

# Chatbots providing emotional comfort during grief

A STUDY ON EMPATHIC CHATBOTS  
SMAAK, CHRISTOPHER

## Introduction

One of the most traumatic experiences is losing a loved one. And although it is something all people struggle with at some point in their lives, it can be quite damaging to someone especially if the death is unexpected (Keyes et al., 2014). An experience like this can bring about phobias, major depressions and even posttraumatic stress disorders. This is not a phenomenon exclusive to younger people, quite the contrary. The older you get, the more likely it becomes that you start losing people close to you. How one deals with this grief may be vastly different from others in their direct surroundings. However, talking to a therapist is never a bad idea as it could very well help you in your grieving process. It has been shown that clinical intervention is helpful for older people of age 60 and over (Welzel et al., 2021), as well as younger people (Zambelli et al., 1988). The problem is that there are simply not enough therapists available to be able to provide support for all those in need, which has been a problem for over a decade (van den Berg et al., 2004) but is even more prevalent now. This is where the concept of a therapeutic chatbot comes in. A specialized chatbot could potentially offload some of the work to give therapists a bit more breathing room. Could emotion be affected positively by talking to a chatbot when dealing with grief? And if so, would a passively or an actively listening chatbot be more effective at providing comfort to those dealing with grief?

Contrary to popular belief, the concept of AI is not something that has only been around since this century. Actually, a man called Alan Turing published a paper back in 1950 about the “Turing machine”. The article was centered around the question “Can machines think?”. While it certainly is a tantalizing thought, it is also a complex question that is difficult to answer. In order to answer this question, one must first decide what the meaning of both “machine” and “think” is. Even still, would one be able to distinguish a machine from a human if both participants could only be asked questions without being able to see them? This is what makes the debate about AI interesting, as for some the inability to distinguish an AI from an actual human might be uncomfortable or scary even.

Nowadays, digital computers have been incorporated into even the most mundane devices like fridges and toasters. The state of the art in AI is being developed by some of the biggest companies in the world, like Microsoft and Google. These companies have created the speech-based agents Cortana (Microsoft, 2021) and Google Assistant (Google, 2021), respectively. These AI companions are programmed to help the user by answering their questions by deploying search queries, keeping track of their appointments or even telling them a joke. While Cortana is tied to the Windows operating system, the Google Assistant can be found on many smart home devices and smartphones. Another well-known virtual assistant is Amazon’s Alexa, which is widely used in Smart Home equipment with smart speakers in particular (Amazon, 2021). Apple also has its own flavor of virtual assistant called SIRI and it is found in all iOS and smart home devices produced by Apple. All of these AI companions can accomplish roughly the same tasks, the differences lie in the way they operate, look and sound (López et al., 2018). For example, the search queries that Cortana deploys are powered by Bing while those from Google Assistant are powered by Google. All of these assistants have their own unique voice, but for all assistants the voice sounds like a female voice. Finally, the apps required to use these assistants all look different in the user interface department in order to accommodate for a certain feel and to make it easier to accomplish certain tasks.

## Modern-day chatbots

However interesting and useful these might be, this study is aimed at chatbots. These are specifically designed to interact with the user through text input. They are widespread on the internet on various web shops as they can be used to answer frequently asked questions, also known as F.A.Q., without the need for someone from customer support. However, these are basic in their operation. They look for certain key words in phrases and try to find a fitting answer. One is not able to have a real conversation with this kind of chatbot, they are more like an interactive version of a standard F.A.Q. section. This saves the user the hassle of searching through the whole F.A.Q. section to find an answer. Furthermore, these chatbots can provide additional product information or connect you to customer service.

On the other end of the chatbot spectrum are some of the most advanced chatbots like Replika, Woebot and Sentinobot. All of these fulfil a different purpose. Replika is a chatbot designed as a virtual friend who tries to comfort and motivate the user during hard times but also to just have a casual chat (Replika, 2021). There is even an option to pay a monthly fee to extend the relationship with the Replika down a romantic path. However, the answers the user receives as responses are not always relevant or appropriate. This is likely because of the way Replika incorporates the user input of all users to generate its own answers. Woebot is focused on mental health by establishing a therapeutic bond with the user (Woebot Health, 2021). For example, it tries to identify whether the user shows symptoms of depression by analyzing the user's input. The creators also show the attention they pay to building trusted relationships with people. Sentinobot tries to evaluate the user's personality with the use of the Big Five (Sentino, 2021). It then compares your results with others in order to make the interpretation of the results somewhat simpler.

