropriately.  §  In the context of ASD, SENS involves a variety of activities designed to stimulate the sensory systems (vision, touch, smell, taste, hearing, vestibular, proprioceptive) in a structured and repetitive manner. These therapies can include techniques such as auditory integration training (AIT) and other sensory-based activities tailored to meet the specific needs of each individual. |
| Resources | blank'>Lane SJ, Leão MA and Spielmann V (2022) Sleep, Sensory Integration/Processing, and Autism: A Scoping Review. Front. Psychol. 13:877527. doi: 10.3389/fpsyg.2022.877527 = [https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.877527/full] |

**SULFO**

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| Acronym | SULFO |
| Name | Sulforaphane |
| Group | Complementary |
| Link image | https://cdn.pixabay.com/photo/2016/02/20/21/41/vegetables-1212845\_1280.jpg |
| History |  |
| Description | Sulforaphane is a naturally occurring compound found in cruciferous vegetables such as broccoli, Brussels sprouts, and kale. It is a type of isothiocyanate, which is produced when the enzyme myrosinase transforms glucoraphanin (a glucosinolate) into sulforaphane during the chewing and digestion of these vegetables. Sulforaphane is renowned for its potent antioxidant and anti-inflammatory properties.  Recent research has highlighted sulforaphane's involvement in various physiological processes, including detoxification, cellular protection, and modulation of the body's defense systems. These functions make sulforaphane a vital compound in promoting overall health and preventing chronic diseases.  §  Given its role in cellular protection and detoxification, sulforaphane has been investigated for its potential benefits in various health conditions, including cancer prevention, cardiovascular health, and neurodegenerative diseases. It is also explored for its possible therapeutic effects in Autism Spectrum Disorder (ASD). In the context of ASD, sulforaphane may influence cognitive function, behavior, and neurological health by reducing oxidative stress and inflammation, which are often elevated in individuals with ASD. |
| Resources | blank'> Zheng W, Li X, Zhang T, Wang J. Biological mechanisms and clinical efficacy of sulforaphane for mental disorders. Gen Psychiatr. 2022;35(2):e100700. Published 2022 Apr 5. doi:10.1136/gpsych-2021-100700 = [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8987744/] |

**tDCS**

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| Acronym | tDCS |
| Name | Transcranial Direct Current Stimulation |
| Group | Complementary |
| Link image | https://neuromtl.com/wp-content/uploads/2018/04/technology-soterix-tdcs.jpg |
| History |  |
| Description | Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique that delivers a low-intensity electrical current to the brain via electrodes placed on the scalp. This technique aims to modulate neuronal excitability, a process known as neuromodulation. There are two types of stimulation: anodal (which increases neuronal activity) and cathodal (which reduces or inhibits neuronal activity).  tDCS has been investigated for its potential to alleviate various symptoms associated with neuropsychiatric conditions, including Autism Spectrum Disorder (ASD). Specifically, tDCS has shown promise in targeting the following areas:  +Social Communication and Interaction: The dorsolateral prefrontal cortex (DLPFC) plays a key role in social cognition. Anodal tDCS applied to the DLPFC may enhance social communication skills and improve interaction abilities in individuals with ASD.  +Repetitive Behaviors: The DLPFC is also involved in motor planning, organization, and regulation/inhibition. Modulating this area through tDCS could potentially reduce repetitive behaviors commonly seen in ASD.  +Cognitive and Sensory Functions: The DLPFC contributes to working memory, attention, and cognitive flexibility. Enhancing neuronal activity in this region may improve cognitive function and sensory processing in individuals with ASD.  By targeting these specific brain regions and functions, tDCS offers a promising therapeutic avenue for addressing some of the core challenges associated with ASD. |
| Resources | Hyde, J., Carr, H., Kelley, N. et al. Efficacy of neurostimulation across mental disorders: systematic review and meta-analysis of 208 randomized controlled trials. Mol Psychiatry 27, 2709–2719 (2022). <https://doi.org/10.1038/s41380-022-01524-8> = [https://www.nature.com/articles/s41380-022-01524-8] |

**VIT-D**

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| Acronym | VIT-D |
| Name | Vitamin-D |
| Group | Complementary |
| Link image | https://d2jx2rerrg6sh3.cloudfront.net/image-handler/ts/20210324120429/ri/673/picture/2021/3/shutterstock\_1691522041.jpg |
| History |  |
| Description | Vitamin D is an essential nutrient for overall health, primarily acquired through exposure to sunlight and dietary sources. It is well-known for its crucial role in bone health, helping to maintain proper calcium and phosphate levels in the blood.  Beyond its traditional functions, recent research highlights Vitamin D's involvement in various physiological processes, including immune regulation, neuroprotection, and neurodevelopment. These findings suggest that Vitamin D plays a more extensive role in maintaining overall health than previously understood.  §  Given its involvement in brain development and immune function, Vitamin D could play a significant role in Autism Spectrum Disorder (ASD). Vitamin D interacts with receptors present in various brain regions associated with social behavior, cognition, and motor functions. It influences the expression of genes involved in neurodevelopment, immune responses, and neuroprotection, potentially modulating the neuronal pathways implicated in ASD. |
| Resources | Rihal V, Khan H, Kaur A, Singh TG, Abdel-Daim MM. Therapeutic and mechanistic intervention of vitamin D in neuropsychiatric disorders. Psychiatry Res. 2022 Nov;317:114782. doi: 10.1016/j.psychres.2022.114782 = [https://www.sciencedirect.com/science/article/pii/S0165178122003766?casa\_token=b0zLoCXJh-wAAAAA:CrjzzoIuVXUscog\_pzGQSGZFZbgOivxJly0-Y1If7uZyzuZfw8deODAdpHxnZCIT6oKW3OxBrQ] |

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