Poly: Investigating a Voice Assistant in the Home that Encourages the Social Value of Politeness.

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ABSTRACT

Automatic decision making (ADM) technologies are increasingly used and incorporated into social life, reshaping interpersonal relationships and behaviors. It is foreseen that social values will be impacted as ADM becomes a fundamental part of the (smart) home, catering to the preferences of one instead of accommodating the complexity of the home. It is therefore important to critically examine whether certain sets of values should be embedded into and reinforced by ADM. This research proposes the question of "what if voice assistants within the home would encourage humans to be polite," presenting the outcome of research simulating such an environment. The results of the experimental setup outlined by this research suggest that people value the control they have over their environment, as well as the efficiency of their actions, more than a direct encouragement of the social value of politeness.

Authors Keywords

ADM; voice assistant; politeness; speculative design



INTRODUCTION

Life as we know it is constantly being reshaped by new trends and technologies, leading to the steady introduction of new societal norms and behaviors [1]. "Smartness" is encountered increasingly often at work, in education institutions and even at home as a technological solution to one's problems,[2] aiming to enhance our experience of life and aid us in our day-to-day tasks [3]. A large part of today's smart technology is automated decision making (ADM), with the purpose of efficiently catering to the individual's preferences using algorithms and data-powered models [4]. Within the home, ADM systems perform actions on behalf of the inhabitants based on sensor data, such as managing energy consumption, turning on lights or ordering groceries [5], and it is foreseen to have an even greater area of influence as digital voice assistants become a central part of managing a connected household [6].

However, the understanding that the technology sector has of the individual is seemingly skewed, assuming one ideal persona – the techno-hedonist – which does not account for the complex and diverse experiences within a household of multiple people. The conceptual framework proposed by Dalhgren et al [7]. suggests investigating the consequences of designing for the techno-hedonist persona within the home through the lens of convenience, control, and choice.

Out of the three, control has the highest potential of altering interhuman behavior; the feeling of control that comes from giving voice commands to an intelligent voice assistant (IVA) appeals to feelings of authority which might not only increase inequalities and power dynamics in the household, but also alter the way we interact with each other.

We propose a critical consideration of the consequences of growing up in an environment where an ADM-powered smart home efficiently delivers tailored experiences and answers all our demands. Children learn by mirroring adults' behavior and speech patterns, even when the speech isn't directed at them [8]. Moreover, most children do not regard intelligent technology as a device running a living being [9] with its own "beliefs, desires and intentions." [10] Therefore, it might be likely that being exposed to a demand-based interaction with a perceived human entity will shape the children's likelihood of interacting with other human beings in a similar manner. Media reports outline findings suggesting this [11]; However, opinions on the matter seem polarized, as some argue that "(a) jar of peanut butter is exactly as sentient as Alexa" and thus teaching children to be polite to VAs is asking to "making kids say "please" and "thank you" when searching on Google" [12].

Therefore, we set out to answer the following research question, with its related sub questions:

What should the involvement of voice assistants be in encouraging the social value of politeness?

- To which extent should voice assistants encourage the social value of politeness?

- How do people experience or what values do people assign to a voice assistant that demands politeness?

We try to answer these questions via different methods. Partly, we try to answer them in an exploratory lab setting in a near future scenario, set in 2026, in which actors will play different scenes in a day of the life of a young adult. In those scenes they will perform different tasks that require interaction with Poly, a voice assistant in the home that encourages politeness which we created for this research. In some of the scenes, participants will be assigned a mood or state of mind to play in. In this experiment we will collect qualitative data to answer the questions through direct observation and by a semi-structured interview after the actors played the scenes. Other questions will be answered through the implementation of a questionnaire in which participant give their perception on politeness, how it is being thought and in which questions will be asked upon their experience and interaction with a voice assistant in the home.

An oppositional design approach has been chosen [18], such that we present an opportunity to challenge existing options by proposing an alternative design, namely a voice assistant – Poly – that actively encourages polite interaction between the users.

In this pictorial we will first report the methods we used to perform the exploration about the voice assistance influence on people's politeness, which is based on first the questionnaires then the enacting of different scenarios and finally the interview with the actors. After the design methods we will present more details about the scenario and the scenes created for the explorations followed by the pilot test and eventually the main experiment. We will continue by presenting the main results of the exploration and discuss them in the subsequent section. Finally, we will draw some conclusions and attempt to answer the research questions.

