PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in **Psychological Science**

Volume 3, Number 1 **June 2025**

CONTENTS

1 Neurobiological and Functional Outcomes of the Interpersonal Whole-Brain Model of Care in Autism Spectrum Disorder: A Mixed-Methods Study

Amy O' Dell, Allegra Saunders, Julian Gonzalez, Holly A. Haynes

13 Psychology of Consciousness as a Universal Phenomenon Proposed Visualization for the Mechanism of Consciousness

Samah Khaled Zahran

17 Light Deprivation Induces Anxiety-Like Behaviors in Mice

Xiaonuan Wang, Yiru Zhang

24 Perceived Overqualification in College Students: A Double-Edged Impact via Knowledge Hiding

Siyu Li, Jiangyu Li

34 The Effect of Parenting Style and Attachment Style on New Adult Intimacy

Jing Luo

40 How Parent-Parent Relationships, Parent-Child Relationships and the Interactions Among Them Affect Teenagers' Happiness

Steve Shi

46 The Relationship Between Growth Mindset and Academic Perseverance in Junior High School Students: The Mediating Role of Achievement Motivation

Xiangxin Zhou, Yue Sun, Jiaxin Zhou

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

Neurobiological and Functional Outcomes of the Interpersonal Whole-Brain Model of Care in Autism Spectrum Disorder: A Mixed-Methods Study

Amy O' Dell[1], Allegra Saunders[1], Julian Gonzalez[1] & Holly A. Haynes[1,2]

[1] The Jacob's Ladder Group, US
[2] Fresno Pacific University, US
Correspondence: Holly A. Haynes, The Jacob's Ladder Group, US; Fresno Pacific University, US.

doi:10.56397/SPS.2025.06.01

Abstract

The Interpersonal Whole-Brain Model of Care (IWBMC™) presents a comprehensive intervention for autism spectrum disorder (ASD) targeting neurobiological frameworks. This mixed-methods study evaluated its efficacy through QEEG connectivity analysis of a longitudinal case study and pre-post outcomes from 61 ASD clients. Results demonstrated normalization of brain connectivity patterns alongside statistically significant improvements with large effect sizes across behavioral regulation (d=1.26), emotional recognition (d=0.98), cognitive functioning (d=0.84), and neurophysiological integration (d=1.52). The concurrent improvement in brain connectivity and functional outcomes suggests that the IWBMC™'s integrated approach effectively addresses both neurological underpinnings and behavioral manifestations of ASD, offering promising pathways for intervention.

Keywords: autism spectrum disorder, neurodevelopment, QEEG, brain connectivity, behavioral outcomes, emotional recognition, primitive reflexes, interhemispheric communication

1. Introduction

1.1 What Is Autism Spectrum Disorder?

Autism spectrum disorder (ASD) is a developmental disorder that impacts an individual's social interactions, behavior, learning, and communication (Maenner, 2023). Although the presentation can vary greatly, individuals primarily demonstrate challenges in communication abilities, appropriate social interaction, and engagement in restricted or repetitive behaviors. Often, individuals will experience a limited array of interests and can display a wide range of sensory aversions, particularly around activities of daily living such as hair cutting, nail cutting, and tooth brushing. Autism spectrum disorder diagnoses may or may not have an accompanying language or intellectual delay diagnosis or a defined severity level. Physicians screen for autism during well-child visits as early as 18 months; however, for some individuals, indications of challenges are seen before the child is one year old. Therefore, early detection and intervention are critical for individuals diagnosed with ASD (McGlade, Whittingham, Barfoot, Taylor, & Boyd, 2023).

Autism spectrum disorder is divided into three

levels of severity based on Social Communication and Restricted, Repetitive Behaviors (American Psychiatric Association, 2013). Table 1 defines the severity levels and related social communication and behavior issues.

Table 1. Severity of Autism and Implications for Social Communication and Behaviors

Severity Level	Social Communication	Restricted, Repetitive Behaviors
Level 1: Requiring support	Without specific support, the individual experiences deficits in social communication, causing noticeable impairments. Additional challenges may include: • Difficulty initiating social interactions • Atypical or unsuccessful responses to social overtures of others • Appears to have decreased interest in social interactions • Challenges with reciprocal conversational abilities • Challenges with making and sustaining friendships	The individual experiences challenges such as: - Inflexible behavior that causes significant interference with functioning in one or more contexts - Difficulty transitioning between activities - Challenges with organization and planning abilities, which interfere with their independence
Level 2: Requiring substantial support	The individual experiences marked deficits in verbal and nonverbal social communication skills. Additional challenges may include: • Social impairments, even with supports in place • Limited initiation of social interactions • Reduced or abnormal responses to social overtures from others • Communication is limited to particular areas of interest • Markedly odd nonverbal communication skills	The individual experiences challenges such as: - Inflexibility of behavior - Difficulty coping with change - Restricted/repetitive behaviors are frequent enough to be evident to the casual observer and interfere with functioning in various contexts - Distress or difficulty changing focus or action
Level 3: Requiring very substantial support	The individual experiences severe deficits in verbal and nonverbal social communication skills that cause significant impairments in functioning. Additional challenges may include: • Significantly limited initiation of social interactions • Minimal response to social overtures from others, such as only approaching or responding when needing their needs met or in straightforward social approaches	The individual experiences challenges such as: - Inflexible behavior - Extreme difficulty coping with change - Restricted/repetitive behaviors that markedly interfere with functioning in all spheres - Great distress/difficulty changing focus or action

1.2 Comorbid Diagnoses

Individuals with a diagnosis of autism spectrum disorder often experience a multitude of diagnoses related to their functional challenges.

Comorbid diagnoses may include intellectual impairment, attention-deficit/hyperactivity disorder (ADHD), anxiety, and developmental coordination disorder. Additionally, individuals may experience medical conditions such as epilepsy, sleep problems, and constipation (Kandel et al., 2000).

1.3 Why Does this Matter?

The United States has the fourth highest rate of ASD diagnoses in the world (following the United Kingdom, Sweden, and Japan), with 1 in 36 children diagnosed with ASD in the United States (Maenner, 2023). Additionally, more than 25% of those diagnosed are classified as having profound autism and will require lifelong care (Hughes et al., 2023). Notably, most of the children diagnosed with profound autism are from ethnic or racial minority groups and tend to be girls from lower-income households. The disparity in diagnosis rates between genders is significant, with ASD diagnoses being four times more common in boys than girls (Maenner, 2023). These statistics highlight the widespread prevalence of ASD in the United States and underscore the importance of comprehensive care models like the IWBMC™.

As stated above, in addition to the rising diagnoses of ASD within the United States and the increase in population, it is well documented that later diagnoses are often comorbid with intellectual disability and other adverse symptomatology. As such, early diagnosis and intervention are critical. Studies show that early intervention is effective in helping autistic individuals achieve more independence, and interventions involving parents are recommended (e.g., Rojas-Torres, Alonso-Esteban, & Alcantud-Marín, 2020). Growing literature also suggests that various interventions, particularly those in natural and developmental settings, are more effective than traditional behavioral interventions (Franz, Goodwin, Rieder, Matheis, & Damiano, 2022). However, the scientific literature emphasizes the need for any intervention strategies that can help neurodivergent individuals lead more independent and healthy lives.

1.4 Autism Spectrum Disorder and the Interpersonal Whole-Brain Model of Care

The Interpersonal Whole-Brain Model of Care (IWBMC™) uniquely addresses the core issues of an autism spectrum disorder diagnosis, including processing incoming sensory information, mood regulation, behavior control, language processing, and language generation. The mission of the IWBMC™ and, more specifically, individuals with an autism spectrum diagnosis is to take an intentional, all-encompassing, and brain-based approach to examine and execute a targeted action plan for clients navigating these difficulties.

1.5 The Nuts and Bolts of the IWBMC™

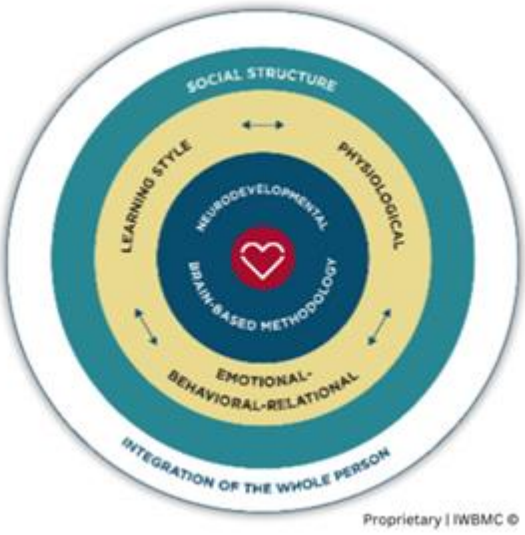

Figure 1. The Elements of the IWBMC™

The Interpersonal Whole Brain Model of Care, or IWBMC™, is a comprehensive and innovative strategy for working with individuals with neurodevelopmental diagnoses, including but not limited to autism spectrum disorders. This model of care aims to develop a unique, highly individualized program for each client through a thorough and multifaceted evaluation. This evaluation encompasses many factors, including the client's motivations, behaviors, physiological and emotional development, neurological functioning, and available social support systems. Considering all these aspects, the IWBMC™ aims to create a holistic understanding of each individual's needs and strengths. The critical elements of the IWBMC™ are visually represented in Figure 1.

Following this comprehensive evaluation process, targeted interventions are planned based on the various components of the IWBMC™. Two of these components are essential to the model's effectiveness. The first is integrating the whole person, which ensures that all aspects of the individual's functioning are considered. The second is the careful

attention paid to the social structures and support systems available to the client, recognizing the crucial role that environment and relationships play in an individual's development and well-being.

As emphasized earlier in the discussion, current research suggests that the most effective approaches for autism should incorporate parents and caregivers as active participants in the intervention process. Additionally, these approaches should carefully consider the developmental stages of the individual and the naturalistic environments in which they live, learn, and interact. The IWBMC™ is specifically designed to address these critical factors, ensuring that interventions are tailored to the individual, integrated into their daily life, and supported by their immediate social circle.

It is important to note that the IWBMC™ was not developed in isolation or based on theoretical concepts alone. Instead, it was carefully crafted using evidence-based research, drawing on scientific literature and clinical studies. This grounding in empirical evidence ensures that the model's approaches and interventions have a solid foundation in proven effectiveness while allowing for the flexibility needed to address each client's unique needs.

1.6 How the IWBMC™ Supports the ASD Population

The IWBMC™ provides comprehensive support for the ASD population through individualized program design targeting each student's neurobiological framework. The approach incorporates QEEG brain map analysis to guide treatment intervention plans and measure progress. It focuses on sensory regulation interventions to reorganize maladaptive sensory processing pathways, while implementing a positive interpersonal behavioral model to address behavioral challenges. The program emphasizes frequent cardiovascular and cross-lateral movement activities to promote new neuronal growth and enhance brain communication. Additionally, it works on increasing emotional awareness and understanding the connection between thoughts and behaviors to improve self-regulation abilities. Social and relational challenges are addressed through structured peer interaction, social skills groups, and mentoring opportunities. Finally, the IWBMC™ utilizes a unique Whole-Brain Language Approach to tackle the complex interplay of factors involved in language processing, production, articulation, and functional communication. Data is continuously collected and reviewed as clients progress through the program. All clients undergo periodic re-evaluations to identify areas of growth and mastery and those that still require improvement. This study seeks to answer the following questions:

1) How does the IWBMC™ approach affect neurological connectivity patterns as measured by QEEG, and how do these changes correlate with functional improvements in individuals with ASD?
2) What patterns of improvement across behavioral, emotional, cognitive, and physiological domains emerge from a larger sample (n=61) of ASD clients following IWBMC™ intervention?

2. Methodology

In order to address our research questions, we utilized a mixed-methods approach combining in-depth neurological analysis and comprehensive functional assessment. First, we present a detailed longitudinal case study analyzing QEEG brain maps of a client with ASD who received the IWBMC™ intervention over eight years (2013-2021). This case analysis examines changes in brain connectivity patterns, explicitly focusing on hyper- and hypo-coherence in regions typically affected in ASD.

To complement the neurological findings, we analyzed behavioral, emotional, cognitive, and physical outcomes from a sample of 61 clients diagnosed with autism spectrum disorder (ASD) who received intervention through the Interpersonal Whole-Brain Model of Care (IWBMC™). The sample consisted of 61 clients: 54 males (88.5%) and seven females (11.5%), with 17 participants (27.9%) identifying as non-white and 44 (72.1%) as white. The IWBMC™ aimed to address challenges that impact learning, social connections, and cognitive development by targeting disruptive behaviors that hinder connection, communication, and learning. Since not all clients completed all outcomes tasks, data was adjusted based on the number of completions.

Participants were conveniently sampled from the entire ASD population of a therapeutic school implementing the IWBMC™ approach in a southeastern metropolitan area in the United

States. All participants received a comprehensive individualized intervention based on the IWBMC™ framework for a minimum of 12 months (range = 12-24 months, M = 18.5 months) between 2015 and 2022. Intervention intensity averaged 25 hours weekly of direct therapeutic and educational programming.

2.1 Measures

We collected data across five crucial outcome domains: behavioral, emotional, cognitive, neurological, and physiological functioning. All measures were administered at initial evaluation before intervention implementation and again after approximately one year of intervention during a formal re-evaluation. All assessments were conducted by trained, certified professionals with expertise in neurodevelopmental evaluation. Data collection procedures were standardized across all participants, and evaluators differed from those providing intervention services to minimize potential bias.

Behavioral Measures: Parent questionnaires assessed frequency and severity of negative and disruptive behaviors using a standardized rating scale (0-5, with higher scores indicating more problematic behaviors). Additionally, the percentage of parents reporting specific challenging behaviors was recorded through structured interviews.

Emotional Measures: Emotional recognition abilities were assessed through standardized testing procedures. Clients were asked to identify emotions portrayed in photographs. The number of correctly identified emotions was recorded, and participants were categorized based on their ability to recognize three or more distinct emotions in others.

Cognitive Measures: Academic achievement was assessed using the Wide Range Achievement Test (WRAT-4), providing standard scores and grade equivalencies for mathematics and reading domains. Deductive reasoning abilities were measured using age-appropriate logical reasoning tasks and scored on a standardized scale.

Neurophysiological Measures: Trained clinicians assessed Interhemispheric communication through standardized observations of cross-lateral movements, including belly crawl and creep patterns, on a 0-5 scale. Primitive reflex integration was measured through a standardized protocol assessing the presence and strength of 17 primitive reflexes, with scores ranging from 0 to 50 (higher scores indicating better integration).

2.2 A Key Component of the IWBMC™: Utilization of QEEG Data | Linked-Ears Mapping

In tandem with the Neurodevelopmental Profile component of the IWBMC™ Evaluation, data is collected through a QEEG (Quantitative Electroencephalogram). The QEEG, based on traditional EEG technology, measures the brain's electrical activity; however, it goes a step further and converts the electrical activity to a visual representation. The visual representation indicates areas of the brain with too much or too little electrical activity by comparing the data to a norm-referenced database, including age, gender, and handedness (Thatcher, 2016). The QEEG provides specific measures within the brain wave frequencies of Delta, Theta, Alpha, Beta, and High Beta about the power that is available within the Brodmann areas, or specifically designated brain regions, the balance between waveforms, the communication from site-to-site, and the speed of firing between sites (Prichep, 2005; Wantzen et al., 2022).

The QEEG corroborates the outcomes derived from the IWBMC™ Evaluation by matching the brain's internal state with the external level of functioning. The unique integration of the QEEG to areas of development attests to the holistic nature of the IWBMC™ rather than having separate, isolated viewpoints on the outcomes of functional or metric-based assessments versus diagnostic tools used in clinical settings, the IWBMC™ combines these two complex processes, resulting in a dynamic and comprehensive evaluation of neurological development. Comparative QEEGS are also part of the ongoing re-evaluation process. Shifts in brain frequencies, electrical activity, and connection patterns can substantiate functional changes resulting from therapeutic programming. Further, evidence of foundational shifts correlates to changes within the lower brain frequencies of the brain, allowing the higher frequencies to regulate in time, enabling overall balance to continue emerging.

This component of the holistic assessment focuses on the latest, most innovative neuroscientific principles, which incorporate the software and engineering of the actual measuring equipment. The IWBMC™ utilizes

and recommends the software NeuroGuide, created by Dr. Robert Thatcher, Professor of Clinical Neuroscience. Additionally, we partner with Dr. Thatcher to review data analyses produced by the software and support the findings of the IWBMC™ Evaluation. The process begins with a 19-channel EEG recording of resting-state brain activity with an individual's eyes open and consists of using an EEG amplifier to magnify the electrical activity occurring in the brain. All EEG data is then analyzed using a linked-ears montage, and advanced mathematical equations are used to estimate the sources of the electrical activity on the scalp accurately while comparing the individual's data to a normative database. The normative database includes data from 678 individuals aged two months to 82 years (Thatcher, Walker, Biver, North, & Curtin, 2003).

First, the electrical activity from the outer part of the brain, the cerebral cortex, is transferred to a two-dimensional map, and areas of activity are "mapped" to the electrode site. Next, activity is measured by a standard z-score, moving to three or more standard deviations away from the mean, illustrating activity with cool colors, which signify deficient activity, and warm colors, which signify excessive activity. Anatomical brain regions near each electrode are associated with specific Brodmann Areas, validated through diagnostic neuroimaging tools, including functional magnetic resonance imaging (fMRI), electroencephalogram (EEG), magnetoencephalography (MEG), and positron emission tomography (PET) (Thompson & Thompson, 2016). The QEEG then provides specific measurements of five brain wave frequencies (delta, theta, alpha, beta, and high beta) and calculates the electrical activity occurring in each area of the brain, the balance between different waveforms, the communication between brain areas, and the speed of firing between brain areas.

The amount of communication between areas of the brain further supports the need for intervention using the IWBMC™. If areas of the brain are not communicating effectively or are over-communicating, the brain is not operating optimally. Therefore, by looking at the top areas that are under-communicating and over-communicating, we can isolate the functions of these areas and identify a plan to redirect these communication patterns, allowing for improved functioning. Coherence measures derived from the QEEG show activity measured by a standard z-score, with the thickness of the lines indicating deviations away from the mean.

Integrating QEEG data with areas of neurological development substantiates the effectiveness of the Interpersonal Whole-Brain Model of Care® approach. The goal is to identify and correlate areas of brain dysregulation, apply focused interventions, and measure improvement in brain activity levels correlated to identified therapeutic, academic, and quality-of-life measures.

2.2.1 Linked-Ears Mapping

Linked-ears mapping shows a surface-level reading of the electrical activity occurring within the brain. Since medication influences many areas of the brain, the effect of medication is seen in Linked-ears mapping.

2.2.2 QEEG Measurements

Absolute Power measures the amount of power, or resource, available at each site. Absolute power reflects the actual microvolts recorded at each of the sites. The amplitude or voltage the brain produces is measured at each site. Absolute power helps to determine whether an excessive or deficient amount of activity within a particular frequency range is present at each site.

Relative Power is the distributed total amount of power at each electrode site. Measuring relative power aids in determining whether a particular frequency is overpowering other vital brain frequencies. In addition, relative power is essential for understanding the balance of electrical activity in the brain, as it tells us "Who is in charge."

Amplitude Asymmetry measures the balance of the brain waves between various sites. Excessive activity may indicate an over-firing of neuronal intercommunication, while insufficient activity may suggest neuronal communication is not firing sufficiently to maintain proper brain function.

Coherence is the measurement indicating communication flow between various brain regions, giving the value of efficiency and effectiveness of the brain's ability to accomplish a specific task. Excessive coherence indicates that two or more brain areas are "overly connected or locked together." The brain has become overly dependent on those centers and is not efficiently processing and executing

information. If areas have low coherence, they are under-communicating and essentially "offline." Coherence patterns represent regional communication, connectivity, and cooperation between brain areas.

Phase Lag measures communication speed, providing a value of the efficiency of timed events between cortical brain sites. The brain cannot perform at peak efficiency when signals arrive too late or too early.

2.2.3 Color-Code Key

Indicated below is a color-coded key for interpreting a QEEG surface reading (See Figure 2). The Absolute Power and Relative Power measurements are based on standard deviations above and below the norm and color-coded accordingly per the chart above. 1-1.5 standard deviations (SD) above the norm is lime green, 1.5-2 SDs above is yellow, 2-2.5 SDs above is orange, and 2.5 SDs or higher is red. Zero is the mean within the white range and represents activity within the normal range. 1-1.5 SDs below the norm is light green, 1.5-2 SDs below is light blue, 2-2.5 SDs below is blue, and 2.5 SD or lower is the darkest blue.

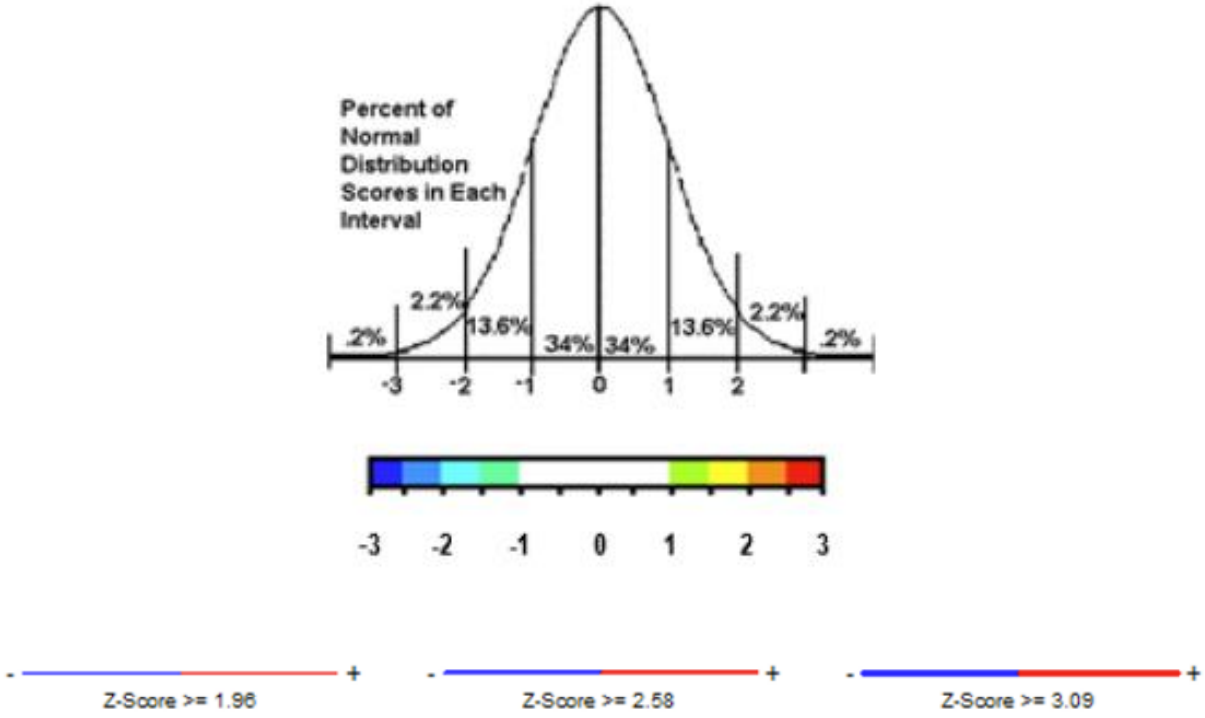

Figure 2. QEEG Surface Reading & Z-Score Key

The Amplitude Asymmetry, Coherence, and Phase Lag measurements are represented as line graphs, with the thinnest lines representing the least significant activity patterns and the thickest lines representing the more substantial activity patterns. Blue lines indicate deficient activity, whereas red lines indicate excessive activity. No lines represent activity within the normal range.