One must be able to trust the chatbot to a certain degree in order to take advantage of the support it can provide (Agarwal, 2021). In the context of an AI that would be employed to comfort people during emotionally harsh times, this could end up being a problem. Research has shown that it is possible for a virtual agent to gain some level of trust from the user, but it is not without its limitations as one miss-timed or unexpected answer can adversely affect the user's perception of this agent (Yang et al., 2017). When a virtual agent shares some personality traits with the user, the user is more likely to find the conversation valuable and enjoyable. Younger audiences seem to be fonder of a cheerful AI personality compared to older audiences (Yang et al., 2017). The inability of an AI to adequately respond to a complex free-form text plays a major role in the emulation of human responses. Some of the responses can be perceived as "too mechanical", not knowledgeable, and the timing of the responses can also play a big role in the user's perception (Yang et al., 2017). This shows that the dialogue tree inside the AI must be enormous in order to accommodate for all sorts of messages it receives.

## Therapeutic chatbots

While it may certainly be pleasant for some people to casually converse with an AI now and then, the medical use of one is still a largely untapped resource. The Woebot is on the forefront of therapeutic use of AI, but it tries to help people dealing with various mental problems. It can detect psychological disorders by means of an initial survey and some follow-up questions. With that information it tries to provide the user with some general tips to cope with their issues. However, the conversation is not that organic, as the user does not always have the option to type a message themselves. Only when a description of a problem or person is required, is it possible to freely type a message. Outside of these moments, one can either choose from a set of responses or in many cases

there is no choice at all with only a “okay” or “good to hear” button displayed to advance the conversation. As such, it does not feel like talking to a human as these elements serve as a constant reminder that it is in fact a chatbot. Research has shown that active listening is a critical component in social work (Weger et al., 2014). Active listening can be defined as “Connecting with a partner through empathy and understanding”. To achieve this, several actions need to be performed such as paraphrasing, asking questions, expressing empathy and avoiding judgment or advice-giving (GGIA, 2021). A passive listener would be a partner that does not meet these requirements. This would be a partner that expresses little interest and empathy, in addition to not paraphrasing. This leads to the questions: “Could emotion be affected positively by talking to a chatbot when dealing with grief?” and “Would a passively or an actively listening chatbot be more effective at providing comfort to those dealing with grief?”. This study will try to answer that question by means of two chatbots: one with an active listening component and one without. The difference in perception of the chatbot and effectiveness in terms of comforting will be assessed afterwards. This will be assessed with questionnaires about mood and a few open questions about comfort after the conversation.

## Methods

### Design

This will be a between-subjects design. One group will be in the condition of the actively understanding and comforting chatbot while the other group will be in the condition of the basic comforting chatbot. The independent variable is the condition, while the dependent variables are their mood and emotions measured by the BMIS questionnaire (Mayer et al., 1988).

### Participants

The group of people was selected because they had lost a loved one and they experience grief. People were invited to this study if they regularly suffer from sad thoughts or feelings because of the loss of a loved one. The sex and age were not part of the selection process but were considered as possible confounding factors. Unfortunately, this study only managed to attract one participant. The pilot study was performed with two participants, but these participants only took part in the conversation with the chatbot and not with the questionnaires.

### Materials

The experiment was performed online through Microsoft Teams and WhatsApp. Microsoft Teams was used to guide the experiment, starting with the introduction and ending with the debriefing. WhatsApp was used in between to facilitate the conversation with the chatbot. All of the surveys were administered through LimeSurvey. STATA was used to interpret the quantitative data gathered from the questionnaires and additional questions.

### Metrics

There was a short questionnaire, namely the BMIS questionnaire. The same BMIS questionnaire was available at the end to compare the results with the one at the beginning. The additional questions after the second BMIS questionnaire included questions about their feeling of comfort and experience of the conversation (Mayer et al., 1988). The BMIS questionnaire has been translated from English to Dutch, but this translation was not validated. This questionnaire featured short questions on a 7-point Likert scale, as well as additional questions about the comfort the chatbot has provided the participant.

