

Supplementary Material for:

“Can Social Robots Improve People’s Attitudes towards Individuals who Stutter?”

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The following text includes the script presented by the technology (Tablet/Robot) as well as the content of the interactive quizzes displayed on the tablet.

The color coding is as follows:

- **Green:** Text used only in the stuttering robot condition (RS).
- **Blue:** Text used only in the robot (R) and tablet (T) condition.
- **Pink:** Interactive quiz sections.
- *Italics:* explanations that were not spoken in the presentation.
- The screen names correspond to the naming conventions used in the code.

Script

[WelcomeScreen]

Hello!

It's nice to meet you! My name is QT! I'm one of the robots here in the Social and Intelligent Robotics Laboratory at the University of Waterloo. I'm very excited to share some of my knowledge about stuttering with you today. Thank you for showing interest! I would say without any further ado, let us jump right into the topic of stuttering!

[TimIntroScreen]

But first let me introduce you to Tim! *[Points to tablet that shows picture of Tim]*

Tim is a 22-year-old economics student. He spends most of his time with his friends, loves eating pizza and doing sports. Tim stutters. Throughout this presentation I will tell you about Tim's experiences, how stuttering has impacted his life, and challenges he has faced along the way.

Since you may not be familiar with stuttering, I'll try to imitate characteristics of stuttering at some points during this presentation. But I'm a robot, so I may not be the best at doing so, but I think you can still get an idea.

[DevelopmentalStutteringScreen]

Tim started stuttering when he was four years old. This is called developmental stuttering. It is one of the most common types of stuttering, as it usually starts between the ages of two and five. Some children naturally recover from it, but there is a small population that does not. It can therefore be persistent throughout the entire life, in cases like Tim's.

[InteractiveQuiz]

But before we continue, I was wondering: Have you ever met someone who stutters before?

- *[Answering options: Yes, No]*
- *[Technology's answers to button press:]*
 - *If participants press "Yes": "That's great! So, you already have an idea what stuttering sounds like."*
 - *if "No": "Okay! But maybe you still have an idea of what stuttering sounds like."*

[StutteringCharacteristicsScreen]

The fluent speech of a person who stutters is disrupted by repetitions, prolongations or speech blocks.

Repetitions typically occur when a person repeats a particular sound or syllable multiple times, before continuing with the rest of the word.

For example: I wa, wa, wa want coffee. *[Stuttering imitation]*

The next one is prolongation. Prolongation refers to the stretching of a sound, syllable, or word during speech.

For example: I am e mmm motional. *[Stuttering imitation]*

The last one is a speech block. During a block, a person who stutters has a hard time getting a word out

This sounds like: You look b (pause) beautiful. *[Stuttering imitation]*

In Stuttering, those different characteristics may happen all at once, or individually in separate instances. In general, it is important to keep in mind that stuttering can vary from person to person. While some people may stutter in every single sentence, others may only stutter every now and then.

[InteractiveQuiz/PrevalenceScreen]

What do you think? How many people worldwide are stuttering?

[Answering options: 1%, 10%, 0.5%]

[Technologies replies to button press:]

- *If participants press 1%: "Yes! You are right! It is approximately 1% of the global population."*
- *If 10% / 0.5%: "It is approximately 1% of the global population."*

Given this relatively small percentage, it is possible that you haven't encountered a person who stutters yet. But it may not only be because of the low prevalence. Maybe you haven't noticed a person who stutters, because they may also avoid taking part in social interactions or speaking up at public place. Why? Let's move on to Tim's experience he had a couple of years ago.

Frist Scenario: Pizza Place Scenario [Start]

In condition RS, the robot imitates stuttering characteristics during Tim's speech.

[PizzaPlaceScreen]

A few years back Tim went to his favorite pizza place with some friends. That day, the place was very crowded, and there were many people waiting in line after him. Tim stepped up to the counter, ready to order his pizza. He looked at the vendor.

[PizzaPlaceScreen_two]

Vendor: Hi! How can I help you today?

Tim responded:

Tim: Hi there! Could I please get a large pizza? / With a slight stutter; Tim ordered a large pizza.

Then, the vendor replied, and asked:

Vendor: Sure thing! What toppings do you want to add?

Tim answered:

Tim: Umm... Just give me a second, please. / Tim requested a bit more Time to decide on the toppings.