3. Results: Autism Spectrum Disorder & QEEG Data: A Sample Client

For individuals with a diagnosis of autism spectrum disorder, patterns of dysregulation are identified through over and under-connectivity in key areas of the brain, including the Temporal region, Occipital Cortex, Limbic system (specifically the Amygdala and Cingulate Gyrus, Post Central gyrus, Somatosensory Association Cortex, and Prefrontal Association Cortex) (Abi-Dhargam et al., 2023). Often, because of the impact of these connectivity patterns, information cannot flow efficiently between brain regions, hindering the brain's ability to communicate effectively. We also consider how foundational levels of the brain function, as higher-level cognitive skills and functioning depend upon organization within the lower brain regions.

The following image shows a client's QEEG captured at their initial evaluation in 2013 (See Figure 3). The images represent the client's QEEG captured at their 2016, 2019, and 2021 re-evaluations. The client, diagnosed with

autism spectrum disorder, completed full-time, intensive programming in the Ladder and Hope School programs at Jacob's Ladder Neurodevelopmental School and Therapy Center in Roswell, Georgia. As part of the programming, the client also completed neurofeedback.

The comparison QEEG findings show improvement in all areas, including electrical activity and communication. Notable improvements are found within absolute power, where excessive activity moved toward the normative range. Further, locked coherence patterns of excessive activity improved, as did amplitude symmetry and phase lag connectivity.

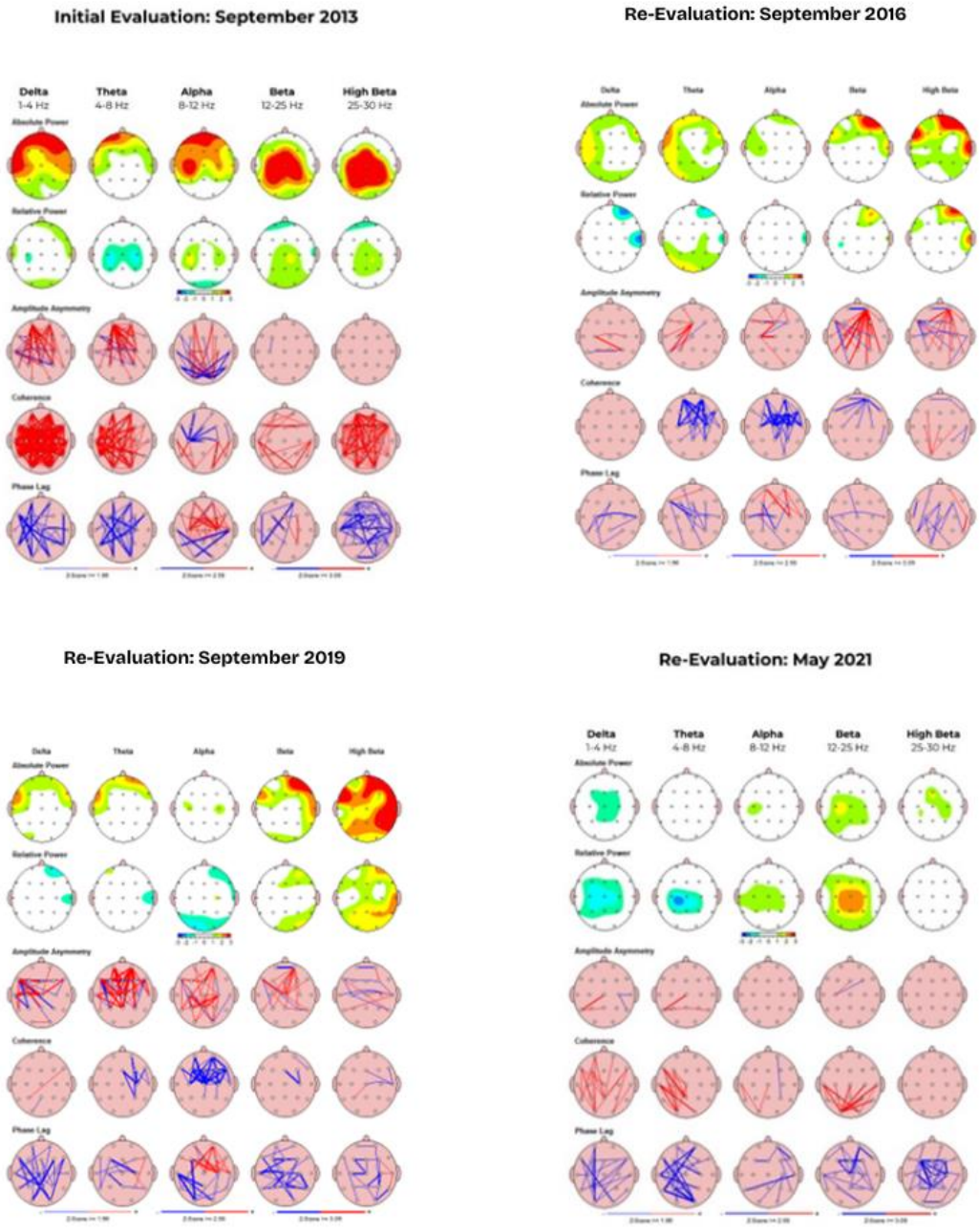

Figure 3. Client's QEEG maps over 8 years of intervention

3.1 QEEG Findings | Top 10 Hyper-Coherence Connections

In addition to images of brain processing, the QEEG can also be used to explore coherence (Thatcher, North, & Biven, 2005). The data below utilizes swLORETA Coherence measures to interpret communication patterns within the brain's deeper structures (Figures 4 and 5). The Top 10 chart provides insight into the most

overly connected regions of the brain. The left-hand column indicates the brain regions, followed by the frequency in the next column, and then the comparison data scores at each evaluation point. Finally, the right-hand column shows the z-score change, as noted by scores moving toward the normative score of zero.

Top 10 Hyper-Coherence Connections Comparison
8/19/2013 & 5/10/2021

Channel			Frequency	8/19/2013 z-score	5/10/2021 z-score	Change Toward Normative
Post Central Gyrus - Right Somatosensory Cortex 3R	to	Pre-Frontal Cortex - Right 9R	Alpha 2	6.58	1.39	5.19
Pre Central Gyrus - Right Primary Motor Cortex 4R	to	Pre-Frontal Cortex - Right 9R	Alpha 2	6.44	1.40	5.03
Parahippocampal Gyrus - Right 27R	to	Anterior Cingulate Gyrus - Right 32R	Alpha 2	6.42	1.17	5.25
Anterior Cingulate Gyrus - Right 32R	to	Red Nucleus – Right Brain Stem - Midbrain	Alpha 2	6.29	1.01	5.29
Anterior Cingulate Gyrus - Right 32R	to	Parahippocampal Gyrus - Right Medial Temporal Lobe 35R	Alpha 2	6.28	0.71	5.58
Pre-Frontal Cortex - Right 9R	to	Uncus – Right Superior Temporal Gyrus 34R	Alpha 2	6.26	0.36	5.91
Anterior Cingulate Gyrus - Right 32R	to	Habenula – Right Diencephalon	Alpha 2	6.26	1.09	5.17
Pre Central Gyrus - Right Primary Motor Cortex 4R	to	Anterior Cingulate Gyrus - Right 32R	Alpha 2	6.25	1.34	4.90
Post Central Gyrus - Right Somatosensory Cortex 1R	to	Pre-Frontal Cortex - Right 9R	Alpha 2	6.19	1.43	4.76
Anterior Cingulate Gyrus - Right 32R	to	Uncus – Right Superior Temporal Gyrus 34R	Alpha 2	6.16	0.65	5.51

Figure 4. Top 10 Hyper-Coherence connections historical comparison

Top 10 Hypo-Coherence Connections Comparison
8/19/2013 & 5/10/2021

Channel			Frequency	8/19/2013 z-score	5/10/2021 z-score	Change Toward Normative
Cerebral Crus 2– Right Brain Stem - Midbrain	to	Cerebellum 6 - Right	Alpha 2	-8.41	-1.37	7.04
Occipital Cortex - Right 17R	to	Temporal Lobe - Right 21R	High Beta 2	-6.85	-2.05	4.80
Gustatory Primary Cortex - Left Postcentral and Paracentral Lobule 43L	to	Hippocampus – Left Temporal Lobe	Delta	-6.62	-1.42	5.21
Occipital Cortex - Right 17R	to	Temporal Lobe - Right 22R	High Beta 2	-6.47	-2.14	4.33
Cerebellum 6 - Right	to	Cerebellum 7b - Right	Alpha 2	-6.44	-1.41	5.02
Cerebral Crus 2 – Left Brain Stem - Midbrain	to	Cerebellum 6 - Left	Alpha 1	-6.36	-0.38	5.98
Pre-Frontal Cortex - Right 8R	to	Occipital Cortex - Left 18L	High Beta 2	-6.30	-3.34	2.97
Occipital Cortex - Right 17R	to	Subthalamus – Right Diencephalon	High Beta 2	-6.17	-2.14	4.03
Occipital Cortex - Right 17R	to	Primary Auditory Cortex - Right Inferior Transverse Temporal Gyrus 42R	High Beta 2	-6.15	-2.02	4.13
Vermis 6 - Medial	to	Vermis 7 - Medial	Alpha 2	-5.95	-0.78	5.17

Figure 5. Top 10 Hypo-Coherence connections historical comparison

In the example above of the same client, throughout the time spent working through the IWBMC™ driven interventions, the client's top 10 hyper-coherence (overactive) connections all move from atypical to typical connectivity. Half the connections for the top 10 hypo-coherence (underactive) move to typical connectivity.

4. Results: Autism Sample

4.1 Behavioral Outcomes

Data from 57 clients (50 male, 88.7%; 7 female, 11.3%; 11 non-white, 21.1%; 46 white, 78.9%) demonstrated a significant decrease in reported negative behavior scores from 14.4 pre-intervention to 9.4 post-intervention ($t(56) = 7.83$, $p < .001$, $d = 1.26$). The percentage of parents reporting observed negative behaviors decreased substantially from 56% pre-intervention to only 11% post-intervention ($\chi^2(1) = 25.68$, $p < .001$). These improvements indicate the effectiveness of the IWBMC™ approach in addressing challenging behavioral patterns common in ASD.

4.2 Emotional Development

Analysis of 61 clients showed notable enhancement in emotional recognition capabilities following intervention. The average number of emotions recognized in others increased from 1.5 pre-intervention to 2.3 post-intervention ($t(60) = 6.42$, $p < .001$, $d = 0.98$). The percentage of ASD clients recognizing three or more emotions in others rose from just 9% pre-intervention to 77% post-intervention ($\chi^2(1) = 31.92$, $p < .001$). Notably, 78% of clients could correctly identify two or more emotional expressions, and 27% demonstrated the ability to identify three or more emotions. Given that emotional recognition is considered a fundamental challenge for individuals with ASD, this improvement represents a particularly significant finding.

4.3 Cognitive Functioning

Cognitive assessments of all 61 clients demonstrated meaningful improvements across multiple domains. Deductive reasoning scores almost doubled post-intervention ($t(60) = 5.17$, $p < .001$, $d = 0.84$). Initial receptive word identification scores also showed significant improvement ($t(60) = 4.76$, $p < .001$, $d = 0.74$).

As measured by WRAT-IV grade equivalencies, academic achievement improved significantly in a combined analysis of 43 clients (34 male, 79.1%; 9 female, 20.9%; 9 non-white, 20.9%; 34 white, 79.1%). Math grade equivalents increased from 3.35 to 4.58 ($t(42) = 8.23$, $p < .001$, $d = 1.13$) and reading grade equivalents advanced from 4.86 to 5.21 ($t(42) = 4.76$, $p < .001$, $d = 0.74$). These gains were achieved after just one year of interventions developed through the IWBMC™ programming.

4.4 Neurophysiological Integration

Physiological measurements revealed substantial improvements in neurobiological functioning. Integrated primitive reflexes scores increased from 22.26 pre-intervention to 34.23 post-intervention ($t(60) = 9.48$, $p < .001$, $d = 1.52$). Interhemispheric communication showed marked improvement, with increases in both belly crawl scores (from 2.21 to 3.7; $t(60) = 7.95$, $p < .001$, $d = 1.28$) and creep scores (from 3.14 to 3.95; $t(60) = 6.87$, $p < .001$, $d = 1.05$). These neurophysiological advancements suggest improved neural pathway development and brain integration, fundamental to overall cognitive and behavioral functioning.

These comprehensive results across behavioral, emotional, cognitive, and neurophysiological domains suggest that the IWBMC™ approach effectively addresses the complex needs of individuals with ASD, potentially opening new avenues for connection, communication, and personal growth. By targeting these fundamental areas, the intervention provides clients with tools to navigate their world more effectively and achieve their full potential.

5. Overall Impact and Conclusion

The comprehensive data from 61 ASD clients provides compelling evidence for the effectiveness of the IWBMC™ approach in addressing the complex needs of individuals with autism spectrum disorder. The statistically significant improvements observed across multiple domains—with consistently large effect sizes—demonstrate that targeting fundamental neurobiological frameworks through individualized programming can produce meaningful changes in development and functioning.

The behavioral improvements ($d = 1.26$) reflect a substantial reduction in disruptive behaviors that typically interfere with learning and social engagement. Similarly, the advances in emotional recognition ($d = 0.98$) represent a critical development in an area considered fundamentally challenging for individuals with ASD. The cognitive gains in both deductive

reasoning (d = 0.84) and academic achievement (math: d = 1.13; reading: d = 0.74) further support the comprehensive impact of the approach.

Perhaps most notably, the neurophysiological improvements in primitive reflex integration (d = 1.52) and interhemispheric communication (belly crawl: d = 1.28; creep: d = 1.05) provide objective evidence of neurobiological reorganization. These changes in brain functioning likely underpin the behavioral, emotional, and cognitive improvements documented throughout this report.

The IWBMC™'s holistic approach addresses each component of development concurrently, producing a synergistic effect that appears to enhance overall functioning. By identifying and addressing root neurological issues while simultaneously supporting behavioral regulation, emotional development, and cognitive growth, the model creates pathways for lasting improvement. The QEEG case analysis further strengthens these findings by demonstrating concrete shifts in brain connectivity resulting from IWBMC™ interventions.

These outcomes suggest that the IWBMC™ has significant potential to improve quality of life for individuals with ASD and their families, offering practical solutions for challenges previously considered resistant to intervention. While acknowledging the study's limitations, the strength and consistency of these findings across multiple domains provide a solid foundation for continued research and implementation of this promising approach.

5.1 Limitations and the Current Study

While the IWBMC™ approach has demonstrated promising results for individuals with ASD, several limitations should be acknowledged. First, the current data represents a specific client population that received intensive programming at Jacob's Ladder, which may not represent all individuals with ASD across varying severity levels and backgrounds. Second, although improvements were observed across multiple domains, the study did not include a control group, making it difficult to isolate the specific effects of the IWBMC™ from potential confounding variables such as maturation or other interventions the clients may have received concurrently.

While QEEG measurements provide valuable insights into neurological changes, they have inherent limitations in spatial resolution compared to other neuroimaging techniques. Additionally, interpreting QEEG data requires specialized expertise, potentially limiting widespread implementation. Furthermore, while parent reports indicate significant improvements in family functioning and quality of life, standardized measures of these outcomes would strengthen these findings.

5.2 Next Steps for Research and Implementation

Future research should address these limitations through several key initiatives. First, conducting randomized controlled trials comparing the IWBMC™ to other established interventions for ASD would provide more substantial evidence of its efficacy. Expanding the demographic diversity of participants would help determine the generalizability of results across different populations, particularly among underrepresented groups where ASD may be diagnosed later or with greater severity.

Longitudinal studies tracking outcomes over extended periods would be valuable to assess the durability of improvements and potential developmental trajectories. Incorporating additional neuroscientific measurements beyond QEEG, such as functional MRI or DTI, could provide complementary data on structural and functional brain changes associated with behavioral improvements.

From an implementation perspective, developing training protocols for the IWBMC™ approach would facilitate its adoption in diverse settings, including schools, clinics, and home-based programs. Training programs for professionals and accessible resources for families would expand the reach of this promising intervention model. Additionally, exploring telehealth adaptations of specific components could increase accessibility for families in underserved communities.

Finally, investigating the cost-effectiveness of the IWBMC™ compared to traditional interventions would provide important information for policy decisions and insurance coverage. By addressing these next steps, we can build on the promising foundation of the IWBMC™ approach and continue to improve outcomes for individuals with ASD and their families.

References

Abi-Dargham, A., Moeller, S. J., Ali, F.,

DeLorenzo, C., Domschke, K., Horga, G., ... & Krystal, J. H. (2023). Candidate biomarkers in psychiatric disorders: state of the field. *World Psychiatry*, *22*(2), 236-262.

American Psychiatric Association, D. S. M. T. F., & American Psychiatric Association, D. S. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (Vol. 5, No. 5). Washington, DC: American Psychiatric Association.

Franz, L., Goodwin, C. D., Rieder, A., Matheis, M., & Damiano, D. L. (2022). Early intervention for very young children with or at high likelihood for autism spectrum disorder: An overview of reviews. *Developmental Medicine & Child Neurology*, *64*(9), 1063-1076.

Hughes, M. M., Shaw, K. A., DiRienzo, M., Durkin, M. S., Esler, A., Hall-Lande, J., ... & Maenner, M. J. (2023). The prevalence and characteristics of children with profound autism, 15 sites, United States, 2000-2016. *Public Health Reports*, *138*(6), 971-980.

Kandel, E. R., Schwartz, J. H., Jessell, T. M., Siegelbaum, S., Hudspeth, A. J., & Mack, S. (Eds.). (2000). *Principles of neural science* (Vol. 4, pp. 1227-1246). New York: McGraw-Hill.

Maenner, M. J. (2023). Prevalence and characteristics of autism spectrum disorder among children aged 8 years—Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020. *MMWR. Surveillance Summaries*, *72*.

McGlade, A., Whittingham, K., Barfoot, J., Taylor, L., & Boyd, R. N. (2023). Efficacy of very early interventions on neurodevelopmental outcomes for infants and toddlers at increased likelihood of or diagnosed with autism: a systematic review and meta-analysis. *Autism Research*, *16*(6), 1145-1160.

Prichep, L. S. (2005). Use of normative databases and statistical methods in demonstrating clinical utility of QEEG: importance and cautions. *Clinical EEG and neuroscience*, *36*(2), 82-87.

Rojas-Torres, L. P., Alonso-Esteban, Y., & Alcantud-Marín, F. (2020). Early intervention with parents of children with autism spectrum disorders: A review of programs. *Children*, *7*(12), 294.

Thatcher, R. W., Walker, R. A., Biver, C. J., North, D. N., & Curtin, R. (2003). Quantitative EEG normative databases: Validation and clinical correlation. *Journal of Neurotherapy*, *7*(3-4), 87-121.

Thatcher, R. W., North, D., & Biver, C. (2005). Evaluation and validity of a LORETA normative EEG database. *Clinical EEG and Neuroscience*, *36*(2), 116-122.

Thatcher R.W. (2016). *Handbook of quantitative electroencephalography and EEG biofeedback*. Ani Publishing Company.

Thompson, M., & Thompson, L. (2016). Current practice of neurofeedback: Where we are and how we got there. *Biofeedback*, *44*(4), 181-205.

Wantzen, P., Clochon, P., Doidy, F., Wallois, F., Mahmoudzadeh, M., Desaunay, P., ... & Guillery-Girard, B. (2022). EEG resting-state functional connectivity: evidence for an imbalance of external/internal information integration in autism. *Journal of Neurodevelopmental Disorders*, *14*(1), 47.

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

Psychology of Consciousness as a Universal Phenomenon Proposed Visualization for the Mechanism of Consciousness

Prof. Dr. Samah Khaled Zahran[1]

[1] Personality and Social Psychologist, Ain Shams University, Cairo, Egypt
Correspondence: Prof. Dr. Samah Khaled Zahran, Personality and Social Psychologist, Ain Shams University, Cairo, Egypt.

doi:10.56397/SPS.2025.06.02

Abstract

This is a descriptive, follow-up article on the subject of consciousness, within the framework of what has been mentioned about it in academic writings. It attempts to shed light on it as a fundamental characteristic of the nature of beings in the universe. From this, it concludes that consciousness is a fundamental and psychological characteristic of the nature of beings, because they are constantly changing to achieve specific goals and process specific information.

Keywords: psychology of consciousness, universal phenomenon, consciousness nature

1. The Meaning of a Psychological Process

There are many definitions for a psychological process, most of them agreed that a psychological process is a series of steps or mechanisms that occur in a regular way -not necessarily a deterministic one- to attain changes in behavior, emotion, or thought. (SciELO Colombia, a checklist to define the psychological process, n.d.)

Another defines a psychological process as a component of three basic steps: (1) information processing, (2) symbol manipulation, and (3) knowledge construction. (Association for Educational Communications and Technology, n.d.)

Psychologists are often interested in *mental processes* (or psychological processes), which are the mechanisms by which people take in stimuli, react, and behave. (Mental Process Definition, Types & Function., n.d.)

From the above, the psychological process can be generalized as a mechanism for a specific series of steps that include processing information to obtain knowledge that results in acting in a certain way.