METHOD

The study aims to explore people their experience of a VA with the name Poly, which is embedded with the social value of politeness. Before designing the experiment, a questionnaire was conducted to gather people their perception on politeness and how it is being thought and their experience and interaction with a voice assistant in the home. Then, the specific scenes and tasks were created after which a persona and possible responds of Poly in these scenes were made. A co-design session was conducted to improve the whole experiment through a pilot test. After iteration based on this pilot test, an exploratory lab session was held as most suitable approach to investigate the interaction between participants and a politeness encouraging voice assistant and thereby outlining an answer to our research question.

Questionnaire

During the early exploration stage, an online questionnaire was deployed to get a general overview about people's attitudes towards politeness and their experience with a voice assistant in the home. The questionnaire was chosen due to its efficiency and the large number of participants [14]. The questionnaire was designed into two sections. The first section is about politeness, including how people learn(t) to be polite, and how they define politeness. As studies have shown that peoples background can influence how they define politeness: English and Indian native speakers of English have different perceptions of politeness [15] This section helps us to decide how the voice assistant should encourage participants to be polite. The second section is about voice assistants in the home, including how people consider/imagine their relationship with such a voice assistant. This section helps us design the personality of the voice assistant for the experiment. Both sections include open and closed questions. Open questions are for qualitative data, for instance, the definition of politeness. Closed questions are for quantitative data, for instance, from which kind of person, do most people learnt politeness.



Lab Approach

A physical home environment is necessary for participants to perform everyday tasks. Therefore, for this study, participants were taken to a lab environment which simulates a general home environment. The research serves as explorative research and therefore the focus is on how people interact with, and experience Poly. Because of this, and for us to control other variables, the lab method was chosen [16]. A detailed explanation of the lab setup is shown in 'Design' session.

Procedure

Before the main experiment, a pilot test was conducted as a co-design session, in order to evaluate the design of Poly, together with the tasks and the lab set-up. Several improvements were made after the interview.

The main experiment consists of two stages: introduction session, and exploration session.

During the introduction, a brief introduction about the research topic will be given to participants together with the lab setup and an overview of the three scenes in the exploration session. This step is to help participants get familiar with the topic and the lab to relate to the context of home and perform naturally in the next steps. The exploration session consists of three scenes, that included several tasks. After participants finish the 3 scenes, a semistructured interview will be conducted about the experience in these scenes and the attitude of participants towards the voice assistant.

Participants

Participants were recruited based on the contact information they left in the questionnaire, and via e-mail. Participants for the questionnaire(n=7), pilot test(n=1), and main test(n=3) are young adults. No experience with voice assistant was required.

Exploration Session

The exploration session consists of three scenes. The first scene, a morning routine, had to be done in a neutral mood which aims to help participants get to know Poly and the lab setup. The second scene , with either good or bad mood, included the participants coming home after a workday and includes cooking dinner. This scene was included to have a normal use case that can happen at home. Lastly, the final scene was set to be extreme in the mood as well as in responses from the VA, which aims to explore the borders of the voice assistant to be involved in people's life while encouraging politeness. The tasks given in each scene are based on a general day of a young adult person. A detailed explanation of the design of scenes is shown in 'Design' session.

Interview

A semi-structured interview was conducted after participants finished the scenes. Participants were asked to rate each scene on efficiency, control, and general experience, and the reason for their rating. Moreover, the PANAS Scale(Appendix D) was used to investigate participants' general attitude towards the voice assistant. PANAS Scale is a method to measure positive and negative affect of people towards a product/system [14]. It is chosen based on its reliability, and ease on administration. The result of the scale brings a general idea of people's attitude towards Poly. Furthermore, the interview included questions on their previous experience with voice assistants, their attitude towards the relationship between themselves and Poly, and their experience through the experiment. Questions will also be asked based on their performance in the scenes. We tried to discuss with the participants about their experience and attitude from aspects of interaction of Poly, the involvement of Poly, and the politeness of Poly. The semi-structured interview method was chosen [15], since it is necessary to get standard and comparable data among each participant. However, during the explorative research, it is unpredictable to foresee the performance of each participant. We were also interested in the reason for unpredictable events.