## Procedure

The entire experiment was recorded using the Microsoft Teams recording feature. Firstly, the participant was asked to think about a moment in their life which evoked sad emotions. When they managed to find that state of mind, the participant was asked to fill in a questionnaire to assess their mood. Then they were given the opportunity to talk to a chatbot. The chatbot tried to find out what exactly it was that the participant was struggling with and told them things to comfort them. However, behind the scenes there was an actual human entering the messages picked from a set dialogue tree. The more advanced chatbot of the two was also able to show the participant they were actively “listening” by replying with a summary of what they were told in addition to the comforting words. An example of this can be seen in the figure below. The difference between the conditions is displayed by the two branches after the question.

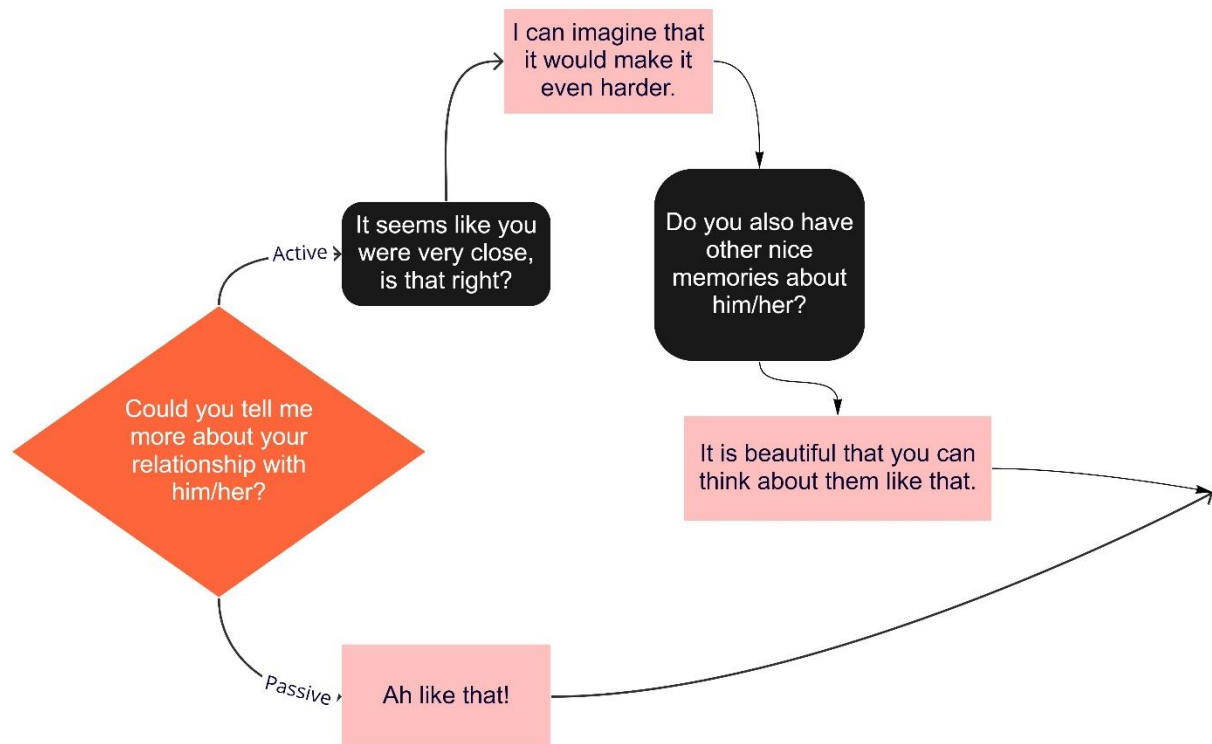


Figure 1: An excerpt of the dialogue tree and its branches translated to English

The orange diamond represents a main question that it asked in both conditions. The black boxes with rounded corners show additional questions that are only asked in the active condition. Finally, the pink boxes show the responses from the chatbot. The passive condition only provided the participant with a short and simple reply, which is “Ah like that!” in this example. This is in stark contrast with the active condition, which features longer replies with more depth like “I can imagine that it would make it even harder”. Furthermore, the active chatbot poses additional questions to deepen the conversation, such as “It seems like you were very close, is that right?”. This shows the user that there is understanding from the chatbot towards the user. The full dialogue tree used in the experiment can be found in the Appendix and is in Dutch. The chatbot responded 3 seconds after the user had sent a message. If the user started to type again while the chatbot was “typing”,

the chatbot would stop and wait for the user to complete their message. If the user had not responded after 3 minutes, the chatbot would send a kind reminder that it was still there and ready to listen.