In this way, the psychological process becomes an implicit learning process that takes place after it has been acquired at the subconscious level, as the definition of a science direct site; *the internal psychological process of elaboration and acquisition* in which new impulses are connected with the results of prior learning. (ScienceDirect, n.d. a)

2. The Meaning of a Universal Phenomenon

Phenomenon means a widespread or far-reaching occurrence or event, which happens in a regular way and spreads widely. (Power

Thesaurus, n.d.)

The phenomenon is widespread and is characterized by exact patterns that do not differ according to circumstances, such as natural phenomena; sunrise and sunset, such as lightning and thunder, as well as psychological phenomena; cognitive bias, selective attention, and the halo effect.

3. Consciousness Definition

Consciousness, in its simplest definition, is the sense or awareness of inner and outer existence. Despite thousands of years of analysis, definitions, explanations and discussions among philosophers and scientists, consciousness remains a puzzling and controversial matter as "the most familiar and most mysterious aspect of our lives." (Wikipedia, n.d.)

Consciousness is the feeling that you know and should do what is right and should avoid doing what is wrong. (Cambridge University Press, n.d.)

Accordingly, consciousness from a broad perspective is to be aware of your decision.

4. Consciousness Theory

A theory of consciousness based upon an organism's interactions with environmental stimuli has been developed by Damasio. In this theory, interconnected brain stem, nuclei and somatosensory cortices, which monitor and control the body state, give rise to a sense of self. A collection of proto-self systems has its states mapped in a correlated way with the mappings of sensory objects. Consciousness reflects a neurodynamic melding of object mappings and self-mappings. (ScienceDirect, n.d. b)

Many people have conjectured that consciousness might be linked to cognitive characteristics, such as emotions, imagination and a model of the self. If consciousness depends on functions at the cognitive level, then it should be possible to realize it on any piece of hardware that is capable of carrying out the appropriate processing. (ScienceDirect, n.d. b)

People's folk theory of consciousness encompasses three prototypes of conscious mental functioning: monitoring (awareness), choice, and subjective experience. All three are embedded in a broader folk theory of mind and thus closely linked to the concept of intentionality, action explanation, and a conception of free will. At least some of the prototypes of consciousness play a critical role in the assignment of personhood and responsibility.

Many other theories of consciousness have positive implications for the possibility of creating consciousness in artificial systems. Various theories for the neural basis of consciousness have been proposed, suggesting a diversity of neural signs and mechanisms. We ask to what extent this diversity is real, or whether many theories share the same basic ideas with a potential for convergence towards a more unified theory of the neural basis of consciousness.

A true scientific theory — in the future — will say how functions such as attention, working memory and decision making interact and come together to form a conscious experience. (ScienceDirect, n.d. b)

5. The Mechanism of Consciousness in Nature and How It Occurs

Is consciousness a phenomenon associated with the human brain? Is it associated with relatively rational organisms? Is it associated with living things in particular, or with life and all its components in general?

In 2001, Scaruffi postulated that consciousness is an intrinsic physical property of nature, not the product of the interaction of other components. This hypothesis is supported by Niels, one of the founders of quantum theory. Researchers Hunt and Schooler (2019) believe that synchronous resonance between interacting objects, which allows for the rapid exchange of information, is the key to consciousness. Other scientists believe that organisms generally live in complex, changing environments teeming with competing organisms; therefore, they are forced to exchange materials, energy, and information, leading them to make decisions about how to survive. The repulsion or attraction associated with interactions between charged particles, changing energy levels, and the effects of electromagnetic fields create the ability to recognize interacting entities and thus distinguish between self and non-self. This gives rise to consciousness. From a series of trials and tribulations, memory arises, allowing information to be acquired, stored, and used. All of this leads to awareness and perception. When any of the above components is absent, behavior becomes random; without memory, learning becomes impossible. (Sherif, Muhammad Fayyad, 2017: 211-214)

Scientists define biological cognition (consciousness) as the information processing mechanisms that a living organism is accustomed to, such as understanding, evaluation, behavior, memory, learning, prediction, decision-making, and finally communication. This does not occur in a purely automatic and passive manner, but rather through the organism's interaction with events within a complex, adaptive system with a purpose. An organism's intelligence increases the more it is able to change its behavior to increase its chances of survival. This applies to single-celled organisms as well as to humans, whose brains can process a large amount of information in a specific or short period of time. It also applies to organisms such as viruses, which can only survive inside living cells and know how to employ them to their advantage. (Sherif, Muhammad Fayyad, 2017: 320-325)

A number of scientists believe that the seed of consciousness originated in the atom, a fundamental component of all beings, from living to inanimate. It then expanded through molecules, becoming more complex and diverse with the emergence of primitive life. Consciousness is the product of the interaction of information in two different states: charged-uncharged, negative-positive, particle-wave, high energy-low energy, present particle-missing particle, and so on. (Sharif, Muhammad Fayyad: 330-350). These interactions generate energy fields, whether electric or electromagnetic. Any field is in a continuous state of energy in space, synchronizing with each other, forming a kind of self-referential, circular loop. This is believed to be the basic component of consciousness.

The physical universe is composed of matter and energy. Matter is a condensed state of energy, while the universe is composed of matter composed of millions of particles. Each particle or molecule has its own vibration or frequency. All of these elements, materials, and objects interact with each other at varying degrees of complexity. (Sherif, Muhammad Fayyad, 2017: 330-350)

There are four levels of complexity in nature. The first is the level of the four fundamental forces of nature, which includes electromagnetism, weak and strong nuclear forces, and gravity. The second level includes the atoms and molecules that make up the objects and materials in the universe. The third level includes the world of living organisms. Finally, the fourth level includes large human societies. Nature at its four levels is characterized by constant movement and continuous, instantaneous change. This occurs through a deliberate mechanism, not spontaneously or randomly. (Sherif, Muhammad Fayyad, 2017: 22-47)

The resonance theory of consciousness assumes that everything in the universe is in a state of motion, constantly vibrating and oscillating at different frequencies. Matter is composed of vibrations of underlying energy fields. The theory describes a phenomenon called spontaneous self-organization, which states that two objects vibrating at different frequencies can combine after a certain period of vibration to resonate at the same frequency, sometimes synchronizing with each other under different conditions. (Frontiers., n.d.)

This theory also proposes a set of laws it calls psychophysical laws, which are:

1) All things resonate in some way.

2) In many circumstances, we find that many things that resonate in close proximity to each other begin to resonate together at the same frequency, achieving a common resonance.

3) This panpsychist view holds that all matter is linked to at least some degree by consciousness.

4) Achieving common resonance is what drives conscious microorganisms to merge into larger conscious entities, often resulting in a qualitative transition that accelerates the sharing of information resulting from this common resonance.

5) Consciousness is linked to the ability to integrate information, meaning that the degree of consciousness is proportional to and consistent with the ability to integrate information, and the greater the degree, the greater the consciousness.

6) All aspects of nature are processes, not fixed objects. All these processes resonate at different frequencies, and processes that resonate close to each other sometimes synchronize and resonate together after a certain time.

6. Conclusion

From the previous presentation the following can be concluded:

Consciousness is purposeful activity.

- Activity or movement consists of vibrations or

frequencies of varying degrees.

- Interactions are integrated when the frequencies of interacting entities or objects are synchronized in a way that achieves the goals of the interacting parties.

- An entity is everything that exists in nature, from atoms to galaxies, from cells to humans.

- Consciousness is a psychological phenomenon because it processes information at all levels of existence. It is a fundamental property of nature. All beings change purposefully and non-randomly according to the amount of information they process in order to achieve their goals. Thus, consciousness is a fundamental component of the nature of things in the universe.

References

Association for Educational Communications and Technology. (n.d.). https://members.aect.org/edtech/ed1/05/05-04.html. Retrieved March, 2025.

Cambridge University Press. (n.d.). https://dictionary.cambridge.org/dictionary/english/conscience. Retrieved March, 2025.

Frontiers. (n.d.). www.frontiersin.org/journals/human-neuroscience. Retrieved March, 2025.

Mental Process Definition, Types & Function. (n.d.). https://study.com/academy/lesson/basic-psychological-processes-definition-lesson-quiz.html. Retrieved March, 2025.

Power Thesaurus. (n.d.). https://www.powerthesaurus.org/universal_phenomenon/definitions. Retrieved March, 2025.

SciELO Colombia, a checklist to define the psychological process. (n.d.). http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0121-54692011000200013. Retrieved March, 2025.

ScienceDirect. (n.d.a). https://www.sciencedirect.com/topics/mathematics/psychological-process. Retrieved March, 2025.

ScienceDirect. (n.d.b). https://www.sciencedirect.com/topics/psychology/theory-of-consciousness. Retrieved March, 2025.

Sherif, Mohamed Fayyad. (2017). *Quantum Biology*. Hindawi Publishing House, Cairo, Egypt.

Wikipedia. (n.d.). https://en.wikipedia.org/wiki/Consciousness. Retrieved March, 2025.

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

Light Deprivation Induces Anxiety-Like Behaviors in Mice

Xiaonuan Wang[1#] & Yiru Zhang[2#]

[1] The Experimental High School Attached to Beijing Normal University, Beijing, China
[2] Capital Normal University High School, Beijing, China
Correspondence: Xiaonuan Wang, The Experimental High School Attached to Beijing Normal University, Beijing, China; Yiru Zhang, Capital Normal University High School, Beijing, China.
[#] These authors shared first authorships.

doi:10.56397/SPS.2025.06.03

Abstract

To gain a more profound understanding of the nature of anxiety, this study utilized two animal behavioral models: the Open Field Test (OFT) and the Light/Dark Box Transition Test (LDT), using two groups of C57BL/6J mice: one with anxiety — like symptoms and the other without. In the LDT, the control group (healthy mice) showed a significantly higher tendency for active movement ($P < 0.05$) and a greater preference for exploring unfamiliar environments compared to the group of mice with anxiety, while the differences revealed by the OFT were less pronounced. Our findings highlight the effectiveness of these two animal models and the correlation between locomotive behavior and anxiety, which can be applied in future research.

Keywords: open field test, Light/Dark Box Transition Test, anxiety, motor performance

1. Introduction

Anxiety disorders are often referred to as panic attacks, and are characterized by recurrent, sudden and intense anxiety and fear. These episodes can escalate severely within minutes, which in turn can cause unbearable disruption to daily life. Moreover, the symptoms are difficult to control and can persist over extended periods, significantly impairing an individual's ability to function in social environments (Mayo Clinic, 2018). These anxieties usually cause patients to exhibit physical symptoms such as increased heart rate, shortness of breath, dizziness or nausea, as well as psychological distress such as persistent worry and apprehension.

Over the past decade, anxiety disorders have increased rapidly among the adolescents. Perhaps several social environmental factors caused this phenomenon, such as the isolation caused by the COVID-19 pandemic. It is estimated that approximately one in seven of adolescents aged 10–19 experience mental health issues, and anxiety disorders are among the most common. Furthermore, roughly one in three adolescents between the ages of 13 and 18 experience anxiety disorders at some point during their growth (World Health Organization: WHO, 2024). Despite these alarming statistics, the National Institutes of

Health (NIH) reports that anxiety disorders in adolescents remain largely unrecognized and undertreated.

Animal models play an important role in the study of mechanisms underlying anxiety disorders and other psychological disorders. Animal models of rodents have been used particularly extensively. For instance, an earlier study found that GAL 3 receptor KO mice exhibit an anxiety-like phenotype using the OFT (Brunner et al., 2014).

Seasonal Affective Disorder, a type of depression, tends to occur more frequently in autumn and winter due to shorter days. Because the daylight hours are relatively short in the northern winter, Seasonal Affective Disorder is also more common in regions with northern climates (such as the Nordic countries and Canada). Based on the theory that light exposure affects emotions, we adopted the method of light deprivation to create an animal model — the light deprivation model. Specifically, we suppressed light exposure to induce anxiety behaviors in the mice participating in the experiment.

Commonly used animal models of anxiety include the Open Field test (OFT), Light Dark Box Transition Test (LDT), the Elevated Zero Maze (EZM) etc.

The OFT provides a well-controlled and standardized setting that can be conveniently used to observe behavioral traits such as locomotive activity, exploration, and anxiety-like behaviors. OFT is particularly useful for studying anxiety in rodents as it simulates a mildly stressful environment where the animals are exposed to a large, open area. Studies based on the OFT have revealed that factors like sex, breed, and genes may cause mice to exhibit different patterns of locomotion and exploratory behavior. These behavioral patterns are often linked to the animals' psychological state (Kraeuter, A., Guest, P. C., & Sarnyai, Z., 2018).

The LDT is based on rodents' natural aversion to bright light and their tendency to explore new environments when mildly stressed. The model consists of two connected chambers, a dark one and a lit one. By observing behaviors such as transitions between the two chambers, researchers can evaluate the anxiety levels of rodents.

In a study published in Behavioral Ecology and Sociobiology by Springer Nature, researchers assessed the behavioral responses of rodents to stress and explored potential correlations between these behaviors and physiological stress markers using the OFT model (Mazza et al., 2019b). The study found that animals exhibiting heightened anxiety-related behaviors in the experiment also exhibited increased levels of corticosterone, suggesting a link between behavioral and physiological markers of anxiety.

While much research has examined the psychological connections between rodent behavior and various characteristics, the current body of knowledge remains limited in the specific relationship between locomotor activity and anxiety. Animal models like the OFT however, can be invaluable in providing insights into the fundamental biological and behavioral underpinnings of anxiety disorders.

Our study aims to address this gap by comparing the behaviors of mice exhibiting anxiety-like symptoms with those that do not based on the OFT and LDT model. By focusing on the contrast between these two groups, we identified specific behavioral markers associated with anxiety in rodents.

By understanding anxiety behavior in animal models, we can provide a theoretical framework for the treatment of adolescent anxiety disorders which helps not only to develop better diagnostic tools, but also to improve our understanding of the neurobiological mechanisms underlying anxiety, thus ultimately creating more effective treatment strategies. This research could serve as a basis for interventions aimed at alleviating the psychological distress experienced by young people, potentially offering a path to more effective treatments for adolescent anxiety disorders and contributing to a broader understanding of how mental health challenges affect youth on a global scale.

Our study, however, still holds its limits. We failed to explore the inner mechanisms that drive rodent behaviors and how the anxiety behaviors of rodents can be related to that of humans. Therefore, these two questions remain an area of ongoing research we plan to address in the future.

2. Materials and Methods

2.1 Open Field Test

The OFT is a commonly used behavioral test designed to assess an animal's exploratory behavior, activity level, and anxiety state.

In this study, mice were placed in an open environment to examine their natural reactions in an unfamiliar environment. Mice with lower levels of anxiety showed a stronger tendency to explore, boldly venturing into the center of the open field for deeper investigation. Conversely, mice with higher levels of anxiety showed lower mobility and exploratory tendencies, preferring to remain along the perimeter of the field for a sense of safety.

In general, mice are averse to bright, open spaces and prefer dim, enclosed spaces, presumably to prevent detection by predators.

In our experiment, we used C57BL/6J mice as experimental model organisms. By observing and analyzing their behavior in the box area, we can determine how they behave in an unfamiliar environment.

Experimental method: We adopted a control-based approach, maintaining the control group under normal light conditions (twelve hours each day) and exposing the experimental group to reduced light (eight hours per day).

The experimental tools included seven three-month-old C57 mice for each group (two groups in total), a 40×40×25 cm open white acrylic box and a camera.

The experimental steps are as follows:

a. Preparation:

There are fourteen three-month-old C57BL/6J mice divided into two groups, seven mice for control group and the other seven mice for experimental group (light depression). The mice in the control group were treated with normal light (twelve hours each day), while the mice in the experimental group were treated with unusual light and had eight hours of light deprivation per day (four hours of light per day). Before the experiment officially began, these fourteen mice had been acclimated in the laboratory for an hour.

b. Process of experiment:

One mouse was randomly selected at a time, placed in the acrylic box for five minutes, and its behavior was recorded with the camera. Before the next mouse was put into the box, we use 75% alcohol to clean the box to eliminate the smell of the last mouse.

2.2 Light/Dark Box Transition Test

LDT is a classic method to evaluate anxiety and depression, and is widely used in the basic research of psycho-neuropharmacology because of its good structural validity. The LDT can be used to study disease models associated with mood disorders. The light-dark chamber can be used to test the unconditional anxiety response in rats and mice. It is based on innate light avoidance and spontaneous exploration behaviors in rodents faced with mild stressors, such as novel environments and light/open Spaces. By comparing the behavioral differences between normal mice and mice that mimic specific diseases (such as anxiety, depression) in the light-dark box, we can obtain correlations between emotional states and behavioral performance. Rodents in the light — dark box tend to explore the novel environment. However, due to their aversion to the bright light in the lit chamber, they are compelled to retreat, creating a state of conflict. Consequently, the frequency of their transitions between the two chambers is reduced.

In our experiment, we used C57BL/6J mice as experimental model organisms, by observing and analyzing their behavior in a certain light and dark box. We can recognize which kind of area they prefer to stay, and then analyze their anxiety level.

The experimental method is the same as that of the OFT.

The experimental tools included seven three-month-old C57 mice for each group (there are two groups in total), a 45×25×25 light dark acrylic box (the light area is 30×25×25, and the dark area is 15×25×25).

PS: The light area is composed of transparent acrylic plates, while the dark area is made up of opaque black acrylic plates. There is also a 15×25 black opaque acrylic plate that is placed on top of the box in the dark area during the experiment.

The experimental steps are as follows:

a. Preparation:

The LDT used the same experimental mice as OFT experiments. Before the experiment officially began, these fourteen mice had been acclimated in the laboratory for three days.

b. Process of experiment:

One mouse was randomly selected at a time, placed in the acrylic box for ten minutes, and its behavior was recorded with the camera. Before the next mouse was put into the box, we needed to use 75% alcohol to clean the box to eliminate

the smell of the last mouse.

2.3 Statistics and Analysis

The results of the experiments were expressed as mean ± standard deviation; Normality analysis with t-test was applied to analyze significant differences between the samples (*P<0.05, significant difference).

GraphPad Prism was used to analyze other figures and draw images.

a. OFT

Use EthoVision to identify the video and extract the data of mice.

b. LDT

Since this experiment was not suitable for video analysis by software, we personally observed and analyzed the number of times the C57 mice entered and exited in the dark area and the duration of their stay.

3. Results

3.1 OFT

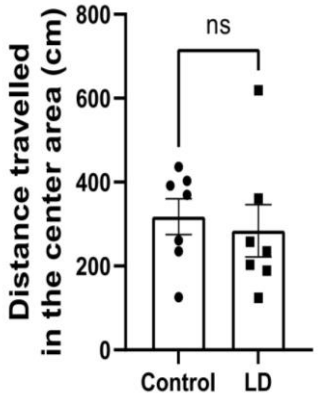

Figure 1. Distance travelled in the center area

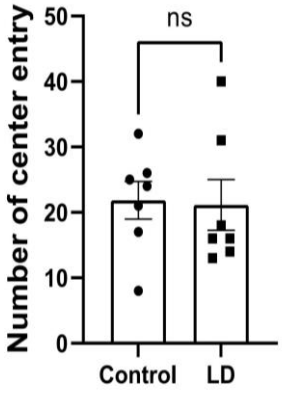

Figure 2. Number of center entry

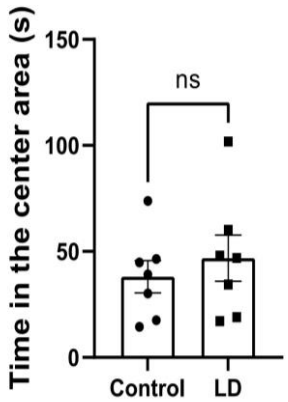

Figure 3. Time in the center area

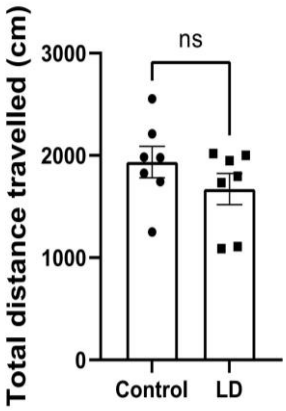

Figure 4. Total distance travelled

Figure 1 shows the distance travelled in the center area. The distances travelled by the control-group and light-deprivation group mice were nearly the same (*p > 0.05), indicating similar anxiety levels.

Figure 2 shows the number of center entry. The travel frequency of mice in the control and light-deprivation groups was almost the same, and the difference between the two was not significant (*p > 0.05). These data indicate that the mice from the light deprivation group have the same anxiety level as the control group.

Figure 3 shows the time in the center area. As we can see, the time the mice stayed in the center area in the light deprivation group was less than that of the control group, and the difference between the two was significant (*p < 0.05). These data indicate that the anxiety level of the light deprivation group was higher than that of the control group.

Figure 4 shows the total distance travelled. As we can see, the distance travelled by the mice in the control group was almost the same as that of the light deprivation group, and the difference between the two was not significant (*p > 0.05). These data indicate that the mice from the light deprivation group have the same anxiety level as the control group.

Based on the above four sets of data, we can see that these experiment mice did not show significant behavioral differences in this experiment. Therefore, the inhibition of light did not cause the light deprivation group of mice to have a significantly higher anxiety level in the open field test.

3.2 LDT

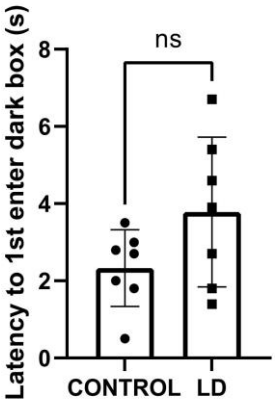

Figure 5. Latency to 1st enter dark box

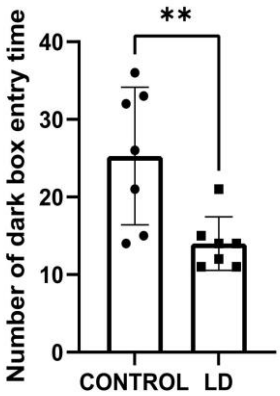

Figure 6. Number of dark box entry time

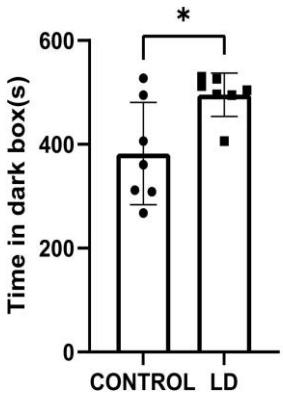

Figure 7. Time in dark box

In the light/dark box experiment, we detected data in three aspects, latency to 1st enter dark box, number of dark box entry time, time in dark box, which correspond to figure 5, 6, and 7 respectively.

