IMPULSE RESEARCH STUDY DETAIL AND RESULTS

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Executive Summary

This quasi-experimental study investigates how the immersive virtual reality (VR)/Mixed Reality experience *Impulse* influences knowledge, engagement or immersion, stigma, behavioral intentions, empathy toward individuals with Attention-Deficit/Hyperactivity Disorder (ADHD). Participants (N ≈ 60–100) were categorized into three groups: individuals with ADHD, family members or professionals who support people with ADHD, and a control group with no direct ADHD experience. Measures were collected at three time points—pre-test, immediate post-test (T1), and one-month follow-up (T2)—to assess sustained changes. Results are expected to demonstrate increased ADHD knowledge, reduced stigma, improved empathy, and positive behavioral change, highlighting VR's potential as an educational and empathy-building tool for reducing social misconceptions about ADHD.

1. Background

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental condition characterized by inattention, impulsivity, and hyperactivity. Despite its prevalence, ADHD remains highly stigmatized, often associated with negative stereotypes such as lack of self-control, aggression, or unpredictability. These misconceptions can lead to discrimination, self-stigma, and limited access to support systems (Hinshaw, 2018).

Virtual reality (VR)/ Mixed Reality (MR) has emerged as a promising medium for empathy enhancement and behavioral change. By providing an immersive, first-person experience, VR allows users to "step into the shoes" of individuals facing stigmatized conditions, thus promoting understanding and reducing prejudice (Herrera et al., 2018). The *Impulse* VR experience, created as part of an educational initiative, aims to simulate cognitive and emotional aspects of living with ADHD—offering a multisensory insight into the condition's challenges and societal barriers.

2. Objectives

This study aims to assess whether participation in *Impulse* leads to measurable changes in:

1. Knowledge about ADHD
2. Stigma and attitudes toward ADHD
3. Behavioral intentions and self-reported actions
4. Empathy (cognitive and affective) toward people with ADHD
5. Immersion and engagement in VR

3. Methodology

A quantitative-method experimental design was employed only quantitative data. Participants experienced the Impulse VR simulation and completed structured questionnaires before and after the session.

4. Participants:

Adults (minimum 18 years old) from three groups:

Group 1 (ADHD): 20–35 participants

This group includes individuals who have been diagnosed with ADHD or who believe they may have ADHD. Note: If a participant also has a family member with ADHD, they should still select this option, as the focus is on their own experience living with ADHD.

Group 2 (Family of ADHD / Close Contact): 20–35 participants. This group consists of individuals who do not have ADHD themselves, but: Have a family member or very close friend with ADHD, or work closely with children or adults who have ADHD (e.g., teachers, counselors, caregivers).

Participants in this group have experienced some impact or influence from ADHD in their personal or professional life.

Group 3 (Control): 20–35 participants

This group includes individuals who:

- Do not have ADHD,
- Do not have a close family member or close friend diagnosed with ADHD, and
- Do not work closely with children or adults with ADHD (e.g., as a teacher, counselor, or caregiver).

This group serves as a baseline comparison to evaluate changes in knowledge, empathy, and behavior after the VR experience.

5. Participants:

- Participants completed a **consent form** agreeing to take part in the study and a **pre-test** to assess baseline knowledge and attitudes/stigma.
- They experienced the **VR simulation "Impulse"**, designed to replicate the cognitive and emotional challenges faced by individuals with ADHD.
- Immediately after, participants entered a **reflection room** to discuss their impressions and filled in the **post-test** (T1).
- A **follow-up survey (T2)** will be distributed one month later to assess sustained changes in knowledge, attitudes/stigma, empathy, behavior and immersion or engagement.

6. Experimental Research Design

The study follows a **pre-test/post-test/follow-up design**, with data collected at three points:

- **T0 – Pre-test:** Baseline measurement of ADHD knowledge and attitudes.
- **T1 – Immediate Post-test:** Measurement of changes after the VR experience.
- **T2 – One-Month Follow-up:** Evaluation of retained learning and long-term behavioral changes.

This design allows comparison across time and participant groups to identify both immediate and lasting effects of the VR intervention.

7. Research & Hypotheses

1. Knowledge about ADHD

Research Question:

Does the VR experience (Impulse) increase knowledge about ADHD, and does this effect differ across groups (ADHD, family of ADHD, control) over time?

Hypothesis (Time):

- H1a: Knowledge scores will increase **immediately after the VR experience and remain higher at 1-month follow-up** compared to pre-test scores.

Hypothesis (Group):

- H1b: The control group will have **higher knowledge gains** than the Participants with ADHD or family members of ADHD.

2. Attitude/ Stigmatization toward ADHD

Research Question:

Does the VR experience (Impulse) reduce stigma toward people with ADHD/themself, and does this effect differ across groups over time?

Hypothesis (Time):

- H2a: Stigma levels will **decrease immediately after the VR experience and remain lower at 1-month follow-up** compared to baseline.

Hypothesis (Group):

- H2b: Participants with the control group will show **greater reductions in stigma** than ADHD or family members of ADHD.

3. Behavioral Change

Research Question:

Does the VR experience (Impulse) promote positive behavioral changes toward people with ADHD or themself, and does this effect differ across groups over time?

Hypothesis (Time):

- H3a: Positive behaviors toward people with ADHD will **increase immediately after the VR experience and remain higher at 1-month follow-up**.

Hypothesis (Group):

- H3b: Participants with ADHD or family members of ADHD will show **larger or more sustained behavioral changes** than the control group.

4. Empathy toward People with ADHD

Research Question:

Does the VR experience (Impulse) increase empathy (cognitive and affective) toward people with ADHD, and does this effect differ across groups over time?

Hypothesis (Time):

- H4a: Cognitive and affective empathy scores will **increase immediately after the VR experience and remain higher at 1-month follow-up**.

Hypothesis (Group):

- H4b: Participants with ADHD or family members of ADHD will show **higher empathy gains** than the control group.

5. Immersion/ Engagement

Research Question (Immersion/Engagement):

Does the level of immersion or engagement in the VR experience **Impulse** differ depending on participant group (ADHD, family of ADHD, control)?

Hypothesis (Group)

- H5: Participants with ADHD or who have a family member with ADHD will report **higher immersion and engagement** in the VR experience compared to the control group.

8. Questionnaires and Measures

To assess these hypotheses, the study includes the following instruments:

1. **Knowledge Questionnaire** – Measures understanding of ADHD diagnosis and symptoms (Pre-test, Post-test, Follow-up).
2. **Stigma Scales:**
    - *Self-Stigma* (for Group 1).
    - *Perceived Stigma from Others* (for Groups 2 and 3).
3. **Behavioral Change Scales:**
    - *Toward Self* (for Group 1).
    - *Toward Others* (for Groups 2 and 3).
4. **Empathy Scale** – Measures cognitive and emotional empathy toward individuals with ADHD. (Post-test, Follow-up).
5. **Immersion Questionnaire** – Evaluates the level of presence and engagement during the VR experience (Post-test only).
6. **Demographic Questions** – Age, gender, education, occupation, and city.

7. **Feedback Section** – Open-ended comments on user experience and feedback

Quick mapping table

Measure	**Pre-test**	**Immediate post (T1)**	**Follow-up (T2, 1 month)**
Knowledge (diagnosis & screening)	✓	✓	✓
Attitudes / Stigmatization	✓	✓	✓
Behavioral baseline (current behaviour)	✓	Intentions / plans	Actual behaviour report ✓
Empathy (cognitive & affective)	—	✓	-
Immersion / engagement (VR)	—	✓	—

Questionnaires by Group

Measure / Section	**Group 1 (ADHD)**	**Group 2 (Family, close relationship/ Professional)**	**Group 3 (Control)**
ADHD Knowledge	Pre-test, Immediate Post (T1), Follow-up (T2)	Pre-test, Immediate Post (T1), Follow-up (T2)	Pre-test, Immediate Post (T1), Follow-up (T2)
Self-Stigma	Pre-test, Immediate Post (T1), Follow-up (T2)	—	—

Stigma from Others	Immediate Post (T1), Follow-up (T2)	Immediate Post (T1), Follow-up (T2)	Immediate Post (T1), Follow-up (T2)
Behavioral Change Toward Self	Immediate Post (T1), Follow-up (T2)	—	—
Behavioral Change Toward Others	Immediate Post (T1), Follow-up (T2)	Immediate Post (T1), Follow-up (T2)	Immediate Post (T1), Follow-up (T2)
Empathy Toward Others with ADHD	Immediate Post (T1), Follow-up (T2)	Immediate Post (T1)	
Immersion – VR Experience	Immediate Post (T1)	Immediate Post (T1)	

9. Consent and Ethical Considerations

All participants signed an **Informed Consent Form** outlining:

- The voluntary nature of participation.
- The right to withdraw at any time without consequences.
- Assurance of anonymity and confidentiality.
- Agreement to participate in a follow-up survey after one month.
- Provision of contact information (email or WhatsApp) solely for survey reminders.

Participants received a **voucher** as recognition for their contribution after they will fill out the last follow-up survey (1 month). The study adheres to ethical standards for research involving human participants.

10. Expected Outcomes

The *Impulse* project is expected to demonstrate that immersive VR can:

- Foster **empathy, knowledge** and **understanding** of ADHD challenges.
- Reduce **social stigma** through this immersive experience.
- Encourage **behavioral and attitudinal change** both toward oneself and others.
- High level of **immersion/engagement** of the VR/MR experience in the audience.

11. IMPULSE Impact Goals

The *Impulse* VR experience was designed with the following **learning and impact objectives**:

a) Experiential Understanding of ADHD:

- Provide participants with a closer understanding of what it feels like to **experience ADHD**, including the **challenges of the condition** and the **stigma** associated with it.

b) Embodied Experience of Overwhelm:

- Allow participants to **experience being overwhelmed** in a safe, controlled environment to foster empathy and self-reflection.

c) Importance of Diagnosis:

- Offer **insights into why a formal ADHD diagnosis is valuable** and highlight the significance of that moment in someone's life.

d) Reflective Space:

- Encourage participants to **reflect on whether they see themselves or others** in the behaviors and experiences depicted.

e) Societal Impact on Outcomes:

- Demonstrate how **treatment of people with ADHD by society** (acceptance, support, or stigma) can **significantly influence outcomes**.

f) Compassion and Self-Compassion:

- Foster a **felt experience of approaching people they know — including themselves — with more compassion**, promoting **self-compassion** for those with ADHD.

g) Appreciation of Condition Severity:

- Help participants **appreciate the gravity of ADHD** and the challenges it entails.

h) Proactive Adaptations:

- Inspire participants to be **more proactive in making adaptations** within their own capacity to accommodate ADHD needs in everyday life.

i) Social and Economic Awareness:

- Highlight that **outcomes for individuals in lower-income or less well-supported communities** may be worse than in more advantaged social groups, emphasizing the importance of support.

j) Empowerment Through Support:

- Interviews indicated participants **appreciated the power of individuals** to make meaningful differences in supporting others through these challenges.

12. Links of the Questionnaire or Survey

Pre test Survey: https://forms.gle/NHETBCGD5ArLJL9m9

Post test Survey: https://forms.gle/qC1RFNP8hxMQb6e58

Follow up test Survey (1 month later): https://forms.gle/ixWQ8YDA5Zak1uH7A

13. Consent form

The consent form is included at the beginning of the **pre-survey** and is completed **digitally**. Participants are required to read and agree to the consent form before

proceeding with the survey. The form is hosted and managed through **Google Forms**, ensuring easy access and secure collection of responses.

Text of the consent form for participants

Research Purpose

You are invited to participate in an experimental study exploring attitude, stigma, empathy, and behavioral responses toward ADHD after experiencing the virtual reality project *Impulse*.

Procedure

If you agree to participate, you will:

Complete a short **pre-test questionnaire** before the VR experience. *(Estimated time: 10–14 minutes)*

Participate in the **VR experience (Impulse)** at the gallery.

Visit the **reflection room** immediately after the VR experience.

Complete an **immediate post-test questionnaire** after the session. *(Estimated time: 6–10 minutes)*

Complete a **follow-up questionnaire one month later**, which will be sent to you digitally. *(Estimated time: 6–10 minutes)*

You will receive a **voucher** for your participation, one month after completing the final online survey.

Commitment

By participating in this research, you agree to complete all stages of the study, including the follow-up questionnaire after one month. Please note that if you do not complete the final questionnaire, your data may not be included in the final analysis.

Contact Information

To send your follow-up questionnaire, we require your full name, **email address or WhatsApp number**.
This contact information will be used **only** to remind you about the final questionnaire and will remain **confidential** and **anonymous** in the final report.

All data will be stored securely and treated confidentially according to ethical research standards.

Voluntary Participation and Withdrawal

Your participation is entirely voluntary. Some participants may experience emotional reactions during the VR experience. You are free to pause or end the session at any time without penalty or loss of benefits. If you experience discomfort or wish to end your participation, please inform the research team immediately.

Honesty in Responses

Please answer all questions as honestly as possible.
Your genuine responses are essential for the quality and validity of this study.

Publication and Confidentiality

The findings of this research may be published in a report. All information collected will be used for research purposes only.

Consent and Commitment Questions

Do you agree to participate in this research study?

- Yes
- No

Do you commit to completing a follow-up survey about this experience in one month? *

- Yes
- No

Would you like to receive the results of this experience by email? *

- Yes
- No

What is your full name?*

What is your email?*

What is your WhatsApp number or phone number? *

13. Pre -Test IMPULSE SURVEY

Demographics

Please answer the following demographic questions

1. What is your age?* (open question)

2. What is your gender identity?*

- Female
- Male
- Non-binary
- Prefer not to say

3. What is your nationality?*

4. In which city do you live?*

5. Educational Level (please select the highest level you have completed) *

- No formal education
- Primary education (elementary school)
- Secondary education (high school)
- Vocational training / Technical education
- Some college / Higher education, not completed
- Bachelor's degree
- Master's degree
- Doctoral degree (PhD, EdD, etc.)
- Other:

6. What is your previous experience with Virtual Reality (VR)? *

- I have never used Virtual Reality
- I have used Virtual Reality occasionally
- I use Virtual Reality frequently

7. What is your previous experience with ADHD education or resources? *

- Yes, I have taken courses or workshops, or accessed information about ADHD
- No, I have not had any previous experience with ADHD education or resources

8. ADHD Diagnosis*

- Yes, I have been diagnosed with ADHD
- I believe I have ADHD but have not been formally diagnosed
- No

9. Family History of ADHD*

- I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example,

as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.
- No

10. To confirm your status in this study, please indicate which group best describes you: *

- 1. I have been diagnosed with ADHD, or I believe I may have ADHD.
- 2: I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.
- 3: I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).

2. Section A. Self-Stigma (Only Group 1)

Please answer the following questions **based on your own personal experience living with ADHD**.
There are no right or wrong answers — we are interested in understanding your genuine thoughts and feelings.

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

*2.1. I sometimes feel guilty about having ADHD**

*2.2. I feel worse about myself because of how others think about ADHD**

*2.3. I worry it is risky to tell others that I have ADHD**

*2.4. I work hard to keep my ADHD a secret.**

*2.5. I feel that I am not as good a person as others because I have ADHD.**

*2.6. I sometimes feel damaged because of my ADHD**

*2.7. Since learning I have ADHD, I have felt set apart or isolated from others**

*2.8. I worry that others will judge me because of my ADHD.**

*2.9. I regret telling some people that I have ADHD.**

*2.10. Getting an ADHD diagnosis helped me understand myself better and cope with challenges.**

3. Behavioral Change Toward themself ADHD (Only Group 1)

Please answer the following questions **based on any changes you have noticed in your own behavior, habits, or self-care since becoming more aware of ADHD**. Try to reflect honestly on how your thoughts, routines, or attitudes toward yourself may have evolved.

3.1 Which of the following actions have you taken to learn more about or manage ADHD? * *(You can choose more than one answer)**

a. I decided to see a doctor or mental health professional to learn more about ADHD.

b. I have scheduled or attended an appointment with a healthcare professional about ADHD.

c. I seek advice from online resources or support groups about ADHD.

d. I joined an ADHD support group.

e. I consulted a coach or mentor.

f. I talked to a school or work counselor.

g. Other type of help or support I have sought.

3.2. If you selected "Other", please describe which type of help or support you have sought: (Open Question)

3.3. *Which of the following actions have you taken to increase your self-awareness or knowledge about ADHD?*
*(You can choose more than one answer)**

a. I decided to read more about ADHD

b. I attend workshops, webinars, or online courses to learn more about ADHD

c. I reflect more on my own behaviors or habits in relation to ADHD symptoms

d. I have adopted new strategies to manage my attention or focus based on what I learned

e(g). Other type of help or support I have sought.

3.4. If you selected "Other," please describe which type of self-education or awareness activity you have engaged in: (Open Question)

3.5. ***Which of the following changes have you made in your daily life since learning more about ADHD? (You can choose more than one answer)****

a. I have implemented strategies in daily life to improve focus, patience, or organization.

b. I practice mindfulness, relaxation, or coping techniques I learned from the VR experience.

c. I have changed routines or habits to be more supportive or understanding toward people with ADHD.

d. I monitor and adjust my own behavior to reduce stress or conflict in daily life

e. Since the VR experience, I am more likely to notice when I act impulsively or lose focus in daily life

f. Other

3.6. If you selected "Other," please describe *changes have you made in your daily life since learning more about ADHD:* (Open Question)

4. Section B. Stigma from Others

Please answer the following questions **based on your experiences with how others perceive or treat people with ADHD**. There are no right or wrong answers — we are interested in your honest observations and feelings. Try to reflect on situations in which you have noticed **stereotypes, misunderstandings, or stigmatizing behaviors** directed toward yourself or others with ADHD.

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

*4.1. People with ADHD lose their jobs when their employers find out.**

4.2. People often think that those with ADHD cannot control their impulses and may behave unpredictably *

4.3. Sometimes, when people find out that someone has ADHD, they start avoiding them or spending less time with them. *

*4.4. Most people are uncomfortable around someone with ADHD.**

*4.5. Some people act as though it is the person's fault that they have ADHD.**

*4.6. The good points of people with ADHD tend to be ignored.**

4.7. Some people believe that individuals with ADHD are more aggressive, violence or likely to get into trouble.*

*4.8. People don't want someone with ADHD around their children once they know.**

*4.9. Workplaces and schools should make small changes to support people with ADHD.**

*4.10. People in lower-income or less supported communities may have worse outcomes because of ADHD.**

5. Behavioral Change Toward others ADHD

Please answer the following questions **based on any changes you have made in your behavior, interactions, or support toward people with ADHD**. Consider how you communicate, assist, or adapt your environment to be more understanding and supportive. Try to reflect honestly on actions you have implemented or behaviors you intend to maintain.

Changes in Behavior or Attitude Toward Others

5.1. Which of the following statements describe changes in your behavior or attitude? (You can choose more than one answer)*

a. I am more patient with my family or people around me

b. I opened up and spoke with my relatives or family about ADHD

c. I have started educating others (family/friends) about ADHD

d. I am more supportive or understanding toward friends or colleagues with ADHD.

e. Other

5.2. If you selected "Other," please describe the change you have noticed: (open question)

Support Actions Toward Others

5.3. Which of the following actions have you done to support others regarding ADHD? (You can choose more than one answer)*

a. I encourage friends, family, or colleagues who might have ADHD to seek professional help.

b. I provide information about ADHD assessment or support services to someone who might need it.

c. I reflect on whether someone I know could benefit from ADHD assessment or support

d. I feel confident guiding someone to ADHD resources when needed

e. I believe suggesting professional help can improve outcomes for someone with ADHD

f. Other

5.4. If you selected "Other," please describe the support you provide or reflect on: (open question)

<u>Daily Life Actions to Support Someone with ADHD</u>

5.5. *Which of the following actions or behaviors do you apply to support someone with ADHD? (You can choose more than one answer)**

a. I adjust my communication or environment to help someone with ADHD succeed

b. I notice and respond when someone with ADHD is struggling

c. I actively make small changes in my daily interactions to reduce challenges for someone with ADHD

d. I reflect on my behavior to ensure I am not unintentionally creating difficulties for someone with ADHD

e. I feel empowered to make a positive difference in the life of someone with ADHD through simple actions

f. Other

5.6. If you selected "Other," please describe the actions or strategies you have applied: (open question)

6. ADHD Knowledge

Please answer the following questions based on your current understanding of ADHD. There are no right or wrong answers — we are interested in your knowledge and awareness about ADHD, its symptoms, diagnosis, and screening. Try to answer as accurately as you can based on what you know or have learned.

ADHD Knowledge Test

6. 1. *General knowledge*

Q1. ADHD is characterized by all these Except? (1a) *(learning goal e)*
a) Inattention
b) Impulsivity
c) Hyperactivity
d) Attention ✅

e) I don't know

***Explanation: General knowledge (not in script).* ADHD is defined by inattention, hyperactivity, and impulsivity — not "attention."**

2. What does ADHD stand for?
a) Attention Deficit and Hyperactivity Disorder ✅
b) Attention Development and Health Disorder
c) Active Distraction and Hyperactivity Disorder
d) Attention Deficit Hyperactive Development

e) I don't know

***Explanation: General knowledge (not in script).* ADHD is defined as Attention Deficit and Hyperactivity Disorder.**

3. What is a common co-occurring condition with ADHD? (1c) (1d)
a) Anxiety disorders ✅
b) Asthma
c) Diabetes
d) Migraine

e) I don't know
***Explanation:* Anxiety disorders are frequently observed alongside ADHD, complicating diagnosis and Q11.**

4. Which of the following is a core symptom of ADHD? (1c) (1d)
a) Inattention ✅
b) High intelligence

c) Excessive sleep
d) Chronic pain

e) I don't know

Explanation: **Core symptoms include inattention, hyperactivity, and impulsivity, lasting at least six months with functional impairment.**

2. Based on the VR experience

5. Which part of the brain is linked to planning and focus? ***(learning goal g)***
a) Amygdala
b) Prefrontal cortex ✅
c) Cerebellum
d) Hippocampus

e) I don't know

Script reference: "This gangly web is the prefrontal cortex. The 'new era' brain. Cool. Calm. Collected. It plans ahead. Precise but slow." (00:04:41–00:04:53)

6. What is the amygdala mainly responsible for? ***(learning goal g)***
a) Memory storage
b) Fear and fight-or-flight response ✅
c) Long-term planning
d) Language processing

e) I don't know

Script reference: "Around you is the amygdala, the ancient brain. All fight and flight... Fear. Pure muscle adrenaline. And boy, can it panic." (00:03:56–00:04:18)

7. People with ADHD may often feel... ***(learning goal a, e, b)***

a) Calm and slow in their reactions
b) Overloaded or *bombarded* with too much information at once ✅
c) Completely unaffected by emotions
d) Always able to finish tasks easily

e) I don't know

Script reference: "Your sensory cortex hoovers up oodles of information every microsecond. You're bombarded. It's down to you to sort this mayhem." (00:05:07–00:05:18)

8. Which chemical in the brain is linked to reward and motivation? *(learning goal g)*

a) Serotonin
b) Dopamine ✅
c) Adrenaline
d) Cortisol

e) I don't know

Script reference: "Winning releases dopamine. A reassurance that you're doing things well. But only if the challenge is big enough." (00:07:55–00:08:07)

9. What can help people with ADHD regulate their focus?

a) *Take a deep breath* and doing relaxation exercises ✅
b) Ignoring all distractions
c) Forcing themselves to never take breaks
d) Avoiding physical movement

e) I don't know

Script reference: "Take a deep breath. Squeeze. Hold. And release." (00:01:53–00:02:07)

10. A "blink" can be compared with…*(learning goal b)*

a) A break or comma in your thoughts ✅
b) A complete blackout
c) A memory loss
d) A new idea forming

e) I don't know

Script reference: "A blink is a comma in your thoughts. You can't control it. It just happens." (00:02:11–00:02:18)

11. People with ADHD sometimes describe their mind as… *(learning goal a)*

a) Silent and empty
b) Chaotic and *your mind is everywhere* ✅
c) Very slow and still
d) Always perfectly in order

e) I don't know

Script reference: "It's all a bit too much, isn't it? Your mind is everywhere. But where are you really?" (00:10:45–00:10:54)

12. Which of the following can help support someone with ADHD? *(learning goal e)*

a) Clear routines and structure *in managing thoughts* ✅
b) Ignoring their needs
c) Forcing them to stay still all day
d) Expecting them to learn without breaks

e) I don't know

Script reference: "Decisions. Routines. Associations. Memories. Obligations..." (00:10:18–00:10:28) → points to importance of routines/structure in managing thoughts.