After the conversation, the participant's mood was assessed once more with the same questionnaire as in the beginning. Finally, the participant was comforted by the experiment leader and they had a chance to give their thoughts on the chatbot. There were also some predefined questions to gather information about how they experienced the conversation, whether they were comforted or not and if they felt like it was an actual chatbot or not. Additionally, they were debriefed by also revealing the Wizard of Oz method that was employed. The participant was cheered up by means of a video and a conversation. This was to make sure the participant was not left on their own with feelings of intense sadness.

## Data analysis

There was simple comparison of the mood before and after the conversation per individual. No extensive quantitative data analysis was possible due to the amount of data present. Furthermore, a qualitative analysis was performed on the feedback given after the conversation with the chatbot.

## Pilot study

Before the experiment commenced, a pilot study was performed on two participants to check for ambiguities regarding the conversation with the chatbot. The questionnaire was not completely finalized at this point, as such it was not incorporated into the pilot study. The instructions for the pilot study provided to the participants was shortened as some parts of it were not relevant for the conversation with the chatbot. One of the participants was assigned to the passive condition while the other was assigned to the active condition.

## Follow-up survey

Unfortunately, only one participant had registered for the experiment in almost 4 weeks. To gain more insight into the reasons why people did not want to participate, an additional survey was created. This survey included just a single question. This question was about what their main reason for not registering was. The possible answers were of a wide variety to cover reasons that had to do with the content of the experiment but also its timing. The invitation to fill in this questionnaire was sent separately and only to people who were invited to the experiment before. The translated question and the possible answers can be seen below. The original version in Dutch can be found in the Appendix.

### **Why did you not want to participate in the experiment?**

<b>Reason</b>	<b>Comment</b>
No time in given timeslots	
Do not like to talk about grief	
Is not grieving	
Not want to talk with a chatbot	
Do not want to share something so personal with scientists	
Scared of becoming sad	
Privacy concerns regarding Microsoft Teams	
Privacy concerns regarding WhatsApp	
It involves too many different programs	
Other	

Figure 2: Table with reasons for not participating with comments

## Results

### Pilot study

The preliminary results gathered from the pilot study showed some promise. The participants both felt like they were having a conversation with a chatbot. This mostly due to the short response time and the tone of the responses, but a possible bias because of knowledge about the set-up should also be considered. The responses were phrased in a cheerful manner, which may not be what you expect when you talk to someone for the first time. However, they were pleased with the conversational flow otherwise, with the active condition performing slightly better. There was one instance in which the response from the chatbot did not complement the participant's message well. The disconnect was due to the participant stating that something was not done, while the follow-up question asked whether it had been done. This was an example of an instance where some questions should be omitted or placed in a different order. The dialogue tree in this study was designed in a linear fashion however. The additional questions and remarks in the active condition were appreciated, while the absence of them in the passive condition were not noticed. However, there was one remark regarding the passive condition that some of the responses were fairly short, especially in comparison with the messages the participant wrote.

Furthermore, the feeling of comfort was there. Both participants felt like they could trust the chatbot enough to share their feelings and tell their story. There was no hesitation and it may have even been easier to talk with the chatbot about such a heavy subject than to an actual human. This could indicate that it can be beneficial to talk with a chatbot about subjects like losing a loved one, especially because there was no judgement of any kind.

Additionally, there was an interesting remark regarding the active condition. The participant mentioned that it not only felt comforting but also that it provided the opportunity to think about the situation in a different manner. This was because the conversation allowed for deconstructing the situation in pieces before putting them together again in a novel way.



These results have contributed to the optimization of the dialogue tree. The feedback helped with working out some hitches in the conversational flow. The cheerfulness that could have been off-putting was also toned down in the final dialogue tree to ease the participant into the conversation.

## Experiment

The results discussed in this section are based on only one session with a participant. As such, these results should be taken with a grain of salt. That being said, there were still some interesting findings. The participant was assigned to the passive condition.

Firstly, the conversational flow was experienced as pleasant. Unlike the participants from the pilot study noted, the conversation did not make the participant think about a chatbot. The experience felt natural and it was easy to talk about this emotional subject. The chatbot made talking about the subject feel easy and there was no judgement. It even felt easier to talk about it to the chatbot than to an actual human. The responses from the chatbot seemed humanlike and the speed at which the replies were sent was not too quick, nor too slow. If it had been instant, then the flow of the conversation would have been unnatural according to the participant. All in all, the conversation felt like a conversation with a real person, who was interested but also easier to talk to than an actual person.