Figure 5 shows the latency to 1st enter dark box. We can see that the latency of the mice in the control group was almost the same as that of the light deprivation group, and the difference between the two was not significant (*p > 0.05). These data indicate that the mice from light deprivation group have the same anxiety level as the control group.

Figure 6 shows the number of dark box entry times. From this graph, we can see that the number of dark box entries of the mice in the control group was more than that of the light deprivation group (which also means that the mice of control group entered light box more frequently), and the difference between the two was significant (*p < 0.05). These data indicate that the mice from the light deprivation group have a higher anxiety level than control group.

Figure 7 shows the total time the mice were in the dark box. From this graph, we can see that the control group mice persisted in the dark box

for a shorter period than that of the light deprivation group, indicating that the mice from control group are more willing to stay in open and unfamiliar environments. The difference between the two groups was significant (*$p < 0.05$). These data indicate that the mice from light deprivation group have a higher anxiety level than the control group.

Based on the above four sets of data, we can see that these C57 mice did show significant behavioral differences in this experiment — the mice in deprivation have significantly higher anxiety level than the mice in control group. Therefore, we can infer that depriving light exposure does indeed affect the mood of living organisms and increases their anxiety index.

4. Conclusion and Discussion

In this experiment, our main objective was to construct an anxiety model using mice and conduct research on the behavioral characterization of anxiety onset based on the results. The results of this study provide a foundation for work on the neural mechanisms of anxiety disorders.

First and foremost, we constructed an acute light deprivation model of mice. This method, which is commonly used, simulates human mood disorders by altering the light conditions in the mice's living environment to affect their moods. In this experiment, we established an acute light deprivation model by controlling the light exposure time of mice and investigated the effect of light duration on the emotional behavior of mice.

This study mainly conducted two experiments: the Open Field Test (OFT) and the Light/Dark Box Transition Test (LDT), using a control-based experimental method.

The first experiment we conducted was the OFT. In this experiment, we detected the data about total distance traveled, time in center area, distance traveled in center area and Number of center entry time. By analyzing these four types of data, we determined that in OFT, there was no significant difference in the performance between control group and light deprivation group.

We propose several reasons for the lack of significant differences in the experimental results. First, the adaptation period for the mice was too short, so they had not fully adapted to the experimental environment. As a result, they exhibited excessive tension, which affected their exploratory behavior and led to insignificant differences between groups. Second, there were errors made by experimental operators introduced by irregular or inconsistent operation of the experimenters. For example, placing mice in different positions in the open field would affect their initial direction of exploration and range of activity; inconsistent standards for observing and recording behavior would lead to inaccurate data and make it difficult to detect differences between groups. Third, too small a sample size reduced the statistical validity of the experiment and made it difficult to detect real differences between groups.

The second experiment we conducted was the LDT. In this experiment, we detected the data about the time when the mouse first enters the dark box (referred to as the latency period), the time the mouse stays in the dark box, the number of times the mouse enters the light box.

Based on the above two experiments, we can infer that suppressing light exposure has a significant impact on organisms, such as the anxiety level, which we are concerned about.

The limitations of this study lie in the small number of mice involved in the research and the relatively small sample size, which may affect the generalizability of the results.

The open field test can be widely applied to assess the behavioral effects of various drugs, such as anti-anxiety drugs, antidepressants, and other central nervous system drugs. By comparing the behavioral changes before and after drug treatment, researchers can evaluate the efficacy and potential side effects of the drugs. For instance, central stimulants can increase the spontaneous activity of mice. (Ye et al., 2011)

The light-dark box test is mainly based on the natural aversion of mice to bright areas and their exploratory behavior in new environments. This test is often used to study the efficacy of anti-anxiety drugs. Anti-anxiety drugs can significantly increase the number of times mice enter the light box and the time they spend in it, thereby reflecting their improvement of anxiety behavior. In addition, this experiment can also be used to evaluate the potential anxiogenic effects of drugs. Besides that, by observing the behavior of mice in the light-dark box, researchers can infer their emotional responses

to different lighting conditions, thereby revealing the mechanisms of emotional regulation and stress response in animals. For instance, anxiety model mice exhibit more pronounced light-avoiding behavior in the light-dark box experiment.

Thus, through this experiment, we have not only analyzed and simply summarized the possible causes and factors that may lead to the onset of anxiety, but also laid a certain foundation for the research of drugs for treating related mental disorders.

Regarding future development, the research will place greater emphasis on the integration of multiple disciplines, such as the combination of techniques from neuroscience, immunology, genetics, and behavioral science. For instance, the research of Yu Xiaofei's team has revealed the role of IL-22-mediated "gut-brain axis" in alleviating mental stress, indicating that the interaction between the immune system and the nervous system is of significant importance in anxiety disorders (Xia et al., 2024). Such interdisciplinary research will contribute to a more comprehensive understanding of the pathological mechanisms of anxiety disorders.

Research directions for mouse models of anxiety also include in-depth exploration of neural circuit mechanisms, in-depth study of gene-environment interactions, application of non-invasive techniques, and exploration of brain-gut axis mechanisms, which are expected to provide more effective strategies for the treatment and intervention of anxiety disorders.

References

Bourin, M., & Hascoët, M. (2003). The mouse Light/Dark Box Transition Test. *European Journal of Pharmacology*, *463*(1-3), 55–65. https://doi.org/10.1016/s0014-2999(03)01274-3

Brunner, S. M., Farzi, A., Locker, F., et al. (2014). GAL 3 receptor KO mice exhibit an anxiety-like phenotype. *Proceedings of the National Academy of Sciences*, *111*(19), 7138–7143. https://doi.org/10.1073/pnas.1318066111

Kraeuter, A., Guest, P. C., & Sarnyai, Z. (2018). The Open Field Test for Measuring Locomotor Activity and Anxiety-Like Behavior. *Methods in Molecular Biology*, 1796, 99–103. https://doi.org/10.1007/978-1-4939-8994-2_9

Mayo Clinic. (2018). Anxiety disorders-Symptoms and causes. Mayo Clinic. Retrieved from https://www.mayoclinic.org/diseases-conditions/anxiety/symptoms-causes/syc-20350961

Mazza, V., Dammhahn, M., Eccard, J.A. et al. (2019). Coping with style: individual differences in responses to environmental variation. *Behav Ecol Sociobiol*, 73, 142. https://doi.org/10.1007/s00265-019-2760-2

Xia, M., Lu, J., Lan, J., et al. (2024). Elevated IL-22 as a result of stress-induced gut leakage suppresses septal neuron activation to ameliorate anxiety-like behavior. *Immunity*, *58*(1), 218-231.e12. https://doi.org/10.1016/j.immuni.2024.11.008

Ye, Y., Zhang, J., Zhong, Y., Zhang, W., et al. (2011). Comparison of behavioral effects of psychoactive drugs between two strains of mice. *Journal of Zhejiang University*, *40*(4), 384–390. https://doi.org/10.3785/j.issn.1008-9292.2011.04.007

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

Perceived Overqualification in College Students: A Double-Edged Impact via Knowledge Hiding

Siyu Li[1], Jiangyu Li[2]

[1] International School Bangkok, Nonthaburi 11120, Thailand
[2] Public Administration School, Sichuan University, Chengdu 610065, China
Correspondence: Siyu Li, International School Bangkok, Nonthaburi 11120, Thailand.

doi:10.56397/SPS.2025.06.04

Abstract

Perceived Overqualification (POQ) has been widely studied in organizational settings, yet the exploration of its implications in academic environments remain limited. Using Conservation of resources (COR) Theory as the primary theoretical framework, this study examines the mediating role of knowledge hiding in the relationship between POQ and academic performance. Data were collected through a survey of 307 college students, analyzing the direct and indirect effects of POQ on academic performance. Results reveal that POQ was positively correlated with academic performance and knowledge hiding, while the indirect effect of POQ on academic performance via knowledge hiding was statically significant. These findings highlight the complex impact of POQ, emphasizing the need for targeted strategies to minimize its negative effects and foster a more collaborative academic environment.

Keywords: perceived overqualification, academic performance, knowledge hiding, Conservation of Resources theory

1. Introduction

Over the past few decades, global literacy levels have risen dramatically as a result of the advancement of education systems globally. From just over half of the population being literate in the 1970s, an impressive 87% are literate by 2022, reflecting significant educational progress and making the younger generations better educated than ever (M. Roser & E. Ortiz-Ospina, 2024). However, the rapid growth in educational attainment has created an imbalance in the job market as the supply of high-quality talent exceeds the demand, leading to a growing mismatch between individuals' abilities and their roles in society (B. Erdogan & T. N. Bauer., 2021). For instance, as early as 2020, there were over 60,000 Chinese postgraduates and 170,000 undergraduates among 3 million food delivery riders—a job that requires minimal educational qualifications. Students who recognize the highly competitive job market may feel a misalignment between their academic abilities and the opportunities available to them (G. Montt, 2017), fueling perceptions of overqualification. As such, the competitive pressures in education systems and the oversupply of highly qualified individuals contribute to the increasing prevalence of perceived overqualification (POQ) among

students (B. Erdogan & T. N. Bauer, 2021; C. Ma, D. B. Ganegoda, (George) Zhen Xiong Chen, J. Zhao, X. Jiang, & X. Zhang, 2023).

POQ occurs when individuals feel they possess more knowledge, skills, education, and work experience than what is needed for their current job or academic program (D. C. Maynard, T. A. Joseph, & A. M. Maynard, 2006), causing a mismatch between their abilities and their environment. Past research suggested that a similar mismatch exists between students and colleges (S. Ovink, D. Kalogrides, M. Nanney, & P. Delaney, 2018), as more students enter higher education and acquire advanced academic capabilities (B. Erdogan & T. N. Bauer., 2021), leading to some researchers anticipating POQ among college students (P. Wang et al, 2023). One key area where the effects of POQ manifest is academic performance, which includes measures such as grades, class engagement, and learning attitudes. While students with POQ have the prerequisite skills for being a high academic performer (T. W. H. Ng & D. C. Feldman, 2009), it can also have negative impacts on task performance due to negative motivation (A. Lee, B. Erdogan, A. Tian, S. Willis, & J. Cao, 2021). Previous studies suggest that POQ may negatively affect academic performance by decreasing academic motivation or causing students to lack interest in course content (R. M. Ryan & E. L. Deci, 2000). For instance, students may feel that course content is too easy and unchallenging, which in turn leads to decreased interest in learning and lower academic performance (D. Jiang, L. Ning, & Y. Zhang, 2024). Hence, understanding the relationship between POQ and academic performance is crucial for assessing the broader implications of POQ in an educational context.

Our study examines this relationship based on the Conservation of Resources Theory (COR). Conservation of Resources Theory states that individuals seek to maintain, protect, and expand their social and psychological resources in the face of environmental pressures (S. E. Hobfoll, 1989). When students feel that they are exceeding the demands of their academic environment, they may feel that resources are being wasted and ineffectively used, which in turn affects their academic performance (E. Howard, A. Luksyte, R. K. Amarnani, & C. Spitzmueller, 2022).

Furthermore, research suggests that Knowledge Hiding (KH) may act as a mediating variable in this process (N. Garg, A. Talukdar, A. Ganguly, & C. Kumar, 2021). Students often regard knowledge as a means of competitive advantage (A. S. Chaudhry, n.d.), and when they feel overqualified, they are more likely to engage in KH, particularly regarding graded activities (T. Jer Yuen & M. Shaheen Majid, 2007). By choosing to withhold their knowledge or abilities, students protect their perceived loss of resources and reinforce their resource protection mechanism. Additionally, research has shown that KH can decrease intellectual thinking, innovations, and collaborations (S. Al-Husseini & I. Elbeltagi, 2018; U. Ghani et al., 2020), which in turn, can lead to reduced participation and academic performance (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012).

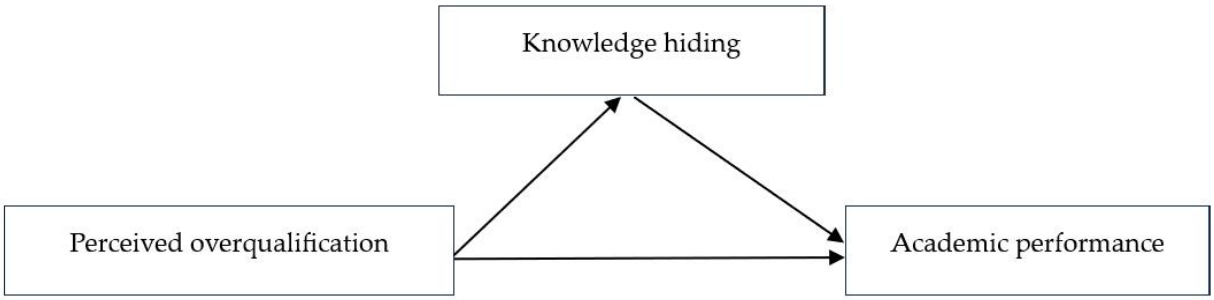

Figure 1. Conceptual model linking perceived stress, subjective well-being and outness

2. Theory and Hypotheses

2.1 Perceived Overqualification and Academic Performance

Perceived overqualification (POQ) is defined as an individual's subjective feeling of them possessing more education, experience, or skills than required by their jobs (D. C. Maynard, T. A. Joseph, & A. M. Maynard, 2006). Academic performance indicates a student's learning across various subjects, and is typically measured by formative and summative

assessments (T. Madden-Dent & D. Oliver, n.d.). Under circumstances where the overqualified employees feel that their skills are being utilized effectively, it can lead to enhanced task performance (Y. Li & S. Wang, 2024). Therefore, it is reasonable to infer that when overqualified students perceive their surplus knowledge and skills are being used effectively, it can improve their academic performance.

The Conservation of Resource theory (COR) states that individuals strive to acquire, maintain, and protect their resources (e.g., time, energy, and skills) (S. E. Hobfoll, 1989). Similar to employees, students who feel overqualified may show less interest in class and become disengaged as they perceive the material as too easy or unchallenging (M. Rafiei & H. Van Dijk, 2024). However, the Conservation of resources theory suggests that "individuals who are abundant in resources have more opportunities to acquire new resources through resource investment" (D. Jiang, L. Ning, & Y. Zhang, 2024). When these overqualified students see their surplus resources as an advantage and opportunity, they are motivated to actively seek new resources and engage in resource investment behaviors (D. Jiang, L. Ning, & Y. Zhang, 2024) such as self-learning, researching, actively participating in class etc. These resource gaining behaviors, in addition to overqualified students' superior knowledge and skills, enhances their learning engagement and can lead to an increase in their overall academic performance. Additionally, scholars have shown that employee's perceived overqualification positively predicts affiliative and proactive performance at work (C. Ma, D. B. Ganegoda, (George) Zhen Xiong Chen, J. Zhao, X. Jiang, & X. Zhang, 2023), which in turn, enhances job performance (K. Alfes, 2013). Moreover, studies have shown that POQ among employees is positively related to career identity when they are being supported by a humble leader, which increases knowledge sharing and career planning behaviors (J. Khan, I. Saeed, M. Zada, H. G. Nisar, A. Ali, & S. Zada., 2023), further enhancing task performance in an organization (S. L. Kim & S. Yun, 2015). Thus, based on the above analysis, we propose the hypothesis:

H1: Perceived overqualification is positively related to academic performance.

2.2 Perceived Overqualification and Knowledge Hiding

Knowledge hiding is defined as "an intentional attempt by an individual to withhold or conceal knowledge that has been requested by another person" (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012). It has been shown that knowledge hiding can have multiple negative effects on organizations as well in educational institutions.

The Conservation of Resources Theory suggests that the loss of resources can induce stress in individuals (S. E. Hobfoll, 2011). For students with POQ, while their surplus abilities may enhance their academic performance, they can also lead to the perception that their resources are being wasted (E. Howard, A. Luksyte, R. K. Amarnani, & C. Spitzmueller, 2022). Overqualified students may experience stress as a result of the perceived underutilization of their surplus resources, further leading to feelings of dissatisfaction and frustration (J. Khan, I. Saeed, & M. Zada, 2022). Such negative emotions can deplete the student's mental resources and trigger a resource protection mechanism, which aims to conserve remaining resources and prevent further loss (D. Jiang, L. Ning, & Y. Zhang, 2024).

As part of this protection mechanism, POQ students, who are experiencing stress due to the perception of their underutilized resources, are likely to engage in knowledge hiding (E. Howard, A. Luksyte, R. K. Amarnani, & C. Spitzmueller, 2022). Unlike refraining from sharing knowledge, which may occur due to a lack of opportunity, knowledge hiding involves students deliberately withholding information, knowledge, or expertise from their peers when requested (B. K. A. Almagharbeh, M. D. Shamout, & S. Hamouche, 2023). This behavior is motivated by a need to preserve perceived limited resources and avoid further emotional and mental depletion. In addition, prior research supports this relationship between POQ and knowledge hiding. Studies indicate that employees with POQ are more likely to engage in knowledge hiding in organizations as a protective strategy (C. S. Li, H. Liao, & Y. Han, 2022). Furthermore, past scholars have found a negative relationship between POQ and helping behaviors toward peers (B. Erdogan, A. Karaeminogullari, T. N. Bauer, & A. M. Ellis., 2020), suggesting a reduced willingness to invest resources in others. This deliberate decision to hide knowledge reflects an effort to protect oneself from the stress caused by resource

depletion stemming from POQ. Hence, this paper proposes the hypothesis:

H2: Perceived overqualification increases knowledge hiding behavior.

2.3 Knowledge Hiding's Mediating Role Between Perceived Overqualification and Academic Performance

Based on COR theory, individuals strive to protect and conserve their valuable resources, including time, energy, and knowledge (S. E. Hobfoll, 2011). Overqualified students are more likely to engage in knowledge hiding behaviors as a strategy to conserve their resources. By withholding their information, these students tend to disengage from collaborative activities (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012), further limiting group performance and opportunities for intellectual exchange. Additionally, knowledge hiding fosters feelings of distrust among students (C. E. Connelly & D. Zweig, May 2015), reducing collaboration and communication and ultimately negatively impacting academic performance. While POQ can lead to increased performance when students view their resources as opportunities and advantages (D. Jiang, L. Ning, & Y. Zhang, 2024), it can also cause emotional and mental strain when they feel their surplus information is being underutilized (B. Erdogan & T. N. Bauer, 2009). This frustration leads to knowledge hiding behaviors as students attempt to protect themselves from further resource loss. In turn, this response to stress may diminish the positive effects of POQ by limiting collaborative learning and intellectual engagement with peers (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012). Therefore, knowledge hiding mediates the relationship between POQ and academic performance by acting as a mechanism through which overqualified students conserve their resources, leading to reduced academic outcomes despite their initial resource abundance. Thus, our paper proposes that:

H3: Knowledge hiding mediates the positive relationship between perceived overqualification and academic performance.

3. Method

3.1 Sample

Prior to data collection, the study conducted brief interviews with a number of college students from a variety of academic institutions. The interviews indicated that the respondents perceived the phenomenon of knowledge hiding to be prevalent among their peers in an environment characterized by intense competition. Subsequently, the snowball sampling method was employed in this study. A research questionnaire was disseminated via various social media platforms with the objective of recruiting interested university students who would be willing to complete the questionnaire on a voluntary basis. All participants were informed that the data collected via the questionnaire would be kept strictly confidential. The study was conducted in the form of an online questionnaire. Initially, the questionnaire was disseminated to our university acquaintances, who were asked to assist us in identifying other individuals who might support this study and meet the criteria for completing the questionnaire. Concurrently, the questionnaire was posted on the online platform to recruit a larger group of university students.

A total of 328 questionnaires were distributed for analysis in this study. After the removal of questionnaires deemed invalid, a total of 307 valid questionnaires were returned. The respondents were predominantly male (41.0%), with the remainder being female (59.0%). The mean age was 20 years. A minority of the college students (12.1%) had attended non-double first-class universities, while the majority (87.9%) had attended double first-class universities.

3.2 Measures

The variables in our study were measured using well-established scales published in the research literature. To ensure the quality of translation and avoid language ambiguity, our study strictly followed the "translation-back translation" procedure to translate the scales originally developed in English into Chinese.

Knowledge hiding. The instrument used to assess the knowledge hiding was adapted from a twelve-item scale (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012). Sample items included the following: "In the event that my fellow students seek clarification on a matter of academic importance, I feign a lack of comprehension." Participants responded on a five-point response scale from 1 = strongly disagree to 5 = strongly agree. Internal consistency for this scale was α= 0.915 in the

current study.

Academic performance. Academic performance was measured using a seven-item scale (G. Dupaul, M. Rapport, & L. Perriello, 1991). Sample items are, "I can accurately complete more assignments relative to my batch mates." Participants responded on a five-point response scale from 1 = strongly disagree to 5 = strongly agree. Internal consistency for this scale was α= 0.951 in the current study.

Perceived overqualification. We measured perceived overqualification using a nine-item scale developed by Maynard et al. (2006). One example item was "I have a lot of knowledge that I do not need for my job." Subjects responded on a five-point scale ranging from 1 = strongly disagree to 5 = strongly agree. The internal consistency of the scale in this study was α= 0.982.

Control variables. Prior research has shown some influence of demographic variables on academic performance, i.e., gender, age (C. Fan, Z. Wang, Y. Yang, & X. Liu, 2023), school and grade (M. A. Opoku, S.-W. Kang, & N. Kim, 2023). Gender was measured as a dichotomous variable coded as 0 = Female, 1 = Male. Grade was coded as an ordinal variable 1 = Freshman, 2 = Sophomore, 3 = Junior, 4 = Senior. School is coded as an ordinal variable 0 = Non-Double First-Class Initiative, 1 = Double First-Class Initiative.

4. Results

The data analysis in this study was conducted using two software programs: SPSS 27.0 and Amos 24.0. SPSS 27.0 was employed for three specific purposes: first, to conduct a reliability test; second, to perform descriptive statistical analysis; and third, to conduct a correlation analysis. Amos 24.0 was used for two distinct purposes: first, to conduct a validation factor analysis; and second, to test hypotheses. Finally, to test for mediating effects, the bias correction method of 2000 resamples with a 95% confidence interval (CI) was utilized.

4.1 Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was conducted to assess the construct validity of the three main variables. The results demonstrated that the proposed three-factor model (χ2 = 315.703; df = 291; χ2 / df = 1.09; CFI = 0.99; TLI = 0.99; RMSEA = 0.02; SRMR = 0.04) exhibited superior fit to the alternative models (see Table 1). The results of the CFA provide evidence supporting the validity of the proposed model.