The vendor said:

Vendor: Of course, let me know when you are ready!

After a brief pause, Tim decided:

Tim: Um...okay I think I'll go with mushrooms, tomatoes and peperoni / After a brief pause, Tim settled on mushrooms, tomatoes, and his all-time favorite, pepperoni. However, when he tried to say 'pepperoni', he suddenly got stuck on the word. He struggled to push through the speech block.

[PizzaPlaceScreen_three]

The people standing behind him started chuckling, exchanging glances.

One person asked:

Person 1: Did he forget how to speak?

Another one said:

Person 2: Come on buddy, we don't have all day!

The third one shouted from behind:

Person 3: Just spit it out!

The vendor began to lose his patience. His gaze drifted away.

Tim tried to start his sentence again:

Tim: Olives and p [gets stuck on word "pepperoni"] / Tim tried to start his sentence again, hoping to overcome the speech block.

But there was no way of getting the words out. The moment felt like eternity for Tim.

The vendor interrupted him with:

Vendor: You mean pineapple, right?

To quickly escape the situation Tim responded:

Tim: Yes, yes sure! Thanks! / To quickly escape the situation, Tim quickly agreed, and didn't correct the vendor.

[PizzaPlaceScreen_four]

The vendor handed over the pizza to Tim. Tim was sad, because he actually doesn't like Pineapple on Pizzas at all and would have preferred pepperoni. However, in the face of the whole situation, he didn't have the courage to correct the vendor. What if he got stuck again? How would people react?

[PizzaPlaceScreen_five]

So, Tim quickly grabbed his pizza and left the place as fast as possible. He felt a strong sense of embarrassment and shame.

Pizza Place Scenario [End]

I think we would all have felt the same, don't you think?

The way other people respond to us, especially when it's negative, can influence our thoughts, emotions and behavior.

People who stutter may face such experiences as Tim's frequently, sometimes even multiple times a day. They may avoid words they usually tend to stutter on, or social interactions altogether to avoid negative responses from others. It can strongly impact their life and often results in negative, sometimes depressive feelings and low self-esteem. It also influences their confidence.

Let me share another story Tim has experienced.

Second Scenario: Group Work [Start]

In condition RS, the robot imitates stuttering characteristics during Tim's speech.

[BeforeGroupScreen]

As part of a class in his studies as an economic student, Tim was assigned to a group project with three other students.

[InteractiveQuiz/GroupFillerScreen]

What about you, do you like working in a group?

[Answering options: Yes, No]

- *If participants press "Yes": "Nice! Tim usually also enjoys working with his fellow students."*
- *If "No": "Okay! Some people prefer working on their own. Tim enjoys working with his fellow students as well."*

[GroupScreen]

The project focused on analyzing the impact of social media on consumer behavior.

[GroupScreen_two]

As they began brainstorming, Tim's came up with the first idea, and said:

Tim: I think social media has revolutionized how consumers engage with brands. It allows for targeted advertising, instant feedback, and influencer endorsements. / As they began brainstorming, Tim came up with the first idea. He believed that social media had completely revolutionized how consumers interact with brands. He mentioned how it allows for target advertising, instant feedback, and influencer endorsements. While expressing his thoughts, his stuttering became more noticeable. His words stumbled, making it hard for him to tell his ideas clearly.

After finishing, one of his fellow students said;

Fellow Student-1: Sorry, Tim, could you repeat that please? I didn't catch all of it.

Tim responded:

Tim: Sure, I was telling that social media allows for t-t-t [gets stuck on "target"] / Tim repeated his idea, but he got stuck again in the middle of his sentence, when trying to pronounce the word "target".

When Tim got stuck, another student suddenly interrupted him:

Fellow Student-2: Well, I don't think that's that important. Maybe we should move on.

After that Tim didn't say anything again.

As the discussion progressed, another fellow student presented a similar idea as the one Tim has mentioned in the beginning as it was a completely new concept:

Fellow Student-3: Hey, just had an interesting thought. Social media has completely changed the way consumers interact with brands. We should dive deeper into that.

Both other students agreed on that. Tim felt frustrated and disappointed. People disregard his ideas because of his stutter. They don't listen properly. They give him the feeling of being less intelligent and that his thoughts weren't worth sharing.