Secondly, the feeling of comfort is an important factor to consider. This is the main effect that the experiment tried to measure. Unfortunately, due to misunderstandings, the quantitative data was not complete. However, only one mood was filled in both questionnaires, which was about sadness. The results show that the feeling of sadness did not change during the conversation. Both before and after the conversation, the feeling of sadness was rated at a 7. Despite the fact that the sadness remained the same, the participant did feel comforted by the chatbot.

Lastly, some additional remarks regarding the experience of the conversation. The length of the conversation was on the short side, around 12 minutes. The participant would have liked it to be much longer, also to go more in depth. The length of the conversation with the passive chatbot was likely to be significantly shorter than with the active chatbot, as the active condition features additional questions and responses. Interesting to note is that even though the length and depth might not have been satisfying, the feeling of comfort was still there.

## Follow-up survey

As mentioned earlier, the amount of participants was not as expected. A follow-up survey was created in order to gain more insights as to why people did not want to participate. This survey featured a single question about the reasons for not participating. It was a multiple choice question with room for comments. The outcome of this survey can be seen below.

### **Why did you not want to participate in the experiment?**

<b>Reason</b>	<b>Count</b>
No time in given timeslots	5
Do not like to talk about grief	8
Is not grieving	13
Not want to talk with a chatbot	2
Do not want to share something so personal with scientists	2
Scared of becoming sad	3
Privacy concerns regarding Microsoft Teams	1
Privacy concerns regarding WhatsApp	1
It involves too many different programs	2
Other	6

Figure 3: Table with reason counts

The most common reason for not participating is the absence of grief. This is then followed by not wanting to talk about grief. The third biggest reason was “other”, however the answers filled in there were all wildly different. They varied from not wanting to make themselves emotionally vulnerable to not finding the experiment all that rewarding. Therefore, the actual third biggest reason was the lack of time in the given timeslots.

## Discussion

Starting with the pilot study, it has shown that it is of utmost importance that the participant trusts the chatbot in order to share their emotions well. Unfortunately, the surveys were not finalized in time for the pilot study. This was a missed opportunity in making the survey more comprehensible. However, the pilot study did show promise for the concept of a chatbot to talk with about your grief as the experience was pleasant and the chatbot made it comfortable to talk about grief.

Following up on the pilot study, the actual experiment sadly only attracted one participant in almost 4 weeks of collecting data. This made the quantitative data unusable for quantitative data analysis. There was still qualitative data to extract some information about the efficacy of the chatbot. The most important outcome is that the participant did feel comforted by the chatbot, which shows that it is indeed possible for a chatbot to provide comfort to a person dealing with grief.

Lastly, the follow-up survey was created to gather more knowledge about why people did not want to participate. The most common reason, after no time in the available slots, was not wanting to talk about their grief. This is actually a concerning finding, but it has been found before. The study by Jakoby et al. in 2014 reported this phenomenon. Additionally, they found that effort should be made from both sides, i.e. the person that suffers from grief as well as the person in the helping role to get the person in need to talk about their grief. Research actually suggests that talking about your grief in a personalized therapy helps with the processing of your emotions especially when having difficulties in adapting to the loss (Neimeyer et al., 2009). The chatbot may make it easier for people to talk about their grief, as the participant noted that it felt easy and safe to talk about this grief with a chatbot. It felt easier to talk to the chatbot than to an actual person regarding this subject. The uncanny valley is also important to consider with a chatbot like this. Studies have shown that people

are capable of identifying whether they are talking to a chatbot or a human (Skjuve et al., 2019). However, the uncanny valley is when the difference between a chatbot and a human become blurred. This effect occurs when the timing of the messages is not slower than expected from a human. Even more importantly, they should not be too quick. When this speed is just right, it will not affect the conversational flow in a negative manner and the affinity towards the chatbot will be similar to an actual human.