4.2 Common Method Bias

The results of Harman's one-way factor analysis indicated that the unrotated exploratory factor analysis identified a total of three factors, which collectively accounted for 70.873% of the total variation. The first principal component factor explained 39.514% of the variation, which was below the 40% threshold (P. M. Podsakoff, S. B. MacKenzie, J.-Y. Lee, & N. P. Podsakoff., 2003). Furthermore, as illustrated in Table 2, the goodness of fit of the one-factor model was markedly inferior to that of the three-factor model. These findings suggest that the potential for common method bias in this study is minimal.

Table 1. Goodness-of-fit information for the alternative factor models

Model	*Factors*	*χ^2*	*df*	*χ^2/df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
3-factor model	*POQ; KH; AP*	*315.703*	*291*	*1.09*	*0.99*	*0.99*	*0.02*	*0.04*
2-factor model	*POQ + KH; AP*	*3288.094*	*323*	*10.18*	*0.72*	*0.70*	*0.17*	*0.19*
1-factor model	*POQ + KH + AP*	*5444.664*	*324*	*16.81*	*0.52*	*0.48*	*0.23*	*0.26*

Note: POQ= Perceived overqualification; KH= Knowledge hiding; AP= Academic performance.

4.3 Descriptive Statistics

Table 2 illustrates the mean, standard deviation, and correlation between the study variables, as well as the extracted average variance extracted (AVE) and combined reliability (CR) values. The AVE values for all the study variables exceeded 0.50, and the square root of the AVE exceeded the correlation coefficient with the variables, indicating satisfactory convergent validity. The CR values surpassed 0.70, indicating favourable combinatorial reliability.

Table 2. Descriptive statistics

	CR	AVE	1	2	3	4	5	6	7	8
1. Gender [a]	-	-	-							
2. Age	-	-	-.034	-						
3. Grade [b]	-	-	-.112*	.633**	-					
4. School [c]	-	-	.065	-.231**	-.328**	-				
5. Position [d]	-	-	.085	.088	.148**	.065	-			
6. POQ	0.98	0.88	-.062	.066	.026	-.029	.006	-		
7. KH	0.93	0.51	.074	.054	.042	-.045	.018	.440**	-	
8. AP	0.96	0.75	.010	-.106	-.053	.021	-.050	.325**	-.420**	-
Mean	-	-	0.41	20.00	2.44	0.88	0.41	2.87	2.27	2.94
SD	-	-	0.49	1.25	0.97	0.33	0.49	1.30	0.78	1.01

Note: N=307; [a] Gender coded as (0 = Female,1 = Male); [b] Grade coded as (1 = Freshman, 2 = Sophomore, 3 = Junior, 4 = Senior); [c] School coded as (0 = Non-Double First-Class Initiative, 1 = Double First-Class Initiative); [d] Position coded as (0 = Non-class monitor, 1 = Class monitor); POQ= Perceived overqualification; KH= Knowledge hiding; AP= Academic performance; Bolding indicates the square root of AVE; *p < .05; **p < .01.

Table 3. Summary of path-analytic results

	Knowledge hiding		Academic performance	
	B	SE	B	SE
Perceived overqualification	.414***	.047	.172**	.054
Knowledge hiding			-.547***	.067
Gender [a]	.246	.127	.102	.129
Age	-.009	.064	-.126	.065
Grade [b]	.033	.085	.050	.086
School [c]	-.124	.201	-.078	.203

Note: B= Path coefficients; SE=Standardized errors; Path coefficients are unstandardized;

Number of bootstrap samples are 2000; Level of confidence is 95%;

[a] Gender coded as (0 = Female,1 = Male);

[b] Grade coded as (1 = Freshman, 2 = Sophomore, 3 = Junior, 4 = Senior);

[c] School coded as (0 = Non-Double First-Class Initiative, 1 = Double First-Class Initiative);

+p < .1; *p < .05; **p < .01; ***p < .001.

4.4 Hypothesis Tests

In this study, hypothesis testing was conducted using structural equation modelling in Amos 24.0. As anticipated, as illustrated in Table 3, perceived overqualification was found to be positively correlated with academic performance (B = 0.172, p < 0.01), thereby supporting hypothesis 1.

A positive correlation was observed between perceived overqualification and knowledge hiding (B=0.414, p<0.001), thereby supporting hypothesis 2.

In this study, the indirect effect process proposed by Preacher et al. (2010) was employed to ascertain the mediating role of knowledge hiding between perceived overqualification and academic performance. As illustrated in Table 4, the results indicated that the indirect effect of perceived overqualification on academic performance via knowledge hiding was statistically significant (indirect effect = -0.226, 95% CI = [-0.304, -0.164]), thereby supporting hypothesis 3.

Table 4. Bootstrapping results for testing moderation effect

	Perceived overqualification→Knowledge hiding→Academic performance		
	B	SE	95% Boot CI
Indirect effect	-.226***	.036	[-.304, -.164]
Direct effect	.172***	.054	[.063, .278]

Note: B= Path coefficients; SE=Standardized errors; CI that excludes zero indicates that the indirect effects are significant; Path coefficients are unstandardized.

+p < .1; *p < .05; **p < .01; ***p < .001.

5. Discussion and Conclusions

5.1 Theoretical Implication of the Study

This study contributes to the existing literature on POQ by finding a direct positive relationship between POQ and academic performance among college students. Additionally, the study confirms the mediating role of knowledge hiding in this relationship through the framework of COR Theory.

Firstly, our research aimed to address the gap in the literature by exploring how POQ affects performance in educational settings. While much of the prior research on overqualification has focused on workplace contexts (B. Erdogan, A. Karaeminogullari, T. N. Bauer, & A. M. Ellis, 2020), particularly how it affects employees' work attitudes and behaviors (D. Jiang, L. Ning, & Y. Zhang, 2024), there is limited exploration of how POQ impacts academic environments. This gap is significant because overqualification may impact students differently than employees, especially in its effect on academic performance.

Secondly, this research extends the application of COR Theory to understand how POQ influences students' academic performance through knowledge hiding (S. E. Hobfoll, 2011). While COR Theory has been widely used to study stress and resource conservation in organizational settings (D. Jiang, L. Ning, & Y. Zhang, 2024), this paper introduces a novel application of COR within the educational domain. Our study demonstrates that students with POQ, similar to employees, engage in knowledge hiding as a strategy to protect their perceived loss of resources (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012), which mediates the relationship between POQ and academic performance. The introduction of knowledge hiding as a mediator enriches the understanding of POQ's dual-edged nature—both enhancing and hindering performance depending on the emotional and cognitive response of individuals (D. Jiang, L. Ning, & Y. Zhang, 2024).

Finally, our findings reveal that the proactive behaviors in organizations associated with POQ, such as employee creativity and job crafting (D. Jiang, L. Ning, & Y. Zhang, 2024), do not necessarily translate to higher academic performance. The study indicates that while POQ has a direct positive relationship with academic performance, knowledge hiding, as a mediating factor grounded in COR Theory, mediates this relationship by undermining its positive effects. This might lead to disengagement and knowledge withholding (C. E. Connelly, D. Zweig, J. Webster, & J. P. Trougakos, 2012), which diminishes collaborative learning and intellectual exchange among peers, negatively affecting academic performance.

5.2 Practical Implications of the Study

From a practical perspective, this study emphasizes the importance of designing an academic environment that better matches students' abilities with academic challenges, allowing students with POQ to fully utilize their excess knowledge and demonstrate their potential. The study reveals that POQ alone enhances academic performance by providing students with surplus knowledge and skills. It is the wasted resources that trigger knowledge hiding as a protective mechanism (E. Howard, A. Luksyte, R. K. Amarnani, & C. Spitzmueller, 2022), ultimately hindering academic performance. Hence, educators should adopt appropriate teaching methods that accommodate students with different qualifications, where students with POQ are provided with opportunities to engage in advanced tasks, explore challenging projects, or participate in leadership roles (H. Xu, Y.-M. Li, & P. Huang, 2017). The findings provide valuable insights to educators, academic counselors, and school policymakers looking to manage the problem of overqualification among

students. By developing differentiated instructions in educational institutions, it prevents overqualified students from being disengaged and feeling underutilized, effectively reducing knowledge hiding behavior.

Furthermore, the study highlights the importance of fostering an optimistic mindset among POQ students and a collaborative learning environment. As students with POQ may withhold knowledge to conserve their perceived advantage (D. Jiang, L. Ning, & Y. Zhang, 2024), promoting a culture of communication and knowledge sharing is essential. Students should be encouraged to view their surplus knowledge and skills not as wasted resources (H. Xu, Y.-M. Li, & P. Huang, 2017), but instead, as valuable resources that can positively contribute to their own academic growth as well as supporting others.

5.3 Limitations and Future Research

It would be beneficial to consider several limitations of this study in future research. Firstly, the research model was tested using a questionnaire. In light of these considerations, any inferences regarding causality should be made with caution. Subsequent studies might employ an experimental research design to substantiate the causal relationships between variables. Secondly, although the Harman one-factor method indicated that the CMV in this study was not severe, this issue may not have been entirely resolved. It would be beneficial for future studies to employ more rigorous scientific measures, such as teacher assessment or the design of situational experiments, to enhance the robustness of the data.

References

A. Lee, B. Erdogan, A. Tian, S. Willis, and J. Cao. (2021). Perceived overqualification and task performance: Reconciling two opposing pathways. *J. Occup. Organ. Psychol.*, *94*(1), pp. 80–106, doi: 10.1111/joop.12323.

A. S. Chaudhry. (n.d.). Knowledge sharing practices in Asian institutions: a multi-cultural perspective from Singapore.

B. Erdogan and T. N. Bauer. (2009). Perceived overqualification and its outcomes: The moderating role of empowerment. *J. Appl. Psychol.*, *94*(2), pp. 557–565, doi: 10.1037/a0013528.

B. Erdogan and T. N. Bauer. (2021). Overqualification at Work: A Review and Synthesis of the Literature. *Annu. Rev. Organ. Psychol. Organ. Behav.*, *8*, pp. 259–283, Jan. 2021, doi: 10.1146/annurev-orgpsych-012420-055831.

B. Erdogan, A. Karaeminogullari, T. N. Bauer, and A. M. Ellis. (2020). Perceived overqualification at work: Implications for extra-role behaviors and advice network centrality. *J. Manag.*, *46*(4), pp. 583–606, doi: 10.1177/0149206318804331.

B. K. A. Almagharbeh, M. D. Shamout, and S. Hamouche. (Dec. 2023). Impact of perceived overqualification on knowledge hiding and service delivery performance: The moderating role of occupational instrumentality. *Knowl. Process Manag.*, doi: 10.1002/kpm.1772.

C. E. Connelly and D. Zweig. (May 2015). How perpetrators and targets construe knowledge hiding in organizations. *Eur. J. Work Organ. Psychol.*, *24*(3), pp. 479–489, doi: 10.1080/1359432X.2014.931325.

C. E. Connelly, D. Zweig, J. Webster, and J. P. Trougakos. (2012). Knowledge hiding in organizations. *J. Organ. Behav.*, *33*(1), pp. 64–88, doi: 10.1002/job.737.

C. E. Connelly, D. Zweig, J. Webster, and J. P. Trougakos. (Jan. 2012). Knowledge hiding in organizations. *J. Organ. Behav.*, *33*(1), pp. 64–88, doi: 10.1002/job.737.

C. Fan, Z. Wang, Y. Yang, and X. Liu. (Jun. 2023). Higher vocational college students' perceptions of creativity during the COVID-19 pandemic: support and constraint. *Curr. Psychol.*, doi: 10.1007/s12144-023-04853-1.

C. Ma, D. B. Ganegoda, (George) Zhen Xiong Chen, J. Zhao, X. Jiang, and X. Zhang. (2023). To stand out or fit in? How perceived overqualification motivates proactive and affiliative performance. *Hum. Resour. Manage.*, *62*(6), pp. 953–970, doi: 10.1002/hrm.22181.

C. S. Li, H. Liao, and Y. Han. (2022). I despise but also envy you: A dyadic investigation of perceived overqualification, perceived relative qualification, and knowledge hiding. *Pers. Psychol.*, *75*(1), pp. 91–118, doi: 10.1111/peps.12444.

D. C. Maynard, T. A. Joseph, and A. M. Maynard. (2006). Underemployment, job

attitudes, and turnover intentions. *J. Organ. Behav., 27*(4), pp. 509–536, doi: 10.1002/job.389.

D. C. Maynard, T. A. Joseph, and A. M. Maynard. (Jun. 2006). Underemployment, job attitudes, and turnover intentions. *J. Organ. Behav., 27*(4), pp. 509–536, doi: 10.1002/job.389.

D. Jiang, L. Ning, & Y. Zhang. (Jun. 2024). Perceived overqualification as a double-edged sword for employee creativity: The mediating role of job crafting and work withdrawal behavior. *PLOS ONE, 19*(6), p. e0304529, doi: 10.1371/journal.pone.0304529.

E. Howard, A. Luksyte, R. K. Amarnani, and C. Spitzmueller. (2022). Perceived overqualification and experiences of incivility: Can task i-deals help or hurt?. *J. Occup. Health Psychol., 27*(1), pp. 89–103, doi: 10.1037/ocp0000304.

G. Dupaul, M. Rapport, and L. Perriello. (1991). Teacher Ratings of Academic Skills — the Development of the Academic-Performance Rating-Scale. *Sch. Psychol. Rev., 20*(2), pp. 284–300, doi: 10.1080/02796015.1991.12085552.

G. Montt. (Jan. 2017). Field-of-study mismatch and overqualification: labour market correlates and their wage penalty. *IZA J. Labor Econ., 6*(1), p. 2, doi: 10.1186/s40172-016-0052-x.

H. Xu, Y.-M. Li, and P. Huang. (2017). The Influence of Perceived Over Qualification on College Students' Classroom Learning, in *Proceedings of the 3rd Annual 2017 International Conference on Management Science and Engineering (MSE 2017)*, Guilin, China: Atlantis Press. doi: 10.2991/mse-17.2017.54.

J. Khan, I. Saeed, and M. Zada. (Jun. 2022). The positive side of overqualification: examining perceived overqualification linkage with knowledge sharing and career planning. *J. Knowl. Manag., 27*, doi: 10.1108/JKM-02-2022-0111.

J. Khan, I. Saeed, M. Zada, H. G. Nisar, A. Ali, and S. Zada. (Jan. 2023). The positive side of overqualification: examining perceived overqualification linkage with knowledge sharing and career planning. *J. Knowl. Manag., 27*(4), pp. 993–1015, doi: 10.1108/JKM-02-2022-0111.

K. Alfes. (Nov. 2013). Perceived Overqualification and Performance. The Role of the Peer-Group. *Ger. J. Hum. Resour. Manag., 27*(4), pp. 314–330, doi: 10.1177/239700221302700403.

M. A. Opoku, S.-W. Kang, and N. Kim. (Jun. 2023). Sleep-deprived and emotionally exhausted: depleted resources as inhibitors of creativity at work. *Pers. Rev., 52*(5), pp. 1437–1461, doi: 10.1108/PR-09-2021-0620.

M. Rafiei and H. Van Dijk. (Jan. 2024). Not your average candidate: overqualified job applicants in the eyes of hiring practitioners. *Pers. Rev., ahead-of-print*(ahead-of-print), doi: 10.1108/PR-02-2023-0103.

M. Roser and E. Ortiz-Ospina. (Mar. 2024). "Literacy," Our World Data. Accessed: Oct. 28, 2024. Available: https://ourworldindata.org/literacy

N. Garg, A. Talukdar, A. Ganguly, and C. Kumar. (Nov. 2021). Knowledge hiding in academia: an empirical study of Indian higher education students. *J. Knowl. Manag., 25*(9), pp. 2196–2219, doi: 10.1108/JKM-10-2020-0783.

P. M. Podsakoff, S. B. MacKenzie, J.-Y. Lee, and N. P. Podsakoff. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol., 88*(5), pp. 879–903, doi: 10.1037/0021-9010.88.5.879.

P. Wang et al. (Aug. 2023). College students' perceived overqualification and adaptation: A double-edged sword model. *Curr. Psychol., 42*(24), pp. 20661–20679, doi: 10.1007/s12144-022-03174-z.

R. M. Ryan and E. L. Deci. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *Am. Psychol*.

S. Al-Husseini and I. Elbeltagi. (Jan. 2018). The role of knowledge sharing in enhancing innovation: a comparative study of public and private higher education institutions in Iraq. *Innov. Educ. Teach. Int., 55*(1), pp. 23–33, doi: 10.1080/14703297.2015.1122544.

S. E. Hobfoll. (1989). Conservation of resources: A new attempt at conceptualizing stress. *Am. Psychol., 44*(3), pp. 513–524, doi:

10.1037/0003-066X.44.3.513.

S. E. Hobfoll. (2011). Conservation of resource caravans and engaged settings. *J. Occup. Organ. Psychol., 84*(1), pp. 116–122, doi: 10.1111/j.2044-8325.2010.02016.x.

S. L. Kim and S. Yun. (2015). The effect of coworker knowledge sharing on performance and its boundary conditions: An interactional perspective. *J. Appl. Psychol., 100*(2), pp. 575–582, doi: 10.1037/a0037834.

S. Ovink, D. Kalogrides, M. Nanney, and P. Delaney. (Aug. 2018). College Match and Undermatch: Assessing Student Preferences, College Proximity, and Inequality in Post-College Outcomes. *Res. High. Educ., 59*(5), pp. 553–590, doi: 10.1007/s11162-017-9482-y.

T. Jer Yuen and M. Shaheen Majid. (Jul. 2007). Knowledge-sharing patterns of undergraduate students in Singapore. *Libr. Rev., 56*(6), pp. 485–494, doi: 10.1108/00242530710760382.

T. Madden-Dent and D. Oliver. (n.d.). Leading Schools with Social, Emotional, and Academic Development (SEAD). IGI Global, 1AD. Accessed: Aug. 19, 2024. Available: https://www.igi-global.com/book/leading-schools-social-emotional-academic/www.igi-global.com/book/leading-schools-social-emotional-academic/256645

T. W. H. Ng and D. C. Feldman. (2009). How Broadly Does Education Contribute to Job Performance?. *Pers. Psychol., 6*(1), pp. 89–134, doi: 10.1111/j.1744-6570.2008.01130.x.

U. Ghani et al. (Feb. 2020). Knowledge hiding in higher education: role of interactional justice and professional commitment. *High. Educ., 79*(2), pp. 325–344, doi: 10.1007/s10734-019-00412-5.

Y. Li and S. Wang. (Mar. 2024). The path from overqualification to success: career adaptability perspective. *Curr. Psychol., 43*(11), pp. 9920–9932, doi: 10.1007/s12144-023-05148-1.

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

The Effect of Parenting Style and Attachment Style on New Adult Intimacy

Jing Luo[1]

[1] Department of Applied Psychology, New York University, US
Correspondence: Jing Luo, Department of Applied Psychology, New York University, US.

doi:10.56397/SPS.2025.06.05

Abstract

Establishing intimate relationships with romantic partners is an essential part of emerging adulthood, but how good relationships are established and whether they are related to parenting styles, early attachment styles, and adult attachment styles still need to be studied. The current study will examine how parenting style relates to attachment style and what role attachment style plays in intimate relationships. This paper proposes the following hypothesis: parenting styles influence the development of attachment styles. Attachment styles in childhood form different adult attachment styles under different parenting styles, which ultimately influence new adult intimate relationships.

Keywords: new adult, parenting style, parent-child attachment style, adult attachment style, intimate relationship

1. Introduction

The transition from adolescence to adulthood is a crucial period of development. During this period, individuals become increasingly independent from their families. Young adults may still maintain close relationships with their parents, but they also develop close bonds, or intimate relationships, with their romantic partners. The formation of intimate relationships is an important milestone during this stage. People develop throughout their lives with the influence of childhood experiences, and intimate relationships are no exception. Childhood family relationships in emerging adults lay the foundation for later relationships with others inside and outside the family (Bretherton, 1985). Intimate relationships often develop through learning patterns of relationships with parents and other family members. Attachment theory provides a model for understanding the correlation between the quality of children's relationships with their parents and their later relationships with their parents and others.

Attachment styles are divided into attachment relationships with nurturers during childhood and attachment relationships that develop in adulthood with close loved ones (Bartholomew, 1993). Research suggests that attachment styles lead to internal working patterns that guide intimate relationships in adulthood (Neal & Frick-Horbury, 2001). Early attachment history is the basis for an internal working model of adult relationships (Collins & Read, 1990). Individuals with secure childhood attachments exhibit higher trust, intimacy, and reliability levels. In contrast, the opposite is true for those with insecure childhood attachments (Bowlby, 1973, 1982).

Attachment and caregiving systems are often activated simultaneously (Doinita & Maria, 2015). Baumrind (1991) defined three parenting styles: authoritative parenting style, with high responsiveness and high demand; authoritarian style, with low responsiveness and high demand; and permissive style, characterized by increased responsiveness and low demand. Responsiveness refers to how responsive parents are to their children's needs and the degree of support, warmth, and care they show them. Demanding refers to the degree to which parents require maturity and responsibility from their children, the rules and limits parents establish and apply for their children. Research has shown that secure attachment experiences with partners and responsive care for partners are positively associated with authoritative parenting styles and negatively associated with authoritarian and permissive parenting styles (Millings, Walsh, Hepper & O'Brien, 2013). Parenting style explains attachment style, while schematic style predicts two sub-dimensions of attachment style (Mahasneh, Al-Zoubi, Batayenh & Jawarneh, 2013). Therefore, this research paper aims to explore the attachment styles of children who grow up with different parenting styles and whether these impacts affect the building of their intimate relationships. This paper proposes the following hypothesis: parenting styles influence the formation of attachment styles. Attachment styles in childhood form different adult attachment styles under different parenting styles, which ultimately affects the intimate relationships of new adults.

2. Parenting Styles Influence New Adults' Attachment Styles

Attachment style is an internal and consistent working model throughout one's life and is influenced by parenting style. Longitudinal studies have demonstrated that childhood attachment relationships extend into adulthood (Shaver, Hazan, & Bradshaw, 1988). According to attachment theory, the initial attachment figure is the caregiver (parents), but throughout development, the attachment object gradually changes to the romantic partner (Doinita & Maria, 2015). This is because early interactions between children and caregivers have developed internalized beliefs and encoded them into a cognitive and emotional schema that becomes an internal working model. This working schema learned from interactions with parents is the attachment style and continues to influence individuals' emotions, behaviors, and expectations in intimate relationships. Parenting style is an interaction with parents, so it affects this internal working model, which is the attachment style. Therefore, parenting style influences attachment style.

