Real enough: A virtual classroom can induce an increase in anxiety and speech disfluencies in adolescents

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Virtual reality (VR)

• Computer-generated 3D world

• Immersive environment that enables to navigate and interact with the virtual environment in real time

• Increasing number of studies showing the interest of using VR in the treatment of anxiety disorders

Wiederhold & Bouchard, 2014
VR and social anxiety

• Social anxiety disorder (SAD): fear of negative evaluation

• Virtual audiences can induce an increase in subjective anxiety in people with SAD and controls (Parrish et al., 2016)

• Efficacy of the cognitive behavior therapy using VR for public speaking anxiety (Wallach et al., 2009)
What about stuttering?

- Stuttering: childhood-onset fluency disorder (ASHA, 2017)
  - Part- or whole-word repetitions, prolongations and blocks produced with tension
  - Frequency and severity fluctuate in relation to the speaking situation
  - Avoidance behaviors: approximately 50% of people who stutter (PWS) may be suffering from social anxiety disorder (Menzies et al., 2009)
What about stuttering?

• Due to avoidance behaviors, current therapy approaches that target speech fluency show a propensity for relapse.

• ‘The most crucial component to any therapy is the transfer to and maintenance of treatment gains in the ‘real world’ ’ (Hearne et al., 2008, p.92)

• A cognitive behavior therapy combined to the speech therapy is associated with significant and sustained improvements in psychological functioning in PWS (Menzies et al., 2009)

• Assessment and treatment should include the exposure to a hierarchy of low-fear to more challenging situations (ASHA, 2017)
VR and stuttering

• Feasibility of using VR with adults who stutter
  • Subjective ratings of distress were significantly higher in a virtual audience condition compared to a virtual empty room (Brundage et al., 2016)
  • Virtual audiences create similar anticipatory apprehension in PWS that live audience do (Brundage & Hancock, 2015)
  • PWS spoke less and stuttered more in a virtual challenging job interview than in a virtual supportive job interview (Brundage et al., 2006)

• What about adolescents?
The aim of the study

• Validate a virtual classroom to be used with adolescents who stutter

• The first step: validating this environment with adolescents who do not stutter

• ➡️ A virtual classroom should create higher levels of anxiety and speech disfluencies than a virtual neutral environment
Methods

• Participants
  • 20 adolescents who do not stutter (9 boys, age range: 10 – 17 years)

• Procedure
  • Social anxiety scales
    • Fear of Negative Evaluation
    • Personal Report of Confidence as a Speaker
    • Liewobitz Social Anxiety Scale
  • Speech disfluencies and subjective anxiety (0-10)
Results: Speech disfluencies

Speech disfluencies (% disfluent words)

- Examiner
- Supportive classroom
- Challenging classroom
- Empty apartment

The graph shows the percentage of disfluent words in speech disfluencies under different conditions. The bar charts represent different scenarios with marked data points indicating significant differences.
Results: Anxiety

- Subjective anxiety:
  - Examiner
  - Supportive classroom
  - Challenging classroom
  - Empty apartment

*Significant difference
Results: Anxiety

- Subjective anxiety correlates with the performance - and social anxiety scores in the Liebowitz social anxiety scale

<table>
<thead>
<tr>
<th></th>
<th>Subjective anxiety in the supportive classroom</th>
<th>Subjective anxiety in the challenging classroom</th>
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</thead>
<tbody>
<tr>
<td>Liebowitz Performance anxiety</td>
<td>$r_s = .48, p = .03$</td>
<td>$r_s = .54, p = .02$</td>
</tr>
<tr>
<td>Liebowitz Social anxiety</td>
<td>$r_s = .47, p = .04$</td>
<td>$r_s = .59, p = .01$</td>
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</tbody>
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Conclusions

• The virtual classroom developed by *InVirtuo, Inc.* can induce an increase in speech disfluencies and anxiety in adolescents who do not stutter.

• The subjective anxiety induced by the VR classrooms accurately reflects the global social anxiety level.
Limits

• The order of the VR classrooms was not counterbalanced

• Very low levels of self-rapported subjective anxiety (adolescents without social anxiety disorder)

• Challenging classroom: sporadic reactions ➔ not challenging enough?

• To be validated in adolescents who stutter!
Thank you!

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