13. Post -Test IMPULSE SURVEY

After watching the virtual experience *Impulse*, please answer the following questions. Your honest responses will help us understand your experience, learning, and reflections.

* Indicates required question

1. What is your full name?*

2. What is your email?*

3. What is your whatsapp number or phone number? *

4. To confirm your status in this study, please indicate which group best describes you: *

- 1: I have a diagnosis of ADHD or I believe I may have ADHD (If this applies to you, please select this option regardless of whether a family member also has ADHD.)
- 2: I do not have ADHD but I have a family member has ADHD or I work closely with children or people who have ADHD (for example, as a teacher, counselor, or caregiver)
- 3: I do not have ADHD and do not have a close family member diagnosed with ADHD or I work closely with children or people who have ADHD (for example, as a teacher, counselor, or caregiver)

2. Section A. Self-Stigma (Only Group 1)

After experiencing the VR experience *Impulse*, please answer the following questions **based on your personal experience with ADHD**. There are no right or wrong answers — we are interested in your **honest thoughts and feelings**.

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

*2.1. I sometimes feel guilty about having ADHD**

*2.2. I feel worse about myself because of how others think about ADHD**

*2.3. I worry it is risky to tell others that I have ADHD**

*2.4. I work hard to keep my ADHD a secret.**

*2.5. I feel that I am not as good a person as others because I have ADHD.**

*2.6. I sometimes feel damaged because of my ADHD**

*2.7. Since learning I have ADHD, I have felt set apart or isolated from others**

*2.8. I worry that others will judge me because of my ADHD.**

*2.9. I regret telling some people that I have ADHD.**

*2.10. Getting an ADHD diagnosis helped me understand myself better and cope with challenges.**

3. Behavioral Change Toward themself ADHD (Only Group 1)

After experiencing the VR experience *Impulse*, please indicate which actions you plan to do in the future to better manage ADHD or improve your well-being. You can select more than one option.

3.1 Which of the following actions do you plan to take to learn more about or manage ADHD? (Select all that apply)*

a. I plan to see a doctor or mental health professional to learn more about ADHD.

b. I plan to schedule or attend an appointment with a healthcare professional about ADHD.

c. I plan to seek advice from online resources or support groups about ADHD.

d. I plan to join an ADHD support group.

e. I plan to consult a coach or mentor.

f. I plan to talk to a school or work counselor.

g. Other actions I plan to take.

3.2. If you selected "Other", please describe which type of help or support you plan to seek:

3.3. Which of the following actions do you plan to take to increase your self-awareness or knowledge about ADHD? (Select all that apply)*

a. I plan to read more about ADHD.

b. I plan to attend workshops, webinars, or online courses to learn more about ADHD.

c. I plan to reflect more on my own behaviors or habits in relation to ADHD symptoms.

d. I plan to adopt new strategies to manage my attention or focus based on what I learn.

e. Other self-education or awareness actions I plan to take

3.4 If you selected "Other," please describe which type of self-education or awareness activity you plan to engage in:

3.5 Which of the following changes do you plan to make in your daily life to better manage ADHD? (Select all that apply) *

a. I plan to implement strategies in daily life to improve focus, patience, or organization.

b. I plan to practice mindfulness, relaxation, or coping techniques I learned from the VR experience.

c. I plan to change routines or habits to be more supportive or understanding toward people with ADHD.

d. I plan to monitor and adjust my own behavior to reduce stress or conflict in daily life.

e. I plan to notice and manage impulsive behaviors or lapses in focus in daily life.

f. Other

3.6 If you selected "Other," please describe changes you plan to make in your daily life to better manage ADHD:

4. Section B. Stigma from Others

After the VR experience, please answer the following questions **based on your experiences with how others perceive or treat people with ADHD**. There are no right or wrong answers — we are interested in your honest observations and feelings.
Try to reflect on situations in which you have noticed **stereotypes, misunderstandings, or stigmatizing behaviors** directed toward yourself or others with ADHD.

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

*4.1. People with ADHD lose their jobs when their employers find out.**

4.2. People often think that those with ADHD cannot control their impulses and may behave unpredictably *

4.3. Sometimes, when people find out that someone has ADHD, they start avoiding them or spending less time with them. *

*4.4. Most people are uncomfortable around someone with ADHD.**

*4.5. Some people act as though it is the person's fault that they have ADHD.**

*4.6. The good points of people with ADHD tend to be ignored.**

4.7. Some people believe that individuals with ADHD are more aggressive, violence or likely to get into trouble.*

*4.8. People don't want someone with ADHD around their children once they know.**

*4.9. Workplaces and schools should make small changes to support people with ADHD.**

*4.10. People in lower-income or less supported communities may have worse outcomes because of ADHD.**

5. Behavioral Change Toward others ADHD

After experiencing the VR experience *Impulse*, please indicate which actions you **plan to take in the future to support or help people with ADHD**. You can select more than one option.

5.1 Which of the following statements describe changes in your behavior or attitude that you plan to make toward others? *(Select all that apply)**

a. I plan to be more patient with my family member with ADHD or people who have ADHD (e.g., teachers, counselors, or caregivers)

b. I plan to open up and speak with my relatives or family member with ADHD or people who have ADHD (e.g., teachers, counselors, or caregivers)

c. I plan to educate others (family/friends/others) about ADHD

d. I plan to be more supportive or understanding toward friends or colleagues or people with ADHD.

e. Other actions

5.2 If you selected "Other," please describe the change you plan to make in your behavior or attitude toward others: (Open Question)

5.3 Which of the following actions do you plan to take to support others regarding ADHD? *(You can choose more than one answer)

a. I plan to encourage friends, family, or colleagues who might have ADHD to seek professional help.

b. I plan to provide information about ADHD assessment or support services to someone who might need it.

c. I plan to reflect on whether someone I know could benefit from ADHD assessment or support.

d. I plan to guide someone to ADHD resources when needed.

e. I plan to suggest professional help to improve outcomes for someone with ADHD.

f. Other

5.4 If you selected "Other," please describe the support you plan to provide or actions you plan to take: (Open Question)

5.5 Which of the following actions do you plan to take in your daily life to support someone with ADHD?
(Select all that apply) *

a. I plan to adjust my communication or environment to help someone with ADHD succeed.

b. I plan to notice and respond when someone with ADHD is struggling.

c. I plan to make small changes in my daily interactions to reduce challenges for someone with ADHD.

d. I plan to reflect on my behavior to ensure I do not unintentionally create difficulties for someone with ADHD.

e. I plan to take actions to make a positive difference in the life of someone with ADHD.

f. Other

5.6 If you selected "Other," please describe the actions or strategies you plan to apply: (Open Question)

6. ADHD Knowledge

After experiencing the VR experience *Impulse*, please, please answer the following questions based on your current understanding of ADHD. There are no right or wrong answers — we are interested in your knowledge and awareness about ADHD,

its symptoms, diagnosis, and screening. Try to answer as accurately as you can based on what you know or have learned.

ADHD Knowledge Test

6. 1. *General knowledge*

Q1. ADHD is characterized by all these Except? (1a) *(learning goal e)*
a) Inattention
b) Impulsivity
c) Hyperactivity
d) Attention ✅

e) I don't know

***Explanation: General knowledge (not in script).* ADHD is defined by inattention, hyperactivity, and impulsivity — not "attention."**

2. What does ADHD stand for?
a) Attention Deficit and Hyperactivity Disorder ✅
b) Attention Development and Health Disorder
c) Active Distraction and Hyperactivity Disorder
d) Attention Deficit Hyperactive Development

e) I don't know

***Explanation: General knowledge (not in script).* ADHD is defined as Attention Deficit and Hyperactivity Disorder.**

3. What is a common co-occurring condition with ADHD? (1c) (1d)
a) Anxiety disorders ✅
b) Asthma
c) Diabetes
d) Migraine

e) I don't know
***Explanation:* Anxiety disorders are frequently observed alongside ADHD, complicating diagnosis and Q11.**

4. Which of the following is a core symptom of ADHD? (1c) (1d)
a) Inattention ✅
b) High intelligence

c) Excessive sleep
d) Chronic pain

e) I don't know

Explanation: **Core symptoms include inattention, hyperactivity, and impulsivity, lasting at least six months with functional impairment.**

2. Based on the VR experience

5. Which part of the brain is linked to planning and focus? ***(learning goal g)***
a) Amygdala
b) Prefrontal cortex ✅
c) Cerebellum
d) Hippocampus

e) I don't know

Script reference: "This gangly web is the prefrontal cortex. The 'new era' brain. Cool. Calm. Collected. It plans ahead. Precise but slow." (00:04:41–00:04:53)

6. What is the amygdala mainly responsible for? ***(learning goal g)***
a) Memory storage
b) Fear and fight-or-flight response ✅
c) Long-term planning
d) Language processing

e) I don't know

Script reference: "Around you is the amygdala, the ancient brain. All fight and flight... Fear. Pure muscle adrenaline. And boy, can it panic." (00:03:56–00:04:18)

7. People with ADHD may often feel... ***(learning goal a, e, b)***

a) Calm and slow in their reactions
b) Overloaded or *bombarded* with too much information at once ✅
c) Completely unaffected by emotions
d) Always able to finish tasks easily

e) I don't know

Script reference: "Your sensory cortex hoovers up oodles of information every microsecond. You're bombarded. It's down to you to sort this mayhem." (00:05:07–00:05:18)

8. Which chemical in the brain is linked to reward and motivation? *(learning goal g)*

a) Serotonin
b) Dopamine ✅
c) Adrenaline
d) Cortisol

e) I don't know

Script reference: "Winning releases dopamine. A reassurance that you're doing things well. But only if the challenge is big enough." (00:07:55–00:08:07)

9. What can help people with ADHD regulate their focus?

a) *Take a deep breath* and doing relaxation exercises ✅
b) Ignoring all distractions
c) Forcing themselves to never take breaks
d) Avoiding physical movement

e) I don't know

Script reference: "Take a deep breath. Squeeze. Hold. And release." (00:01:53–00:02:07)

10. A "blink" can be compared with…*(learning goal b)*

a) A break or comma in your thoughts ✅
b) A complete blackout
c) A memory loss
d) A new idea forming

e) I don't know

Script reference: "A blink is a comma in your thoughts. You can't control it. It just happens." (00:02:11–00:02:18)

11. People with ADHD sometimes describe their mind as… *(learning goal a)*

a) Silent and empty
b) Chaotic and *your mind is everywhere* ✅
c) Very slow and still
d) Always perfectly in order

e) I don't know

Script reference: "It's all a bit too much, isn't it? Your mind is everywhere. But where are you really?" (00:10:45–00:10:54)

12. Which of the following can help support someone with ADHD? *(learning goal e)*

a) Clear routines and structure *in managing thoughts* ✅
b) Ignoring their needs
c) Forcing them to stay still all day
d) Expecting them to learn without breaks

e) I don't know

Script reference: "Decisions. Routines. Associations. Memories. Obligations..." (00:10:18–00:10:28) → points to importance of routines/structure in managing thoughts.

7. Empathy Toward Others With ADHD

After experiencing the VR experience *Impulse*, please answer the following questions **based on your thoughts and feelings toward people with ADHD**. Focus on how you understand, relate to, or emotionally respond to the experiences of others with ADHD.

Scale: *1 = Not at all / Never → 5 = Very much / Always*

Cognitive Empathy – understanding others' thoughts and challenges *(4 questions)*

*7.1. I feel more understanding toward people with ADHD**

*7.2. I can better recognize the challenges faced by people with ADHD**

*7.3. I understand how societal attitudes and stigma can make life more difficult for people with ADHD**

*7.4. I reflect on how ADHD affects people differently depending on their personal or social circumstances.**

Affective / Emotional Empathy – emotional response, "putting oneself in their shoes" *(4 questions)*

*7.5. I can imagine how difficult daily tasks are for a person with ADHD**

*7.6. I feel concern or compassion when I see someone struggling because of ADHD**

*7.7. I care about the emotional wellbeing of those living with ADHD**

*7.8. I can understand and share the feelings of people struggling with ADHD**

8. Immersion Questionnaire – VR Experience

After experiencing the VR experience Impulse, please answer the following questions based on your experience during the Virtual Reality Experience Impulse. 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

8.1. I felt that I really empathised/felt for with the VR experience.*

8.2. I did not feel any emotional attachment to the VR experience.*

8.3. I was interested in seeing how the VR experience's events would progress.*

8.4. It did not interest me to know what would happen next in the VR experience.*

8.5. I was in suspense about whether I would succeed or fail in the VR experience.*

8.6. I was not concerned about whether I would succeed or fail in the VR experience.*

8.7. I sometimes found myself to become so involved with the VR experience that I wanted to speak to it directly.*

8.8. I did not find myself to become so caught up with the VR experience that I wanted to speak to it directly.*

8.10. I did not like the graphics and imagery of the VR experience.*

8.11. I enjoyed participating in the VR experience.*

8.12. Participating in the VR experience was not fun.*

8.13. The controls were not easy to pick up.*

8.14. There were not any particularly frustrating aspects of the controls to get the hang of.*

8.15. I became unaware that I was even using any controls.*

8.16. The controls were not invisible to me.*

8.17. I felt myself to be directly travelling through the VR experience according to my own volition.*

8.18. I did not feel as if I was moving through the VR experience according to my own will.*

8.19. It was as if I could interact with the world of the VR experience as if I was in the real world.*

8.20. Interacting with the world of the VR experience did not feel as real to me as it would be in the real world.*

8.21. I was unaware of what was happening around me.*

8.22. I was aware of my surroundings.*

8.23. I felt detached from the outside world.*

8.24. I still felt attached to the real world.*

8.25. At the time the VR experience was my only concern.*

8.26. Everyday thoughts and concerns were still very much on my mind.*

8.27. I did not feel the urge at any point to stop the VR experience and see what was going on around me.*

8.28. I was interested to know what might be happening around me.*

8.29. I did not feel like I was in the real world but the VR experience world.*

8.30. I still felt as if I was in the real world whilst participating in the VR experience.*

8.31. To me it felt like only a very short amount of time had passed.*

8.32. When participating in the VR experience, time appeared to go by very slowly.*

8.33. How immersed or engaged did you feel during Virtual Reality Experience Impulse?*

1: Not at all immersed

5: Very immersed

Reverse / Inversed Items:

- 8.2. I did not feel any emotional attachment to the VR experience.
- 8.4. It did not interest me to know what would happen next in the VR experience.
- 8.6. I was not concerned about whether I would succeed or fail in the VR experience.
- 8.8. I did not find myself to become so caught up with the VR experience that I wanted to speak to it directly.
- 8.10. I did not like the graphics and imagery of the VR experience.

- 8.12. Participating in the VR experience was not fun.
- 8.13. The controls were not easy to pick up.
- 8.14. There were not any particularly frustrating aspects of the controls to get the hang of.
- 8.16. The controls were not invisible to me.
- 8.18. I did not feel as if I was moving through the VR experience according to my own will.
- 8.20. Interacting with the world of the VR experience did not feel as real to me as it would be in the real world.
- 8.21. I was unaware of what was happening around me.
- 8.23. I felt detached from the outside world.
- 8.27. I did not feel the urge at any point to stop the VR experience and see what was going on around me.
- 8.29. I did not feel like I was in the real world but the VR experience world.
- 8.32. When participating in the VR experience, time appeared to go by very slowly.

All other items are **positively worded** and do not need reverse coding.

13. Follow-Up Survey – 1 Month After the VR Experience “Impulse"

Thank you again for participating in the *Impulse* VR experience. One month has passed since your session, and we would like to invite you to complete this **follow-up online survey**.

There are **no right or wrong answers** — we are interested in your **honest reflections and experiences** since completing the VR experience.

Estimated time to complete: 6–10 minutes

* Indicates required question

What is your full name?*

What is your email?*

To confirm your status in this study, please indicate which group best describes you: *

- I have been diagnosed with ADHD, or I believe I may have ADHD.
- 2: I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.
- 3: I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).

2. Section A. Self-Stigma (Only Group 1)

After 1 month of experiencing the VR simulation *Impulse*, please answer the following questions **based on your own personal experience living with ADHD**. There are no right or wrong answers — we are interested in understanding your genuine thoughts and feelings.

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

*2.1. I sometimes feel guilty about having ADHD**

*2.2. I feel worse about myself because of how others think about ADHD**

*2.3. I worry it is risky to tell others that I have ADHD**

*2.4. I work hard to keep my ADHD a secret.**

*2.5. I feel that I am not as good a person as others because I have ADHD.**

*2.6. I sometimes feel damaged because of my ADHD**

*2.7. Since learning I have ADHD, I have felt set apart or isolated from others**

*2.8. I worry that others will judge me because of my ADHD.**

*2.9. I regret telling some people that I have ADHD.**

*2.10. Getting an ADHD diagnosis helped me understand myself better and cope with challenges.**

3. Behavioral Change Toward themself ADHD (Only Group 1)

After 1 month of experiencing the VR simulation *Impulse*, please answer the following questions **based on any changes you have noticed in your own behavior, habits, or self-care since becoming more aware of ADHD**. Try to reflect honestly on how your thoughts, routines, or attitudes toward yourself may have evolved.

3.1 Which of the following actions have you taken to learn more about or manage ADHD? * *(You can choose more than one answer)

a. I decided to see a doctor or mental health professional to learn more about ADHD.

b. I have scheduled or attended an appointment with a healthcare professional about ADHD.

c. I seek advice from online resources or support groups about ADHD.

d. I joined an ADHD support group.

e. I consulted a coach or mentor.

f. I talked to a school or work counselor.

g. Other type of help or support I have sought.

3.2. If you selected "Other", please describe which type of help or support you have sought: (Open Question)

3.3. *Which of the following actions have you taken to increase your self-awareness or knowledge about ADHD?*
*(You can choose more than one answer)**

a. I decided to read more about ADHD

b. I attend workshops, webinars, or online courses to learn more about ADHD

c. I reflect more on my own behaviors or habits in relation to ADHD symptoms

d. I have adopted new strategies to manage my attention or focus based on what I learned

g. Other type of help or support I have sought.

3.4. If you selected "Other," please describe which type of self-education or awareness activity you have engaged in: (Open Question)

3.5. *Which of the following changes have you made in your daily life since learning more about ADHD? (You can choose more than one answer)**

a. I have implemented strategies in daily life to improve focus, patience, or organization.

b. I practice mindfulness, relaxation, or coping techniques I learned from the VR experience.

c. I have changed routines or habits to be more supportive or understanding toward people with ADHD.

d. I monitor and adjust my own behavior to reduce stress or conflict in daily life

e. Since the VR experience, I am more likely to notice when I act impulsively or lose focus in daily life

f. Other

3.6. If you selected "Other," please describe *changes have you made in your daily life since learning more about ADHD:* (Open Question)

4. Section B. Stigma from Others

After 1 month of experiencing the VR simulation *Impulse*, please answer the following questions **based on your experiences with how others perceive or treat people with ADHD**. There are no right or wrong answers — we are interested in your honest observations and feelings. Try to reflect on situations in which you have noticed **stereotypes, misunderstandings, or stigmatizing behaviors** directed toward yourself or others with ADHD.

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

*4.1. People with ADHD lose their jobs when their employers find out.**

4.2. People often think that those with ADHD cannot control their impulses and may behave unpredictably *

4.3. Sometimes, when people find out that someone has ADHD, they start avoiding them or spending less time with them. *

*4.4. Most people are uncomfortable around someone with ADHD.**

*4.5. Some people act as though it is the person's fault that they have ADHD.**

*4.6. The good points of people with ADHD tend to be ignored.**

4.7. Some people believe that individuals with ADHD are more aggressive, violence or likely to get into trouble.*

*4.8. People don't want someone with ADHD around their children once they know.**

*4.9. Workplaces and schools should make small changes to support people with ADHD.**

*4.10. People in lower-income or less supported communities may have worse outcomes because of ADHD.**

5. Behavioral Change Toward others ADHD

After 1 month of experiencing the VR simulation *Impulse*, please answer the following questions **based on any changes you have made in your behavior, interactions, or support toward people with ADHD**. Consider how you communicate, assist, or adapt your environment to be more understanding and supportive. Try to reflect honestly on actions you have implemented or behaviors you intend to maintain.

5.1. Which of the following statements describe changes in your behavior or attitude? (You can choose more than one answer)*

a. I am more patient with my family or people around me

b. I opened up and spoke with my relatives or family about ADHD

c. I have started educating others (family/friends) about ADHD

d. I am more supportive or understanding toward friends or colleagues with ADHD.

e. Other

5.2. If you selected "Other," please describe the change you have noticed: (open question)

5.3. Which of the following actions have you done to support others regarding ADHD? (You can choose more than one answer)*

a. I encourage friends, family, or colleagues who might have ADHD to seek professional help.

b. I provide information about ADHD assessment or support services to someone who might need it.

c. I reflect on whether someone I know could benefit from ADHD assessment or support

d. I feel confident guiding someone to ADHD resources when needed

e. I believe suggesting professional help can improve outcomes for someone with ADHD

f. Other

5.4. If you selected "Other," please describe the support you provide or reflect on: (open question)

5.5. *Which of the following actions or behaviors do you apply to support someone with ADHD? (You can choose more than one answer)**

a. I adjust my communication or environment to help someone with ADHD succeed

b. I notice and respond when someone with ADHD is struggling

c. I actively make small changes in my daily interactions to reduce challenges for someone with ADHD

d. I reflect on my behavior to ensure I am not unintentionally creating difficulties for someone with ADHD

e. I feel empowered to make a positive difference in the life of someone with ADHD through simple actions

f. Other

5.6. If you selected "Other," please describe the actions or strategies you have applied: (open question)

6. ADHD Knowledge

After 1 month of experiencing the VR simulation *Impulse*, please answer the following questions based on your current understanding of ADHD. There are no

right or wrong answers — we are interested in your knowledge and awareness about ADHD, its symptoms, diagnosis, and screening. Try to answer as accurately as you can based on what you know or have learned.

