PUBLIC PERCEPTIONS
OF EMERGING NEUROTECHNOLOGIES TARGETING
MOOD, MEMORY, AND MOTOR SYMPTOMS

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SAMPLE

N=1084
Online Survey distributed by Prolific (sampling firm)
Stratified to be nationally representative on:
• Age  Race  Gender

EXPERIMENTAL DESIGN

Between Subjects Groups - Symptoms:
• Mood  Memory  Motor

Within Subjects Groups – Neurotechnologies:
• DBS  TMS  Pills  MRgFUS

Outcome Measures:
• Benefit  Acceptability  Personal Use
  Risk  Invasiveness  Change to Person

Analyses:
• Repeated Measures ANOVAs

SAMPLE DEMOGRAPHICS

Sample size (N)  1084
Age
  Mean (SD)  45.5 (SD=16.1)
Gender
  Female  514 (49.1%)
  Male  507 (48.5%)
  Trans female/Trans woman  3 (0.28)
  Trans male/Trans man  7 (0.7%)
  Genderqueer/Gender non-conforming  12 (1.1%)
  *Other  25 (2.4%)
Race
  American Indian, Native American, Alaska Native  11 (1%)
  Asian  65 (6%)
  Black or African American  135 (12.5%)
  Native Hawaiian, Pacific Islander  3 (0.3%)
  *Other  8 (0.7%)
  White  825 (76.1%)
Ethnicity
  Non-Hispanic  992 (91.5%)
  Hispanic or Latino  57 (5.3%)
Education level
  Less than Bachelor's  496 (47.4%)
  Bachelor's or higher  551 (52.6%)
Household income
  $0–$49,999  444 (42.4%)
  ≥ $50,000–$109,999  399 (36.8%)
  ≥ $110,000  205 (18.9%)
A person has been experiencing the following:

<table>
<thead>
<tr>
<th>MOOD</th>
<th>MEMORY</th>
<th>MOTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mood symptoms</strong> (e.g., feeling sad, irritable, empty), a loss of pleasure or interest in activities, for most of the day, every day. They experience poor concentration, feelings of excessive low self-worth, hopelessness about the future, disrupted sleep, changes in appetite, and feeling tired.</td>
<td><strong>Memory symptoms</strong> (e.g., unable to recall memories, difficulty retaining new information), memory loss for most of the day, every day. They experience difficulty learning and recalling new information such as recent events, conversations, or people, and recalling important memories and personal information about themselves.</td>
<td><strong>Motor symptoms</strong> (e.g., slowed movement, muscle weakness), a loss of muscle control, for most of the day, every day. They experience tremors while their muscles are at rest, stiffness, trouble swallowing, unstable posture, difficulties with walking, and reduced control over their facial muscles.</td>
</tr>
</tbody>
</table>
Given the severity of their condition, they are presented with the following **neurotechnology** to help reduce symptoms:

<table>
<thead>
<tr>
<th></th>
<th>DBS</th>
<th>MRgFUS</th>
<th>Pills</th>
<th>TMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deep Brain Stimulation (DBS) involves surgically implanting electrodes into the brain to deliver electrical stimulation to a specific region of the brain.</td>
<td>MRI-guided focused <strong>ultrasound</strong> (MRgFUS) involves placing a cap on the outside of the head that delivers focused sound waves to create a precise lesion in a specific region of the brain</td>
<td>Pills involve ingesting medication (taken by mouth) in the form of a pill to deliver chemicals to the brain.</td>
<td>Transcranial Magnetic Stimulation (TMS) involves placing a magnet against an area (outside) of the head to deliver magnetic stimulation to a specific region of the brain.</td>
</tr>
</tbody>
</table>
OUTCOME MEASURES

Given this person's (Mood / Memory / Motor) symptoms, to what extent do you think using (DBS / TMS / Pills / MRgFUS) would be:

- Beneficial
- Risky
- Invasive
- Acceptable

Not at all  Slightly  Moderately  Very  Extremely

Given this person's (Mood / Memory / Motor) symptoms, to what extent do you think using (DBS / TMS / Pills / MRgFUS) would:

- change who they are as a person?

Not at all  A little  A moderate amount  A lot  A great deal

Now, suppose YOU were experiencing these (Mood / Memory / Motor) symptoms, would you consider using (DBS / TMS / Pills / MRgFUS)?

I definitely would not  I probably would not  I might or I might not  I probably would  I definitely would
Suppose you were experiencing these symptoms: mood, memory, motor, would you consider using:

<table>
<thead>
<tr>
<th></th>
<th>DBS</th>
<th>MRGFUS</th>
<th>TMS</th>
<th>PILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentages</td>
<td>26%</td>
<td>22%</td>
<td>14%</td>
<td>6%</td>
</tr>
<tr>
<td>Definitely Would Not</td>
<td>27%</td>
<td>21%</td>
<td>17%</td>
<td>9%</td>
</tr>
<tr>
<td>Probably Would Not</td>
<td>26%</td>
<td>28%</td>
<td>28%</td>
<td>25%</td>
</tr>
<tr>
<td>Might or Might Not</td>
<td>16%</td>
<td>21%</td>
<td>28%</td>
<td>37%</td>
</tr>
<tr>
<td>Probably Would</td>
<td>5%</td>
<td>8%</td>
<td>13%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Legend:
- I definitely would not
- I probably would not
- I might or I might not
- I probably would
- I definitely would
REPEATED MEASURES ANOVA: NEUROTECHNOLOGY x SYMPTOM

PERCEIVED CHANGE TO PERSON

DBS (avg)  MRgFUS (avg)  Pill (avg)  TMS (avg)
KEY FINDINGS

- **DBS** is perceived as the second most **beneficial** treatment, but as least **acceptable**, least **likely to be used**, **riskiest**, most **invasive**, and most likely to **change the person**.

- Likelihood of **Personal Use** is more strongly associated with perceived **acceptability** than perceived **benefit**

- In contrast to the other neurotechnologies, **pills** are perceived as the least **invasive**.

- **Pills** are perceived as less **invasive**, yet **riskier** than **TMS**.

- **DBS** is perceived as **riskier**, more **invasive**, and more likely to **change a person** compared to **MRgFUS**.

- Neurotechnologies are perceived to be most **beneficial, acceptable, and likely to be used** by people for **Motor > Memory > Mood** symptoms.
THANK YOU

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<th><strong>Ethical Implications</strong></th>
<th><strong>Informed Consent</strong></th>
<th><strong>Autonomy &amp; Decision Making</strong></th>
<th><strong>Public Engagement &amp; Trust</strong></th>
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<td>Understanding how the public perceives these technologies can inform ethical guidelines and policy decisions regarding their development, regulation, and use.</td>
<td>Public perception studies can shed light on what information individuals deem important when considering the use of neurotechnologies, aiding in the development of informed consent processes.</td>
<td>Understanding how individuals perceive the impact of these technologies on personal identity and autonomy is essential for ethical decision-making.</td>
<td>Engaging the public in discussions about neurotechnologies can build trust and transparency. It allows for meaningful dialogue between researchers, policymakers, and the public, fostering a sense of shared responsibility in shaping the ethical landscape of neurotechnology development and use.</td>
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