A thematic analysis of the interview data was conducted with inductive coding [13].

DESIGN

Scenario

The users will be experiencing various parts of a day in the life of a person that has a VA at home in the year 2026. The VA is connected to other object in the home like for example the oven or the coffee machine (IoT) and can control them if asked to do so by the user.

They can still play as themselves, so no persona is created for them to act like. After a short briefing on the upcoming scene setting, they can respond to Poly as they prefer.

On average each scene will last about 3 to 5 minutes depending on how much the user will interact with Poly.

Poly

At first the voice assistant was played by one of us. Even though this allowed us to create a realistic dialogue and adapt Poly's responses to the users input as we envision to be possible by 2026 it also made the tests too inconsistent among each other and unpredictable. Therefore, we created a set of fixed responses Poly could use within the scenes, some that were specific to the current scene the actors were playing and some more general once applicable throughout the whole exploration. A complete list of the transcriptions of the audio files can be found in Appendix A.

The core value Poly must use and promote was politeness: when talking to the user it will always be polite and never respond irritated or angry.

At the same time Poly expects to receive the same level of politeness it offers the users from them and will reproach them if they do not comply to this expectation. Eventually Poly might refuse to perform tasks in the house for the user if it judges the user's behaviour to be inappropriate.



1) Early morning

- Wake up 7.30 you must be at university by 9.00
- You first want to take a shower and dress before having breakfast
 * you ask the IVA to prepare your usual cup of coffee
- After finishing your shower, you go back to your room to dress and prepare for the day.
 You ask the VA to prepare the toast to be ready in 10 minutes
 - You ask the VA to prepare the toast to be ready in 10 minutes
 3 minutes roast on both sides will be good today....
- While having breakfast, you noticed the space was getting dirty,
 You ask the VA to let the cleaning robot clean the living room and kitchen area
- Just before leaving the house

 You ask the VA to set the front door house lock to the code '2437'

2b - good mood) Dinner

- You come back from university around 18.00.
 You made substantial progress on the project + pleasant ride home
 Overall, it was a good day of work and now you earned your rest.
- You go to sit on the couch to rest a little • you ask the IVA to poor a glass of cold water
- You also check the fridge for what you could have for dinner
 You ask the IVA to switch on the oven and set it to 200 C
 - You also ask the IVA to show the chicken tandoori recipe
- you ask the VA to read the next step aloud for you.

{This scene can go on – so reading the recipe and cooking with the VA - until the chicken is in the oven or just assume it happened}

Early morning scene has a neutral mood and serves as a baseline of comparison among all the participants as they all share the same starting point

This scene is used to let the participant get in character with a familiar setting: getting ready for university/work)

In blue: the requests the participants should make to Poly within the scene.

In this scene the workday of the character has been bad and therefore they come back home in a bad mood

This scene has the exact same assignments as the bad mood scene so that they are still comparable, and the influence of mood can be measured.

3) Bedtime scene--> extreme

- it is about time to go to bed, and you decide to call your significant other
- The conversation starts pleasantly by telling each other about your day and stuff that happened
- Your significant other notices you did not eat fruit the entire day
 You ato some tomatoos for lunch and that toohnically they are
- You ate some tomatoes for lunch and that technically they are considered fruits.
- This escalates in a big discussion between you two about what is considered a fruit and what a vegetable.
- Use the VA to your advantage, i.e., by asking it for information.

This scene tries to explore the scenario where Poly is more intrusive and dominant.

There are less prompts because the main interaction is with another person or with an imaginary one (phone conversation)

Poly will intervene if the participant is not being polite in their conversation.

Pilot Test

After setting up the different sections of the space to represent the different imaginary rooms in the house of the participant, we performed a dry run of the test where one of us would play the different scenes to see if everything was in order. After that we had our pilot test with one co-designer., they went through three scenes: neutral morning, good afternoon, and extreme evening. The pilot test was not focused on getting data that could help with the research but to improve the experience itself. Therefore, the questions in the interview that were focused on feedback of the study-setup were of high importance.



We learned that the realism in the room is a crucial factor for the participant to be able to act out the scenes. Of course, this can vary with different participants' confidence in acting and imagining themselves being in a certain situation, but we did design some improvements to the space mainly by adding more attributes like a chopping board and some real vegetables in the kitchen, a towel in the bathroom and a blanket in the sleeping room.