ADHD Knowledge Test

6. 1. *General knowledge*

Q1. ADHD is characterized by all these Except? (1a) *(learning goal e)*
a) Inattention (lack of attention)
b) Impulsivity
c) Hyperactivity
d) Attention ✅

e) I don't know

Explanation: General knowledge (not in script). **ADHD is defined by inattention, hyperactivity, and impulsivity — not "attention."**

2. What does ADHD stand for?
a) Attention Deficit and Hyperactivity Disorder ✅
b) Attention Development and Health Disorder
c) Active Distraction and Hyperactivity Disorder
d) Attention Deficit Hyperactive Development

e) I don't know

Explanation: General knowledge (not in script). **ADHD is defined as Attention Deficit and Hyperactivity Disorder.**

3. What is a common co-occurring condition with ADHD? (1c) (1d)
a) Anxiety disorders ✅
b) Asthma
c) Diabetes
d) Migraine

e) I don't know
Explanation: **Anxiety disorders are frequently observed alongside ADHD, complicating diagnosis and Q11.**

4. Which of the following is a core symptom of ADHD? (1c) (1d)
a) Inattention ✅
b) High intelligence
c) Excessive sleep
d) Chronic pain

e) I don't know

Explanation: **Core symptoms include inattention, hyperactivity, and impulsivity, lasting at least six months with functional impairment.**

2. Based on the VR experience

5. Which part of the brain is linked to planning and focus? ***(learning goal g)***

a) Amygdala
b) Prefrontal cortex ✅
c) Cerebellum
d) Hippocampus

e) I don't know

Script reference: "This gangly web is the prefrontal cortex. The 'new era' brain. Cool. Calm. Collected. It plans ahead. Precise but slow." (00:04:41–00:04:53)

6. What is the amygdala mainly responsible for? ***(learning goal g)***

a) Memory storage
b) Fear and fight-or-flight response ✅
c) Long-term planning
d) Language processing

e) I don't know

Script reference: "Around you is the amygdala, the ancient brain. All fight and flight... Fear. Pure muscle adrenaline. And boy, can it panic." (00:03:56–00:04:18)

7. People with ADHD may often feel... ***(learning goal a, e, b)***

a) Calm and slow in their reactions
b) Overloaded or *bombarded* with too much information at once ✅
c) Completely unaffected by emotions
d) Always able to finish tasks easily

e) I don't know

Script reference: "Your sensory cortex hoovers up oodles of information every microsecond. You're bombarded. It's down to you to sort this mayhem." (00:05:07–00:05:18)

8. Which chemical in the brain is linked to reward and motivation? ***(learning goal g)***

a) Serotonin
b) Dopamine ✅
c) Adrenaline
d) Cortisol

e) I don't know

Script reference: "Winning releases dopamine. A reassurance that you're doing things well. But only if the challenge is big enough." (00:07:55–00:08:07)

9. What can help people with ADHD regulate their focus?
a) *Take a deep breath* and doing relaxation exercises ✅
b) Ignoring all distractions
c) Forcing themselves to never take breaks
d) Avoiding physical movement

e) I don't know

Script reference: "Take a deep breath. Squeeze. Hold. And release." (00:01:53–00:02:07)

10. A "blink" can be compared with…*(learning goal b)*
a) A break or comma in your thoughts ✅
b) A complete blackout
c) A memory loss
d) A new idea forming

e) I don't know

Script reference: "A blink is a comma in your thoughts. You can't control it. It just happens." (00:02:11–00:02:18)

11. People with ADHD sometimes describe their mind as… *(learning goal a)*
a) Silent and empty
b) Chaotic and *your mind is everywhere* ✅
c) Very slow and still
d) Always perfectly in order

e) I don't know

Script reference: "It's all a bit too much, isn't it? Your mind is everywhere. But where are you really?" (00:10:45–00:10:54)

12. Which of the following can help support someone with ADHD? *(learning goal e)*

a) Clear routines and structure *in managing thoughts* ✅
b) Ignoring their needs
c) Forcing them to stay still all day
d) Expecting them to learn without breaks

e) I don't know

Script reference: "Decisions. Routines. Associations. Memories. Obligations..." (00:10:18–00:10:28) → points to importance of routines/structure in managing thoughts.

7. Empathy Toward Others With ADHD

After 1 month of experiencing the VR simulation *Impulse*, please answer the following questions **based on your thoughts and feelings toward people with ADHD**. Focus on how you understand, relate to, or emotionally respond to the experiences of others with ADHD.

Scale: *1 = Not at all / Never → 5 = Very much / Always*

Cognitive Empathy – understanding others' thoughts and challenges *(4 questions)*

*7.1. I feel more understanding toward people with ADHD**

*7.2. I can better recognize the challenges faced by people with ADHD**

*7.3. I understand how societal attitudes and stigma can make life more difficult for people with ADHD**

*7.4. I reflect on how ADHD affects people differently depending on their personal or social circumstances.**

Affective / Emotional Empathy – emotional response, "putting oneself in their shoes" *(4 questions)*

*7.5. I can imagine how difficult daily tasks are for a person with ADHD**

*7.6. I feel concern or compassion when I see someone struggling because of ADHD**

*7.7. I care about the emotional wellbeing of those living with ADHD**

*7.8. I can understand and share the feelings of people struggling with ADHD**

14. Pilot

A pilot study was conducted for each of the three participant groups at The Watershed on **October 6, 2025**. The purpose of the pilot was to evaluate the clarity, usability, and timing of the pre- and post-test questionnaires, as well as the overall VR experience.

During the pilot, **all pre- and post-test questionnaires were timed**, and the duration of the VR experience was also recorded to ensure consistency across participants. Based on the pilot, **corrections and adjustments were made** to the pre- and post-test instruments to improve comprehension, reduce ambiguity, and optimize the flow of the study.

The pilot confirmed that the overall procedure—including questionnaire completion and VR participation—was feasible within the planned timeframe, providing confidence in the study design for the main experiment.

15. Results

These results are valid, especially because the Kruskal–Wallis test, a non-parametric method that does not require equal group sizes, was used. **However, it is important to note a limitation:** the smaller group may reduce the statistical power to detect differences.

Gender Distribution Across Groups

The sample consisted of 118 participants divided into three groups. Group 1 included 54 participants, Group 2 had 42 participants, and Group 3 consisted of 22 participants.

In **Group 1**, the largest gender category was **female**, representing almost half of the group (27 participants). Males made up 17 participants, while 6 participants identified as non-binary. Additionally, 4 participants chose not to disclose their gender.

In **Group 2**, females again formed the largest proportion, with 27 participants. Males accounted for 14 participants, and only one participant identified as non-binary. No participants in this group selected “prefer not to say.”

In **Group 3**, the gender distribution between females and males was evenly balanced, with 11 females and 11 males. No participants in this group identified as non-binary, and none chose not to disclose their gender.

Overall, across all three groups, females constituted the largest gender category, followed by males. Non-binary individuals and those who preferred not to report their gender were present only in Groups 1 and 2.

Group	Female	Male	Non-binary	Prefer not to say	Total
1	27	17	6	4	**54**
2	27	14	1	0	**42**
3	11	11	0	0	**22**

Gender	N
Female	65
Male	42
Non-binary	7
Prefer not to say	4
Total	**118**

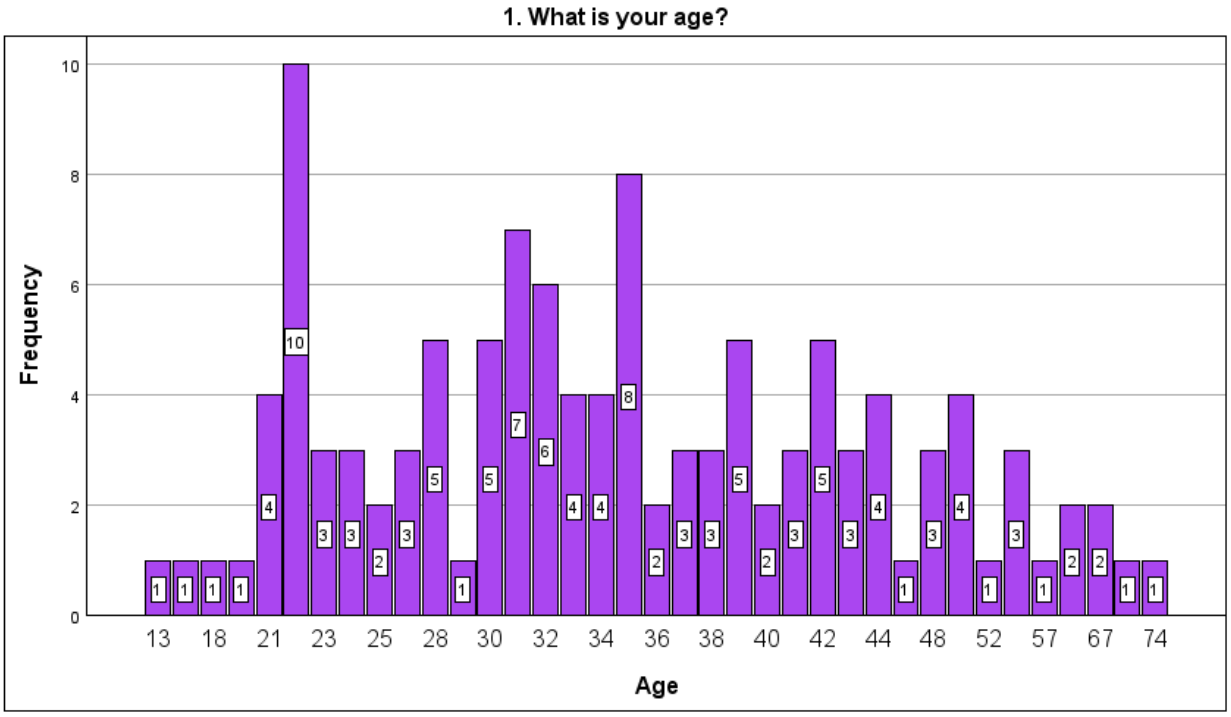
Age Distribution of Participants

The study sample included individuals ranging in age from **13 to 74 years old**. Most participants were in early to mid-adulthood. The largest age groups were **22 years (10 participants, 8.5%)**, **35 years (8 participants, 6.8%)**, **31 years (7 participants, 5.9%)**, and **32 years (6 participants, 5.1%)**. Several ages had moderate representation, including **28, 30, 39, 42** (each with 5 participants, 4.2%), and **33, 34, 43, 49** (each with 4 participants, 3.4%).

Smaller groups (2.5% each) included ages **23, 24, 26, 37, 38, 41, 43, 48, 56**, while ages **25, 36, 40, 60, 67** each represented **1.7%** of the sample.

The least represented ages—each with **1 participant (0.8%)**—were **13, 16, 18, 19, 29, 46, 52, 57, 69, and 74**.

Overall, the age distribution shows a strong concentration of participants between **21 and 44 years old**, with fewer participants at the youngest and oldest ends of the range.



Educational Level of Participants

The educational background of the participants ranged from secondary education to doctoral degrees. Nearly half of the sample held a **Bachelor's degree**, making it the most common level of education reported (55 participants, 46.6%). The second-largest group consisted of those with a **Master's degree** (35 participants, 29.7%).

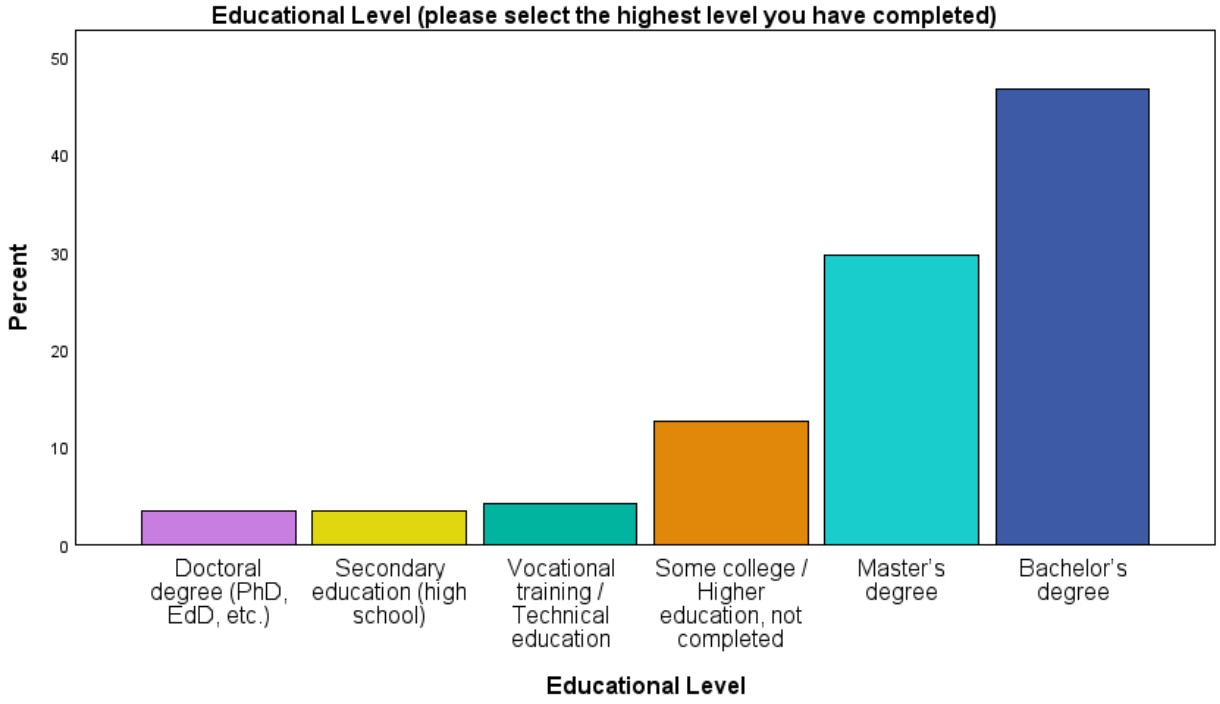
A smaller portion of the participants reported having completed **some college or higher education without earning a degree** (15 participants, 12.7%). Additionally, **vocational or technical training** was reported by 5 participants (4.2%).

The least represented educational levels were **secondary education** and **doctoral degrees**, each reported by 4 participants (3.4%).

Overall, the data indicate that the sample was highly educated, with the majority of participants holding undergraduate or graduate degrees.

5. Educational Level (please select the highest level you have completed)

	N	%
Doctoral degree (PhD, EdD, etc.)	4	3.4%
Secondary education (high school)	4	3.4%
Vocational training / Technical education	5	4.2%
Some college / Higher education, not completed	15	12.7%
Master's degree	35	29.7%
Bachelor's degree	55	46.6%



Previous Experience With Virtual Reality

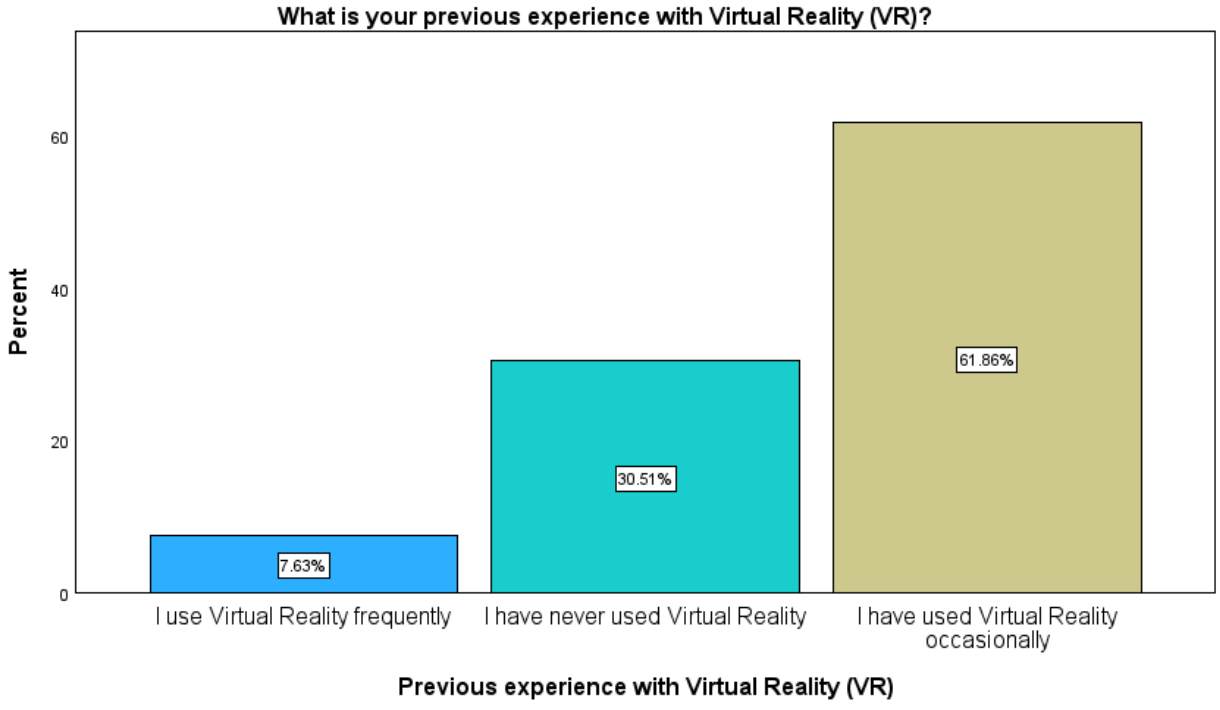
Participants reported varying levels of prior experience with Virtual Reality (VR). The majority indicated that they had **used VR occasionally**, accounting for 73 participants (61.9%). A smaller portion of the sample, 36 participants (30.5%), stated

that they had **never used VR**. Only 9 participants (7.6%) reported **frequent use of VR**, making this the least represented category.

Overall, most participants had at least some exposure to VR, although regular use was relatively uncommon.

6. What is your previous experience with Virtual Reality (VR)?

	N	%
I use Virtual Reality frequently	9	7.6%
I have never used Virtual Reality	36	30.5%
I have used Virtual Reality occasionally	73	61.9%



Description of VR Experience by Gender

Virtual Reality (VR) experience varied across gender groups. Among **female participants**, the majority reported having used VR occasionally (**56.1%**), while **39.4%** had never used VR and a small proportion (**3.0%**) reported frequent use. This suggests that most females had at least some exposure to VR, although regular use remained uncommon.

Among **male participants**, occasional use of VR was also the most common (**63.0%**), but men showed a substantially higher rate of frequent VR use (**15.2%**) compared to females. Only **13.0%** of males reported never having used VR, making them the gender group with the **lowest proportion of VR non-users**.

For **non-binary participants**, VR experience followed a similar pattern: **62.5%** reported occasional use, **25.0%** had never used VR, and none used VR frequently. This group's distribution was closer to the female pattern than the male pattern.

Participants who **preferred not to disclose their gender** were evenly split between never having used VR (**50.0%**) and occasional use (**50.0%**), with no frequent users.

Overall, the data indicate that across all gender groups, **occasional VR use** was the most common pattern. However, **male participants were disproportionately more likely to be frequent users** of VR, while females and non-binary individuals tended to cluster more toward occasional or no use.

Gender	Never Used VR	Occasionally Used VR	Frequently Use VR	Total
Female (n = 66)	**39.4%**	**56.1%**	**3.0%**	100%
Male (n = 46)	**13.0%**	**63.0%**	**15.2%**	100%
Non-binary (n = 8)	**25.0%**	**62.5%**	**0%**	100%
Prefer not to say (n = 4)	**50.0%**	**50.0%**	**0%**	100%
Overall (N = 118)	**30.5%**	**61.9%**	**7.6%**	100%

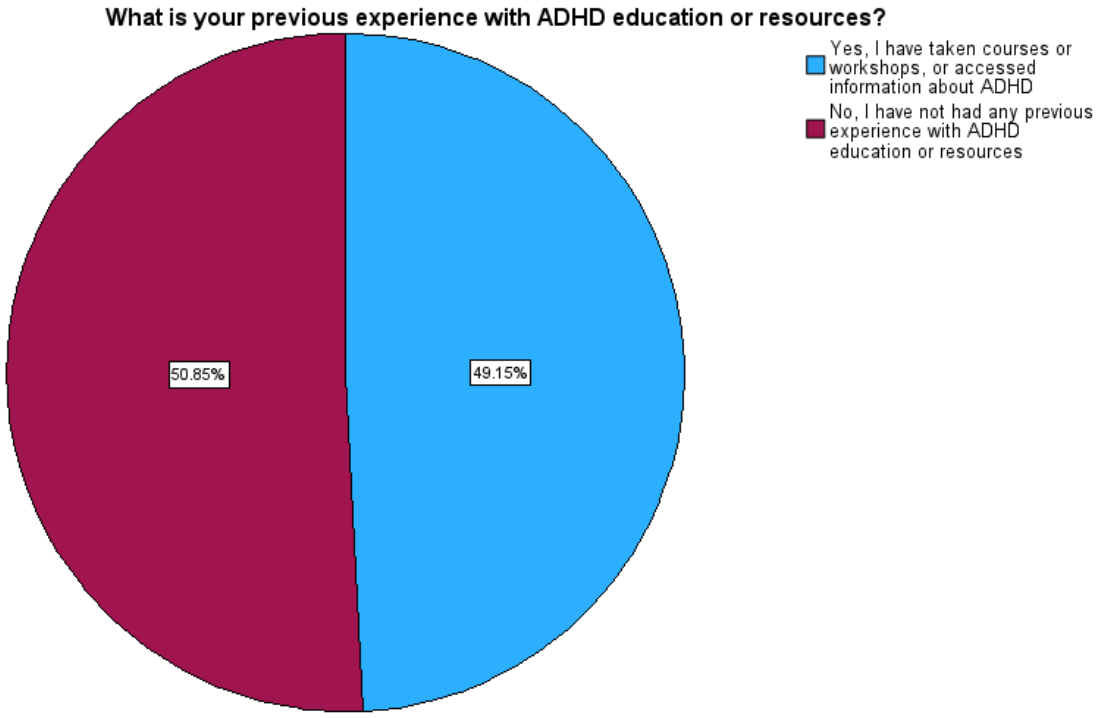
Previous Experience With ADHD Education or Resources

Participants were nearly evenly divided in their previous experience with ADHD education or resources. A total of **58 participants (49.2%)** reported that they had **taken courses, attended workshops, or accessed information about ADHD**. In contrast, **60 participants (50.8%)** indicated that they had **no prior experience** with ADHD-related educational materials or resources.

Overall, the sample shows a balanced split between those with and without prior exposure to ADHD education.

What is your previous experience with ADHD education or resources?

	N	%
Yes, I have taken courses or workshops, or accessed information about ADHD	58	49.2%
No, I have not had any previous experience with ADHD education or resources	60	50.8%



Description of Gender Differences in Previous ADHD Education Experience

The data show notable differences in previous ADHD education experience across gender groups. Among **female participants**, experience was nearly evenly divided, with **34 females reporting prior exposure to ADHD education or resources**, and **31 reporting no previous experience**. This indicates a balanced distribution of familiarity with ADHD-related content within this group.

In contrast, **male participants** were more likely to report no prior ADHD education. While **16 males indicated previous experience**, a larger group of **26 males** reported having no prior exposure to ADHD courses, workshops, or informational resources.

