Detecting Adolescent Depression & Anxiety with Nanotechnology and Biofeedback

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Title: Detecting Adolescent Depression & Anxiety with Nanotechnology and Biofeedback
Objectives: This study examines how wearable nanotechnology supports the early detection of anxiety and depression in adolescents by monitoring physiological markers. It aims to enhance intervention strategies, promote patient-centric treatment, and evaluate future implications of nanotechnology in improving mental health responsiveness and accessibility.
Background: Adolescence is a critical period marked by rising anxiety and depression rates, making early detection vital. Nanotechnology enables non-invasive devices to track real-time biological signals, while biofeedback translates physiological data, like heart rate or brain activity, to assess neurological states. Together, these tools can transform early intervention for depression and anxiety, while being applied to broader mental health conditions in the future.
Methods: We conducted a literature search in the Web of Science database using terms such as "bio/neurofeedback depression teens" and "early detection anxiety/depression," identifying 396 preliminary articles. Articles focusing on unrelated mental health conditions or general therapy approaches were excluded. Bibliometric data from the top 100 most cited articles were exported to Excel for analysis.
Results: The most frequently published journals were *Nucleic Acid Research* and *Bioinformatics*, indicating key dissemination platforms for research on wearable nanotechnology and adolescent mental health (Figure 3). Keyword trends from the 1980s to 2022 revealed significant growth in research activity, accompanied by an increase in terms such as "Central Pattern Generator", "Neurons", and "Stomatogastric Ganglion" (Figure 5).
Conclusions: Researchers are increasingly exploring the intersection of nanotechnology and biofeedback in the context of adolescent mental health. There has been a notable rise in publications across major journals, accompanied by a growing focus on neural circuitry and modeling as reflected in keyword trends, which are essential for developing more precise and responsive mental health monitoring technologies. Future studies should continue integrating bioinformatics and neural modeling to enhance early, data-driven detection strategies.

Keyword 1: Adolescent mental health
Keyword 2: Nanotechnology
Keyword 3: Biofeedback
Keyword 4: Early Detection

1. **I confirm that the abstract and all information are correct:** Yes
2. **I confirm that the abstract constitutes consent to publication:** Yes
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