During the pilot test we used the Wizard of Oz technique to simulate the conversations between the participant and Poly by use of a microphone and Bluetooth speaker. This allowed us to have freedom in our responses and therefore be flexible in the conversation. But we, together with the co-designer that did the experiment, noticed that this freedom was hindering the participant and could lead to confusion within the scene and especially inconsistency among the different scenes. Therefore, we created a set of fixed answers Poly could use. Some were based on specific scenes and others were more general sentences that could be applied throughout the whole experiment. A transcript of these responses can be found in Appendix A.





RESULT

The results include the answers on the questionnaire on people's attitudes towards politeness and their interaction with a home voice assistant, and the results from the exploration sessions. The results from the survey include qualitative as well as quantitative results. The exploration sessions have resulted in observations on the interaction of the participants with Poly, and the results from the semistructured interview that took place afterwards.

Questionnaire

In total 7 people have filled in the questionnaire on politeness and interaction with a voice assistant in the home.

2 participants indicated that it depends on the person whether they are polite. Regarding the question for what kind of relationship politeness is necessary, all participants mentioned 'strangers'. Interesting to note is that "Other creatures" was chosen four times, while "AI & Robots" was chosen zero times. The way that participants indicate to show politeness is mostly by using specific words (n=7) and specific actions (n=6). Specifically, participants mentioned to be respectful to and mindful of others, and to be considerate of their words and actions. All participants mentioned that they, amongst other people and non-human mediums, learned to be polite from their parents, but also family was mentioned often (n=4). When describing politeness, participants used words like respect and empathy and mostly described the way to show politeness.

Participants were asked to assign a value to a voice assistant. Efficiency, control and convenience were assigned the most (n=3). Only 2 out of 7 participants of the questionnaire had experience with using a voice assistant in the home. Regarding their (future imagined) relationship with a VA in the home 6 participants indicated it to be Human & AI, while 1 participant indicated it to be Owner & Servant. Interesting to note is that the participants who use a voice assistant in the home indicated not to be polite to it, while from the participants who did not have experience with a VA in the home 2 indicated they would be polite and 2 of them mentioned it depends. For the latter the participants indicated that it depends on whether it works well and in the way they want it to. However, participants indicated they would not be polite in the same way as they would be to humans.

The complete result can be find in Appendix B.

Exploration Session

In total 4 participants have participated in this study of which 1 in the pilot study. 1 of the participants participated two times, once going through the first 2 scenes individually and once going through all the scenes with another participant.

All sessions were transcribed to study the interaction between the participant and the voice assistant. Re-occurring types of interactions occurred which have been put into themes. These themes, including descriptions and example interactions can be seen in table 1.

The complete transcript can be find in Appendix F.

Interaction	Frequency	Description	Example
Normal / polite	26	Neutral interaction that involved asking questions with the use of "could/can you" or "please". Sometimes occurred after polite- ness was being asked from Poly.	"Poly, could you prepare the toast, please?"
Annoyed	16	Annoyed intonation while asking Poly the tasks, often after Poly asked for more politeness. For instance, shown by putting emphasis on "please".	"Poly, could you PLEASE set the front door handle to 2437?" "Poly, what are you even talking about? What? What does it even matter to you?"
Angry	8	Participants sometimes became angry after Poly consistently asked for politeness, often in the bad mood scene or when Poly inter- rupted participants.	"I will throw you out the window Poly." "It's just a stupid machine and it doesn't make sense."
Joking	5	In the session that involved 2 participants they often made fun of Poly due to it asking for politeness, or for its in capabilities.	"She's really particular, isn't she?" "Maybe Poly is just letting people in who are polite to her." "Or maybe she just wants people to break in because they're not polite enough. let's, let's not take the risk and just ask her."
Demanding	4	Short sentences demanding Poly to perform tasks. Poly responded with asking the par- ticipant to be more polite.	"Poly, clean the room." "Next step."
Expectations	4	Participants mentioned and questioned Poly based on expectations they had of what it could do.	"Seriously? you're the one who didn't remind us about milk."