For **non-binary participants**, the majority had prior ADHD educational experience. **Six out of seven** non-binary individuals reported having taken courses, attended workshops, or accessed ADHD-related information, while only one participant reported no previous experience.

Participants who **preferred not to disclose their gender** were evenly split, with **two reporting previous ADHD education** and **two reporting none**.

Overall, the results suggest that females and non-binary individuals were more likely to have prior experience with ADHD education, whereas males were more likely to lack previous exposure to ADHD-related resources.

Comparative Table: Gender × Previous ADHD Education Experience

Gender	Yes (Has previous ADHD education)	No (No previous ADHD education)	Total
Female	34	31	65
Male	16	26	42
Non-binary	6	1	7
Prefer not to say	2	2	4
Total	**58**	**60**	**118**

Knowledge about ADHD

Research Question:

Does the VR experience (Impulse) increase knowledge about ADHD, and does this effect differ across groups (ADHD, family of ADHD, control) over time?

Hypothesis (Time):

- H1a: Knowledge scores will increase **immediately after the VR experience and remain higher at 1-month follow-up** compared to pre-test scores.

Hypothesis (Group):

- H1b: The control group will have **higher knowledge gains** than the Participants with ADHD or family members of ADHD.

Normality Test

Tests of Normality were conducted for both the pre-test and post-test ADHD knowledge scores using the Kolmogorov–Smirnov and Shapiro–Wilk statistics. Across all items and all participant subgroups (those with ADHD or self-perceived symptoms, those with indirect exposure to ADHD, and those without any exposure),

the results consistently showed statistically significant p-values ($p < .001$), indicating that the distributions deviated from normality at each measurement point. This pattern was observed in both the baseline and post-intervention data, even when some post-test Shapiro–Wilk values were not available due to data characteristics such as categorical responses or low variability. Taken together, these results demonstrate that the ADHD knowledge scores were non-normally distributed prior to and following the intervention. Therefore, non-parametric methods are more appropriate for analyzing intervention effects and comparing the participant groups.

Reliability of the ADHD Knowledge Scale

The internal consistency reliability of the 12-item ADHD knowledge scale was assessed using Cronbach's alpha. For the pre-test, the scale demonstrated **acceptable** internal consistency, $\alpha = .62$ (standardized $\alpha = .68$), which is considered suitable for early-stage or exploratory research instruments. Item analysis indicated that the scale's items measured related but somewhat broad aspects of participants' ADHD knowledge prior to the intervention.

In the post-test, the reliability of the scale decreased, $\alpha = .47$ (standardized $\alpha = .48$), with 11 items retained. This reduction in internal consistency may reflect several factors:
(1) the removal or modification of one item in the post-test version,
(2) a potential increase in response variability following the VR intervention, and
(3) the possibility that participants gained knowledge unevenly across different ADHD topics, leading to lower inter-item correlations.

Although the post-test alpha falls below the conventional threshold for research instruments (>.70), such reliability fluctuations are common in attitude and knowledge scales used in brief interventions, where learning is expected to impact different concepts at different levels. The results suggest that the scale could benefit from further refinement, including clearer item structuring and balanced distribution of content across ADHD symptomatology, diagnosis, and daily life impact domains.

Overall, the reliability results indicate that the scale performed sufficiently in the pre-assessment but requires improvement for consistent post-intervention measurement in future studies.

Kruskal–Wallis Test: Group Differences in Stigma and Knowledge Change

A Kruskal–Wallis H test was conducted to examine whether participants' group membership (1 = ADHD diagnosis/suspected, 2 = Familiar or working closely with ADHD, 3 = No prior experience with ADHD) influenced levels of stigma toward others and knowledge change.

Stigma Toward Others (Pre-test)

There were **no statistically significant differences** in stigma toward others between the three groups before the VR intervention,
$H(2) = 0.007$, **$p = .997$**.
Mean ranks were nearly identical across groups (≈ 59), suggesting that all participants began with a similar baseline level of stigma toward others, regardless of their ADHD experience.

Stigma Toward Others (Post-test)

There was a **statistically significant difference** between groups after the VR experience,
$H(2) = 12.50$, **$p = .002$**.
Mean ranks increased progressively by level of ADHD exposure:

Group	Mean Rank Post-test
ADHD diagnosis/suspected	47.63
Close connection with ADHD	67.38
No known ADHD connection	73.59

Participants **with less personal exposure** to ADHD reported **greater improvements** (higher positive shift and reduced stigma), whereas those who already had ADHD showed **smaller changes**, likely due to already having lower stigma levels prior to the intervention.

Knowledge Change

Group differences were also significant for knowledge change,
$H(2) = 7.62$, **$p = .022$**.

Group	Mean Rank
ADHD diagnosis/suspected	51.59
Close connection with ADHD	60.25
No known ADHD connection	74.45

Again, those **without previous ADHD knowledge or personal experience** demonstrated **the greatest gains** in ADHD knowledge following the VR intervention. Those already familiar with ADHD showed **smaller improvements**, consistent with a ceiling effect.

Summary

Outcome	Pre-test Differences	Post-test Differences	Interpretation
Stigma Toward Others	❌ None	✔ Significant	VR was especially impactful for people with little/no ADHD exposure
Knowledge Change	—	✔ Significant	The VR experience increased knowledge more in those unfamiliar with ADHD

These findings indicate the VR intervention **successfully reduced stigma and increased knowledge**, particularly among individuals **with the least prior exposure to ADHD**.

Hypothesis H1b

H1b: *The control group will have higher knowledge gains than the Participants with ADHD or family members of ADHD.*

Result: ✔ Supported

A Kruskal–Wallis test showed a **statistically significant difference** in knowledge change between groups,
$H(2) = 7.62$, **$p = .022$**.

Mean ranks showed the expected pattern:

Group	Mean Rank for Knowledge Change
Control group (no ADHD exposure)	**74.45**
Family/friends of ADHD	60.25
ADHD diagnosis/suspected	51.59

Participants **in the control group** demonstrated the **largest increase in knowledge** following the VR experience, while those with direct or indirect ADHD experience showed **smaller gains**, likely due to greater baseline knowledge.

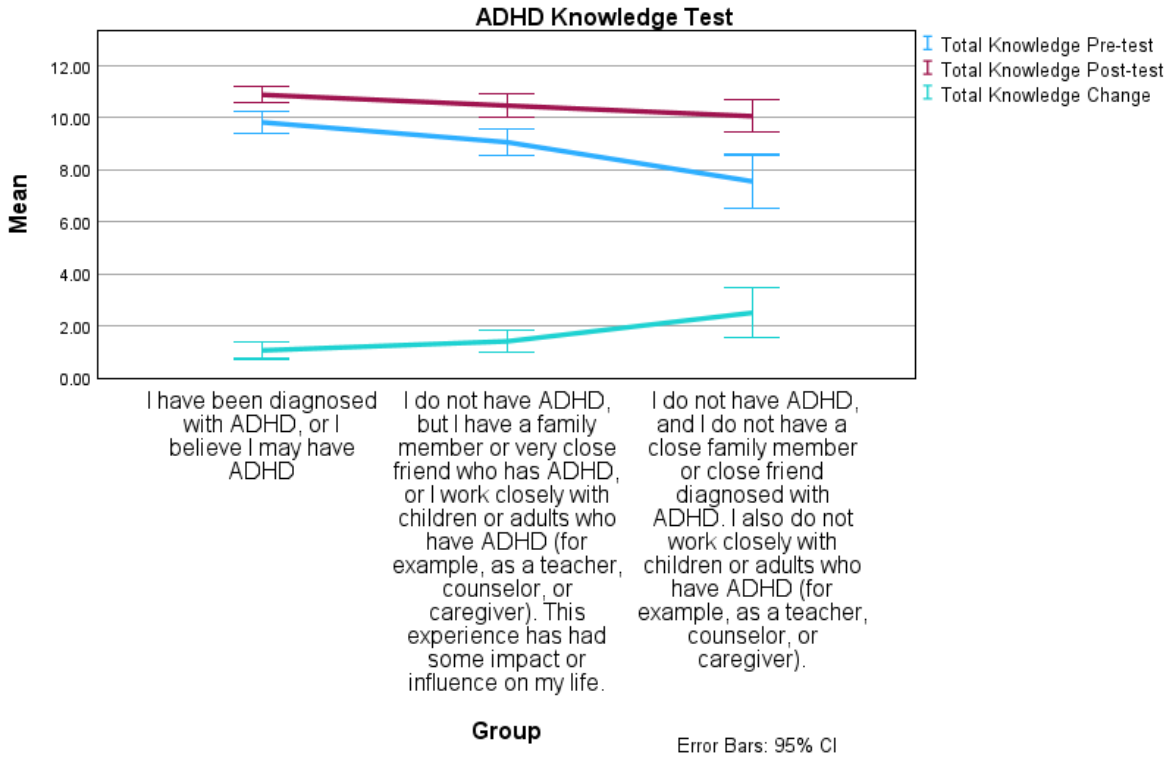
Academic

To test Hypothesis H1b, a Kruskal–Wallis non-parametric test was conducted to compare knowledge gains among the three participant groups. The results indicated a statistically significant difference in total knowledge change across groups, $H(2) = 7.62$, $p = .022$, suggesting that the VR experience influenced the groups differently. Post-test descriptive results showed that participants in the control group (those without ADHD and without close exposure to ADHD) demonstrated the highest knowledge gains (Mean Rank = 74.45), followed by participants with a family member or close contact with ADHD (Mean Rank = 60.25). Participants with ADHD or suspected ADHD showed the lowest increase in knowledge (Mean Rank = 51.59). In practical terms, these results indicate that participants with no previous exposure to ADHD improved approximately 30–45% more than those with ADHD and 15–20% more than the family/friends group. Therefore, Hypothesis H1b was supported. These findings suggest that the Impulse VR experience may be particularly effective at improving knowledge and awareness among individuals who start with lower baseline familiarity, such as the general public, reinforcing its potential as an impactful educational tool for reducing misinformation and stigma.

General Public

We wanted to see if the VR experience helped people learn more about ADHD and if different types of people learned differently from it. We compared three groups: people with ADHD, people who have a family member or close friend with ADHD, and people who had no experience with ADHD at all (the control group). After the VR experience, the control group showed the biggest improvement in what they learned—for example, about 7 out of 10 people in this group increased their knowledge. The improvement was smaller for the group who had friends or family with ADHD (about 5 out of 10), and even smaller for people with ADHD themselves (about 4 out of 10). In simple terms, the VR experience helped those who didn't know

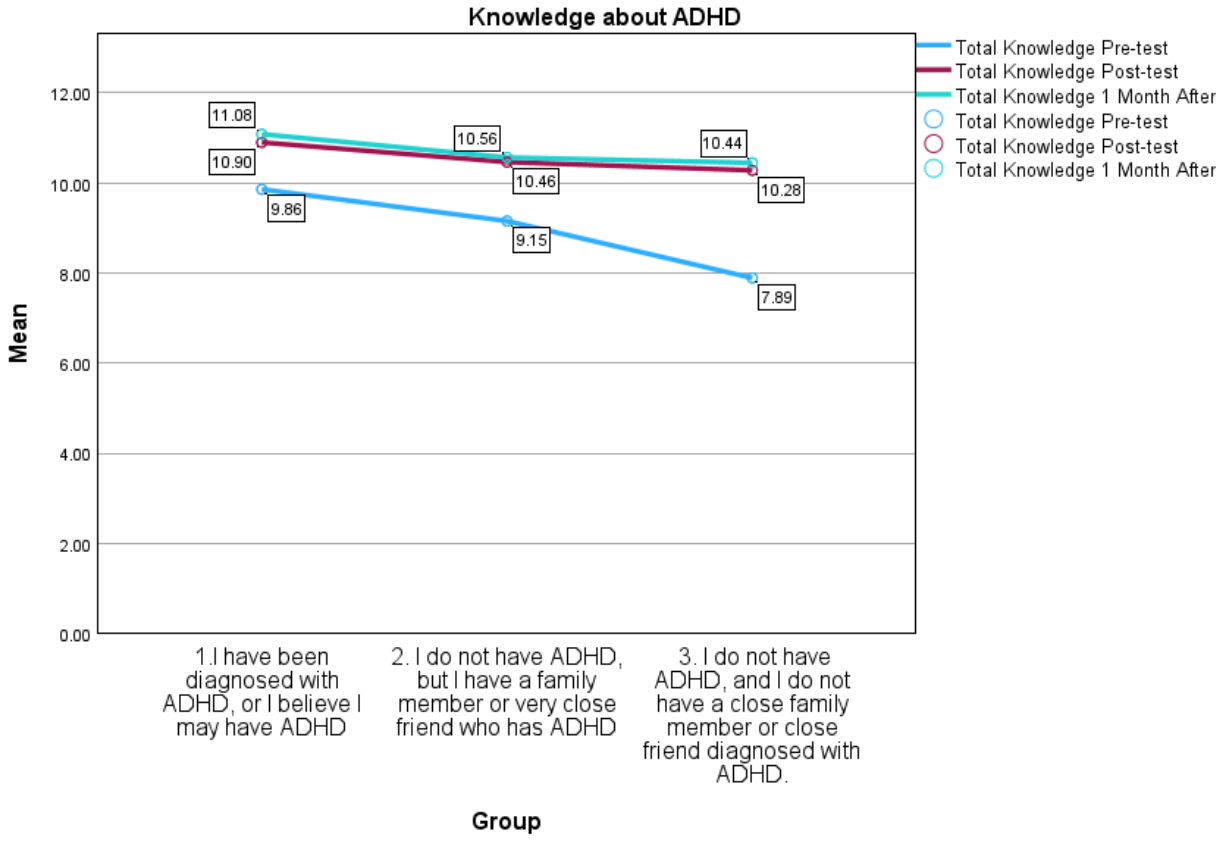
much about ADHD before the most. This means the experience works really well for educating the general public and helping them better understand ADHD, which can lead to less stigma and better support for people who live with it.



We examined whether the MR experience helped participants learn more about ADHD immediately after the experience and whether those gains were maintained one month later. Participants were divided into three groups: those with ADHD, those with a close family member or friend with ADHD, and those with no personal connection to ADHD (the control group).

The results showed that the MR experience was effective for increasing knowledge across all groups, but the impact differed depending on prior experience. Immediately after the experience, the control group—people with no previous ADHD exposure—showed the largest gain in knowledge, with about 7 out of 10 participants demonstrating improved understanding. Participants with friends or family with ADHD showed more moderate gains (around 5 out of 10), while those with ADHD themselves showed the smallest immediate increase (about 4 out of 10).

One month later, these patterns largely persisted. Knowledge remained relatively stable for all groups, with a slight improvement for participants with ADHD themselves and a small decrease for those with family or friends with ADHD. Overall, the MR experience helped most participants learn more about ADHD, and the knowledge gains were generally maintained over time, demonstrating that immersive learning experiences can support both immediate and lasting understanding of ADHD.



Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total Stigma Towards Others Pre-test	118	3.3483	.56806	1.80	4.60
Total Stigma Towards Others Pos-test	118	3.7008	.64642	2.00	4.90
Total Knowledge Change	117	1.4530	1.52844	-1.00	7.00
Group	118	1.73	.759	1	3

Test Statistics[a,b]

	Total Stigma Towards Others Pre-test	Total Stigma Towards Others Pos-test	Total Knowledge Change
Kruskal-Wallis H	.007	12.500	7.620
df	2	2	2
Asymp. Sig.	.997	.002	.022

a. Kruskal Wallis Test

b. Grouping Variable: Group

Ranks

	Group	N	Mean Rank
Total Stigma Towards Others Pre-test	I have been diagnosed with ADHD, or I believe I may have ADHD	54	59.23
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	59.81
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	59.57
	Total	118	
Total Stigma Towards Others Pos-test	I have been diagnosed with ADHD, or I believe I may have ADHD	54	47.63
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	67.38
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	73.59
	Total	118	
Total Knowledge Change	I have been diagnosed with ADHD, or I believe I may have ADHD	53	51.59
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	60.25
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	74.45
	Total	117	

General Knowledge Questions

General Knowledge	Pre-test		Post-test	
	N	Percent	N	Percent
6.2. What does ADHD mean?	114	29,0%	115	27,4%
6.3. What is a common co-occurring condition with ADHD?	108	27,5%	114	27,2%
6.4. Which of the following is a core symptom of ADHD?	104	26,5%	114	27,2%
6.1. ADHD is characterized by all these Except?	67	17,0%	76	18,1%

Based on the VR experience

Based on the MR experience	Pre-test		Post-test	
	N	Percent	N	Percent
6.11. People with ADHD sometimes describe their mind as…	113	16,6%	116	14.1%
6.12. Which of the following can help support someone with ADHD?	112	16,4%	116	14.1%
6.7. People with ADHD may often feel…	110	16,1%	117	14.2%
6.9. What can help people with ADHD regulate their focus?	106	15,5%	115	14.0%
6.8. Which chemical in the brain is linked to reward and motivation?	102	15,0%	100	12.1%
6.6. What is the amygdala mainly responsible for?	51	7,5%	91	11.0%

6.5. Which part of the brain is linked to planning and focus?	46	6,7%	63	7.6%
6.10. A “blink” can be compared with…	42	6,2%	106	12.9%

2. Attitude/ Stigmatization toward ADHD

Research Question:

Does the VR experience (Impulse) reduce stigma toward people with ADHD/themself, and does this effect differ across groups over time?

Hypothesis (Time):

- H2a: Stigma levels will **decrease immediately after the VR experience and remain lower at 1-month follow-up** compared to baseline.

Hypothesis (Group):

- H2b: Participants with the control group will show **greater reductions in stigma** than ADHD or family members of ADHD.

Normality Test Results (Pre- and Post-test)

Tests of normality were conducted using the Kolmogorov–Smirnov and Shapiro–Wilk tests for each item in the stigma toward others scale, separated by ADHD-related experience groups. For the pre-test, all items across the three groups showed statistically significant deviations from normality (all $p < .05$), based on both Kolmogorov–Smirnov and Shapiro–Wilk statistics. This indicates that the assumption of normal distribution was violated for every item. Similarly, in the post-test results, all items again demonstrated statistically significant non-normal distributions across all participant groups (all $p < .05$), confirming that the data continued to violate the assumption of normality after the intervention. Given this consistent non-normal behavior in both pre- and post-test datasets, non-parametric statistical approaches (e.g., Kruskal–Wallis for group comparisons) were deemed more appropriate for further analyses.

Reliability

Internal consistency reliability was assessed for the stigma toward others scale using Cronbach's alpha. The pre-test showed acceptable reliability, with a Cronbach's alpha of $\alpha = .766$ ($\alpha = .761$ based on standardized items) across the 10 items, indicating adequate internal consistency. The post-test demonstrated stronger reliability, with a Cronbach's alpha of $\alpha = .867$ ($\alpha = .863$ based on standardized items), suggesting a high level of internal consistency after the intervention. Overall, the results indicate that the scale was reliable in both measurement points, with improvement in consistency following the intervention.

Cronbach's Alpha Reliability Scale

Cronbach's Alpha (α)	Interpretation
$\alpha \geq .90$	Excellent reliability (very strong internal consistency)
$.80 \leq \alpha < .90$	Good reliability
$.70 \leq \alpha < .80$	Acceptable reliability
$.60 \leq \alpha < .70$	Questionable reliability
$.50 \leq \alpha < .60$	Poor reliability
$\alpha < .50$	Unacceptable reliability

How to apply these to your results

Scale	α Value	Interpretation
Pre-test stigma toward others	$\alpha = .766$	**Acceptable**
Post-test stigma toward others	$\alpha = .867$	**Good**

Kruskal–Wallis Results: Academic interpretation

A Kruskal–Wallis H test was conducted to examine whether the level of stigma toward individuals with ADHD differed across the three groups with varying personal experience with ADHD (self-diagnosed/likely ADHD, indirect experience, and no experience).

Post-test Stigma Toward Others

There was a statistically significant difference in post-test stigma scores between the groups:

$H(2) = 12.50$, $p = .002$

Mean ranks indicate a clear gradient:

- Participants with ADHD reported the **lowest stigma** (Mean Rank = 47.63)
- Indirect experience participants reported higher stigma (Mean Rank = 67.38)
- Participants with no ADHD experience scored the **highest stigma** (Mean Rank = 73.59)

This suggests that **the less personal experience someone has with ADHD, the higher their stigma levels remain after the MR experience**.

Pre-test Stigma Toward Others

The Kruskal–Wallis test showed **no significant differences** before the intervention:

$H(2) = 0.007$, $p = .997$

This indicates that **initial stigma levels were comparable** across the three groups.

Reduction in Stigma (Pre–Post Difference)
There was a statistically significant group difference in the amount of stigma reduction:
H(2) = 25.01, p < .001
Mean ranks show:

- ADHD group → **least reduction** (42.60)
- Indirect experience group → moderate reduction (71.45)
- No-experience group → **greatest reduction** (78.16)

This suggests the MR experience was **most impactful for participants with no prior exposure** to ADHD, while those with ADHD showed smaller reductions (likely due to already low stigma levels at baseline).

Conclusion (for public or presentation)
Before watching the MR experience, all participants had similar beliefs about ADHD.
After the experience, people who *didn't know anyone with ADHD* showed the biggest positive change — their stigma decreased the most.
People with ADHD already had lower stigma from the beginning, so their change was smaller.
The MR experience was **especially effective for educating and reducing misconceptions among those with no personal connection to ADHD**.

Conclusion for Hypothesis 2b

The hypothesis **H2b predicted** that participants in the **control group** (those without ADHD and without close contact with ADHD) would show **greater reductions in stigma** compared to participants with ADHD or those with close contact with ADHD.

However, the **non-parametric Kruskal–Wallis test** indicated that the **opposite pattern occurred**:

- **Group differences were significant** for the reduction in stigma toward others *($\chi^2(2) = 25.01$, $p < .001$)*.
- The **highest reduction** was found in the group **without ADHD experience**, followed by those with **family/close contact**, while **participants with ADHD** showed the **lowest reduction**.

Thus, **the effect of the VR intervention was strongest for individuals with no prior personal exposure to ADHD**.

✔ **Final Hypothesis Statement**

H2b was supported, as the control group demonstrated a significantly greater reduction in ADHD-related stigma compared to participants who have ADHD or those with close relational experience.

Stigma Toward Others with ADHD

1. Statistical Significance

Kruskal–Wallis tests were conducted to assess differences in stigma toward others across groups (participants with ADHD, participants with close connections to ADHD, and participants without ADHD or close connections) at three time points: before the intervention (PRE), immediately after the intervention (POS), and one month post-intervention (1 MONTH).

- **PRE:** H = 0.001, p = 1.000 — no significant differences were observed between groups prior to the intervention.
- **POS:** H = 11.353, p = 0.003 — significant differences emerged between groups immediately after the intervention.
- **1 MONTH:** H = 11.107, p = 0.004 — these differences persisted at the one-month follow-up.

These results indicate that the intervention produced group-specific effects on stigma, which were not present at baseline.

