

Alteration in Expression of Long-Term Potentiation (LTP) Through Protein Manipulation or Genetic Differentiation

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The goal of this literature review was to describe long-term potentiation in both neurotypical and neurodiverse populations. By reviewing the different influences before and after birth, we can help prepare the field for future research into neurodiversity including future therapies and treatments.

Research was collected through online sources. Articles and research papers were analyzed. Information was pulled to create a paper which overviews topics of memory formation and learning in typically-developing individuals and individuals with neurodevelopmental disorders.

What is long-term potentiation (LTP)? What is long-term depression (LTD)?

- Long-term potentiation (LTP) is a process to make a pathway in your brain strong.
 - By learning or repeating something often, the connections between supporting brain cells get stronger, so information can travel along those connections easier.
 - This process helps with learning and remembering.
- Long-term depression (LTD) is a process to make a pathway in your brain weak.
 - When you stop practicing a skill or stop thinking about certain information, the connections between supporting brain areas weaken.
 - This process helps with prioritizing important brain connections and letting go of less important ones, so people can adapt to new situations and learn new things.

What are the influences on long-term potentiation before and after birth?

- The four areas explored were differences in proteins, chemicals, drugs, and genetics.



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Some findings related to how memory formation is different in people with Intellectual and Developmental Disabilities (IDD):

- Rett syndrome, Autism Spectrum Disorder, and Down syndrome were used as models to find differences in LTP compared to nondisabled people.
 - The beginning of the process of LTP is lower in these populations.
 - Overall, early phases of LTP are lower, but some studies show that late phases of LTP stay functioning at a normal level.
 - This difference in early LTP leads to fewer long-lasting connections between brain cells. Without these long-lasting connections, impairments in learning and memory are more likely.

Some updates in research

- The non-typical biology and chemistry behind LTP in people with IDD needs further research and new theories are still in development.
- Along with this, there are new findings for countermeasures or therapies to treat the changes in LTP.
- Research has also found applications of stimulated LTP and LTD to possibly treat different neurological disorders such as depression, Parkinson's disease, chronic pain, and others.

Recommendations for future research

- Future research should be dedicated to exploring more interventions and therapies to improve LTP expression for neurodevelopmentally disabled populations.
- There should be research dedicated to the neuroscience of IDD at the molecular and systems levels, as well as research into how best to support individuals with memory formation and learning skills.
 - Implementing both approaches can help us move toward more equal engagement of people with IDD with the world.



Download the full report from the University of Arizona Libraries Honors Thesis Repository:
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