Different parenting styles explain different attachment styles. Research has shown a significant positive correlation between authoritative, neglectful, and authoritarian parenting styles and secure, anxious-ambivalent, and avoidant attachment types and a significant negative correlation between neglectful and anxious-ambivalent, redundant protective, and secure parenting styles (Doinita & Maria, 2015). Warm and accepting parents are consistently associated with positive developmental outcomes, such as emotional attachment security and good relationships with others (Ladd & Pettit, 2002). Secure attachment in childhood occurs when parents are responsive to the needs of their children. Positive parenting provides an environment in which children can safely explore and allows children to develop the confidence to interact with an autonomous world, face challenges, and regulate emotions (Mikulincer & Shaver, 2004). Neglect or failure to engage parents and indifferent discipline can imprint the emotional circuitry and lead to the adoption of an anxious or avoidant attachment strategy (Collins & Feeney, 2010). Parenting characteristics, such as lack of warmth, supervision, inconsistency, and poor parenting practices, are associated with anxious parent-child attachment (Ainsworth, Blehar, Waters & Wall,1978).

3. Parenting Styles Influence New Adults' Intimacy

Parenting styles shape early parent-child relationships and foster an emotional climate in children that can be generalized to intimate relationships. The family is one of the most potent influences on young people before they enter mature intimate relationships (Simons, Simons, Landor, Bryant & Beach, 2014). This is because children are exposed to parenting practices that influence behavior, cognition, and emotion, internalizing interactions with parents as their working models. Romantic relationships (intimate relationships) are the same emotionally charged relationships as parent-child relationships, so the internal working models learned from parent-child

relationships can guide the intimate relationships children form and maintain in the future. According to Detterman's (1993) cognitive research, the similarity between two situations will help the skills learned from one situation to transfer more directly to the other, as mentioned above, where both parent-child and romantic relationships are emotionally close.

Parents' different parenting styles influence the quality of their children's future intimate relationships. According to social learning theory, family experiences can influence a person's performance in later relationships by mimicking parental interaction styles (Seiffge-Krenke, Overbeek & Veermulst, 2010). For example, parental caring and encouraging autonomy are positively associated with later romantic relationship satisfaction in children (Scharf & Mayseless, 2008). Unskilled parenting, characterized by poor communication, inadequate monitoring, unresponsiveness, and insensitivity, is associated with adverse interactions with intimate partners in early adulthood (Simons et al., 2014); young people who experience positive parenting perceive others as accessible and responsive, have meaningful and vital relationships with others and are significantly associated with the degree to which they can form healthy relationships (Dalton III, Frick-Horbury & Kitzmann, 2006).

4. Attachment Styles Influence Intimate Relationships in New Adult

Childhood attachment styles are consistent with adult attachment styles and influence the quality of intimate relationships in new adults. Research suggests that attachment styles continue after infancy and influence many aspects of an individual's life as they enter adulthood (Feeney & Cassidy, 2003). The adult attachment carried over from childhood, with stylistic qualities nearly identical to the attachment style with their primary caregiver as a child (Shaver & Hazan, 1993). According to Ainsworth and colleagues (1978), adults can be classified into three attachment styles. Adults who fall into the secure attachment category have the healthiest relationships characterized by compassion, helpfulness, minimal jealousy, and trust. Those who fit into the anxious attachment style are characterized by dependency and a strong desire to make commitments in relationships, but their inability to trust leads to clinginess. Avoidant attachment styles tend to avoid intimate relationships altogether (Feeney & Noller, 1990).

Adult attachment styles influence the quality of intimate relationships through attachment to romantic partners. A series of studies have shown that, as intimate relationships develop, young adults are primarily inclined to use romantic relationships for attachment-related functions according to Umemura, Lacinová, and Macek (2015). Over time, young people become increasingly dependent on their romantic partners (Umemura, Lacinová, Macek, & Kunnen, 2017). Romantic partners, like caregivers to parents, can serve as essential attachment roles, one of the critical tenets of romantic attachment theory (Hazan & Shaver, 1994).

As with parent-child attachment in childhood, the quality of intimate relationships may vary across adult attachment styles. Some people have relatively strong bonds with their partners, while others have somewhat insecure relationships (Hazan & Shaver, 1987). People with a secure attachment style should be attracted to and develop stable, supportive relationships with high levels of trust, interdependence, commitment, and satisfaction. Conversely, those with an avoidant style should form emotionally distant relationships with low levels of trust, interdependence, loyalty, and joy (Simpson, 1990). Insecure adults have difficulty managing the powerful emotions that arise in intimate relationships. However, biased interpretations and maladaptive coping skills related to negative perceptions of self or others create an imbalance in seeking connection and retaining autonomy, both of which are important for healthy intimate relationships (Blatt & Levy, 2003). For example, an insecure person craves connection. However, research has shown that they may become addicted, lose control over their sexual relationships, and express themselves too freely and too much to be acknowledged by others (Shaver, Schachner & Mikulincer, 2005).

5. Parenting Style and Attachment Style Influence Intimacy in New Adults

It has been argued above that parenting styles influence attachment formation, and that parenting style and attachment style predict intimacy in young adults. Therefore, according to the above foundations, this paper concludes that: parenting styles influence the formation of

attachment styles, attachment styles in childhood form different adult attachment styles under different parenting styles, and adult attachment styles influence intimacy in new adults.

Parenting styles shape early family relationships and influence individuals' attachment relationships with their parents. There was a significant positive correlation between authoritative, neglectful, and authoritarian parenting styles and secure, anxious-ambivalent, and avoidant attachment types (Doinita & Maria, 2015). Children's earliest family relationships set the stage for later relationships with others (Bretherton, 1985). A large body of empirical data relates attachment to broad socialization outcomes during childhood and adulthood (Waters et al., 1986). Young people's relationships with romantic partners are social relationships that develop from early attachment relationships with their parents, forming adult attachment relationships. Research has shown that young people's perceptions of the quality of their childhood relationships with their parents are significantly associated with the type of current attachment to others (Hazan & Shaver, 1987). Maternal respect, confidence, acceptance, responsibility, non-aggression, non-demand, paternal care, love, and humor can differentiate between secure and insecure (avoidant and anxious or ambivalent) adult attachment styles (Feeney & Noller, 1990).

Different attachment styles influence the quality of intimate relationships. Attachment theories can be divided into parent-child attachment relationships and adult attachment relationships. There is a connection between the two. The attachment relationship children form with their parents may translate to the quality of their marital relationships in the future. People who had a secure attachment style to their parents as children endorsed trusting relationships and were able to maintain romantic relationships in adulthood; people who had an anxious attachment style to their parents as children showed codependency in adult relationships and no lasting romantic relationships; Those with an avoidant attachment style to their parents were distrustful, distant from others, and reported fewer romantic experiences (Feeney & Noller, 1990). As adults, couples with an insecure parent-child attachment style were more likely than couples with a secure parental attachment style to report marital difficulties (e.g., disagreements, verbal violence, decreased intimacy) and divorce within the first few years of marriage (Crowell et al., 2009). Attachment theory provides a framework to conceptualize how healthy and unhealthy love arises from rational adaptations to early social experiences. These patterns persist into adulthood and serve as templates for intimate relationships (Stackert & Bursik, 2003).

Therefore, it can be concluded that parenting style influences attachment style, and attachment style influences intimacy. Parenting style and attachment style together influence intimacy.

6. Discussion

6.1 Limitations and Future Directions

First, the study does not discuss different cultures and socioeconomic statuses (SES). Most empirical studies cited in this paper are based on Western cultural samples, so further research is needed to study whether the findings apply to different cultural contexts. For example, whether authoritarian parenting is more prevalent in Asian contexts and whether people raised in authoritative and authoritarian parenting behave differently in intimate relationships than people from Western contexts. Moreover, the effects of parenting styles on close relationships may differ across economic levels. Culture and SES are areas of great inquiry for the future.

Second, gender differences are not discussed in this paper. Parenting styles also differ between mothers and fathers. Children are influenced by parenting styles that may come from their fathers, mothers, or both parents. Whether the absence of the father's or mother's role in the child's development affects the child's attachment style and future intimate relationships. In addition, whether there are gender differences in attachment styles and quality of intimate relationships between girls and boys is also an area worthy of study.

Third, most of the empirical findings cited in this paper are based on individual self-reports, which may be biased. Because the findings may be overestimated due to common methodological differences and response tendencies, such as consistency bias and social desirability. Most research samples provided retrospective reports of parental behaviors from childhood memories. Retrospective reports of childhood experiences are likely to contain

errors, unreliability, and imperfect memories. In addition, parents of new adults commenting on their less-than-ideal parenting style may also contribute to the bias of new adult reports.

Fourth, the effect of parenting and attachment styles in the conclusions presented in this research paper is unidirectional. However, it must be acknowledged that this is an uncritical conclusion and that there is a two-way possibility for any influence. Therefore, further causal analysis is needed in the future. Because the quality of past and present parent-child and intimate relationships were measured simultaneously in the previously cited studies, any interpretation must acknowledge the possibility of a two-way influence. For example, current relationship quality may affect young people's memories and perceptions of attachment security or quality in early parent-child relationships.

Finally, the research population of this paper is new adults and does not cover late adulthood. Because most of the existing empirical studies are on college students, it is also worthwhile to explore whether parenting styles and attachment styles affect intimacy and even marital relationships in late adulthood.

References

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). Patterns of attachment: A psychological study of the strange situation. Hillside. NJ: Erlbaum. Armsden, GC, & Greenberg, MT (1987). The inventory of parent and peer attachment: Individual differences and their relationship to psychological well-being in adolescence. *Journal of Youth and Adolescence*, *16*, 427-454.

Bartholomew, K. (1993). From childhood to adult relationships: Attachment theory and research.

Baumrind, D. (1991). Parenting styles and adolescent development. In J. Brooks-Gunn, R. Lerner, A.C. Peterson (Eds.), *The encyclopaedia of adolescence* (746-758). New York: Garland.

Blatt, S. J., & Levy, K. N. (2003). Attachment theory, psychoanalysis, personality development, and psychopathology. *Psychoanalytic Inquiry*, *23*(1), 102-150.

Bowlby, J. (1973). Attachment and loss: Volume II: Separation, anxiety and anger. In *Attachment and loss: Volume II: Separation, anxiety and anger* (pp. 1-429). London: The Hogarth press and the institute of psychoanalysis.

Bowlby, J. (1982). Attachment and loss: retrospect and prospect. *American journal of Orthopsychiatry*, *52*(4), 664.

Cassidy, J., Ziv, Y., Mehta, T. G., & Feeney, B. C. (2003). Feedback seeking in children and adolescents: associations with self-perceptions, attachment representations, and depression. *Child development*, *74*(2), 612-628.

Collins, N. L., & Feeney, B. C. (2010). An attachment theoretical perspective on social support dynamics in couples: Normative processes and individual differences. *Support processes in intimate relationships*, 89-120.

Collins, Nancy L., Read, S.J. (1990). Adult Attachment, Working Models, and Relationship Quality in Dating Couples. *Journal of Personality and Social Psychology*, *58*(4), 644-663.

Crowell, J. A., Treboux, D., & Brockmeyer, S. (2009). Parental divorce and adult children's attachment representations and marital status. *Attachment & Human Development*, *11*, 87-101. doi:10.1080/ 14616730802500867

Dalton III, W. T., Frick-Horbury, D., & Kitzmann, K. M. (2006). Young adults' retrospective reports of parenting by mothers and fathers: Associations with current relationship quality. *The Journal of General Psychology*, *133*(1), 5-18.

Detterman, D. K. (1993). The case for the prosecution: Transfer as an epiphenomenon.

Doinita, N. E., & Maria, N. D. (2015). Attachment and parenting styles. *Procedia-Social and Behavioral Sciences*, *203*, 199-204.

Feeney, J. A., & Noller, P. (1990). Attachment style as a predictor of adult romantic relationships. *Journal of personality and Social Psychology*, *58*(2), 281.

Feeney, J. A., & Noller, P. (1990). Attachment style as a predictor of adult romantic relationships. *Journal of Personality and Social Psychology*, *58*, 281-291. doi:10.1037/0022-3514.58.2.281

Hazan, C., & Shaver, P. R. (1994). Attachment as

an organizational framework for research on close relationships. *Psychological Inquiry*, *5*(1), 1-22.

Hazan, C., Shaver, P. R., & Bragshaw, D. (1988). Love as attachment the integration of tree behavioral systems. *The psychology of love*, 68-99.

Ladd, G. W., & Pettit, G. S. (2002). Parenting and the development of children's peer relationships. In M. H. Bornstein (Ed.), *Handbook of parenting*: *Vol. 5. Practical Issues in Parenting* (pp. 269–309). Mahwah, NJ: Erlbaum.

Mahasneh, A. M., Al-Zoubi, Z. H., Batayenh, O. T., & Jawarneh, M. S. (2013). The relationship between parenting styles and adult attachment styles from Jordan university students. *International Journal of Asian Social Science*, *3*(6), 1431-1441.

Mikulincer, M., & Shaver, P. R. (2004). Security-based self-representations in adulthood. *Adult attachment: Theory, research, and clinical implications*, 159-195.

Millings, A., Walsh, J., Hepper, E., & O'Brien, M. (2013). Good partner, good parent: Responsiveness mediates the link between romantic attachment and parenting style. *Personality and Social Psychology Bulletin*, *39*(2), 170-180.

Neal, J., & Frick-Horbury, D. (2001). The effects of parenting styles and childhood attachment patterns on intimate relationships. *Journal of Instructional Psychology*, *28*(3), 178-178.

Scharf, M., & Mayseless, O. (2008). Late adolescent girls' relationships with parents and romantic partner: The distinct role of mothers and fathers. *Journal of Adolescence*, *31*(6), 837-855.

Seiffge-Krenke, I., Overbeek, G., & Vermulst, A. (2010). Parent–child relationship trajectories during adolescence: Longitudinal associations with romantic outcomes in emerging adulthood. *Journal of Adolescence*, *33*(1), 159-171.

Shaver, P. R., & Hazan, C. (1993). Adult romantic attachment: Theory and evidence. *Advances in personal relationships*, *4*, 29-70.

Shaver, P. R., Schachner, D. A., & Mikulincer, M. (2005). Attachment style, excessive reassurance seeking, relationship processes, and depression. *Personality and Social Psychology Bulletin*, *31*(3), 343-359.

Simons, L. G., Simons, R. L., Landor, A. M., Bryant, C. M., & Beach, S. R. (2014). Factors linking childhood experiences to adult romantic relationships among African Americans. *Journal of Family Psychology*, *28*(3), 368.

Simpson, J. A. (1990). Influence of attachment styles on romantic relationships. *Journal of Personality and Social Psychology*, *59*(5), 971.

Stackert, R. A., & Bursik, K. (2003). Why am I unsatisfied? Adult attachment style, gendered irrational relationship beliefs, and young adult romantic relationship satisfaction. *Personality and individual differences*, *34*(8), 1419-1429.

Umemura, T., Lacinová, L., & Macek, P. (2015). Is emerging adults' attachment preference for the romantic partner transferred from their attachment preferences for their mother, father, and friends? *Emerging Adulthood*, *3*(3), 179-193.

Umemura, T., Lacinová, L., Macek, P., & Kunnen, E. S. (2017). Longitudinal changes in emerging adults' attachment preferences for their mother, father, friends, and romantic partner: Focusing on the start and end of romantic relationships. *International Journal of Behavioral Development*, *41*(1), 136-142.

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

How Parent-Parent Relationships, Parent-Child Relationships and the Interactions Among Them Affect Teenagers' Happiness

Steve Shi[1]

[1] Southridge School, BC V3Z 0B7, Canada
Correspondence: Steve Shi, Southridge School, BC V3Z 0B7, Canada.

doi:10.56397/SPS.2025.06.06

Abstract

Previous research has focused on both the relationship between parents and parents and the relationship between parents and children, and how they affect and are affected by various different factors. This study focuses on the interactions between parent-parent relationships and parent-child relationships, specifically how they relate to and affect each other. We approached this study mainly by examining three key relations: how parent-parent relationships affect teenagers' happiness, how parent-child relationships affect teenagers' happiness, and how the interaction between parent-parent relationships and parent-child relationships affect teenagers' happiness, specifically how these two different types of relationships relate to each other. After designing a survey with many questions in it and distributing it to an audience of 32 teenagers, several core relations were revealed. Firstly, individual happiness affects overall happiness more than happiness when with family. Secondly, relationships with the child's parents individually and the relationship strength between their parents both factor into the child's happiness when they are with their parents. Finally, the parent-parent relationship is independent of the parent-child relationship; they act independently on the child's happiness. Synthesizing all major and minor findings, it is clear that both a positive parent-parent relationship and positive parent-child relationships are important to maintain the child's happiness.

Keywords: parent-child relationship, parent-parent relationship, teenager well-being, family dynamics, adolescent well-being, teenager happiness, adolescent happiness, life satisfaction

1. Introduction

Several recent studies have explored the critical role family relationships play in shaping teenager well-being. Li et al. (2023) examined the influence of positive parenting behaviors on teenagers' general happiness and found how much the mother and father's supportive parenting were associated with the teenagers' happiness. The difference found was that the fathers' positive parenting had some partially indirect effects on teenagers' life satisfaction, while the mothers' positive parenting influenced teenagers mainly by strengthening emotional attachment. This means that the study found evidence that the mother and father had different impacts on a teenager's happiness. Ratliff et al. (2023) investigated the relationship between parent-child relationships and emotional regulation and

positive psychology in teenagers. Their study shows that teenagers who perceive their parents to be emotionally supportive develop stronger emotional regulation skills, which leads to being generally more happy later in their lives and corresponding to lower rates of depression and anxiety. However, the study only focused on the parent-child relationship. Chiang et al. (2023) found that teenagers were significantly happier on days when they were closer and had less conflict with their parents. This study studied the dynamic of parent-child relationships only, not considering how parent-parent relationships can also affect this in tandem with parent-child relationships.

While the above studies do not explore the parent to parent dynamic, we may find other literature discussing the effect of parent-parent relationships on the child's happiness. Lucas-Thompson et al. (2015) examined the relationship between exposure to conflict between parents and adolescent mental health. The group of researchers found that teenagers who perceived more conflict between their parents were more likely to internalize the stress, leading to signs of anxiety, and depression. The study also found that adolescents who blamed themselves for arguments between their parents often experienced the most harmful effects. This shows the negative effect of excessive conflict between parents, as too much exposure to adolescents could lead to many mental health disorders. However, just a few years later, Lucas-Thompson and George (2017) found that not all parent to parent conflict is damaging to a child. When the individual's parents handled arguments and conflicts with cooperation and approached them in a healthy way, the individual was found to develop better emotional regulation and felt more secure when they were at home or around their family. This suggests that the way in which parents argue could be more important than whether or not they argue. Clark (2011) also studied the parent to parent conflict but focused instead on its effect on parenting quality. The study found that disorder in parent to parent relationships led to reduced parental warmth and connection with the child. This resulted in lower levels of positive social behavior in adolescents such as empathy and cooperation.

This study aims to connect the two different types of relationships explored previously and explore the effects of the interactions between parent-parent relationships and parent-child relationships on teenagers' happiness levels. We started off with trying to determine three research relations: how parent-parent relationships affect teenagers' happiness, how parent-child relationships affect teenagers' happiness, and how the interaction between parent-parent relationships and parent-child relationships affect teenagers' happiness, specifically how these two different types of relationships relate to each other.

2. Methodology

An anonymous online survey consisting of 2 demographic questions and 14 five-point-scale questions was conducted using Google Forms on 32 English-speaking teenagers aged from 13 to 18 inclusive measuring three main aspects: their relationship with their parents, the relationship of their parents, and their satisfaction with life. Everyone who was surveyed has both parents present in their lives, meaning they currently see both parents at least once a year. All survey questions and their corresponding numbers can be found in the appendix.

Once the data is collected, the following relationships will be determined:

- How individual parent child relationships (HPInd) affect teenagers' happiness when they are with their parents (Q12)

To find this, we have to first give a value to their happiness with their parents in general. Since no questions in the form collect this statistic exactly, a new equation was created to measure general happiness with parents: We will label this as HPInd. This is an accurate representation of their happiness with their parents because how much they like each of their parents is weighted by how much time they spend together. There is a Q2+Q5 in the denominator to keep the value in the original range from 1-5. How happy they are with both their parents is directly measured through Q12. Next, the data will be separated into 2 groups. Individuals with an HPInd value equal to or less than 3 will be put in one group 1, while individuals with an HPInd value greater than 3 will be put in group 2. These groups will separate the people who have a positive relationship with their parents individually and the people who have a negative relationship with their parents individually. Each group's average value of Q12 will be taken, and a one tailed Welch's t test will be done to determine whether the Q12 value of group 1 is significantly higher than the Q12 value of group 2. The null hypothesis will be group 1 =

group 2, and the alternative hypothesis will be group 1 < group 2.

- How teenagers' happiness with their parents (Q12) affects teenagers' happiness in general (Q14)

The value (Q7+Q8)/2 will be taken to get the Parent Relationship Strength (PRS) parameter. This should be accurate because the relationship strength between two people should be an average of how much time they spend with each other and how close they are. This is different from before where we took the proportion because closeness is different from how much they like each other. Closeness is very similar to how much time they spend together and thus an average will suffice. Data will be separated again into 2 groups, with group 1 having a PRS value less than or equal to 3 and group 2 having a PRS value greater than 3. A one tailed Welch's t test will also be run to determine whether group 2 is significantly happier than group 1 when around either parent individually. The null hypothesis will be group 1 = group 2 and the alternative hypothesis will be group 1 < group 2.

- How Parent Relationship Strength (PRS) affect teenagers' happiness affect teenagers' happiness when they are with their parents individually (HPInd)

The value (Q7+Q8)/2 will be taken to get the Parent Relationship Strength (PRS) parameter. This should be accurate because the relationship strength between two people should be an average of how much time they spend with each other and how close they are. This is different from before where we took the proportion because closeness is different from how much they like each other. Closeness is very similar to how much time they spend together and thus an average will suffice. Data will be separated again into 2 groups, with group 1 having a PRS value less than or equal to 3 and group 2 having a PRS value greater than 3. A one tailed Welch's t test will also be run to determine whether group 2 is significantly happier than group 1 when around either parent individually. The null hypothesis will be group 1 = group 2 and the alternative hypothesis will be group 1 < group 2.