A personalized experience is exactly what this chatbot is trying to provide. There was research done in the field online tools to help with grief (Franken, 2022) that seems to support the idea of a chatbot at least to some extent. This study involved a series of interviews with experts in the area of therapy. The general consensus is that a chatbot is likely to work for uncomplicated grief, as for many people it would already help if they could talk to someone or something that is empathic. However for a more complicated situation a more personalized chatbot would be required that could react to many different messages. This might be too complex to program, however with the recent developments in artificial intelligence it may actually be possible soon or even now to make such a complex chatbot. Additionally, all of the experts agree that suppressing these emotions is never a good idea. Avoiding the emotions is not going to help you in the long run. It is actually vital to stop and take the time to evaluate your emotions and your progress in the grieving process. Accepting the reality of the loss and experiencing the pain of the grief instead of postponing it are important tasks in the mourning process (Martin, 2019). Failing to do this can lead to depression and dysfunction.

Taking all of the above into account, again the questions are posed “Could emotion be affected positively by talking to a chatbot when dealing with grief?” and “Would a passively or an actively listening chatbot be more effective at providing comfort to those dealing with grief?”. This study has shown that even a simple chatbot with characteristics of a passive listener can be beneficial to people dealing with grief, although it is still unclear whether an actively listening chatbot would be even more effective.

## Limitations

Firstly, the current situation should be considered. At the time of this writing, the world is still amidst a pandemic with many countries in some form of a lockdown. This has influenced the people’s mood negatively (Terry et al., 2020). And whether it is due to reduced physical behavior (Ingram et al., 2020) or fear, this could have also impacted the decision about their participation in this experiment. The pandemic has also made it so that the entire experiment was online. This may have actually been a beneficial side-effect, as it may feel more natural to talk about your feelings at home as opposed to a lab.

This study has been performed in a limited set-up due to time constraints. The chatbot was originally planned to be created in DialogFlow, however due to the workload of such an endeavor it was scrapped and instead we opted for a Wizard of Oz method. The structure is still similar to that of a chatbot made in DialogFlow. Needless to say, an actual chatbot is the goal. Furthermore, the amount of participants was far from what was needed to perform quantitative data analysis. It remains unclear why only one person wanted to participate out of all of the invitees, but at least some of them provided a reason for it. All of the persons invited were registered in the JFS Participant Database. It could also be that most of the persons registered in the JFS Participant Database are

young adolescents, and these will typically have less experience with loss than older adults. This has changed this study into more of a qualitative work than it would have been otherwise.

### Future work

Some remarks for future research on this topic. The dialogue tree should incorporate many more branches to account for more varied user input. It would also be interesting to expand the chatbot to account for other forms of emotional issues such as irrational fears or depressive thoughts. This would likely become more attainable when artificial intelligence has advanced sufficiently. Lastly, a longitudinal study would give more insights on the effect of a chatbot for these means in the long run as it is still unclear whether the positive effect will remain over a longer period of time.

### Recommendations

For future work on this subject, it might be beneficial to incorporate various conversation lengths into the study to gain more insight about the preferred length or if there even is one. The time to respond to a question should be kept at 3 seconds according to these findings. The length of the messages could also be varied, as it would be interesting to see whether the length of the message would affect the user's perception of the message. Furthermore, it would be interesting to study whether the length of a message has a significant effect on whether the chatbot is perceived as actively or passively listening.

### Conclusion

This study has shown that it may be possible that chatbots could help people with dealing with their grief, or at least providing them with some comfort. If it were to be developed further, it could help many people around the world and alleviate some workload from therapists, or at least work as an additional tool. It might be beneficial to make a chatbot like this available to everyone in all popular app stores to make the barrier for entry as low as possible.