Group Work Scenario [End]

The two experiences that Tim has had as a person who stutters already gave a good insight into the challenges the challenges faced by people who stutter in our society.

[StereotypeFillerScreen]

A general problem is that these reactions are often rooted in stereotypes and misconceptions.

[InteractiveQuiz]

What do you think is the most common stereotype related to stuttering?

[Answering options: PWS are nervous, PWS are less intelligent, PWS are less confident]

- *If participants press **nervous** / **less confident**:* "Nervousness and reduced confidence are stereotypes related to stuttering. However, the most common mistaken belief is that people who stutter are less intelligent."
- *If **less intelligent**:* "Yes! That's correct! The most common mistaken belief is that people who stutter are less intelligent."

[StereotypesIntelligenceScreen]

But there is absolutely no connection between intelligence and stuttering.

[StereotypesAndMisconceptionScreen]

People who stutter are also frequently perceived as being more nervous, and less confident. Because of these stereotypes, many of them have difficulties in getting hired for jobs. Especially for those that require lots of communication skills.

These stereotypes become apparent in the way people react to individuals who stutter. Constant exposure to such reactions can cause them to internalize these beliefs. They may perceive themselves as being less intelligent and feel that their thoughts are not valuable enough to be shared. It's exactly what happened to Tim with his fellow students. After his group member had interrupted him, he didn't continue speaking.

Internalizing these stereotypes can also impact their confidence. It may lead to negative and sometimes depressive feelings. It strongly affects their lives on multiple levels.

So, what can be done to improve the situation of people who stutter?

Tim went to speech therapy multiple times. With the help of a Speech and Language Pathologist he developed strategies to overcome speech difficulties and to become more fluent.

However, it's not only their responsibility to change, but society as a whole should learn to adapt to a variety of communication styles.

And the good part of it is that this can be done quite easily by applying some tips!

Let us think about Tim's two experiences again, the Pizza place and the group project with his fellow students.

I'm very curious to hear your opinion!

[InteractiveQuiz/PenAndPaperScreen]

What do you think would have helped in these situations? How could the vendor, the people at the pizza place, or Tim's fellow students have reacted differently? Grab a pencil and tell me what you think! I'm very excited to read your ideas later! Once you're done, just press the button on the tablet, to move on. *(Participants write answer on sheet of paper)*

[Answering options: I'm done!]

- **Once pressed:** "Thank you! You can put the paper right next to you. Okay, let us move on!"

[TipsScreen]

As a last point of this presentation, I will give you some tips on how to react towards people who stutter. First, it's all about patience! It's clear that for Tim the situation would have been much better if everyone had just been patient. This means, if people at the pizza place hadn't started laughing and making rude comments, and if Tim's fellow students had just listened to what Tim wanted to say without interrupting him. People who stutter know exactly what they want to say, and they will finish in their time. So, give them the time they need. It may be a few more seconds of your time, but it can make a huge difference for them.

Being patient also includes showing interest and paying attention. With his group members, Tim had the impression that people aren't listening. That his thoughts aren't worth sharing. By maintaining eye contact, also during moments of stuttering, you give them the confirmation that you are still listening.

Another thing that may not be immediately obvious is the habit of filling in words and completing sentences for someone who stutters. Maybe the vendor at the pizza place was trying to be helpful, but completing sentences can be very discouraging. In Tim's case it was even wrong.

In general, show an overall relaxed attitude. When a person starts stuttering - Don't behave differently. Have a smile on your face, try not to add any additional distress to the situation. To wrap it all up, keep in mind: People who stutter aren't less intelligent. Behaviors as nervousness that you may notice, isn't because of stuttering. It may be a result of negative reactions they have faced, or due to self-stigmatization.

As a general tip: It's always a good idea to consider how you would feel if you were in a similar situation. How would you like people to react in such situations? Knowing facts and being aware of the truth is important!

[EmbraceScreen]

We all know that communication is essential for the exchange of information, friendship making, and relationship building. But communication doesn't need fluent speech. Stuttering is one variation of speech, much like others speak in higher or lower pitches. So, let's remember! Acceptance is key! And we should embrace this diversity!

[GoodbyeScreen]

I hope you enjoyed this presentation! Thank you for listening! Have a good day!