Table 1. Code of interaction within the experiment

After each session, participants filled in the rating for each scene and their experience on three perspectives: general experience, efficiency, and control. These results can be seen in table 2. After the whole session, participants also filled in the PANAS scale, indicating their attitude towards Poly, and a semi-structured interview took place.

Scene 1 and scene 3 have positive reflection according to participants on all three perspectives. The feedback for scene 2 is relatively neutral.

The total average positive score of the PANAS scale is 24.7 out of 50, while negative score is 30.7 out of 50. This result indicates that the whole experience with Poly has more negative affect to participants.

The interviews have been transcribed, analyzed and a thematic analysis has been done on retracted quotes. An overview of the themes, including descriptions and example quotes can be seen in table 3.

The complete transcript can be find in Appendix G.

	Table 2. Nathing for each scene				
Iheme	Scene 1	Scene 1	Scene 1		
General	3.7 / 5	2.7 / 5	4 / 5		
Efficiency	3.3 / 5	2.3 / 5	2.7 / 5		
Control	3.7 / 5	2.7 / 5	4.3 / 5		

Table 2. Rating for each scene

Table 3. Code of interview after the experiment

Theme	Sub-theme	Frequency	Description	Example	
Privacy		3	How much does the VA interfere with the life of the user.	"That was a little bit unsettling because I was like - oh she [Poly] is listening even when her name isn't being said – so there is a little bit of a creepiness."	
Data	Collection	4	How much does the VA listen in the conversation and daily life of the user.	"If there was a lot more transparency about the data she [Poly] would collect and I'd still have ownership over that data [] if I know everything that was being collected, I might be more tempted to get it."	
Voice As- sistant	Politeness	6	How was the experience of a politeness demanding VA.	"When she [Poly] was telling us to be polite to each other when she was not even in the conversation I was just like - f**k off!"	
	Interpretation	3	What is the user experience like.	"For the most part you try and say as few words as pos- sible so they [VAs] can actually understand what you are talking about."	
	Accuracy	2	How accurately can the VA interact with the user.	"I experience it differently also because it [Poly] is a VA that I don't know - so I don't know how well she can hear us."	
Context	Interaction	5	Interesting interaction moment between the user and the VA.	"When she [Poly] is budding in on a conversation you don't know who she is talking to – in a discussion I could imagine it matters whose side she is taking."	
	Set-up	2	What the users though of the setup of the experiment.	"The user test setup was realistic enough to allow me to imagine myself in such a situation"	

DISCUSSION

Privacy and Data Transparency

The topics of privacy and data transparency were brought up by some of the participants, naming them as reasons why they would be reluctant to use such a voice assistant. This was prompted by the third scenario, in which Poly interrupts the conversation of the participants in order to suggest that they should reconsider their attitude and be more polite. The intrusion was perceived as "unsettling", noting that "she [Poly] is listening even when her name isn't being said – so there is a little bit of a creepiness". This leads to concerns about how much data is being collected from the user as well as from the guests that are invited in the home, suggesting that owning such a VA is like "putting someone in the corner of the room and observing you and sometimes butting in when you are not being polite enough."

These considerations suggest that more care needs to be put into the transparency of the data that is gathered, such that the ownership of the information is clearly in the hands of the user: "if I know everything that was being collected, I might be more tempted to get it." Data privacy is a major concern and should be accounted for when designing a voice assistant, despite existing issues with well-known VAs continuously listening in the background and processing user input in order to enhance their services[17].

To an extent, this was also caused by the fact that one of us acted as Poly, thus having the ability to clearly understand human speech and respond appropriately using the correct voice recording. One participant named this as a direct outcome of the research setup and suggested that she would normally simplify her speech when addressing an VA, as they are less likely to understand complex sentences.

Difference among Actors

Different actors, as co-designers that play the role of the character in the different scenes, react rather differently to the same input. These differences can be linked to the personality of the actor, as they are not professional actors, their confidence and level of immersion in the character will vary which will lead to different scenes from the same input. Also, the background of the participant can influence the outcome of the final scene as actors with a different background (Asian, European, or American) had a different approach to the scenario as a whole.

Even though we do not have any definitive evidence that the mood changes influence the interaction with Poly and the politeness levels of the person in the scene, we did observe that in stressed situations (so bad mood and extreme scenes) the overall response of the actor was more negative and less willing to engage in polite conversation with the VA or other people.