- How parent relationship strength (PRS) affects Child happiness with both parents (Q12)

Data will be separated again into 2 groups, with group 1 having a PRS value less than or equal to 3 and group 2 having a PRS value greater than 3. A one tailed Welch's t test will also be run to determine whether group 2 is significantly happier than group 1 when around both parents together. The null hypothesis will be group 1 = group 2 and the alternative hypothesis will be group 1 < group 2.

- The interaction between parent-parent relationships (PRS) and parent-child relationships (HPInd) teenagers' happiness when they are with their parents (Q12), specifically how these two different types of relationships relate to each other.

A two-way ANOVA test will be run to find the interaction between parent relationships and parent-child relationships on and teenagers' happiness when they are with both parents, and how these two interactions relate to each other. HPInd and PRS are the two independent variables, and Q12 is the dependent variable.

- Q12, Q13, Q14

A multiple regression model will be run with the variables Q12 and Q13 as the independent variables and Q14 as the dependent variable. We will be able to determine which variable is more significant, or even significant at all.

3. Results

In this study, there were three different relations explored: Parent-child relationships and their effect on happiness, parent-parent relationships and their effect on happiness, and the interactions between parent-child relationships and parent-parent relationships.

3.1 Parent-Child Relationships

The relation outlined in the previous section that shows how parent-child relationships affect happiness is relation 1. After taking a one tailed Welch's t test (df = 11.0163, t = -2.9840), a p value of 0.0066 was obtained. Since the p-value is less than 0.05, we can reject the null hypothesis at the 0.05 significance level. This indicates that individuals with worse relationships with their parents individually have significantly worse relationships with both parents together than those with better relationships with each individual parent.

3.2 Parent-Parent Relationships

The relation outlined in the previous section that shows how parent-parent relationships affect happiness is relation 4. After following a similar procedure to the first relation and taking a one tailed Welch's t test (df = 25.1934, t = -2.1279), we

obtained a p-value of 0.0217. Since the p-value is less than 0.05, we reject the null hypothesis at the 0.05 significance level. This means that individuals with a worse parent to parent relationship will often be less happy when they are around both parents.

3.3 Interactions

The rest of the relations all included some interactions between parent-parent relationships and parent-child relationships. First and foremost, interaction 6 reveals that only happiness when the individual was by themselves significantly affected overall happiness, and not the happiness of the individual when they were with their parents. The multiple regression model found that only Q13, or happiness by yourself, was a significant predictor of overall happiness. Q13 had a p value of 0.001, which is statistically significant at the 0.05 significance level. The value of Q13 was 0.591 suggesting a high correlation with overall happiness. Q12, happiness with parents, actually did not predict overall happiness at all. A p value of 0.313 was returned for Q12, and so it was not significant at a 0.05 significance level, thus not affecting overall happiness. The intercept was non-significant because its p value was calculated to be 0.646, far above the 0.05 we need for significance. This was further corroborated when a one-tailed Welch's t test was run on Q12 and Q14 in relation 2 which revealed the same thing: overall happiness was significantly related to happiness alone, and not significantly related to happiness when with both parents. The one-tailed Welch's t test (df = 25.1934, t = -2.1279) conducted in relation 2 obtained a p-value of 0.0217. Since the p-value is less than 0.05, we reject the null hypothesis at the 0.05 significance level. This means that individuals whose parents have a worse relationship will often be less happy when they are around both parents.

Relation 3 shows that when 2 parents do not have a good relationship, it can translate into negative relationships with the child as well. The one-tailed Welch's t test (df = 23.4761, t = -2.6803) obtained a p-value of 0.0066. Since the p-value is less than 0.05, we reject the null hypothesis at the 0.05 significance level. This means that individuals whose parents have a worse relationship will often have a worse relationship individually with their parents.

After the 2-way ANOVA was conducted for relation 5, here are the findings from the model.

Table 1. ANOVA for HPInd and PRS on Q12

Source	SS	df	MS	F-Value	P-Value
HPInd	12.847	1	12.847	8.624	0.006
PRS	7.892	1	7.892	5.301	0.028
HPInd + PRS	0.953	1	0.953	0.640	0.430
Residual	44.226	29	1.400	n/a	n/a

Both HPInd and PRS have significant p values at the 0.05 significance level. This means that they both significantly affect Q12 or happiness of the individual when around both parents. HPInd also has a stronger effect on Q12 than PRS did. The interaction between HPInd and PRS was insignificant as the p value was 0.43, much higher than the 0.05 needed to be significant. This means that HPInd and PRS are independent of each other and are additive instead of interactive.

4. Discussion

It would be beneficial to first list out each individual result found, and explain the implications. The first result we found was between parent-child relationships and happiness when with both parents. We found that individuals with worse relationships with their parents individually have significantly worse relationships with both parents together than those with better relationships with each individual parent. This is fairly intuitive because we are stating that if a child has a worse relationship with the parents individually then they will also have a worse relationship with both parents present. There is not much to dig into here.

The second result we found was that individuals with a worse parent to parent relationship will often be less happy when they are around both parents. This is also fairly intuitive because we are finding that the unstable relationship of the

parents does not translate well onto the child's relationship with their parents either. Therefore, it is important for parents to have a good relationship if they want the child to have a good relationship with them.

Similarly, we also found that individuals whose parents have a worse relationship will often have a worse relationship with their parents individually. So, a bad parent to parent relationship can really affect the child's relationship with parents in every sense. If the parents are not close with each other, the child will not fit properly in the family dynamic, leading to the child feeling more unhappy when around their parents both individually and together. We also found that happiness with parents individually and relationship strength of parents are independent of each other, meaning their relation is additive, and they do not interact in a special way.

The third result we found was that overall happiness was affected significantly by happiness when the individual was by themselves and not by happiness when the individual was with both parents. This was very surprising because many teenagers spend a lot of their time at home around both parents, so it is natural to think that their happiness around their parents would significantly affect their overall happiness. A possible explanation for this result would be that teenagers attribute more of their happiness to their happiness alone or with their friends as compared to when they are with their parents. This is because they spend more time with friends or alone in their room than with both parents around, so they think of negative or positive experiences with both parents as occasional and not a major determining factor of their happiness.

Our three research questions are now answered. Negative parent-parent relationships affect teenagers' happiness negatively, and positive parent-parent relationships affect teenagers' happiness positively. However, it only affects their happiness when they are around their parents, not their overall happiness.

Parent-child relationships affect teenagers' happiness in the same way as parent-parent relationships. If a child is not happy around their parents individually, they will also not be happy around both parents. Again, it only affects their happiness when they are around their parents, not their overall happiness.

Finally, the interaction between parent-parent relationships and parent-child relationships affects teenagers' happiness proved to be nothing special. Parent-parent relationships and parent-child relationships both affect the child's happiness, albeit to different degrees. Parent-child relationships affect the child's happiness more than parent-parent relationships, and a possible explanation for this would be that the parent-parent relationship affects how parent-child relationships occur.

However, there is one pressing issue with this survey, and it is that there are not enough participants. 32 is a very small sample size to get any convincing data, and so with a larger sample size and more time, I believe this study could be revisited and reconducted to discern real, meaningful results. Since the sample size is so small, there is much more room than desirable for type I and II errors in every test conducted. The sample size was also mostly Chinese or other Asian races. It would have been better to include people from different backgrounds and demographics because not all demographics have the same traditional parenting values as Chinese people, so the data could be biased in that way.

Overall, the data shows that interparental relationships are extremely important in building the teenager's happiness around their parents, both individually and together. It also shows that the teenager's relationship with each parent individually is extremely important in building the teenager's happiness around their parents together. This study suggests that parents need to maintain a positive relationship with each other as well as with the child to make the child feel comfortable at home and to be able to provide the emotional support and help the child may need to navigate challenges.

References

Chiang, E. S., Hessel, H., & Laird, R. D. (2023). Daily associations between parent-adolescent closeness, conflict, and adolescents' life satisfaction: A diary study. *Journal of Adolescence, 97*, 34–44. https://onlinelibrary.wiley.com/doi/10.1002/jad.12184

Clark, A. M. (2011). The impact of marital conflict on parenting and adolescent prosocial behavior (Master's thesis, Brigham Young University). ScholarsArchive. https://scholarsarchive.byu.edu/etd/2660/

Li, X., Zhang, Y., Zhang, H., & Liu, L. (2023). Positive parenting and adolescent life satisfaction: A multiple mediation model through parent-adolescent attachment and hope. *Frontiers in Psychology, 14*, 1183546. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2023.1183546/full

Lucas-Thompson, R. G., & George, M. W. (2017). Adolescents' responses to marital conflict: The role of cooperative marital conflict. *Journal of Family Psychology, 31*(7), 843–853. https://psycnet.apa.org/doiLanding?doi=10.1037%2Ffam0000310

Lucas-Thompson, R. G., Lunkenheimer, E. S., & Dumitrache, A. (2017). Associations between marital conflict and adolescent conflict appraisals, stress physiology, and mental health. *Journal of Clinical Child & Adolescent Psychology, 46*(3), 379–393. https://www.tandfonline.com/doi/full/10.1080/15374416.2015.1046179

Ratliff, K. M., Wang, X., & Cui, L. (2023). Supportive parent-adolescent relationships and adolescent adjustment: The mediating role of emotion regulation. *Frontiers in Psychology, 14*, 1193449. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2023.1193449/full

Appendix

Form Questions:

Demographic questions:

How old are you?

What are your pronouns?

Q1: How much do you like your mother?

Q2: How much time do you spend with your mother?

Q3: How happy are you when you are only with your mother?

Q4: How much do you like your father?

Q5: How much time do you spend with your father?

Q6: How happy are you when you are only with your father?

Q7: How close are your parents with each other?

Q8: How much time do they spend with each other?

Q9: How much can you share about your daily life with your parents?

Q10: How regularly do you spend family time?

Q11: How busy are you?

Q12: How happy are you when you are with both your parents?

Q13: How happy are you by yourself?

Q14: How happy are you in general?

PIONEER
ACADEMIC PUBLISHING LIMITED

Studies in Psychological Science
ISSN 2959-5266
www.pioneerpublisher.com/sps
Volume 3 Number 1 June 2025

The Relationship Between Growth Mindset and Academic Perseverance in Junior High School Students: The Mediating Role of Achievement Motivation

Xiangxin Zhou[1], Yue Sun[1] & Jiaxin Zhou[1]

[1] Mudanjiang Normal University, Heilongjiang, China
Correspondence: Yue Sun, Mudanjiang Normal University, Heilongjiang, China.

doi:10.56397/SPS.2025.06.07

Abstract

In order to investigate the current situation of academic perseverance of junior high school students, to understand the characteristics of academic perseverance of junior high school students, and to explore the relationship between growth mindset, achievement motivation, and academic perseverance, in order to put forward effective educational suggestions to improve the level of academic perseverance of junior high school students. Using the Growth Mindset Scale, Achievement Motivation Scale and Academic Perseverance Scale, a questionnaire survey was conducted on junior high school students in a middle school in Q and H cities, H province, by random sampling method. After the questionnaires were returned, data were analysed using spss26.0. The results of the study are as follows: (1) The academic perseverance of the subjects in this study was at a moderately high level, and they were both challenging but at the same time possessed sufficient coping ability when facing academic tasks. (2) Growth mindset, academic perseverance, and achievement motivation differed significantly on some demographic variables in terms of gender, being an only child, being a class officer, grade level, and grade rank. (3) There is a two-by-two positive correlation between growth mindset and academic perseverance and achievement motivation among middle school students. Growth mindset has a significant positive predictive effect on academic perseverance and achievement motivation. (4) Achievement motivation has a partial mediating effect between growth mindset and academic perseverance in junior high school students. The conclusion of the study suggests that the level of academic perseverance of junior high school students can be improved through the cultivation of growth mindset and the stimulation of achievement motivation.

Keywords: growth mindset, academic perseverance, achievement motivation, junior high school students

1. Introduction

Duckworth considers perseverance as an individual's ability to persevere and sustain passion for ambitious goals (Xiao, F. F, 2021). She takes students as the subject of her study and proposes that the perseverance and resilience

that students demonstrate in the pursuit of their educational goals is called academic perseverance. Academic perseverance is domain-specific, mainly reflecting a special quality of perseverance in academics, emphasising that adolescents have the persistence, perseverance and determination in academics, as well as the courage to overcome adversity, and are able to maintain their passion and interest in their academic goals (Hongyu Liao, 2022). According to scholar Clark, academic perseverance refers to the determination, perseverance, resilience, and focus that students demonstrate when pursuing goals in the educational field (Clark, K. N., & Malecki, C. K., 2019). Kelly defines academic perseverance as a personal characteristic or skill that involves an individual's dedication to the pursuit of challenging, long-term goals in the educational field (Kelly, D.R., M.D. Matthews, & P.T. Bartone, 2017). Song Naiqing, a scholar in China, defines academic perseverance as the quality of being able to regulate an individual's learning behaviours, learning emotions and self-perceptions in learning, overcoming various difficulties and setbacks encountered in learning, and striving to achieve long-term learning goals (Song Naiqing, Zhao Qiuhong & Luo Shiyan, 2020). Perseverance is considered to be an important positive psychological quality that transcends the influence of intellectual factors on an individual's academic achievement and performance (Von Culin, K. R., Tsukayama, E., & Duckworth, A. L. 2014). Academic perseverance, as a quality of perseverance in specific academic domains, can more accurately predict students' performance in academics. Based on this, Kelly et al. defined academic perseverance as the determination and resilience that an individual possesses when pursuing challenging goals in the educational domain. Most of the previous research results show that junior high school students have moderately high levels of academic perseverance, but there are still some students with low levels of academic perseverance. Low levels of academic perseverance affect individuals in many ways. For example, on the one hand, some students will affect their self-perception and self-evaluation, which will lead to the conflict between the ideal self and the real self, which will lead to negative emotions such as anxiety and depression, and will seriously endanger their physical and psychological health; on the other hand, due to the low level of academic perseverance of some junior high school students, their parents' expectations of their education can not be met, which will affect the parent-child relationship; thus, it can be seen that the positive psychological qualities of academic perseverance for junior high school students is a key factor in the growth of the student's academic development. Thus, it is clear that the positive psychological quality of academic perseverance is the key to the growth and progress of junior high school students (Chengqing Wang, 2021), and the cultivation and establishment of the quality of perseverance is of great value to the future development of junior high school students (Lin Wanru, 2021). Therefore, this study focuses on investigating the current situation of junior high school students' academic perseverance quality, exploring the various factors affecting academic perseverance, and then proposing targeted educational recommendations.

Dweck was one of the first experts to propose that individuals possess a growth mindset, believing that intelligence or ability can be completely improved and enhanced through continuous effort, and their focus is on the process of learning rather than simply achieving performance goals. After problems with performance or good results, they neither give up on themselves nor become proud, but continue to learn and grow in the process of achievement, enjoying the joys of endeavour (Zhao, Yafei, et al., 2022). Tend to attribute positively when assessing successes and failures and see difficulties and challenges as opportunities to improve skills and have the resilience to overcome setbacks. Based on the core definition of growth mindset proposed by Dweck, our scholars have integrated it with different disciplines such as education and management, and have provided conceptual explanations for specific subject areas. This approach helps to better understand and apply the concept of growth mindset, so as to design and implement curriculum teaching that is more in line with the reality of specific disciplines. For example, Liu Ying-shan combines chemistry teaching with growth mindset, which she sees as an attitude of belief that chemistry learning ability can be improved (Liu, Ying-shan, 2020). Sun Shengnan elaborated on growth mindset in biology teaching, and he believed that growth mindset in biology learning is a series of ways

and means that students adopt to reflect their thinking styles by setting reasonable goals to achieve academic progress (Sun Shengnan, 2020). Individuals with a growth mindset hold the view of ability growth, they believe that intelligence is unknown, has the characteristics of growth, moulding and regulation, can be improved through hard learning and training, and will develop and change with individual efforts and experiences (Mindset: the new psychology of success, 2006). In recent years, growth mindset as a non-cognitive factor has attracted more and more attention from scholars (Liu, Y. M., Liu, H. R., & Zhang, P, 2021). In Zhai Xiangping's study, it is pointed out that growth mindset can mould the individual's perseverance quality (Yeh, R.M., K.H., 1992). This shows that there is a significant positive correlation between growth mindset and academic perseverance. Therefore, the independent variable of this study is growth mindset, and academic perseverance is the dependent variable to explore the relationship between the two in depth.

Atkinson believes that achievement motivation is a relatively stable tendency to pursue achievement or success and that success-seeking individuals have a strong desire to accomplish important goals and derive satisfaction from task success (Dong, J., et al., 2023). McClelland believes that achievement motivation is a fairly stable personality trait that can be socially acquired or learned (McClelland, M.M. & F.J. Morrison, 2003). Chongde Yang believes that achievement motivation belongs to a kind of social motivation, which refers to the intrinsic motivation and psychological tendency to endeavour and constantly challenge the difficulties in order to achieve excellence (Lin, Chongde, Yang & Huang, X. T., 2004). Ye Renmin believes that achievement motivation is a relatively stable personality trait, a learned positive or negative expectation related to a specific situation (Yeh, R.M., K.H., 1992). Together, the above perspectives emphasise the important role of achievement motivation as an important psychological trait in individual behaviour and learning processes. The different perspectives of understanding provide valuable food for thought for a deeper understanding of the nature and operating mechanisms of achievement motivation. To some extent, achievement motivation reflects the length of time an individual invests in completing important tasks (Liang, L., 1996). A study of primary and secondary school teachers by Bailey Liu and Xiaoyue Cai pointed out that growth mindset was significantly related to achievement motivation, and individuals with high levels of growth mindset showed stronger motivation to pursue success, while individuals with fixed mindset were more inclined to avoid risk and failure (Liu, Baili Liu & Cai, Xiaoyue, 2011). The results of Zhai Xiangping's study showed that growth mindset had a positive predictive effect on achievement motivation, future time insight and perseverance (Zhai Xiangping, 2018). Zhao Yafei's study found that future time insight and achievement motivation acted as chain mediators between growth mindset and perseverance (Zhao, Yafei, et al., 2022). This shows that there is a significant positive correlation between achievement motivation and academic perseverance. Therefore, this study explores the relationship between growth mindset and academic perseverance in junior high school students by using growth mindset as the independent variable, academic perseverance as the dependent variable, and achievement motivation as the mediator variable, so as to propose scientific educational suggestions.

Growth mindset is significantly and positively related to perseverance. Domestic scholars Peng Jiayi conducted an intervention study on junior high school students, and the results showed that growth mindset significantly and positively affects perseverance (PENG Jia-yi, 2022). Zhai Xiangping's study pointed out that growth mindset can mould the individual's quality of perseverance (Zhai Xiangping, 2018). Lee and Kwon pointed out in their study that growth mindset positively predicts high school students' perseverance (Lee, et al., 2016). Kim took Korean high school students as the research subjects, and the findings showed that growth mindset can have an effect on academic burnout through the mediating role of academic perseverance (K.T., K., 2020). Many previous studies at home and abroad have confirmed that growth mindset is significantly and positively correlated with perseverance (Wang, R. X., 2023), and academic perseverance is the concretisation of the quality of perseverance in academics. Therefore, this study can hypothesise that growth mindset positively predicts the level of academic perseverance of junior high school students.

Zhao Yafei's study showed that growth mindset

positively predicts achievement motivation (Zhao, Yafei, et al., 2022). The study by Dweck et al. proposed a model of motivation in the domain of intellectual achievement, which divides achievement goals into two aspects: learning goals and performance goals. Learning goals are aimed at acquiring knowledge and skills and developing personal competence, while performance goals are aimed at demonstrating an individual's ability to complete a specific task. According to the model, an individual's motivation depends heavily on their achievement goal orientation, i.e., whether they are pursuing learning goals or performance goals. Growth mindset, on the other hand, is closely related to learning goals because growth mindset focuses on the development and progress of the individual and views failure as an opportunity to learn and grow rather than an insurmountable obstacle. Growth mindset for the individual student tends to make students pursue learning goals in terms of both the acquisition of knowledge and skills and the development of personal competence. This learning goal-oriented motivation is consistent with the Implicit Idea-Achievement Goal Orientation-Motivation Model, which emphasises the individual's attitude and response to challenges and difficulties. In addition, Liu Baili and Cai Xiaoyue's study on primary and secondary school teachers found that growth mindset has a significant impact on achievement motivation, and individuals with a high level of growth mindset show stronger motivation to pursue success, while individuals with a fixed mindset are more inclined to avoid risks and failures (Liu, Baili Liu & Cai, Xiaoyue, 2011).

Zhai Xiangping's study found that achievement motivation was significantly and positively related to academic perseverance (Zhao, Yafei, et al., 2022). Perseverance plays a mediating role in academic motivation and academic achievement, and persistence is significantly correlated with achievement motivation, which, as an intrinsic driving force, is manifested mainly through the degree of effort and persistence in individual behaviour (Bei Pingli, 2013). It has been pointed out that, to some extent, achievement motivation reflects the length of time an individual invests in completing tasks that are important to him or her (Von Culin, K. R., Tsukayama, E., & Duckworth, A. L., 2014). This suggests that achievement motivation not only influences individuals' behavioural performance, but also reflects how much they value and invest in their goals.

2. Research Methods and Subjects

2.1 Research Subjects

Three hundred junior high school students in Q and H cities of H province were selected as the research subjects, with an age range of 12-16 years old, and a total of 260 valid questionnaires were collected, with an effective recovery rate of 86.67%. Among them, 122 (46.9%) were boys and 138 (53.1%) were girls; 60 (23.1%) were in the first year of junior high school, 114 (43.8%) in the second year of junior high school and 86 (33.1%) in the third year of junior high school. Academic performance was in the upper stream 74 (28.5%), middle stream 128 (49.2%) and lower stream 58 (22.3%).

2.2 Research Instruments

2.2.1 Growth Mindset Scale

The Growth Mindset Scale developed by Dweck et al. was chosen to contain six items, three of which measure growth mindset and the other three measure fixed mindset, which were reverse scored. The scale is scored on a 6-point scale, with 1 being "completely disagree" and 6 being "completely agree". Higher scores indicate a preference for growth mindset. The synthetic reliability of the growth mindset index scale was 0.61, with a 95% confidence interval of [0.53, 0.68].