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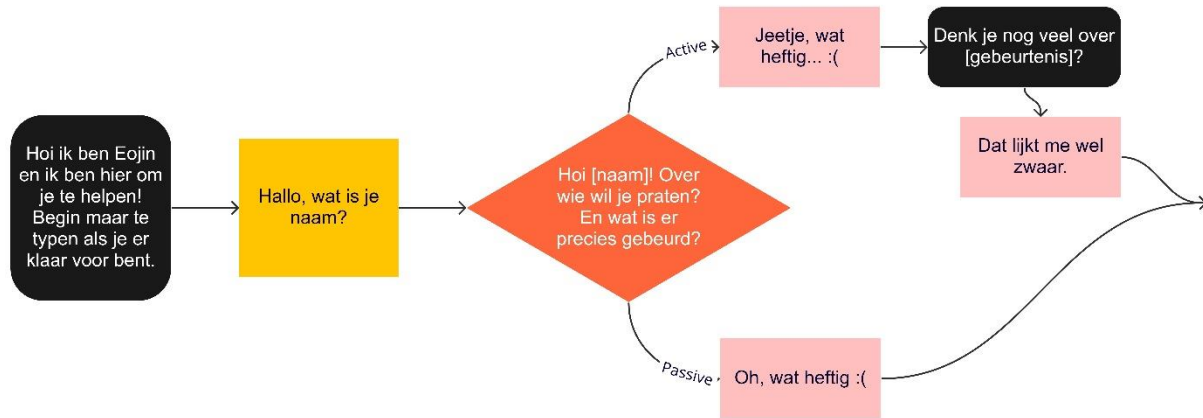
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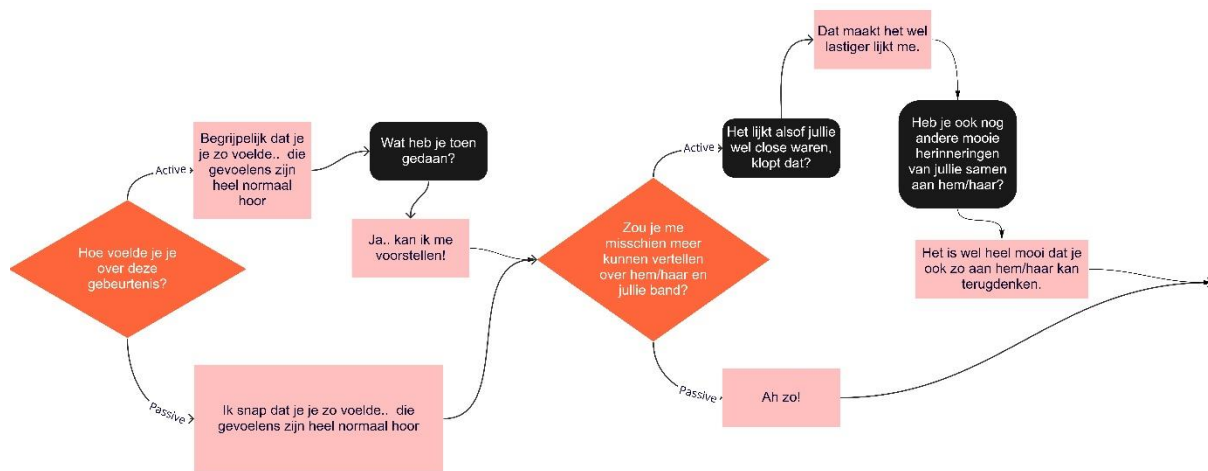
# Appendix