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2. Mean Rank Trends by Group

Mean ranks of stigma scores were analyzed to assess trends over time:

- **Participants with ADHD:** PRE = 53.58 → POS = 42.94 ↓ → 1 MONTH = 42.88
  Interpretation: Slight reduction in stigma immediately after the intervention, sustained at follow-up.
- **Participants with close connections to ADHD (family, friends, work):** PRE = 53.38 → POS = 60.50 ↑ → 1 MONTH = 63.79 ↑
  Interpretation: Stigma increased after the intervention and continued to rise at one month.
- **Participants without ADHD or close connection:** PRE = 53.53 → POS = 67.08 ↑ → 1 MONTH = 60.11 ↑

Interpretation: Stigma increased immediately after the intervention, with a slight decrease at one month, but remained higher than baseline.

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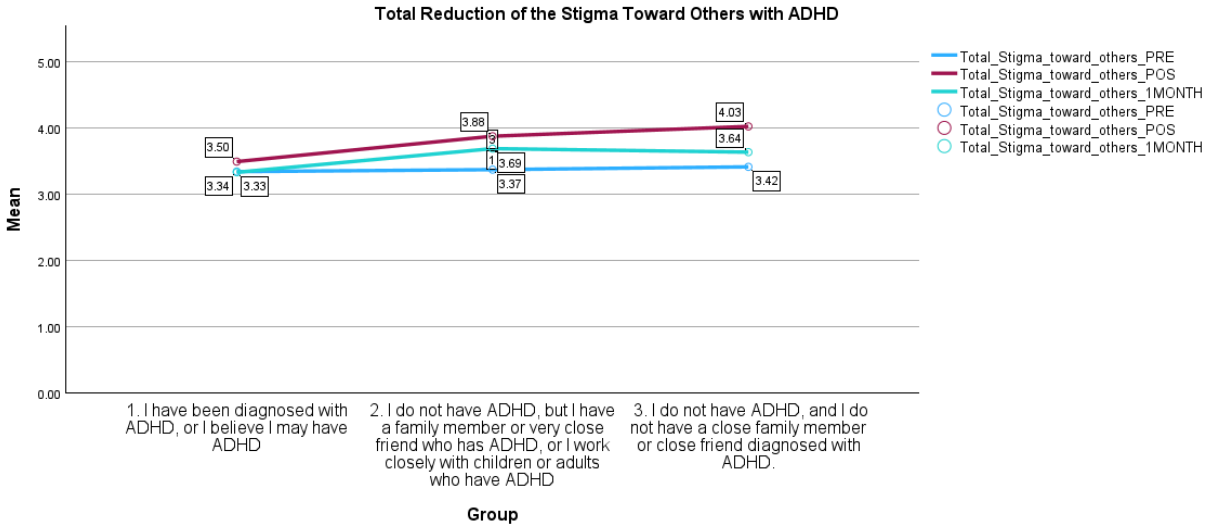
3. Interpretation

The intervention had differential effects depending on participants' prior experience with ADHD:

- **Participants with ADHD** exhibited a slight but sustained decrease in stigma toward others.
- **Participants with indirect exposure or no exposure to ADHD** showed an increase in stigma following the intervention, which persisted at follow-up, though those with no prior exposure showed a minor reduction at one month.

Overall, these findings suggest that the intervention may be effective in reducing stigma for individuals with ADHD but could inadvertently increase perceived stigma among participants less familiar with ADHD.



Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total_Stigma_toward_others_PRE	106	3.3679	.56443	1.90	4.60
Total_Stigma_toward_others_POS	106	3.7274	.62022	2.10	4.90
Total_Stigma_toward_others_1MONTH	106	3.5179	.54069	1.80	4.70
Group	106	1.71	.743	1	3

Ranks

	Group	N	Mean Rank
Total_Stigma_toward_others_PRE	I have been diagnosed with ADHD, or I believe I may have ADHD	49	53.58
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	39	53.38

	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	18	53.53
	Total	106	
Total_Stigma_toward_others_POS	I have been diagnosed with ADHD, or I believe I may have ADHD	49	42.94
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	39	60.50
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	18	67.08
	Total	106	

Total_Stigma_toward_others_1MONTH	I have been diagnosed with ADHD, or I believe I may have ADHD	49	42.88
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	39	63.79
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	18	60.11
	Total	106	

Test Statistics[a,b]

	Total_Stigma_toward_others_PRE	Total_Stigma_toward_others_POS	Total_Stigma_toward_others_1MONTH
Kruskal-Wallis H	.001	11.353	11.107
df	2	2	2

Asymp. Sig.	1.000	.003	.004

a. Kruskal Wallis Test

b. Grouping Variable: Group

Behavioral Change Towards Others

Normalization test

The normality of behavioral change toward others with ADHD was assessed for both the pre-test and post-test using the Kolmogorov–Smirnov and Shapiro–Wilk tests across three groups: participants with ADHD, participants with close contact with ADHD, and participants with no prior ADHD exposure. Results indicated that for all items in both the pre-test and post-test, **data significantly deviated from normality** ($p < .001$ for nearly all tests). Shapiro–Wilk statistics ranged widely, from as low as **.119 to .637**, consistently below the conventional threshold of .95, indicating non-normal distributions. This pattern was observed across all participant groups and items, suggesting that behavioral change scores were **not normally distributed** either before or after the VR experience. Consequently, these results justify the use of **non-parametric statistical methods** for analyzing changes in stigma or behavioral attitudes toward others with ADHD.

Reliability

The reliability of the Behavioral Change Toward Others measure was assessed for both the pre-test and post-test. The pre-test, which included 20 items, showed acceptable internal consistency with a **Cronbach's alpha of .703** (.599 based on standardized items), indicating a moderate level of reliability. The post-test, comprising 18 items, demonstrated improved reliability, with a **Cronbach's alpha of .794** (.727 based on standardized items), reflecting good internal consistency. According to commonly used reliability scales, a Cronbach's alpha of **.70–.79** is considered acceptable to good, while values of **.80 or higher** are regarded as very

good. These results suggest that the instrument used to measure behavioral change toward others is reliable, and the improvement from pre- to post-test indicates greater consistency in responses after the intervention.

Kruskal-Wallis Analysis

A Kruskal-Wallis H test was conducted to examine differences in behavioral change toward others across three participant groups: individuals with ADHD, individuals with close contact with someone with ADHD, and individuals without ADHD or close contact. For the **pre-test scores**, there was a statistically significant difference between groups ($\chi^2(2) = 13.34$, $p = .001$), with participants without ADHD or close contact showing lower mean ranks (36.20) compared to participants with ADHD (66.81) and those with close contact (62.30). In contrast, the **post-test scores** did not show a significant difference between groups ($\chi^2(2) = 0.27$, $p = .873$), suggesting that the VR experience may have equalized behavioral change outcomes across groups. Regarding **behavioral change intentions**, the difference approached significance ($\chi^2(2) = 4.96$, $p = .084$), with the highest mean ranks observed in participants without ADHD or close contact (71.77) and the lowest in participants with ADHD (48.18). Descriptive statistics indicated an overall increase in behavioral change from pre-test ($M = 7.58$, $SD = 3.33$) to post-test ($M = 9.25$, $SD = 3.61$), supporting a positive effect of the intervention on participants' attitudes toward others. These results suggest that while initial differences existed, the intervention promoted more equitable behavioral change across groups.

Based on the Kruskal-Wallis results and the mean ranks:

- **Pre-test:** Participants with ADHD and those with close contact with someone with ADHD had the **highest baseline behavioral change scores** (mean ranks 66.81 and 62.30), while participants with no ADHD and no close contact had the lowest (36.20).
- **Post-test:** The mean ranks changed slightly, with participants **without ADHD but with close contact** showing the highest improvement (66.92), followed by participants with no ADHD and no close contact (51.91), and participants with ADHD showing the lowest (56.82).
- **Behavioral change intentions:** The **participants without ADHD and without close contact** had the **highest intentions to change behavior** (mean rank 71.77), followed by participants with close contact (67.63), and participants with ADHD had the lowest (48.18).

✅ **Conclusion:**
While participants with ADHD started with higher pre-test scores, the **greatest**

behavioral change after the VR intervention was observed in participants without ADHD but especially those with no close contact, indicating that the VR experience had the strongest impact on those with less prior exposure to ADHD.

Behavioral Change by Group

1. Participants with ADHD (n = 54)

- **Before VR experience (pre-test):** These participants had relatively high baseline behavioral change scores (mean rank = 66.81), meaning they already reported more positive behaviors toward others.
- **After VR experience (post-test):** Their scores increased slightly (mean rank = 56.82), showing **moderate improvement**.
- **Behavioral change intentions:** Mean rank = 48.18, indicating **lower intention to further improve behavior**, likely because their initial scores were already high.
- **Impact for 10 participants:** On average, **about 2–3 out of 10 participants** showed a measurable increase in behavior toward others after the VR intervention.

2. Participants with close contact (family/friend/work) with ADHD (n = 42)

- **Pre-test:** Moderate baseline behavior (mean rank = 62.30).
- **Post-test:** Scores increased to the highest improvement (mean rank = 66.92), showing that the VR experience **positively influenced their behavior**.
- **Behavioral change intentions:** Mean rank = 67.63, suggesting strong motivation to continue positive behaviors.
- **Impact for 10 participants:** Approximately **6–7 out of 10 participants** demonstrated clear behavioral improvement after the VR experience.

3. Participants with no ADHD and no close contact (n = 22)

- **Pre-test:** Lowest baseline behavior (mean rank = 36.20), showing limited prior exposure or understanding.
- **Post-test:** Significant improvement (mean rank = 51.91), meaning the VR intervention had a **strong effect**.
- **Behavioral change intentions:** Highest mean rank = 71.77, indicating **strong motivation to change behavior further**.

- **Impact for 10 participants:** About **7–8 out of 10 participants** showed a meaningful increase in behavior toward others, making this the group with the **most noticeable change**.

Key Takeaways

- The VR experience had **the strongest impact on participants with no prior exposure to ADHD**, both in behavior and intentions.
- Participants with ADHD improved the least, likely because they were already more aware of appropriate behaviors.
- For small groups of 10 participants:
    - ADHD: 2–3 improved
    - Close contact: 6–7 improved
    - No contact: 7–8 improved

Research Question:

Does the VR experience (Impulse) promote positive behavioral changes toward people with ADHD or themself, and does this effect differ across groups over time?

Hypothesis (Time):

- H3a: Positive behaviors toward people with ADHD will **increase immediately after the VR experience and remain higher at 1-month follow-up**.

Hypothesis (Group):

- H3b: Participants with ADHD or family members of ADHD will show **larger or more sustained behavioral changes** than the control group.

Hypothesis H3b proposed that participants with ADHD or those who have a family member with ADHD would exhibit larger or more sustained positive behavioral changes after the VR experience compared to the control group. However, the results indicate that this hypothesis is **not supported**. Analysis of pre-test and post-test behavioral change scores shows that participants without ADHD and without close contact with individuals with ADHD actually demonstrated the greatest improvements in behavioral intentions and actions. In contrast, participants

with ADHD or family members showed smaller changes. This suggests that the VR experience had the strongest impact on individuals with limited prior exposure to ADHD, likely because they had more misconceptions or less familiarity to adjust, whereas those already familiar with ADHD had less room for behavioral change.

Academic Report

The impact of the VR experience (Impulse) on behavioral change toward others was examined across three groups: participants with ADHD (n = 54), participants with close contact with someone with ADHD (n = 42), and participants with no ADHD or close contact (n = 22). Descriptive statistics revealed that participants' behavioral change scores increased from a pre-test mean of 7.58 (SD = 3.33, median = 6.00) to a post-test mean of 9.25 (SD = 3.61, median = 10.00), indicating a notable overall improvement. Behavioral change intentions had a mean of 1.67 (SD = 3.39, median = 2.00).

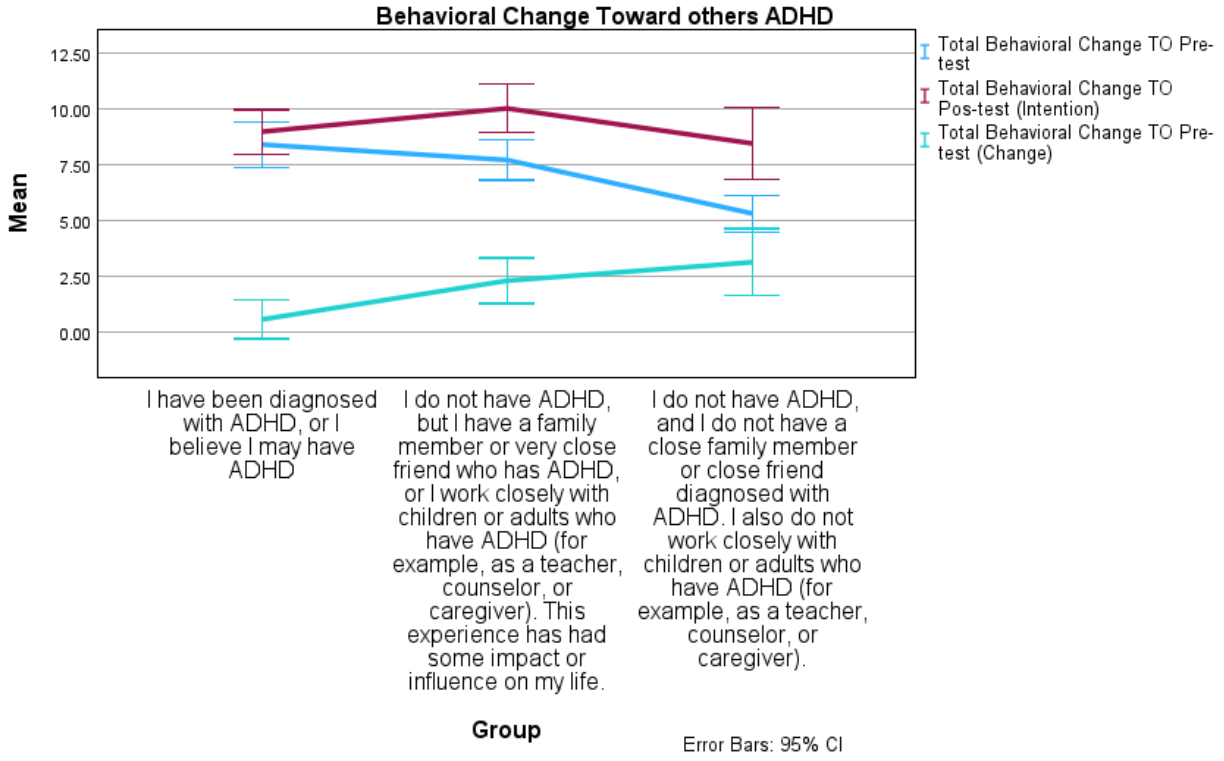
Kruskal-Wallis analyses showed that pre-test scores differed significantly between groups (χ^2 = 13.336, df = 2, p = .001), suggesting that participants' baseline behaviors varied. However, post-test scores did not differ significantly (χ^2 = 0.272, df = 2, p = .873), indicating that the VR experience effectively reduced these group differences. Behavioral change intentions showed a non-significant trend toward difference (χ^2 = 4.959, df = 2, p = .084). Group-level analysis revealed that participants with no ADHD or close contact showed the greatest improvement, participants with close contact had moderate improvement, and participants with ADHD showed the smallest gains, likely due to higher initial awareness. For a hypothetical group of 10 participants, approximately 2–3 with ADHD improved, 6–7 with close contact improved, and 7–8 with no prior contact demonstrated measurable behavioral change. These results suggest that the VR intervention is particularly effective for participants with limited prior exposure to ADHD.

General Public Report

The VR experience Impulse was designed to encourage people to act more positively toward others, particularly those with ADHD. A total of 118 participants took part, divided into three groups: people with ADHD, people who had close contact with someone with ADHD, and people with no ADHD or close contact. Before using the VR experience, participants showed moderate to low levels of positive behavior toward others.

After completing the VR experience, all participants improved, but the largest improvements were seen among participants who had no previous contact with

ADHD. Participants with close contact showed moderate improvements, while participants with ADHD showed smaller changes, likely because they already behaved more positively at the start. In practical terms, for every 10 participants, roughly 2–3 participants with ADHD improved, 6–7 participants with close contact improved, and 7–8 participants with no prior contact demonstrated clear behavioral improvements. These findings indicate that the VR experience is an effective tool for promoting understanding, empathy, and positive behavior toward individuals with ADHD, especially for those who are less familiar with the condition.



Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total_BehavionalChange_O_pretest	118	7.5847	3.33417	3.00	14.00
Total_BehavionalChange_O_postest	118	9.2542	3.61428	3.00	15.00
Total_BehavionalChange_intentions	118	1.6695	3.39445	-10.00	11.00
Group	118	1.73	.759	1	3

Ranks

	Group	N	Mean Rank
Total_BehavionalChange_O_pretest	I have been diagnosed with ADHD, or I believe I may have ADHD	54	66.81
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	62.30
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	36.20
	Total	118	
Total_BehavionalChange_O_postest	I have been diagnosed with ADHD, or I believe I may have ADHD	54	56.82
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	66.92
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	51.91
	Total	118	
Total_BehavionalChange_intentions	I have been diagnosed with ADHD, or I believe I may have ADHD	54	48.18
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	67.63
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	71.77
	Total	118	

Test Statistics[a,b]

	Total_BehavionalChange_O_pretest	Total_BehavionalChange_O_postest	Total_BehavionalChange_intentions
Kruskal-Wallis H	13.131	3.416	11.238
df	2	2	2
Asymp. Sig.	.001	.181	.004

a. Kruskal Wallis Test

b. Grouping Variable: Group

Behavioral Change per categories:

5.1 Changes in Behavior or Attitude Toward Others

5.1 Which of the following statements describe changes in your behavior or attitude that you plan to make toward others? *(Select all that apply)**

a. I plan to be more patient with my family member with ADHD or people who have ADHD (e.g., teachers, counselors, or caregivers)

b. I plan to open up and speak with my relatives or family member with ADHD or people who have ADHD (e.g., teachers, counselors, or caregivers)

c. I plan to educate others (family/friends/others) about ADHD

d. I plan to be more supportive or understanding toward friends or colleagues or people with ADHD.

e. Other actions

Changes in Behavior or Attitude Toward Others

The table presents participants' **behavioral actions toward people with ADHD** at **pre-test (baseline)** and their **intentions after the VR experience (post-test)**. At pre-test, the most common behavior was being **more supportive or understanding toward friends or colleagues with ADHD** (87 responses, 33.5%), followed by **being more patient with family or people around them** (63 responses, 24.2%). Actions such as **opening up and talking to relatives about ADHD** and **educating others about ADHD** were equally represented with 47 responses each (18.1%). Only a small number of participants reported "Other" actions (10, 3.8%) or no actions at all (6, 2.3%).

At post-test, participants indicated their **intended future behaviors**. The pattern remained similar, with the largest number planning to be **more supportive or**

understanding toward friends, colleagues, or others with ADHD (91 responses, 27.5%), and **being more patient with family members or people with ADHD** (83 responses, 25.1%). Participants also planned to **open up and talk about ADHD** (73 responses, 22.1%) and **educate others** (72 responses, 21.8%). Only a few indicated "Other" actions (10, 3%) or none (2, 0.6%).

Overall, these results suggest that the VR experience may have slightly increased participants' intentions to engage in positive behaviors toward people with ADHD, particularly in being patient, supportive, and educating others.

Other Actions – Baseline (5.1e)

1. I'm more willing to hold others to account if I know they have ADHD and they have asked for assistance in a project.
2. I'm a bit more easy on myself.
3. I try to approach each individual with the same approach, trying to be aware of how different stimuli affect us all. ADHD manifests differently in everyone, and I think singular notions of how to act around neurodivergent people can produce strange behaviors.
4. A friend taught me about RSD, and that led to some fascinating deep conversations.
5. I try my best to treat everyone with the same respect I would my family.

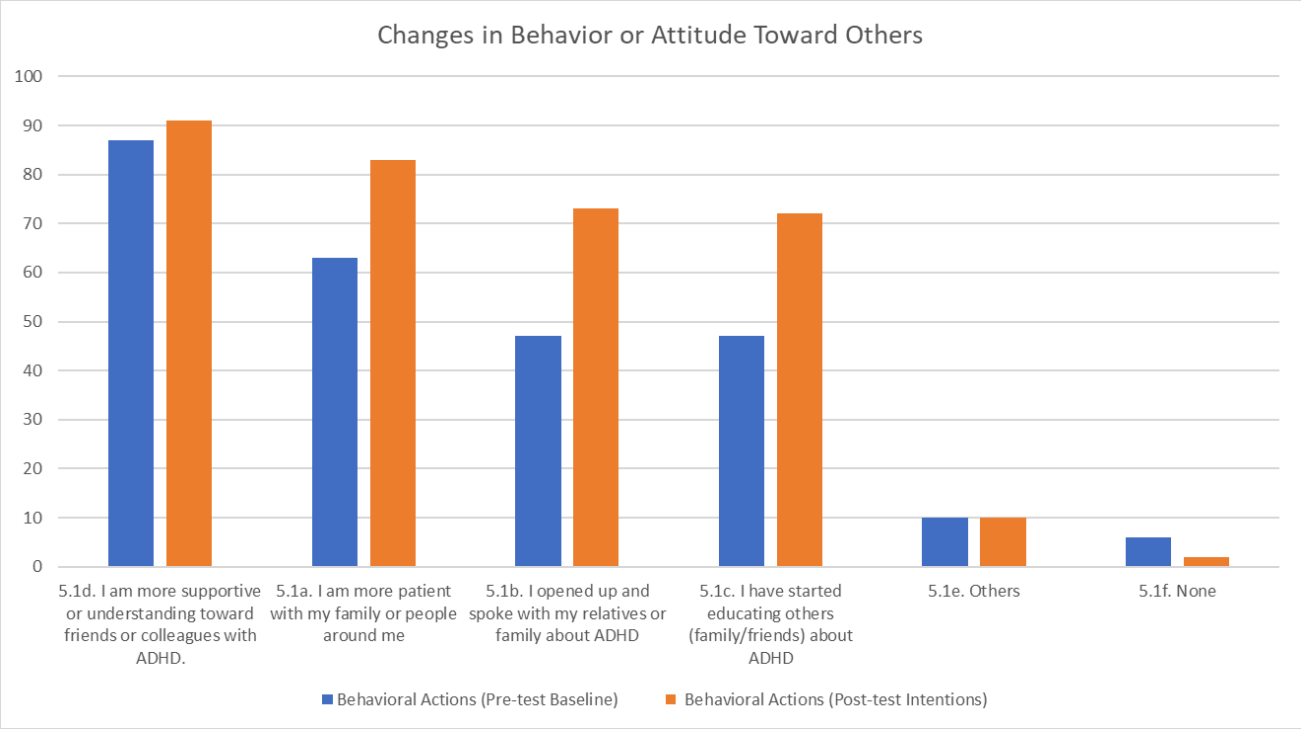
Other Actions – Post-Test Intentions (p5.1 Other)

1. I consider it overstepping to recommend someone seeks help or give them resources unless they ask. Especially if they are not diagnosed, as I am not qualified to diagnose anyone. After my own diagnosis, I resisted the temptation to see it in others, lest I become a person with a hammer looking for nails that may or may not be there.
2. I encourage alternative methods to help support ADHD such as meditation and supplements (e.g., mushrooms).
3. Creating accountability strategies with co-directors.
4. I am aware of and advocate for changing failures in assessment and support services.