2.2.2 Achievement Motivation Scale

The Achievement Motivation Scale compiled by Norwegian scholars Gjesme and Nygard, which was translated and revised by Ye Renmin, was used, which was divided into two dimensions: pursuit of success and avoidance of failure, with a total of 30 items, 15 questions for each dimension, and a 5-point scale, ranging from "not conforming to any of them" to "conforming completely". The higher the score, the stronger this type of motivation, the scale has a split-half reliability of 0.77 and a validity of 0.58 (Zhang Lifan, et al., 2017). The synthetic reliability of the achievement motivation scale for this measurement was 0.79 with a 95% confidence interval of [0.75, 0.82].

2.2.3 Academic Perseverance Scale

The Academic Perseverance Scale developed by Kelly was chosen, which is a unidimensional

scale consisting of 10 items, and the questionnaire adopts a 5-point scale, with 1 standing for "not conforming at all" and 5 standing for "conforming completely", and the higher the score, the higher the level of perseverance. The synthetic reliability of the Academic Perseverance Scale was 0.85, with a 95% confidence interval of [0.82, 0.88].

2.3 Research Methods

SPSS 26.0 was used to enter and process the collected data and Process was used for correlation analysis and testing of the model.

3. Results and Analyses

3.1 Common Method Bias Test

In order to verify whether the effect of the recovered questionnaire is in line with the study, the results of Harman one-way test of the data show that there are 12 factors with eigenvalues greater than 1, and the first factor is 13.89%, which is less than 40%. It shows that the questionnaire has validity and scientificity and meets the test criteria.

3.2 Correlation Analysis Among Variables

Correlation analysis of growth mindset, achievement motivation and academic perseverance was conducted through the statistical method of Pearson's product-difference correlation, and growth mindset was positively correlated with academic perseverance, growth mindset was significantly positively correlated with achievement motivation, and academic perseverance was significantly positively correlated with achievement motivation. The results are shown in Table 1.

Table 1. Correlation of Growth Mindset, Achievement Motivation, and Academic Perseverance

	M	*SD*	Growth mindset	Academic perseverance	Achievement Motivation
Growth Mindset	3.09	0.73	1		
Achievement Motivation	3.24	0.44	0.36**	1	
Academic perseverance	3.34	0.65	0.23**	0.37**	1

Note: $p<0.05^{*}$, $p<0.01^{**}$.

3.3 Test of Mediating Effect of Achievement Motivation

The mediating validity of achievement motivation in the relationship between growth mindset and academic perseverance was tested using Model 4 (Model 4 is a simple mediation model) in the SPSS macro prepared by Hayes (2012), controlling for gender, only child, and grade level, as shown in Table 2.

Table 2. Mediation model of achievement motivation in the relationship between growth mindset and academic perseverance

Regression equation (N=260)		Fit Indicator			Coefficient Significant	
Outcome variable	Predictor variable	*R*	*R2*	*F*	*β*	*t*
		0.36	0.13	4.66***		
Academic perseverance	Gender				0.16	2.08*
	Grade				-0.09	-1.08
	Growth mindset				0.22	4.21***
		0.38	0.14	5.19***		
Achievement Motivation	Gender				0.01	0.20
	Grade				0.01	0.41

	Growth mindset				0.21	6.05 ***
		0.49	0.24	8.64 ***		
Academic Perseverance	Gender				0.16	2.14*
	Grade				-0.10	-2.07*
	Growth mindset				0.11	2.07*
	Achievement Motivation				0.53	5.95***

Note: All variables in the model are standardised Z-score treated and brought into the regression equation, below.

Table 3. Decomposition of total, direct and mediating effects

	Effect Value	*Boot* standard error	*Boot* lower limit	*Boot* upper limit	Relative Effect Value
Total effect	0.22	0.05	0.12	0.33	
Direct effect	0.11	0.05	0.01	0.21	50.00 per cent
Achievement Motivation Mediation Effect	0.11	0.03	0.06	0.17	50.00 per cent

Note: All values are retained in two digits by rounding, same below.

The results (see Table 3) showed that the effect of growth mindset on academic perseverance was significant for junior high school students (β=0.22, t=4.21, p<0.001) and remained significant after putting in the mediator variable (β=0.11, t=2.07, p<0.05). The positive predictive effect of growth mindset on achievement motivation was also significant (β=0.21, t=6.05, p<0.001). In addition, the upper and lower bounds of the bootstrap 95% confidence intervals for the direct effect of growth mindset on the impact of academic perseverance and the mediating effect of achievement motivation did not contain 0 (see Table 3). The data suggest that, on the one hand, growth mindset directly predicts academic perseverance and, on the other hand, growth mindset predicts academic perseverance through the mediating effect of achievement motivation. This direct effect (0.11) and mediating effect (0.11) accounted for 50.00% and 50.00% of the total effect (0.22), respectively.

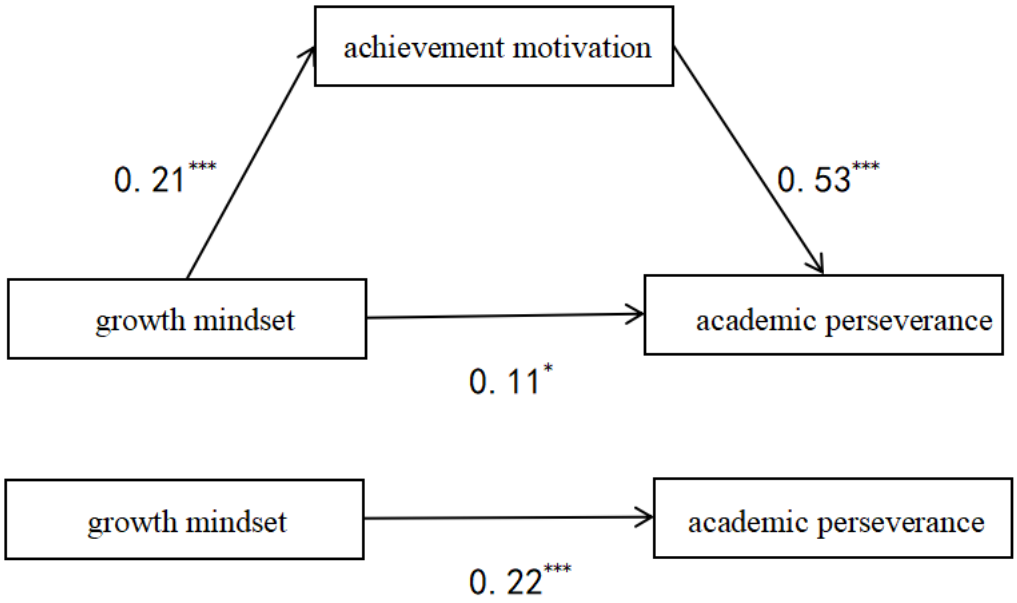

Figure 1. Path diagram showing the mediating effect of achievement motivation

4. Discussion and Suggestions

4.1 Conclusion of the Study

Through the investigation of the current situation of middle school students' growth mindset, academic perseverance, and achievement motivation, the test of demographic differences of each variable, and the analysis of the relationship between the variables, the following conclusions are drawn: (1) The academic perseverance of the subjects of the study is at a moderately high level, and when facing the academic tasks they are both challenging but at the same time they have enough coping ability. (2) Growth mindset, academic perseverance, and achievement motivation differed significantly on some demographic variables, such as gender, being an only child, being a class officer, grade level, and grade rank. (3) There is a two-by-two positive correlation between growth mindset and academic perseverance and achievement motivation among middle school students. Growth mindset has a significant positive predictive effect on academic perseverance and achievement motivation. (4) Achievement motivation has a partial mediating effect between growth mindset and academic perseverance among junior high school students.

4.2 Discussion of Results

A correlation analysis was conducted between growth mindset, achievement motivation, and academic perseverance of junior high school students. The results show that there is a significant positive correlation between these three variables. Students with higher levels of growth mindset tend to also have stronger achievement motivation and academic perseverance, and vice versa.

There was a significant positive correlation between growth mindset and academic perseverance among junior high school students, a result that is consistent with the findings of Wu Jing's study (Jing Wu, 2023). The higher the growth mindset score, the more the individual desires to achieve success, shows more perseverance in learning, and scores higher in academic perseverance. Students with a growth mindset carry a full passion for the learning process, actively discuss problems with teachers and classmates, and enjoy pursuing challenging tasks. When faced with hardships and setbacks in learning, they respond with a positive and optimistic mindset and do their best to find solutions to problems. The growth mindset tends to view challenges as opportunities for growth. This positive mindset will stimulate individuals' intrinsic achievement motivation and prompt them to work hard to achieve their academic goals. At the same time, this positive mindset enhances students' academic fortitude, enabling them to face difficulties with greater patience and perseverance. As a result, individuals with a growth mindset have increasing levels of academic perseverance as they progress in their studies. The higher the level of growth mindset, the more capable individuals are of overcoming difficulties when facing academic setbacks, and the quicker they find solutions to problems and the best way to solve them. There is a significant positive correlation between growth mindset and achievement motivation in junior high school students, and the higher the level of growth mindset, the higher the total achievement motivation score. Growth mindset people are more inclined to see setbacks as opportunities to learn and grow rather than the end of failure. Instead of being knocked down by setbacks, they face them positively and learn from them. Students with a growth mindset are typically more resilient and adaptable to adversity, and are more likely to face challenges and learn from them rather than be knocked down by them. This resilience and adaptability to adversity may enhance their academic fortitude, enabling them to maintain a positive attitude and sustained effort in the face of difficulties. As a result, they are more motivated and patient to overcome challenges and difficulties, thus finding solutions to problems more quickly. Moreover, growth mindset people are open to new knowledge and skills and are willing to learn and explore hard. They believe that their efforts and learning can improve the status quo. A growth mindset is usually associated with a clear perception of future goals and the active pursuit of them. This goal-orientation may stimulate intrinsic achievement motivation within individuals, driving them to work hard to achieve their academic goals. At the same time, this goal-orientation may also promote academic perseverance in students as they become aware of the effort and persistence required to achieve their goals. As a result, they will be more proactive in finding solutions and the best way

to deal with problems. They are willing to try different approaches and learn and improve from them. In addition to this, achievement motivation is significantly positively correlated with academic perseverance, a result that is consistent with the findings of Sun Mengmeng (Sun, M. M., 2021). Higher achievement motivation scores indicate that individuals are able to show more perseverance and determination in the face of academic difficulties, actively explore them, and are willing to take the initiative to maintain a moderate level of achievement motivation so as to achieve academic success.

The results of the study revealed a significant positive predictive effect between growth mindset, academic perseverance, and achievement motivation among middle school students. Specifically, there was a significant positive correlation between growth mindset and academic perseverance, suggesting that individuals who are more inclined to growth mindset tend to show greater academic perseverance. There was also a significant correlation between growth mindset and achievement motivation, suggesting that individuals with a growth mindset tend to have stronger achievement motivation in the unique domain of academics.

Upon further testing, the results of the study showed that achievement motivation played a partial mediating role between growth mindset and academic perseverance. This implies that growth mindset influences the level of academic perseverance by affecting achievement motivation. Specifically, individuals with growth mindset are more likely to show higher achievement motivation, which makes them more motivated to pursue academic success; at the same time, higher achievement motivation also leads to higher academic perseverance, as they believe that they can achieve their goals through hard work and perseverance, which makes them more motivated to face the challenges and difficulties in their studies, and therefore, they show stronger academic perseverance. In turn, growth mindset indirectly promotes the development of academic perseverance by stimulating students' achievement motivation. This finding highlights the critical role of achievement motivation in the relationship between growth mindset and academic perseverance, and provides important insights for educational practice. The findings validate the hypothesis that achievement motivation mediates growth mindset and academic perseverance. The reason for this hypothesis may be that with the spread of education, educators are paying more attention to the development of growth mindset in their students and encouraging students to have moderate achievement motivation. At the same time, educators are able to care not only about students' achievement, but also about students' physical and mental health, and actively encourage students when they face academic setbacks, so that students continue to grow in the process, and the level of academic perseverance continues to increase. Therefore, the study shows that the level of academic perseverance of junior high school students can be improved by cultivating their growth mindset or by enhancing their achievement motivation.

4.3 Suggestions and Insights

4.3.1 Change the Inherent Mode of Thinking and Cultivate a Growth Mindset

First of all, in family education, on the one hand, it is necessary to cultivate children's imagination from childhood. For example, by cultivating the habit of reading in order to improve children's imagination and thinking ability. Reading, as a basic way for children to learn about the world, facilitates their exposure to books on a variety of topics, which can broaden their horizons and foster critical and creative thinking, thus demonstrating deeper and more original insights when analysing and solving problems. On the other hand, the practice of incorporating a growth mindset into daily life is crucial. Parents can share with their children stories about endeavours, challenges and failures, and emphasise the importance of maintaining an optimistic and positive attitude in the face of setbacks and difficulties.

Secondly, in school education, on the one hand, teachers should help students develop divergent thinking and a sense of creativity in the education process so as to enhance their ability to identify, analyse and solve problems. By exposing students to a variety of different problems and challenges, they can stimulate their thinking and learn to solve problems using a variety of methods and really learn by touch in order to improve their ability to solve practical problems. On the other hand, educators should create a positive learning atmosphere and

campus environment so that students can live and work in a relaxed atmosphere. At the same time, emotional education should be incorporated into educational activities, and emphasis should be placed on cultivating students' emotional literacy and giving them sufficient encouragement and support.

Again, individual students should study diligently and hard on the one hand, and diligence and hard work are the core of growth mindset, individuals should devote their energy and time to their own goals and keep working hard for them, and they should take the initiative to accept all kinds of challenges, and regard the challenges as an opportunity to learn and grow rather than the end of failure. When faced with challenges, students should think about how to learn from them, grow and improve themselves. On the other hand, when an individual succeeds in the pursuit of a goal, he or she should learn to affirm himself or herself that this is the result of his or her own efforts, that my future has unlimited possibilities, and that I believe I can do better and better, thus developing a positive mindset.

4.3.2 Understand Students' Interests and Needs, and Cultivate Moderate Achievement Motivation

First of all, in school education, teachers should deeply understand all students, communicate with them, listen to their opinions and ideas, and understand their needs and interests and preferences for learning. Targeted learning goals should be set according to students' interests and needs. Students should also be encouraged to focus on the learning process rather than the outcome. Emphasise the importance of effort, perseverance and learning methods so that students will realise that success comes through continuous effort and learning.

Secondly, in home education, parents can learn about their children's interests by observing their daily behaviour. Pay attention to what their children usually like to do, what kind of music they like to listen to, what kind of books or films they like to watch, and let their children take the initiative to do hands-on practice and listen to their words in different ways, so that they can realise the actual meaning and importance of the goals in the process of activities and experiences, for example, by linking learning with the practice of life, so as to make students have the awareness of long-term and persistent warfare, persist in putting in learning and working hard to improve the achievement motivation.

Again, individuals need to recognise that clear goals are the first step to success, so they need to clarify their values and visions and set specific, measurable and achievable goals for themselves. Values are the individual's views and beliefs about life and work, and vision is the expectation and plan for the future. Clarifying values and visions can help individuals to know themselves better. Students should proactively seek feedback and suggestions from others and, based on the feedback, adjust and improve their learning methods and behaviours in a timely manner to enhance achievement motivation.

4.3.3 Collaborative Parenting Between Home and School to Improve Students' Academic Perseverance

Firstly, in school education, on the one hand, academic perseverance can be actively integrated into other related programmes through subject penetration. According to the connotation of academic perseverance, teachers can carry out specific perseverance counselling in various humanities, science and social courses through cultivating interest, setting clear goals, systematic practice, active participation in activities and practical exercises. On the other hand, school newspapers, slogans and drawings posted in corridors, and tweets on public websites can be used to enhance students' and parents' awareness of perseverance in a subtle way.

Secondly, in family education, parents should adopt a positive attitude. On the one hand, they should cooperate with the school's educational work, actively participate in parent-teacher conferences, class meetings, expert lectures and other activities, and constantly improve their own educational awareness and ability. Parents can also communicate with school teachers on a regular basis to share their children's learning and growth experiences, discuss how to help their children improve their level of academic perseverance, learn to use scientific education methods to educate their children, and actively participate in their children's education. On the other hand, parents should also actively communicate with their children's teachers to discuss how to improve their children's academic perseverance, so as to provide better support and guidance for their children's growth and development.

Once again, individuals should set clear goals, make specific, quantifiable plans, choose goals they really love, and consistently implement them. Liking is not the same as love, only in the like to continue to persist, will develop into love. And the quality of perseverance that comes from one's love will give one the courage and confidence to overcome difficulties. The key to enhancing students' level of academic perseverance lies in developing their self-discipline and perseverance, establishing good study habits, ensuring that they study regularly every day, and that they do not retreat when they encounter difficulties but face them bravely and look for solutions. The tendency of procrastination and laziness is overcome through strong determination and relentless endeavour.

References

Bei Pingli. (2013). A Study on the Relationship between Self-Esteem, Perseverance, and Achievement Motivation among College Students (Master's Thesis, Sichuan Normal University).

Chengqing Wang. (2021). Relationships between academic perseverance, commitment to learning, teacher support, and academic achievement among junior high school students. *Elementary and Middle School Mental Health Education*, (31), 13-17.

Clark, K. N., & Malecki, C. K. (2019). Academic Grit Scale: Psychometric properties and associations with achievement and life satisfaction. *Journal of school psychology*, *72*, 49–66. https://doi.org/10.1016/j.jsp.2018.12.001

Dong, J., et al. (2023). Effect of Achievement Motivation and Self-Efficacy on General Well-Being among Students at Normal Universities in Ningxia: The Mediating Role of Time Management. *Behavioral Sciences, 14*(1).

Hongyu Liao. (2022). Factors Influencing Academic Perseverance Among Junior High School Students and Course Interventions (Master's Thesis, Fujian Normal University). doi:10.27019/d.cnki.gfjsu.2022.000435.

Jing Wu. (2023). The Impact of Teacher Self-Support on Academic Perseverance Among Junior High School Students: The Role of Growth Mindset and Hope (Master's Thesis, Mudanjiang Normal University). doi:10.27757/d.cnki.gmdjs.2023.000342.

K.T., K. (2020). A Structural relationship among growth mindset, academic grit, and academic burnout as perceived by Korean high school students. *Universal Journal of Educational Research, 8*(9), 4009-4018.

Kelly, D.R., M.D. Matthews, and P.T. Bartone. (2017). Grit and Hardiness as Predictors of Performance Among West Point Cadets. *Military Psychology, 26*(4), 327-342.

Lee, et al. (2016). An Analysis of Structural Relationship among Locus of Control, Mindset, Grit, and Academic Achievement. *Korean Journal of Youth Studies, 23*(11), 245-264.

Liang, L. (1996). History and current status of achievement motivation research. *Educational Theory and Practice*, (01), 32-35+31.

Lin Wanru. (2021). Academic perseverance among secondary school students: Structure, influencing factors, and effects (Doctoral dissertation, Fujian Normal University). doi:10.27019/d.cnki.gfjsu.2021.002170.

Lin, Chongde, Yang, Huang, X. T. (2004). Preface to the Dictionary of Psychology. *Psychological Development and Education*, (02), 96.

Liu, Baili Liu and Cai, Xiaoyue. (2011). A correlational study of primary and secondary school teachers' implicit intellectual stability beliefs and achievement motivation levels. *Education Guide*, (06), 34-38.

Liu, Y. M., Liu, H. R., and Zhang, P. (2021). The relationship between growth mindset, perseverance personality and subjective well-being in adolescents. *Journal of Jimei University (Educational Science Edition), 22*(04), 27-33.

Liu, Ying-shan. (2020). A Study on the Measurement and Teaching Strategies of Growth Mindset in Chemistry Learning (Master's Thesis, Tianjin Normal University). doi:10.27363/d.cnki.gtsfu.2020.000609.

McClelland, M.M. and F.J. Morrison. (2003). The emergence of learning-related social skills in preschool children. *Early Childhood*

Research Quarterly, 18(2), 206-224.

Mindset: the new psychology of success. (2006). *Choice Reviews Online, 44*(04), 44-2397.

PENG Jia-yi. (2022). The Relationship between Growth Mindset, Achievement Goal Orientation, and Grit among Junior High School Students and Intervention Research. Guangzhou University, 2022. DOI: 10.27040/d.cnki.ggzdu.2022.001083.

Song Naiqing, Zhao Qiuhong & Luo Shiyan. (2020). Research on the current status, problems and countermeasures of learning perseverance among secondary school students during a major epidemic. *Research on Education Development, 40*(08), 32-37+44. doi:10.14121/j.cnki.1008-3855.2020.08.007.

Sun Shengnan. (2020). A Study on the Cultivation of Growth Mindset Abilities in High School Students in Biology Education (Master's Thesis, Liaoning Normal University). doi:10.27212/d.cnki.glnsu.2020.000697.

Sun, M. M. (2021). The Relationship between Social Support, Resilience, and Growth Mindset among Upper Primary School Students (Master's Thesis, Hebei Normal University). doi:10.27110/d.cnki.ghsfu.2021.000304.

Von Culin, K. R., Tsukayama, E., & Duckworth, A. L. (2014). Unpacking grit: Motivational correlates of perseverance and passion for long-term goals. *The journal of positive psychology*, *9*(4), 306–312. https://doi.org/10.1080/17439760.2014.898320

Wang, R. X. (2023). The Relationship Between Growth Mindset and Learning Engagement Among High School Students: The Longitudinal Mediating Role of Grit (Master's Thesis, Tianjin Normal University). doi:10.27363/d.cnki.gtsfu.2023.000761.

Xiao, F. F. (2021). A Study on the Relationship between Academic Perseverance, Academic Emotions, and Academic Performance among Upper-Grade Primary School Students and Educational Countermeasures (Master's Thesis, Fujian Normal University). doi:10.27019/d.cnki.gfjsu.2021.001768.

Yeh, R.M., K.H. (1992). Measurement and analysis of achievement motivation. *Psychological Development and Education*, (02), 14-16.

Zhai Xiangping. (2018). The Relationship Between Growth Mindset and Grit: The Mediating Role of Future Time Perspective and Achievement Motivation (Master's Thesis, Ludong University).

Zhang Lifan, et al. (2017). The effects of parental commitment on children's persistence in learning — the mediating role of achievement goals. *Journal of Beijing Normal University (Social Science Edition)*, (04), 26-32.

Zhao, Yafei, et al. (2022). The relationship between growth mindset and perseverance: the chain-mediated effects of future time insight and achievement motivation. *Psychological Development and Education. 38*(02), 216-222.