## Dialogue tree

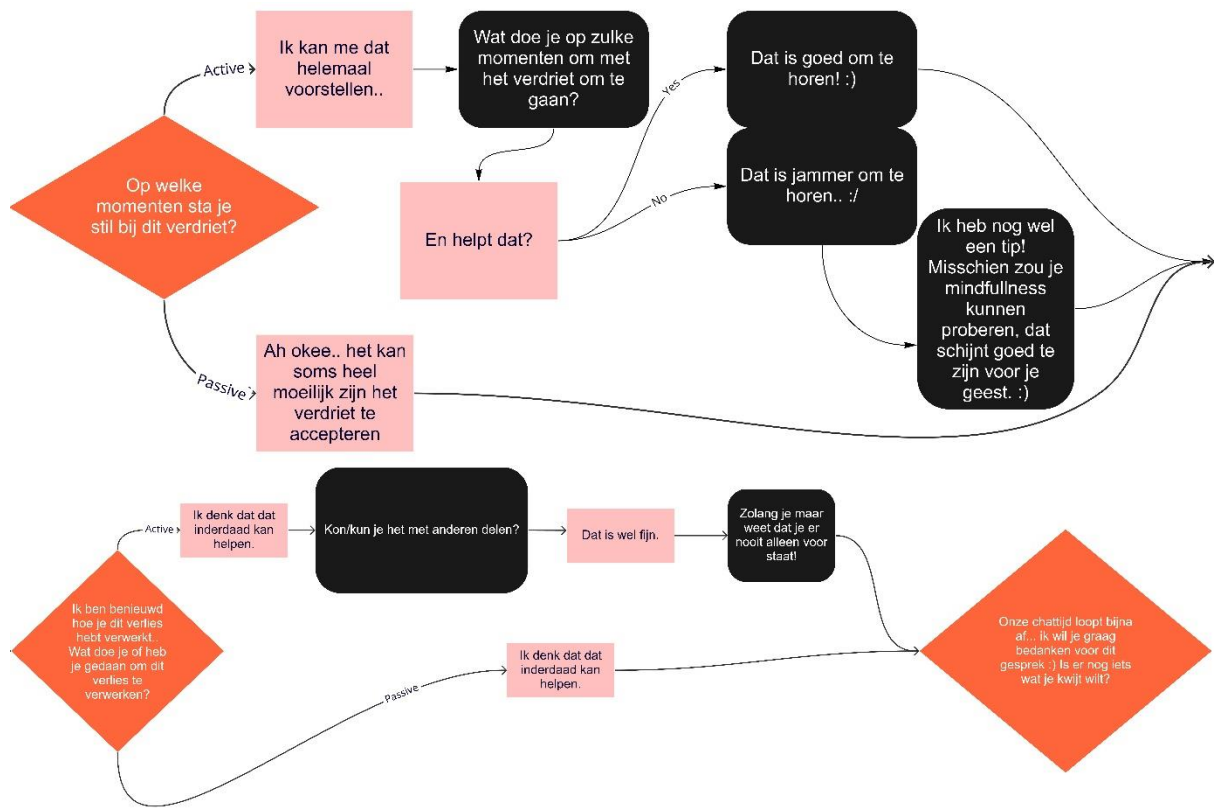


Na 3 seconden reageren

Na 3 minuten even zeggen:  
Ik ben er nog! Je kunt gerust doorgaan met typen.







## BMIS QUESTIONNAIRE IN ENGLISH

INSTRUCTIONS: Circle the response on the scale below that indicates how well each adjective or phrase describes your present mood.  
(definitely do not feel) (do not feel) (slightly feel) (definitely feel)  
XX X V VV

---

Lively XX X V VV Drowsy XX X V VV  
Happy XX X V VV Grouchy XX X V VV  
Sad XX X V VV Peppy XX X V VV  
Tired XX X V VV Nervous XX X V VV  
Caring XX X V VV Calm XX X V VV  
Content XX X V VV Loving XX X V VV  
Gloomy XX X V VV Fed up XX X V VV  
Jittery XX X V VV Active XX X V VV

---

Overall, my mood is:

Very Very

Unpleasant Pleasant

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

---

*Please Note: The "Overall, my mood is" section is usually omitted, although some people use it and fold it into the overall score.*

## BMIS QUESTIONNAIRE IN DUTCH

INSTRUCTIES: Geef voor ieder woord aan hoe goed het bij je huidige stemming past door deze te selecteren.  
7-point Likert: (voel ik helemaal niet) ( ) ( ) ( ) ( ) (Voel ik zeker)

vrolijk	futloos
blij	somber
verdrietig	opgewekt
moe	nerveus
hartelijk	kalm
tevreden	liefdevol
chagrijnig	balend
zenuwachtig	actief

Ik zou mijn stemming als geheel beoordelen als:

Niet fijn -10 -.....- 10 heel fijn

## Follow-up survey

\*Wat is de reden dat je niet mee wilde doen aan het experiment?

📌 Vul alleen een opmerking in als u een antwoord kiest.

- |                          |  |                      |
|--------------------------|--|----------------------|
| <input type="checkbox"/> | Ik heb geen tijd in de beschikbare tijdsloten.                   | <input type="text"/> |
| <input type="checkbox"/> | Ik vind het geen fijn idee om over verdriet te praten.           | <input type="text"/> |
| <input type="checkbox"/> | Ik heb om niemand verdriet.                                      | <input type="text"/> |
| <input type="checkbox"/> | Ik vind het geen fijn idee om met een chatbot te praten          | <input type="text"/> |
| <input type="checkbox"/> | Ik wil zoiets persoonlijks niet delen met wetenschappers.        | <input type="text"/> |
| <input type="checkbox"/> | Ik ben bang dat ik er verdrietig van word.                       | <input type="text"/> |
| <input type="checkbox"/> | Ik maak me zorgen over de privacyveiligheid van Microsoft Teams. | <input type="text"/> |
| <input type="checkbox"/> | Ik maak me zorgen over de privacyveiligheid van WhatsApp.        | <input type="text"/> |
| <input type="checkbox"/> | Ik vind vervelend dat er zo veel programma's nodig zijn.         | <input type="text"/> |
| Anders:                  | <input type="text"/>   | <input type="text"/> |