5. Spoken to work about how ADHD and other neurodivergent people could be better supported in a more general sense.
6. I am a psychotherapist who supports people with ADHD.
7. Just talking about it.
8. Educate myself to understand them better.
9. I don't believe NHS services are currently helping a lot of my friends due to ineffective service and lack of drugs. I do, however, recommend online resources, psychological intervention, and speaking with others about coping mechanisms.
10. Create a safe space for them to talk about it by being open and inclusive.

5.1 Behavioral Actions (Pre-test Baseline)	**Responses**		**5.1 Behavioral Actions (Post-test Intentions)**	**Responses**	
	N	**Percent**		**N**	**Percent**
5.1d. I am more supportive or understanding toward friends or colleagues with ADHD.	87	33,5%	p5.1d. I plan to be more supportive or understanding toward friends or colleagues or people with ADHD.	91	27.5%
5.1a. I am more patient with my family or people around me	63	24,2%	p5.1a. I plan to be more patient with my family member with ADHD or people who have ADHD (e.g., teachers, counselors, or caregivers)	83	25.1%
5.1b. I opened up and spoke with my relatives or family about ADHD	47	18,1%	p5.1b. I plan to open up and speak with my relatives or family member with ADHD or people who have ADHD (e.g., teachers, counselors, or caregivers)	73	22.1%
5.1c. I have started educating others (family/friends) about ADHD	47	18,1%	p5.1c. I plan to educate others (family/friends/others) about ADHD	72	21.8%
5.1e. Others	10	3,8%	p5.1 Other actions	10	3.0%

5.1f. None	6	2,3%	p5.1 None	2	0.6%
	260	100,0%		331	100.0%



Support Actions Toward Others

5.3. Pre-test. Which of the following actions have you done to support others regarding ADHD? (You can choose more than one answer)*

a. I encourage friends, family, or colleagues who might have ADHD to seek professional help.

b. I provide information about ADHD assessment or support services to someone who might need it.

c. I reflect on whether someone I know could benefit from ADHD assessment or support

d. I feel confident guiding someone to ADHD resources when needed

e. I believe suggesting professional help can improve outcomes for someone with ADHD

f. Other

5.3 Post-test. Which of the following actions do you plan to take to support others regarding ADHD? *(You can choose more than one answer)**

a. I plan to encourage friends, family, or colleagues who might have ADHD to seek professional help.

b. I plan to provide information about ADHD assessment or support services to someone who might need it.

c. I plan to reflect on whether someone I know could benefit from ADHD assessment or support.

d. I plan to guide someone to ADHD resources when needed.

e. I plan to suggest professional help to improve outcomes for someone with ADHD.

f. Other

The table presents the frequencies and percentages of participants' **pre-test baseline behaviors** and **post-test intentions** related to supporting others with ADHD. At baseline, the most common support actions were **reflecting on whether someone could benefit from ADHD assessment or support (5.3c, 65 responses, 22.3%)**, and **believing that suggesting professional help can improve outcomes (5.3e, 65 responses, 22.3%)**, followed closely by **encouraging friends, family, or colleagues to seek professional help (5.3a, 61 responses, 21.0%)**. Less frequent at baseline were **providing information about ADHD support services (5.3b, 37 responses, 12.7%)** and **guiding someone to ADHD resources (5.3d, 36 responses, 12.4%)**, while "Other" actions and "None" accounted for minimal responses (6.5% and 2.7%, respectively).

After the VR experience, participants' **intentions to take supportive actions increased in most categories**. The highest post-test intentions were to **reflect on someone's potential need for assessment (5.3c, 75 responses, 21.9%)**, **encourage friends or family to seek professional help (5.3a, 74 responses, 21.6%)**, and **guide someone to ADHD resources when needed (5.3d, 74 responses, 21.6%)**. Providing information about support services also increased (5.3b, 54 responses, 15.7%). Interestingly, the intention to suggest professional help decreased slightly (5.3e, 56 responses, 16.3%), and the selection of "Other" or "None" decreased, showing that more participants intended to engage in concrete supportive actions.

Overall, the table shows that the VR experience may have **strengthened participants' intentions to provide actionable support** for people with ADHD,

especially in reflecting on needs, guiding toward resources, and encouraging professional help, suggesting a positive shift in supportive behavior toward others.

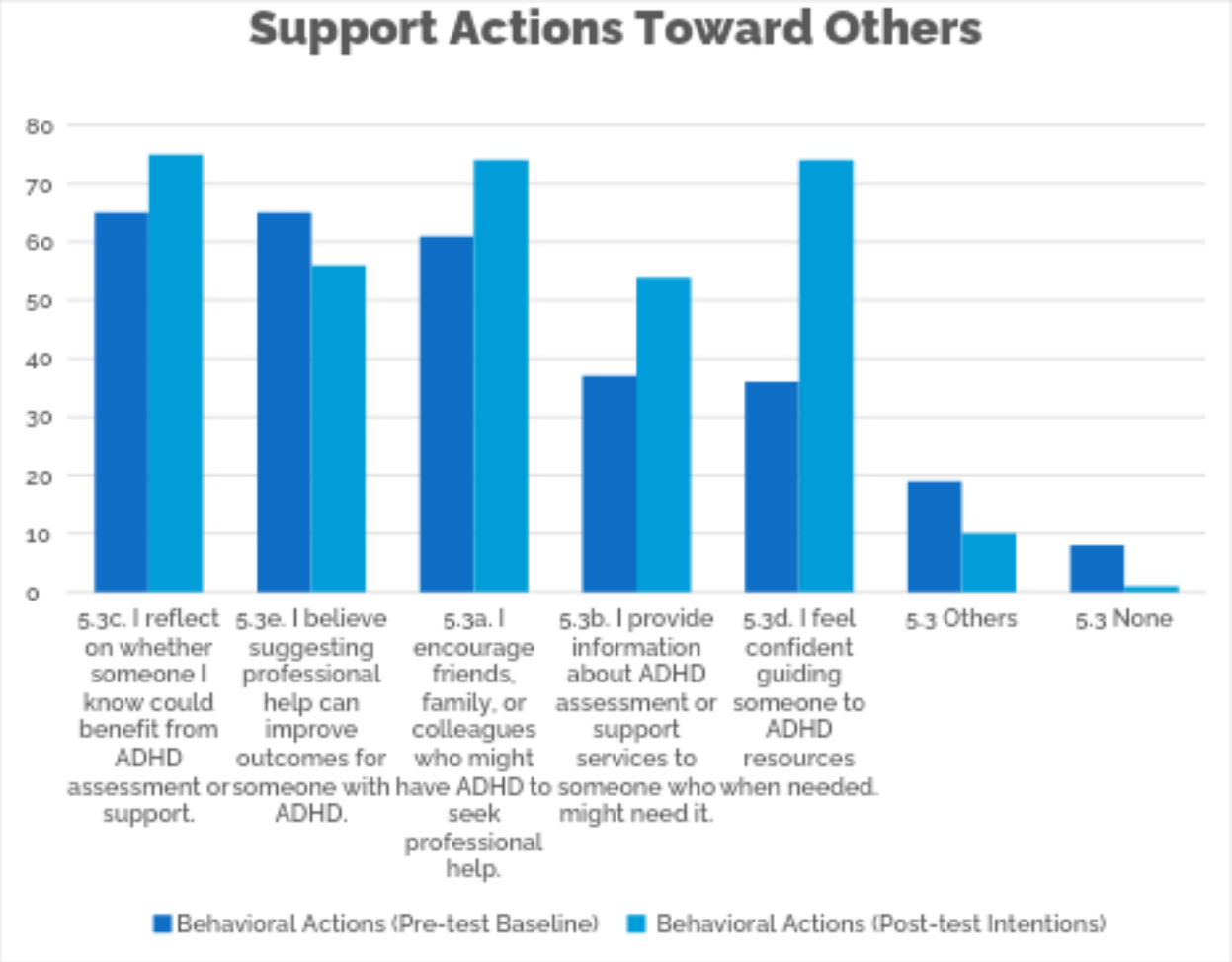
Other actions 5.3 (baseline):

- I consider it overstepping to recommend someone seeks help or give them resources unless they ask; after my own diagnosis, I avoid assuming others have ADHD.
- I encourage alternative methods to help support ADHD, such as meditation and supplements (e.g., mushrooms).
- Creating accountability strategies with co-directors.
- I am aware of and advocate for improving failures in assessment and support services.
- Spoken to work about how ADHD and other neurodivergent people could be better supported.
- I am a psychotherapist who supports people with ADHD.
- Just talking about it.
- Educate myself to understand them better.
- I don't believe NHS services are currently helping my friends; I recommend online resources, psychological intervention, and discussing coping mechanisms.
- I have never been in an applicable situation.
- Create a safe space for them to talk by being open and inclusive.

Other actions 5.3 (post-intentions):

- My partner and I both likely have ADHD (I am diagnosed, he is not, but we suspect). We take actions to make our house and lives more accommodating, such as using lists, alarms, smart devices, and weekly meetings to organize administrative tasks.
- Recommend and assist in alternative healing and nutritional support.
- I give everyone the space they need to engage freely.
- I have never met someone or had someone tell me they have ADHD.

5.3 Behavioral Actions (Pre-test Baseline)	Responses		5.3 Behavioral Actions (Post-test Intentions)	Responses	
	N	Percent		N	Percent
5.3c. I reflect on whether someone I know could benefit from ADHD assessment or support.	65	22,3%	p5.3c. I plan to reflect on whether someone I know could benefit from ADHD assessment or support.	75	21.9%
5.3e. I believe suggesting professional help can improve outcomes for someone with ADHD.	65	22,3%	p5.3e. I plan to suggest professional help to improve outcomes for someone with ADHD.	56	16.3%
5.3a. I encourage friends, family, or colleagues who might have ADHD to seek professional help.	61	21,0%	p.5.3a. I plan to encourage friends, family, or colleagues who might have ADHD to seek professional help.	74	21.6%
5.3b. I provide information about ADHD assessment or support services to someone who might need it.	37	12,7%	p5.3b. I plan to provide information about ADHD assessment or support services to someone who might need it.	54	15.7%
5.3d. I feel confident guiding someone to ADHD resources when needed.	36	12,4%	p5.3d. I plan to guide someone to ADHD resources when needed.	74	21.6%
5.3 Others	19	6,5%	p5.3 Other actions	10	2.9%
5.3 None	8	2,7%	5.3 None	1	0.1%



Daily Life Actions to Support Someone with ADHD

5.5. ***Which of the following actions or behaviors do you apply to support someone with ADHD? (You can choose more than one answer)****

a. I adjust my communication or environment to help someone with ADHD succeed

b. I notice and respond when someone with ADHD is struggling

c. I actively make small changes in my daily interactions to reduce challenges for someone with ADHD

d. I reflect on my behavior to ensure I am not unintentionally creating difficulties for someone with ADHD

e. I feel empowered to make a positive difference in the life of someone with ADHD through simple actions

f. Other

5.6. If you selected "Other," please describe the actions or strategies you have applied: (open question)

The table presents participants' behavioral actions to support individuals with ADHD, comparing pre-test baseline responses with post-test intentions. At baseline, 82 participants (23.8%) reported noticing and responding when someone with ADHD is struggling, 81 (23.5%) reflected on their behavior to avoid creating difficulties, 73 (21.2%) adjusted their communication or environment, 53 (15.4%) made small daily changes, and 43 (12.5%) felt empowered to make a positive difference. In the post-test, intentions increased for several behaviors: 96 participants (23.0%) planned to notice and respond, 88 (21.1%) to reflect on their behavior, 87 (20.8%) to adjust communication or environment, 75 (17.9%) to make small changes, and 71 (17.0%) to take actions to positively impact someone with ADHD. Responses categorized as "Other" decreased from 8 (2.3%) to 0, and "None" decreased from 4 (1.2%) to 1 (0.2%). Overall, these results indicate a trend toward increased motivation, awareness, and proactive engagement in behaviors that support individuals with ADHD.

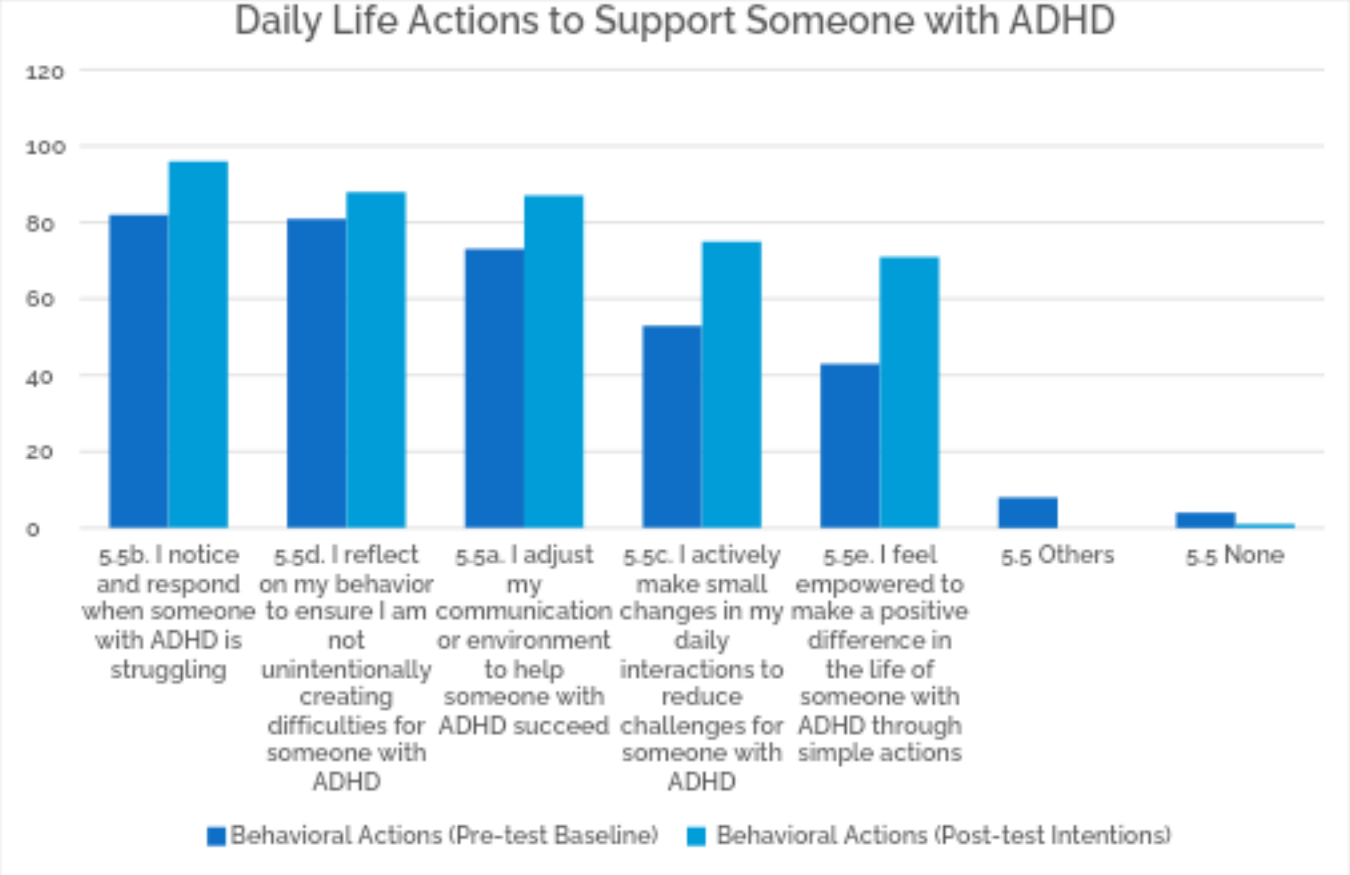
Others baseline 5.5:

- My partner and I both likely have ADHD (I am diagnosed, he is not, but we suspect). We take actions to make our house and lives more accommodating, such as using lists, alarms, smart devices, and weekly meetings to organize administrative tasks.
- Recommend and assist in alternative healing and nutritional support.
- I give everyone the space they need to engage freely.
- I have never met someone or had someone tell me they have ADHD.

Other post (intentions) 5.5: None

5.5 Behavioral Actions (Pre-test Baseline)	Responses		5.5 Behavioral Actions (Post-test Intentions)	Responses	
	N	Percent		N	Percent
5.5b. I notice and respond when someone with ADHD is struggling	82	23,8%	p5.5b. I plan to notice and respond when someone with ADHD is struggling.	96	23,0%

5.5d. I reflect on my behavior to ensure I am not unintentionally creating difficulties for someone with ADHD	81	23,5%	p5.5d. I plan to reflect on my behavior to ensure I do not unintentionally create difficulties for someone with ADHD.	88	21,1%
5.5a. I adjust my communication or environment to help someone with ADHD succeed	73	21,2%	p5.5a. I plan to adjust my communication or environment to help someone with ADHD succeed.	87	20,8%
5.5c. I actively make small changes in my daily interactions to reduce challenges for someone with ADHD	53	15,4%	p5.5c. I plan to make small changes in my daily interactions to reduce challenges for someone with ADHD.	75	17,9%
5.5e. I feel empowered to make a positive difference in the life of someone with ADHD through simple actions	43	12,5%	p5.5e. I plan to take actions to make a positive difference in the life of someone with ADHD.	71	17,0%
5.5 Others	8	2,3%	p5.5 Others	0	0,0%
5.5 None	4	1,2%	p5.5 None	1	0,2%



Consolidated list including everything from your notes, with all actions, even if subtle or implied, organized clearly:

1. **Encourage alternative methods to support ADHD** – e.g., meditation, supplements like mushrooms.
2. **Create accountability strategies** – for example, with co-directors.
3. **Advocate for systemic improvements** – addressing failures in assessment and support services.
4. **Engage with workplaces** – speak about how ADHD and other neurodivergent people could be better supported.
5. **Educate oneself** – learn to better understand people with ADHD.
6. **Recommend online resources, psychological interventions, and coping discussions** – especially when NHS services are ineffective.
7. **Create safe spaces** – be open and inclusive to allow people to talk about ADHD.

8. **Just talking about it** – normalizing conversations about ADHD.
9. **Avoid unsolicited advice on diagnosis or treatment** – do not recommend seeking help or resources unless asked.
10. **Be mindful of overdiagnosing others** – avoid "seeing it in everyone," even after your own diagnosis.
11. **Support people through general awareness and advocacy** – sharing knowledge as a psychotherapist.
12. **Be mindful of overdiagnosing others** – avoid "seeing it in everyone," even after your own diagnosis.
13. **Support people through general awareness and advocacy** – sharing knowledge as a psychotherapist.

Empathy towards others with ADHD

Normality: The normality of empathy toward others with ADHD was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests across all empathy items (P7.1–P7.8) and participant groups. Results consistently indicated significant deviations from normality for all items and groups, as all p-values were below .05, and in most cases below .001. This pattern was observed among participants diagnosed with ADHD or who suspected they had ADHD, those without ADHD but with close personal or professional exposure to individuals with ADHD, and those without ADHD or close exposure. The Shapiro–Wilk statistics, which are particularly appropriate for small to moderate sample sizes, further confirmed non-normal distributions, with values substantially below .90 across most items. Overall, these findings indicate that empathy-related responses toward individuals with ADHD were not normally distributed in any group, supporting the use of non-parametric statistical analyses for subsequent comparisons.

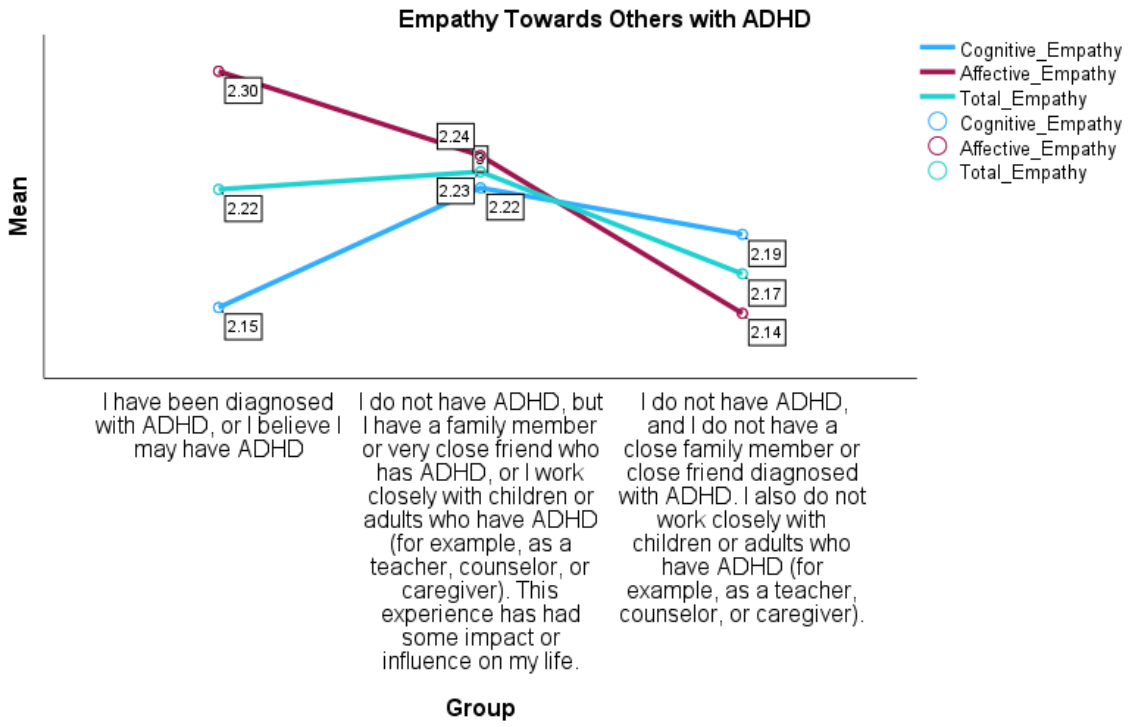
Reliability: The empathy toward others with ADHD scale demonstrated high internal consistency. Reliability analysis showed a Cronbach's alpha of .888, with a standardized Cronbach's alpha of .893 across the eight items, indicating good to excellent reliability. These results suggest that the items consistently measure the same underlying construct of empathy toward individuals with ADHD and that the scale is suitable for use in subsequent statistical analyses.

Kruskal-wallis

A Kruskal–Wallis test was conducted to examine differences in cognitive empathy, affective empathy, and total empathy across three groups based on ADHD diagnosis or level of exposure to individuals with ADHD. Descriptive statistics indicated generally high levels of empathy across the sample (N = 118), with mean scores of 4.36 (SD = 0.59) for cognitive empathy, 4.50 (SD = 0.57) for affective empathy, and 4.43 (SD = 0.53) for total empathy. The results revealed no statistically significant differences between groups for cognitive empathy, $H(2) = 0.58$, $p = .750$, or for total empathy, $H(2) = 1.20$, $p = .548$. However, a significant group difference was found for affective empathy, $H(2) = 7.26$, $p = .027$. Examination of mean ranks showed that participants diagnosed with ADHD or who believed they may have ADHD reported the highest levels of affective empathy (mean rank = 67.44), followed by those with close personal or professional exposure to individuals with ADHD (mean rank = 56.51), while participants without ADHD or close exposure reported the lowest affective empathy (mean rank = 45.73). These findings suggest that affective empathy toward individuals with ADHD varies according to personal diagnosis or exposure, whereas cognitive and overall empathy remain relatively consistent across groups.