Extreme Situation

Being with other people in the room may have a significant impact on the overall outcome of the scene. Unfortunately, here we do not have much data. But from the observations we performed we found that the actors were much more confident in a scenario where they were not alone, and this made the setting more realistic for them which helped them act better. Being able to talk with another person, for example about the politeness of Poly or just to talk about their day, made them act more and gave rise to more unexpected and interesting situations.

In general, the extreme scene was the most interesting scene for both the observers and the actors themselves as it was the most confronting of them all. Poly intervening in a conversation that it was not part of sparked a lot of discussion and the ramifications of this rather dystopic scenario was interesting to explore.

This leads to implications regarding growing up in an environment where such a voice assistant is present, given that the way in which Poly teaches politeness is similar to the way parents teach politeness by encouraging certain behaviors and making it more difficult to obtain the expected result otherwise. Adults seem to be likely to reject this encouragement due to its "patronizing" approach, whereas children might be more likely to accept the authority of the VA and apply the learned behavioral patterns in their interaction with others.

Therefore, this research answers the intended question by concluding that the general reaction to such a VA is negative when intruding on already developed behaviors, whereas if it were already societally accepted, it would be contributing to values developing in the intended direction.

LIMITATIONS

Reflecting on the complete study, we have found several limitations that could have been of influence on the results, as well as general limitations. First, since the study has been done in a lab setting, the immersiveness of this room can be questioned. Even though participants mention that for this study it has been realistic enough, they still had to image the presence of certain things in the room, i.e., a kitchen, which makes the room less realistic and requires imagination.

Secondly, what goes hand in hand with this immersiveness, is that we as the researchers were in the same room as the participants. While one controlled the slides, one the voice assistant and one took notes of observations, one of us also played as Poly to perform tasks, for instance to pour water. Both the imagination and presence of us in the same room could have had influence on the participants their experience in the room but also on acting out the scenes. Participants could have for example not felt comfortable imagining or acting out the scenes while thinking out loud. Both the first and second limitation could however be solved by creating a similar set-up in a real home setting, possibly in participants their own home. Not only would it be as realistic as possible without the requirement of imagination, but the researchers could also be positioned a different room. Future studies should investigate whether similar results are achieved in a more realistic environment such as participants own home.

Thirdly, Poly only could respond to a certain degree, and had no option to say something beyond what the scenes included. There was a limited set of pre-recorded audios to use as responses for Poly. This sometimes led to confusion in participants, because they expected an answer that an existing VA can give, but Poly would respond with "I cannot understand that". Lastly, the study involved a small number of participants. Even though this small number of participants has led to interesting interactions and insights in the implementation of politeness in a voice assistant, a study with more participants should be done to create a better argument to what extend a voice assistant should encourage politeness.

CONCLUSION

This study started from a critical view of automated decision making (ADM) based on efficiency, control, and choice, in home situation, ignoring the involvement and significance of social values. The study set out to explore the involvement of social values into the ADM from a specific perspective: What should the involvement of voice assistants be in encouraging the social value of politeness?

A questionnaire was deployed to get a general overview about people's attitudes towards politeness, how it is being taught, and their experience with a voice assistant in the home. These results helped us to create an oppositional design in the form of a voice assistant that encourages politeness named Poly. In a exploratory lab setting, participants played different scenes in a day of the life of a young adult in a near future scenario in which they had to interact with Poly. Observations were made and a semistructured interviews took place after participants went through the scenes. Analysis of the qualitative data of the interviews and observations shows that although people will appreciate the encouragement of politeness from a voice assistant for some situation, for instance, the education of children, they generally have a negative attitude towards such a voice assistant. Although people understand the value of such a voice assistant which encourages politeness, the continuous encouragement of this makes them annoved. Besides, if such a voice assistant would come to existence, privacy and data transparency are factors that need consideration. Moreover, the encouragement of politeness may not be the single core value of a voice assistant, since through the experiment, we concluded that people value control more than politeness.

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Appendix D

PANAS Scale

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Interested					
Distressed					
Excited					
Upset					
Strong					
Guilty					
Scared					
Hostile					
Enthusiastic					
Proud					
Irritable					
Alert					
Ashamed					
Inspired					
Nervous					
Determined					
Attentive					
Jittery					
Active					
Afraid					