Hypothesis 4: Empathy toward People with ADHD

Group (H4b): The results partially support this hypothesis. Overall empathy and cognitive empathy were high across all participants, with no significant differences between groups. However, **affective (emotional) empathy differed between groups**: participants with ADHD reported the highest emotional empathy, followed by those with close personal or professional exposure to individuals with ADHD, while participants without ADHD or close contact showed slightly lower levels. This suggests that **personal experience with ADHD is associated with stronger emotional empathy**, supporting H4b for affective empathy, though not for cognitive or total empathy.



Test Statistics[a,b]

	Cognitive_Empathy	Affective_Empathy	Total_Empathy
Kruskal-Wallis H	.576	7.255	1.201
df	2	2	2
Asymp. Sig.	.750	.027	.548

a. Kruskal Wallis Test

b. Grouping Variable: Group

Ranks

Group	N	Mean Rank

Cognitive_Empathy	I have been diagnosed with ADHD, or I believe I may have ADHD	54	57.30
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	62.51
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	59.16
	Total	118	
Affective_Empathy	I have been diagnosed with ADHD, or I believe I may have ADHD	54	67.44

	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	56.51
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	45.73
	Total	118	
Total_Empathy	I have been diagnosed with ADHD, or I believe I may have ADHD	54	62.27
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	59.42

	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	52.86
	Total	118	

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Cognitive_Empathy	118	4.3644	.59255	1.75	5.00
Affective_Empathy	118	4.5000	.56802	2.00	5.00
Total_Empathy	118	4.4322	.53350	1.88	5.00
Group	118	1.73	.759	1	3

Immersion Questionnaire – VR Experience

Normality of Immersion in the VR Experience

The normality tests for participants' immersion in the VR experience ("Impulse") indicate that the data are **not normally distributed** across all groups. Both the **Kolmogorov–Smirnov** and **Shapiro–Wilk** tests yielded significant results ($p < .001$) for participants with ADHD, participants with close personal or professional experience with ADHD, and participants with no ADHD or close contact. This pattern was consistent across all individual questions about engagement, emotional attachment, suspense, and perceived realism of the VR experience. These results suggest that **parametric analyses assuming normal distribution may not be appropriate**, and non-parametric tests should be used to analyze immersion levels across groups.

Reliability

The internal consistency of the Immersion Questionnaire, which includes 33 items assessing participants' engagement and immersion in the VR experience, was evaluated using Cronbach's Alpha. The analysis yielded a Cronbach's Alpha of **0.690**, indicating acceptable reliability. When standardized items were considered, Cronbach's Alpha increased slightly to **0.727**, suggesting that the questionnaire demonstrates a moderate to good level of internal consistency. Overall, these results support the reliability of the scale for measuring immersion in the VR experience.

Immersion Across Groups

A Kruskal–Wallis test was conducted to examine whether immersion scores differed across the three participant groups. The results showed no statistically significant differences in total immersion between groups, **H(2) = 2.34, p = .310**, indicating that participants' level of immersion in the VR experience was similar regardless of whether they had ADHD, had a close connection with someone with ADHD, or had no such connection.

Test Statistics[a,b]

	Total_Immersion2
Kruskal-Wallis H	2.342
df	2
Asymp. Sig.	.310

a. Kruskal Wallis Test

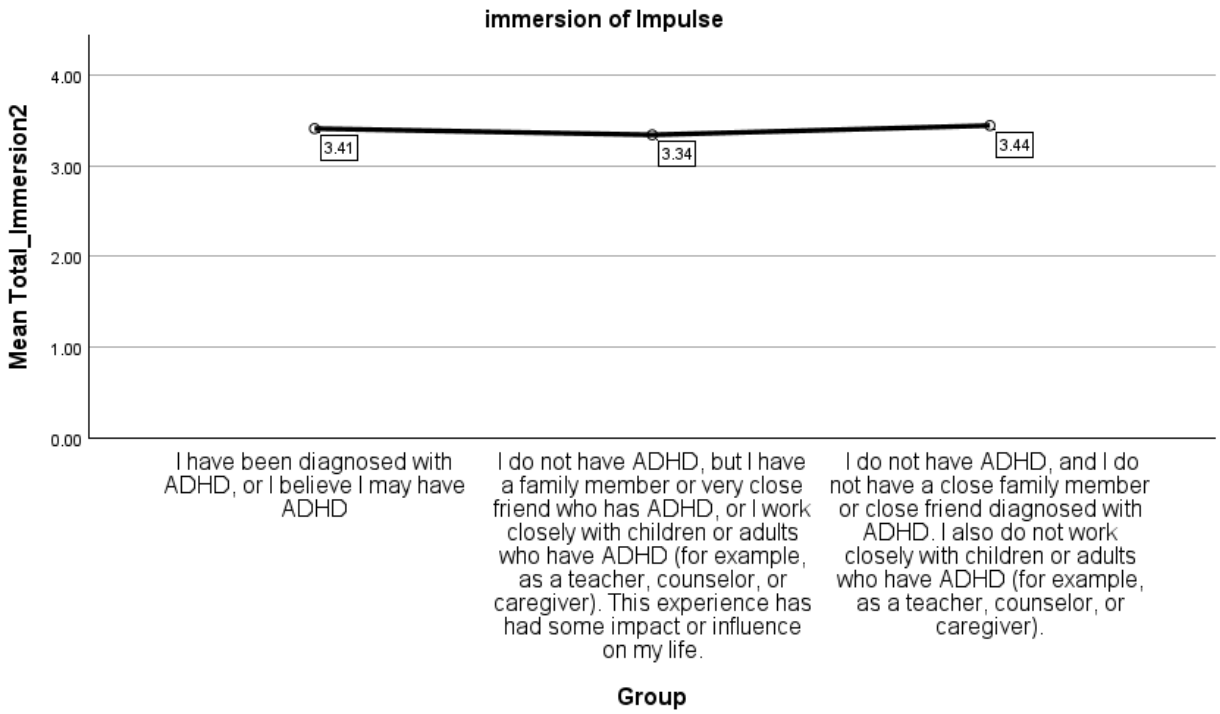
b. Grouping Variable: Group

Ranks

	Group	N	Mean Rank
Total_Immersion2	I have been diagnosed with ADHD, or I believe I may have ADHD	54	60.83
	I do not have ADHD, but I have a family member or very close friend who has ADHD, or I work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver). This experience has had some impact or influence on my life.	42	53.80
	I do not have ADHD, and I do not have a close family member or close friend diagnosed with ADHD. I also do not work closely with children or adults who have ADHD (for example, as a teacher, counselor, or caregiver).	22	67.11
	Total	118	

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total_Immersion2	118	3.3919	.33296	2.33	4.12
Group	118	1.73	.759	1	3



How Immersed Did Participants Feel in the MR Experience Impulse?

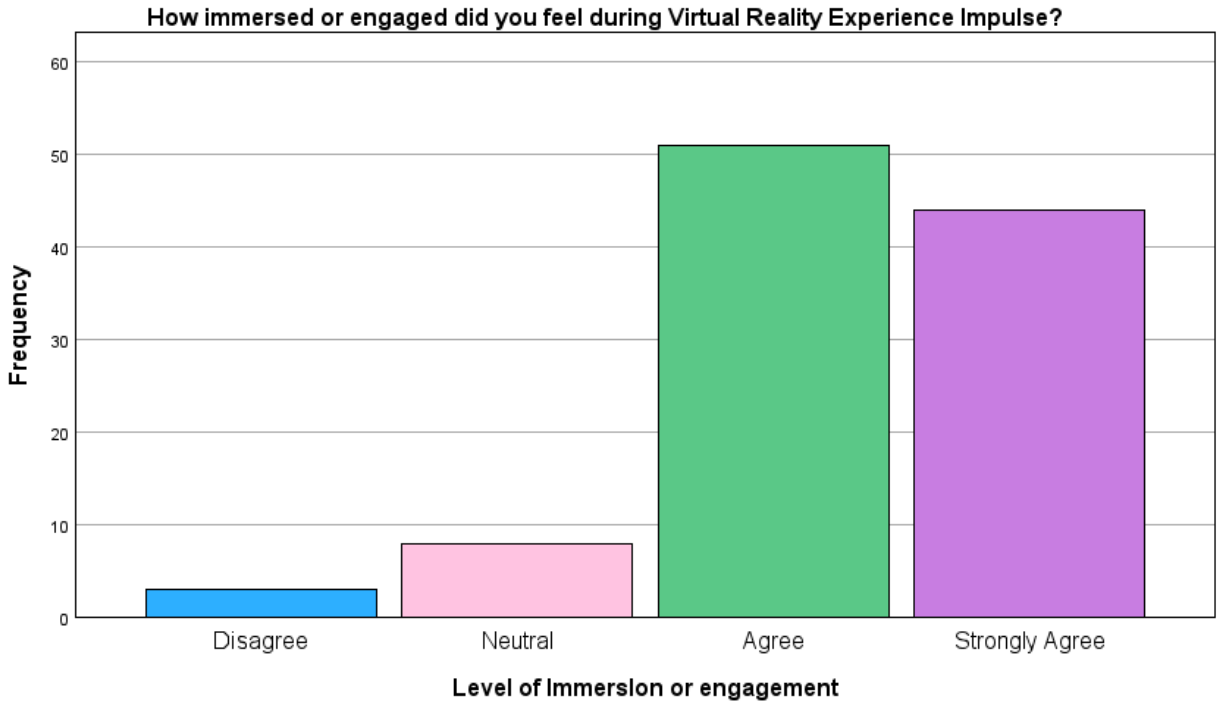
Participants were asked how **immersed or engaged** they felt during the Virtual Reality Experience Impulse. Immersion means how much the experience felt **real, engaging, or "you were inside it"**.

Results:

- **Strongly Agree (21.5%)** → 44 participants felt very immersed and engaged.
- **Agree (24.9%)** → 51 participants felt moderately immersed and engaged.
- **Neutral (3.9%)** → 8 participants were unsure about their level of immersion.
- **Disagree (1.5%)** → Only 3 participants did not feel engaged.
- **Missing responses (48.3%)** → 99 participants did not answer this question (this could be due to survey design or technical issues).

What this means:

Among participants who responded, **almost half (46.4%) felt immersed or strongly immersed** in the VR experience. This suggests that MR Impulse successfully created a sense of engagement for **many participants**, which is important because **higher immersion tends to increase empathy and positive behavior** toward people with ADHD.



1MONTH AFTER

Self-Stigma Group1

A Friedman test was conducted to examine changes in total self-stigma–related behaviors across three time points: pre-experience, post-experience, and one-month follow-up. The analysis revealed no statistically significant effect of time, $\chi^2(2, N = 48) = 2.47$, $p = .291$.

Mean ranks showed a slight decrease from pre-experience ($M_r = 2.18$) to post-experience ($M_r = 1.91$), which remained relatively stable at the one-month follow-up ($M_r = 1.92$). However, these differences were not statistically significant.

Ranks

	Mean Rank
Total_SelfStigma_Group1_PRE	2.18
Total_SelfStigma_Group1_POST	1.91
Total_SelfStigma_Group1_1MONTH	1.92

Test Statistics[a]

N	48
Chi-Square	2.466
df	2
Asymp. Sig.	.291

a. Friedman Test

Stigma from Others, PRE, POST AND 1-MONTH

Descriptive statistics indicated changes in participants' perceptions of stigma from others across three time points. On average, participants reported a stigma score of 3.37 at pre-test (SD = 0.56), which increased to 3.73 immediately post-test (SD = 0.62), and slightly decreased to 3.52 at the one-month follow-up (SD = 0.54).

A Friedman test was conducted to examine whether these changes were statistically significant over time. The analysis revealed a significant effect of time, $\chi^2(2, N = 106) = 44.57$, $p < .001$. Mean ranks showed a clear increase from pre-test ($M_r = 1.60$) to post-test ($M_r = 2.48$), followed by a slight decrease at the one-month follow-up ($M_r = 1.92$). This pattern suggests that participants perceived an increase in stigma from others immediately after the experience, which was partially maintained at one month.

Note: Only participants with complete data across all three time points (N = 106) were included in this analysis.

Time	Mean	Std Dev	Mean Rank
Pre-test	3.37	0.56	1.60
Post-test	3.73	0.62	2.48
1 Month	3.52	0.54	1.92

Pre → Post: 3.37 → 3.73 → increase in perceived stigma

Right after the VR experience, participants rated stigma higher. This doesn't mean people were "more stigmatizing" — it reflects increased awareness of how stigma exists in society.

Post → 1 Month: 3.73 → 3.52 → decrease in stigma

One month later, the mean dropped, meaning participants perceived less stigma than immediately after, but it was still higher than pre-test.

Conclusion:

Immediately after the experience, participants became more aware of stigma toward others with ADHD.

At one month, this awareness moderated, showing a small reduction in perceived stigma compared to immediately post-experience.

The average stigma score did not drop below the pre-test level, but the trend shows a slight decrease from the post-test peak, suggesting some reduction in perceived stigma over time.

Response to Hypothesis H2a – Stigma Toward ADHD

The data **do not fully support Hypothesis H2a**. According to the results:

- **Immediately after the VR experience**, participants' perception of stigma toward others **actually increased** (Mean = 3.73) compared to baseline (Mean = 3.37). This means that instead of reducing stigma, the VR experience **heightened participants' awareness of the social challenges and judgment faced by people with ADHD**.
- **One month later**, the stigma score decreased slightly (Mean = 3.52) compared to immediately post-experience, but it **remained higher than the baseline**,

indicating that participants retained a **greater understanding of stigma**, even though it moderated over time.

- The **Friedman test confirmed that these changes were statistically significant** ($\chi^2(2, N = 106) = 44.57, p < .001$).

Interpretation: Rather than reducing stigma immediately, the VR experience **increased participants' awareness of it**, which is an important step toward empathy and understanding. Over time, the effect partially decreased but remained above baseline, showing that participants maintained a **more informed perspective on the social challenges people with ADHD face**.

Conclusion: H2a is **not supported in the expected direction** (a decrease in stigma). Instead, the VR experience led to a **temporary increase in awareness of stigma**, with some moderation at one month, highlighting its role in **promoting understanding rather than reducing perceptions of stigma outright**.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total_Stigma_toward_others_PRE	106	3.3679	.56443	1.90	4.60
Total_Stigma_toward_others_POS	106	3.7274	.62022	2.10	4.90
Total_Stigma_toward_others_1MONTH	106	3.5179	.54069	1.80	4.70

Ranks

	Mean Rank
Total_Stigma_toward_others_PRE	1.60
Total_Stigma_toward_others_POS	2.48
Total_Stigma_toward_others_1MONTH	1.92

Test Statistics[a]

N	106
Chi-Square	44.572
df	2
Asymp. Sig.	<.001

a. Friedman Test

Behavioral Change Toward themself ADHD-Group 1

Descriptive statistics indicated that participants reported a gradual decrease in the total number of self-directed behavioral changes related to ADHD across time. On average, participants reported 3.88 behaviors at pre-experience (SD = 4.57), 3.77 behaviors immediately post-experience (SD = 4.47), and 3.21 behaviors at the one-month follow-up (SD = 4.10).

A Friedman test was conducted to examine whether these changes were statistically significant across the three time points. The test revealed a significant effect of time, $\chi^2(2, N = 106) = 6.12$, $p = .047$. Mean ranks showed a decreasing trend from pre-experience ($M_r = 2.09$) to post-experience ($M_r = 2.04$), with the lowest rank observed at the one-month follow-up ($M_r = 1.87$), suggesting that participants reported fewer self-directed behavioral changes over time.

Note: Only participants with complete data across all three time points (N = 106) were included in this analysis.

Response to Hypothesis H3a – Behavioral Change Toward Others with ADHD

The data **partially support Hypothesis H3a**. According to the results:

- **Immediately after the VR experience**, participants reported a significant increase in positive behaviors toward others with ADHD (Pre-test Mean = 7.61; Post-test Mean = 9.32), indicating that the VR simulation effectively **encouraged participants to engage in more supportive and understanding behaviors**.

- **One month later**, the number of reported behaviors decreased (Mean = 7.28), returning close to baseline levels. This suggests that while participants initially adopted more positive behaviors, some of these changes **were not fully maintained over time**.
- The **Friedman test confirmed that the changes over time were statistically significant**, $\chi^2(2, N = 106) = 37.43$, $p < .001$.

Interpretation: The VR experience successfully promoted **short-term increases in positive behaviors toward people with ADHD**, demonstrating its immediate impact on behavioral engagement. However, the decline at the one-month follow-up indicates that **not all behaviors were sustained**, highlighting the need for potential **reinforcement or ongoing support** to maintain lasting behavioral change.

Conclusion: H3a is **supported for the immediate post-experience effect**, but the hypothesis that positive behaviors would remain higher at one month is **only partially supported**, as behaviors decreased toward baseline levels over time.

Since the VR experience, I am more likely to notice when I act impulsively or lose focus in daily life

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total_Behavioral_Change_Toward_themself_ADHD_Group1_PRE	106	3.8774	4.57051	.00	14.00
Total_Behavioral_Change_Toward_themself_ADHD_Group1_POS	106	3.7736	4.46848	.00	13.00
Total_Behavioral_Change_Toward_themself_ADHD_Group1_1MONTH	106	3.2075	4.09812	.00	15.00

Ranks

	Mean Rank

Total_Behavioral_Change_Toward_themself_ADHD_Group1_PRE	2.09
Total_Behavioral_Change_Toward_themself_ADHD_Group1_POS	2.04
Total_Behavioral_Change_Toward_themself_ADHD_Group1_1MONTH	1.87

Test Statistics[a]

N	106
Chi-Square	6.118
df	2
Asymp. Sig.	.047

a. Friedman Test

Across the three time points (PRE, POST, and 1-month follow-up), patterns in **help-seeking and support actions (3.1)** indicate an initial decline immediately after the experience followed by partial recovery at follow-up. Prior to the intervention, participants most commonly reported seeking advice from online resources or support groups (63.3%) and deciding to see a doctor or mental health professional (59.2%). These behaviors decreased at POST (61.2% and 28.6%, respectively) but rebounded at 1 month (55.1% and 38.8%). Notably, talking to a school or work counselor showed a delayed increase, rising from 2.0% at POST to 16.3% at follow-up. Engagement with coaches or mentors and formal support groups declined over time, whereas "other types of help or support" returned to baseline levels at 1 month (38.8%). These findings suggest that certain help-seeking behaviors, particularly those requiring access or scheduling, may emerge gradually rather than immediately following the experience.

In the domains of **self-education and awareness (3.3)** and **behavioral change in daily life (3.5)**, results indicate strong baseline engagement with reflective and self-regulatory behaviors, alongside notable post-intervention shifts. Self-reflection

related to ADHD symptoms remained consistently high across time points (95.9% PRE; 81.6% POST; 91.8% at 1 month), suggesting sustained cognitive engagement. Adoption of new attention-management strategies peaked at POST (79.6%) before declining at follow-up (61.2%). For daily life behaviors, several action-oriented strategies increased sharply immediately after the experience, including mindfulness or coping practices (20.4% PRE to 46.9% POST) and awareness of impulsivity or lapses in focus (2.0% PRE to 63.3% POST), with partial attenuation at 1 month (42.9% and 30.6%, respectively). Overall, the data indicate that the experience was associated with immediate gains in practical behavioral strategies and awareness, while longer-term effects were characterized by sustained self-reflection and selective maintenance of behavior change.

Planned Actions (N = 49)						
Item	**PRE Sum**	**PRE %**	**POST Sum**	**POST %**	**1-Month Sum**	**1-Month %**
3.1a. I decided to see a doctor or mental health professional to learn more about ADHD.	29	59.2%	14	28.6%	19	38.8%
3.1b. I have scheduled or attended an appointment with a healthcare professional about ADHD.	22	44.9%	15	30.6%	13	26.5%
3.1c. I seek advice from online resources or support groups about ADHD.	31	63.3%	30	61.2%	27	55.1%
3.1d. I joined an ADHD support group.	11	22.4%	13	26.5%	6	12.2%
3.1e. I consulted a coach or mentor.	16	32.7%	12	24.5%	4	8.2%
3.1f. I talked to a school or work counselor.	9	18.4%	1	2.0%	8	16.3%
3.1. Other type of help or support I have sought.	19	38.8%	11	22.4%	19	38.8%
3.1. None	2	4.1%	0	0.0%	64	130.6%
Self-Education and Awareness (3.3)						
Item	**PRE Sum**	**PRE %**	**POST Sum**	**POST %**	**1-Month Sum**	**1-Month %**
3.3a. I decided to read more about ADHD	43	87.8%	38	77.6%	33	67.3%

3.3b. I attend workshops, webinars, or online courses to learn more about ADHD	13	26.5%	18	36.7%	10	20.4%
3.3c. I reflect more on my own behaviors or habits in relation to ADHD symptoms	47	95.9%	40	81.6%	45	91.8%
3.3d. I have adopted new strategies to manage my attention or focus based on what I learned	37	75.5%	39	79.6%	30	61.2%
3.3. Other type of help or support I have sought.	9	18.4%	3	6.1%	4	8.2%
3.3. None	0	0.0%	0	0.0%	54	110.2%
Behavioral Change / Daily Life Strategies (3.5)						
Item	**PRE Sum**	**PRE %**	**POST Sum**	**POST %**	**1-Month Sum**	**1-Month %**
3.5a. I have implemented strategies in daily life to improve focus, patience, or organization.	32	65.3%	39	79.6%	30	61.2%
3.5b. I practice mindfulness, relaxation, or coping techniques I learned from the VR experience.	10	20.4%	23	46.9%	21	42.9%
3.5c. I have changed routines or habits to be more supportive or understanding toward people with ADHD.	19	38.8%	25	51.0%	21	42.9%
3.5d. I monitor and adjust my own behavior to reduce stress or conflict in daily life	37	75.5%	35	71.4%	32	65.3%
3.5e.Since the VR experience, I am more likely to notice when I act impulsively or lose focus in daily life	1	2.0%	31	63.3%	15	30.6%
3.5. Others	8	16.3%	1	2.0%	3	6.1%
3.5. None	0	0.0%	0	0.0%	28	57.1%

Post & 1 month later Behavioral Change Toward themself ADHD-Group 1

Post-intervention to follow-up comparisons revealed selective changes across domains, with several behaviors showing either recovery or delayed increases

over time. Within the **help-seeking and support actions (3.1)** domain, decisions to see a doctor or mental health professional increased from 28.6% at POST to 38.8% at 1 month, and talking to a school or work counselor rose from 2.0% to 16.3%. Similarly, engagement in other types of help or support increased from 22.4% at POST to 38.8% at follow-up. In contrast, behaviors such as scheduling healthcare appointments, consulting a coach or mentor, and joining ADHD support groups declined between POST and 1 month, indicating that only selected forms of help-seeking demonstrated delayed uptake.

In the self-education and awareness domain (3.3), changes between POST and 1 month were limited but notable for reflective behaviors. Reflection on one's own behaviors or habits related to ADHD symptoms increased from 81.6% at POST to 91.8% at follow-up, suggesting continued cognitive processing after the intervention. A smaller increase was observed for other self-education actions (6.1% to 8.2%), while reading about ADHD, attending educational events, and adopting new strategies decreased over time.

Within behavioral change and daily life strategies (3.5), no behaviors demonstrated increases from POST to the 1-month follow-up; instead, most showed attenuation after initial post-intervention peaks. For example, implementation of daily life strategies, mindfulness or coping practices, and awareness of impulsivity all declined between POST and follow-up, although levels remained above PRE for several behaviors. This pattern suggests that the intervention's strongest effects on practical behavior occurred immediately after exposure, with sustained change more evident in reflective and help-seeking domains rather than in action-oriented strategies.

Help-Seeking / Support Actions			
Behavior	**POST %**	**1-Month %**	**Change**
Seeing a doctor or mental health professional	28.6%	38.8%	**+10.2%**
Talking to a school or work counselor	2.0%	16.3%	**+14.3%**
Other actions planned	22.4%	38.8%	**+16.4%**
Self-Education and Awareness			
Behavior	**POST %**	**1-Month %**	**Change**
Reflecting on own behaviors/habits	81.6%	91.8%	**+10.2%**

Other self-education actions	6.1%	8.2%	+2.1%

5. Behavioral Change Toward others ADHD, PRE, POST AND 1 MONTH AFTER

Descriptive statistics indicated that participants reported changes in behaviors toward others with ADHD over time. On average, participants reported 7.61 behaviors at pre-test (SD = 3.44), which increased to 9.32 immediately post-test (SD = 3.51), and decreased to 7.28 at the one-month follow-up (SD = 3.56).

A Friedman test was conducted to examine whether these changes were statistically significant across the three time points. The analysis revealed a significant effect of time, $\chi^2(2, N = 106) = 37.43$, $p < .001$. Mean ranks showed an increase from pre-test ($M_r = 1.72$) to post-test ($M_r = 2.45$), followed by a decrease at the one-month follow-up ($M_r = 1.83$), suggesting that participants **increased their behavioral engagement toward others with ADHD immediately after the VR experience**, with some decline over time.

Interpretation: These findings indicate that the VR experience promoted **short-term increases in behaviors directed toward supporting or understanding others with ADHD**. Although the effect diminished by the one-month follow-up, participants' engagement remained **slightly higher than baseline**, suggesting some **lasting impact on social behaviors**.

Note: Only participants with complete data across all three time points (N = 106) were included in the analysis.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Total_Behavioral_Change_Toward_OTHERS_ADHD__PRE	106	7.6132	3.44362	3.00	14.00
Total_Behavioral_Change_Toward_OTHERS_ADHD__POS	106	9.3208	3.51201	3.00	15.00
Total_Behavioral_Change_Toward_OTHERS_ADHD__1MONTH	106	7.2830	3.55569	.00	15.00

Ranks

	Mean Rank
Total_Behavioral_Change_Toward_OTHERS_ADHD__PRE	1.72
Total_Behavioral_Change_Toward_OTHERS_ADHD__POS	2.45
Total_Behavioral_Change_Toward_OTHERS_ADHD__1MONTH	1.83

Test Statistics[a]

N	106
Chi-Square	37.432
df	2
Asymp. Sig.	<.001

a. Friedman Test

The reported actions across the three participant groups indicate notable differences in both baseline behaviors and planned actions following the MR experience. At pre-test, participants who had been diagnosed with ADHD or believed they might have ADHD (Group 1) reported moderate engagement in patience and communication behaviors with family or peers, ranging from 49.0% to 83.7%. Participants with close family members or work-related exposure to ADHD (Group 2) generally reported higher baseline percentages, particularly for patience and support toward individuals with ADHD (63.2%–78.9%). In contrast, participants with no direct connection to ADHD (Group 3) exhibited lower initial engagement, with percentages ranging from 16.7% to 61.1%. This baseline variation reflects differing levels of personal experience and awareness of ADHD across groups.

Following the MR experience, post-test measures revealed increased intention to engage in proactive behaviors across all groups, with notable gains in planning to be more patient (5.1a), to open up to others about ADHD (5.1b), and to educate or support others (5.1c–d). Group 1 demonstrated moderate gains, with percentages rising in several domains, while Group 2 displayed higher post-test intentions, particularly for support-oriented behaviors (5.1a, 5.1d). Interestingly, Group 3 participants showed smaller but meaningful increases, especially in planning to educate others or provide support (5.1c–d). These findings suggest that the MR experience effectively heightened participants' awareness and intentions to engage in supportive behaviors, regardless of prior exposure to ADHD.

At the 1-month follow-up, a mixed pattern emerged. Some behaviors, such as planning to suggest professional help (5.3e), continued to increase, particularly in Group 3 (+27.8%), indicating delayed uptake or reinforcement of certain supportive behaviors. However, other behaviors, including patience, opening up, and daily support strategies (5.1a–d; 5.5a–e), tended to decline from post-test levels, especially in Group 1, suggesting that initial enthusiasm may wane without sustained prompts or reinforcement. Group 2 maintained relatively higher engagement over time, while Group 3 exhibited selective increases in reflective or help-seeking actions. Overall, the data highlight that the MR experience prompted both immediate and delayed behavioral intentions, with the sustainability of actions varying by prior ADHD exposure and personal connection.

Reported Actions by Group						
Item	**G1 Sum**	**G1 %**	**G2 Sum**	**G2 %**	**G3 Sum**	**G3 %**
PRE TEST: 5.1a. I am more patient with my family or people around me	24	49.0%	24	63.2%	7	38.9%
POST TEST: 5.1a. I plan to be more patient with people with ADHD	30	61.2%	33	86.8%	12	66.7%
1-MONTH AFTER: 5.1a	13	26.5%	21	55.3%	7	38.9%
PRE TEST: 5.1b. I opened up and spoke with relatives/family about ADHD	29	59.2%	11	28.9%	3	16.7%
POST TEST:5.1b. I plan to open up and speak about ADHD	33	67.3%	29	76.3%	5	27.8%

1-MONTH AFTER5.1b	23	46.9%	10	26.3%	7	38.9%
PRE TEST: 5.1c. I have started educating others about ADHD	28	57.1%	14	36.8%	1	5.6%
POST TEST:5.1c. I plan to educate others about ADHD	31	63.3%	24	63.2%	11	61.1%
1-MONTH AFTER5.1c	22	44.9%	15	39.5%	6	33.3%
PRE TEST: 5.1d. I am more supportive toward friends/colleagues with ADHD	41	83.7%	30	78.9%	11	61.1%
POST TEST:5.1d. I plan to be more supportive toward people with ADHD	37	75.5%	33	86.8%	15	83.3%
1-MONTH AFTER5.1d	26	53.1%	26	68.4%	12	66.7%
PRE TEST: 5.1f. None	0	0.0%	3	7.9%	3	16.7%
POST TEST:5.1 Other actions	1	2.0%	6	15.8%	2	11.1%
1-MONTH AFTER5.1 Others	1	2.0%	3	7.9%	1	5.6%
Encouraging Help-Seeking for Others (5.3)						
Item	**G1 Sum**	**G1 %**	**G2 Sum**	**G2 %**	**G3 Sum**	**G3 %**
PRE TEST: 5.3a. Encourage others to seek professional help	29	59.2%	20	52.6%	6	33.3%
POST TEST:5.3a. Plan to encourage professional help	28	57.1%	24	63.2%	10	55.6%
1-MONTH AFTER5.3a	30	61.2%	18	47.4%	8	44.4%
PRE TEST: 5.3b. Provide information about ADHD services	25	51.0%	7	18.4%	2	11.1%
POST TEST:5.3b. Plan to provide information	26	53.1%	16	42.1%	5	27.8%
1-MONTH AFTER5.3b	26	53.1%	10	26.3%	4	22.2%
PRE TEST: 5.3c. Reflect on whether someone could benefit from assessment	31	63.3%	21	55.3%	6	33.3%
POST TEST:5.3c. Plan to reflect on others' needs	30	61.2%	25	65.8%	14	77.8%
1-MONTH AFTER5.3c	32	65.3%	26	68.4%	14	77.8%

PRE TEST: 5.3d. I feel confident guiding someone to ADHD resources when needed	25	51.0%	8	20.5%	1	5.6%
POST TEST:5.3d. I plan to guide someone to ADHD resources when needed	35	71.4%	23	59.0%	8	44.4%
1-MONTH AFTER5.3d	22	44.9%	8	20.5%	5	27.8%
PRE TEST: 5.3e. I believe suggesting professional help can improve outcomes	30	61.2%	23	59.0%	8	44.4%
POST TEST:5.3e. I plan to suggest professional help	20	40.8%	22	56.4%	8	44.4%
1-MONTH AFTER5.3e	25	51.0%	24	61.5%	13	72.2%
PRE TEST: 5.3 None	0	0.0%	3	7.7%	4	22.2%
POST TEST:5.3 None	0	0.0%	0	0.0%	0	0.0%
1-MONTH AFTER5.3g	7	14.3%	1	2.6%	0	0.0%
PRE TEST: 5.3 Others	5	10.2%	7	17.9%	6	33.3%
POST TEST:5.3 Other actions	3	6.1%	5	12.8%	1	5.6%
1-MONTH AFTER5.3f	1	2.0%	3	7.7%	0	0.0%
Supporting Others in Daily Life (5.5)						
Item	**G1 Sum**	**G1 %**	**G2 Sum**	**G2 %**	**G3 Sum**	**G3 %**
PRE TEST: 5.5a. I adjust my communication or environment to help someone with ADHD succeed	31	63.3%	28	71.8%	7	38.9%
POST TEST:5.5a. I plan to adjust my communication or environment	33	67.3%	33	84.6%	13	72.2%
1-MONTH AFTER5.5a	24	49.0%	28	71.8%	12	66.7%
PRE TEST: 5.5b. I notice and respond when someone with ADHD is struggling	35	71.4%	32	82.1%	9	50.0%
POST TEST:5.5b. I plan to notice and respond	42	85.7%	32	82.1%	13	72.2%
1-MONTH AFTER5.5b	34	69.4%	30	76.9%	7	38.9%
PRE TEST: 5.5c. I make small daily changes to reduce challenges	24	49.0%	21	53.8%	3	16.7%
POST TEST:5.5c. I plan to make small daily changes	28	57.1%	31	79.5%	11	61.1%

1-MONTH AFTER5.5c	24	49.0%	29	74.4%	7	38.9%
PRE TEST: 5.5d. I reflect on my behavior to avoid creating difficulties	37	75.5%	29	74.4%	9	50.0%
POST TEST:5.5d. I plan to reflect on my behavior	34	69.4%	33	84.6%	14	77.8%
1-MONTH AFTER5.5d	28	57.1%	31	79.5%	11	61.1%
PRE TEST: 5.5e. I feel empowered to make a positive difference	22	44.9%	18	46.2%	2	11.1%
POST TEST:5.5e. I plan to take actions to make a positive difference	31	63.3%	29	74.4%	6	33.3%
1-MONTH AFTER5.5e	20	40.8%	19	48.7%	5	27.8%
PRE TEST: 5.5 Others	1	2.0%	2	5.1%	4	22.2%
POST TEST:5.5 Others	0	0.0%	0	0.0%	0	0.0%
1-MONTH AFTER5.5 Others	1	2.0%	0	0.0%	0	0.0%
PRE TEST: 5.5 None	0	0.0%	1	2.6%	2	11.1%
POST TEST:5.5 None	1	2.0%	0	0.0%	0	0.0%
1-MONTH AFTER5.5 None	6	12.2%	1	2.6%	1	5.6%

Positive Change from POST → 1 Month (1-Month > POST)

Group 1 (N = 49, ADHD or believe they have ADHD)

Item	POST %	1-Month %	Change
5.3e. I plan to suggest professional help	40.8%	51.0%	+10.2%
5.3g. Other actions (5.3)	0.0%	14.3%	+14.3%

Group 2 (N = 39, close family/friend or work with ADHD)

Item	POST %	1-Month %	Change
5.3e. I plan to suggest professional help	56.4%	61.5%	+5.1%

Group 3 (N = 18, no ADHD, no close connection)

Item	POST %	1-Month %	Change
5.1b. I plan to open up and speak about ADHD	27.8%	38.9%	+11.1%
5.3e. I plan to suggest professional help	44.4%	72.2%	+27.8%

Observation:

- **5.3e ("Plan to suggest professional help")** shows consistent **positive change across all groups**, with the largest increase in **Group 3**.
- **Group 1** also shows growth in **other actions (5.3g)**, indicating delayed uptake of additional supportive behaviors.

Main Results: Spearman Correlations Between Behavioral Change and Empathy

Spearman's rank-order correlations were conducted to examine the relationship between **behavioral change toward others with ADHD** (pre-experience, post-experience, and one-month follow-up) and **empathy** (affective, cognitive, and total).

Overall, the results reveal **consistent, positive, and statistically significant associations** between behavioral change and empathy across time.

Behavioral Change and Empathy

- **Pre-experience behavioral change** showed a **moderate positive correlation** with **affective empathy** ($\rho = .462$, $p < .001$) and **total empathy** ($\rho = .384$, $p < .001$), and a **small but significant correlation** with **cognitive empathy** ($\rho = .238$, $p = .014$).
  This suggests that participants with higher baseline empathy already reported more positive behaviors toward others with ADHD.
- **Post-experience behavioral change** was **moderately correlated** with all empathy measures:
  - Affective empathy ($\rho = .423$, $p < .001$)
  - Cognitive empathy ($\rho = .471$, $p < .001$)
  - Total empathy ($\rho = .505$, $p < .001$)

These findings indicate that **higher levels of empathy—particularly cognitive empathy—were strongly associated with greater immediate positive behavioral change after the MR Impulse experience**.

- **Behavioral change at the one-month follow-up** also remained significantly related to empathy:
    - Affective empathy ($\rho = .266$, $p = .006$)
    - Cognitive empathy ($\rho = .372$, $p < .001$)
    - Total empathy ($\rho = .358$, $p < .001$)

This suggests that empathy is not only related to immediate behavioral change, but also to the **maintenance of positive behavior toward others with ADHD over time**.

Empathy Dimensions

- **Affective and cognitive empathy** were strongly interrelated ($\rho = .640$, $p < .001$), and both were very strongly correlated with **total empathy** ($\rho = .876$ and $\rho = .921$, respectively), confirming the internal consistency of the empathy construct.

In summary, the findings demonstrate that **higher empathy—especially cognitive empathy—is consistently associated with more positive behavioral change toward others with ADHD**, both immediately after the MR experience and one month later. These results support the idea that **empathy plays a key role in driving and sustaining prosocial behavioral change** following immersive experiences such as MR Impulse.

Correlations

			Total_Behavioral_Change_Toward_OTHERS_ADHD__PRE	Total_Behavioral_Change_Toward_OTHERS_ADHD__POS	Total_Behavioral_Change_Toward_OTHERS_ADHD__1MONTH	Affective Empathy	Cogntive Empathy	Total Empathy	Total Immersion
Spearman's rho	Total_Behavioral_Change_Toward_OTHERS_ADHD__PRE	Correlation Coefficient	1.000	.569***	.388***	.462***	.238*	.384***	.161
		Sig. (2-tailed)	.	<.001	<.001	<.001	.014	<.001	.100
		N	106	106	106	106	106	106	106
	Total_Behavioral_Change_Toward_OTHERS_ADHD__POS	Correlation Coefficient	.569***	1.000	.548***	.423***	.471***	.505***	.278**
		Sig. (2-tailed)	<.001	.	<.001	<.001	<.001	<.001	.004
		N	106	106	106	106	106	106	106
	Total_Behavioral_Change_Toward_OTHERS_ADHD__1MONTH	Correlation Coefficient	.388***	.548***	1.000	.266**	.372***	.358***	.350***
		Sig. (2-tailed)	<.001	<.001	.	.006	<.001	<.001	<.001
		N	106	106	106	106	106	106	106
	Affective Empathy	Correlation Coefficient	.462***	.423***	.266**	1.000	.640***	.876***	.265**
		Sig. (2-tailed)	<.001	<.001	.006	.	<.001	<.001	.006
		N	106	106	106	106	106	106	106
	Cogntive Empathy	Correlation Coefficient	.238*	.471***	.372***	.640***	1.000	.921***	.379***
		Sig. (2-tailed)	.014	<.001	<.001	<.001	.	<.001	<.001
		N	106	106	106	106	106	106	106
	Total Empathy	Correlation Coefficient	.384***	.505***	.358***	.876***	.921***	1.000	.370***
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	.	<.001
		N	106	106	106	106	106	106	106
	Total Immersion	Correlation Coefficient	.161	.278**	.350***	.265**	.379***	.370***	1.000
		Sig. (2-tailed)	.100	.004	<.001	.006	<.001	<.001	.
		N	106	106	106	106	106	106	106

***. Correlation is significant at the 0.001 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

This table shows a **clear and positive relationship** between empathy and how people behave toward individuals with ADHD. The **Spearman correlation values** confirm that people who scored higher in empathy were **significantly more likely to show positive, supportive behavior**.

The strongest relationship was found for **cognitive empathy**, meaning that **understanding the daily experiences of people with ADHD** plays a key role in both **immediate and long-term behavior change**. Emotional empathy also contributed, but its influence was strongest right after the experience.

Overall, the results demonstrate that **empathy is not just an emotion—it is a driver of real, measurable behavioral change** toward people with ADHD.

Type of Empathy	Positive Behavior Immediately After	Positive Behavior 1 Month Later	What This Means
Affective Empathy (Feeling)	ρ = **.423** (≈ **42%**)	ρ = **.266** (≈ **27%**)	Emotional connection leads to kinder behavior, especially right after
Cognitive Empathy (Understanding)	ρ = **.471** (≈ **47%**)	ρ = **.372** (≈ **37%**)	Understanding ADHD creates stronger, longer-lasting behavior change
Total Empathy (Overall)	ρ = **.505** (≈ **51%**)	ρ = **.358** (≈ **36%**)	Higher overall empathy strongly predicts positive behavior over time

16. Conclusions

Conclusions – Key Findings from MR Experience: Impulse

1. MR Experience: Impulse Improves Knowledge About ADHD

- Participants learned more about ADHD immediately after the MR experience.
- People with **no prior exposure to ADHD** gained the most knowledge (about 7 out of 10 participants).
- Knowledge gains were generally **maintained one month later**, showing lasting learning.

2. MR Experience Reduces Stigma Toward Others

Watching *MR experience Impulse* led most participants with ADHD to slightly reduce stigma toward others, and this positive effect was maintained for at least one month.

3. MR Experience Promotes Lasting effects on Self-Care and Supportive Behaviors for people who are diagnosis with ADHD

Participants with ADHD or who believed they may have ADHD showed **ongoing some self-reflection, self-education, and help-seeking** behavioural changes towards themselves.

Participants with ADHD or suspected ADHD increased concrete self-care actions one month after the experience, including:

- Seeing a doctor or mental health professional (+10%)
- Talking to a school or work counselor (+14%)
- Planning other helpful actions, such as personal organization or informal support (+16%)
- Reflecting on personal habits and behaviors (+10%)

4. MR Experience Encourages Positive Behavior Toward Others immediately after the experience and 1 month later

- Participants acted more positively and supportively toward people with ADHD immediately after the experience and after 1 month. We found than people after 1-month:
- Suggesting professional help (+5–28% across all groups)
- Opening up and talking about ADHD (+11% for participants who has no ADHD or no close connection)
- Engaging in other supportive behaviors (+14% for Group with ADHD or suspected ADHD)
- Even one month later, participants reported continuing or expanding these actions, showing that MR Experience: Impulse encourages both self-directed growth and meaningful support for others in everyday life.

5. Empathy is Key to Behavior Change

- **Affective Empathy (Emotional Connection):** Participants who felt emotional connection showed **42% stronger positive change behavior immediately** and **27% stronger one month later**.
- **Cognitive Empathy (Understanding):** Participants who better understood ADHD showed **47% stronger positive change behavior immediately** and **37% stronger one month later**.
- **Total Empathy:** Combining emotional and cognitive empathy, participants showed **51% more positive change behavior immediately** and **36% more positive behavior one month later**.

6. Immersion Strengthens Engagement and Impact

- Among participants who responded, **almost half (46.4%) felt immersed or strongly immersed** in the VR experience.
- **Takeaway:** Higher immersion helps participants feel more connected, increasing empathy and encouraging positive behavior toward people with ADHD.

7. MR Impulse Experience Encourages another Real-Life Support Actions for behavioral change

People who participated in this study recommended various alternative strategies to support behavioral change, such as practicing meditation, using natural supplements, creating accountability systems, sharing resources, and fostering safe, understanding environments.

20. References

- Banakou, D., Hanumanthu, P. D., & Slater, M. (2016). Virtual embodiment of white people in a Black virtual body leads to a sustained reduction in implicit racial bias. *Frontiers in Psychology, 7*, 761.
- Herrera, F., Bailenson, J. N., Weisz, E., Ogle, E., & Zaki, J. (2018). Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking. *PLOS ONE, 13*(10), e0204494.
  Hinshaw, S. P. (2018). *ADHD: What everyone needs to know*. Oxford University Press.
- Corrigan, P. W., et al. (2006). Self-stigma and the "why try" effect: Impact on life goals and self-esteem. *Psychiatric Rehabilitation Journal, 29*(4), 293–297.
- Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International journal of human-computer studies*, *66*(9), 641-661. https://www-users.york.ac.uk/paul.cairns/pubs/JennettIJHCS08.pdf
- Kellison, I., Bussing, R., Bell, L., & Garvan, C. (2010). Assessment of stigma associated with attention-deficit hyperactivity disorder: Psychometric evaluation of the ADHD Stigma Questionnaire. *Psychiatry research*, *178*(2), 363-369. https://www.sciencedirect.com/science/article/pii/S0165178109001759?casa_token=zdI_XZimOt4AAAAA:qtHDMfFPcxvpe33MucfqAQSOCs_GOzvusJlwDY5VhwpHPzvnb-ZDxybPoZqTpsTToeiZoKyW

- (1a) Boufin Tebeu, C. (2023). Mental Health professionals' Knowledge, Attitudes, and Behaviors related to Adult Attention Deficit Disorder (ADHD) and Screening Pre and Post an Educational Intervention: A Quality Improvement Project. https://digitalcommons.fiu.edu/cgi/viewcontent.cgi?article=1182&context=cnhs-studentprojects
- (1b) Morris, S., Hill, S., Brugha, T., & McManus, S. (Eds.). (2025, June 26). Adult Psychiatric Morbidity Survey: Survey of Mental Health and Wellbeing, England, 2023/4. NHS England. https://digital.nhs.uk/data-and-information/publications/statistical/adult-psychiatric-morbidity-survey/survey-of-mental-health-and-wellbeing-england-2023-24
- (1c) Quinn, P. O., & Madhoo, M. (2014). A review of attention-deficit/hyperactivity disorder in women and girls: uncovering this hidden diagnosis. *Prim Care Companion CNS Disord*, *16*(3), PCC-13r01596. https://www.psychiatrist.com/wp-content/uploads/2021/03/25641_review-attention-deficit-hyperactivity-disorder-women.pdf
- (1d) Saad, S., Aljanahi, F., Coumaravelou, S., Agha, A., Alsamiri, M., & Allami, S. (2022). Knowledge about attention-deficit/hyperactivity disorder among primary schoolteachers in Sharjah, UAE. *Journal of education and health promotion*, *11*, 99. https://pmc.ncbi.nlm.nih.gov/articles/PMC9093637/[AS1]