



Trondheim Aging Brain Study

Report

The main goal of the Emotion and Aging Neuroscience group at the Kavli institute for Systems Neuroscience is to understand the mechanisms underlying social-emotional processing in aging. In this document, we would like to provide an overview of the background for our study and motivation of why this is an important area of research and some of the preliminary findings.

Emotion and Aging Neuroscience Team

Motivation of the study!

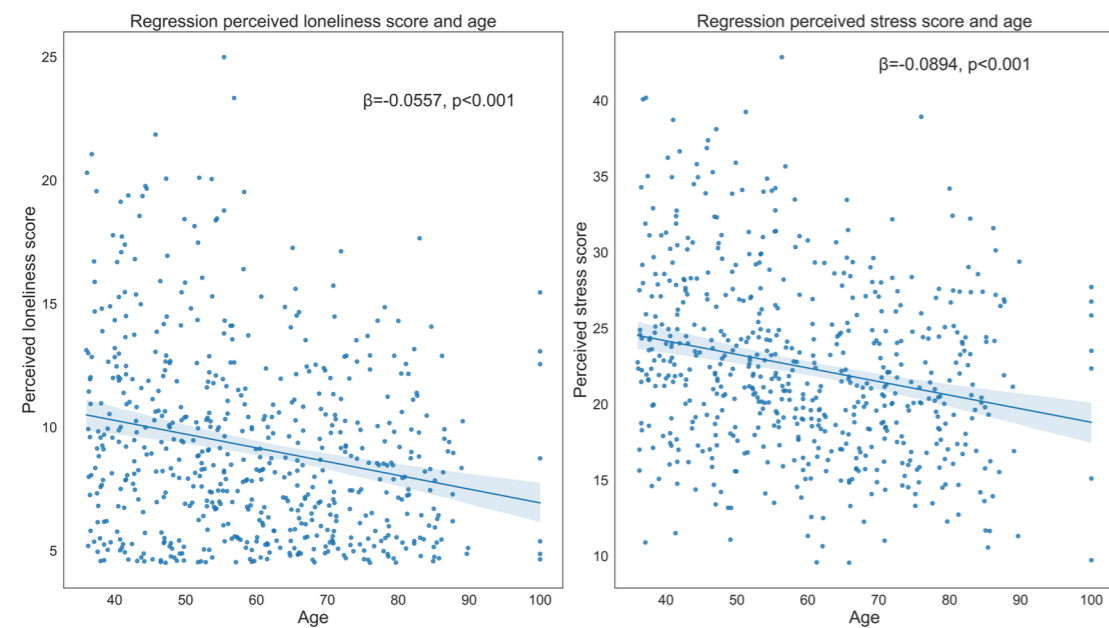
Growing older does not just mean physical changes; it can also mean having better control over our feelings and a happier, less stressful life. Over the years, we and others have shown that this is in fact the case and our data support that most adults feel more positive emotions as they grow older. A new finding using a large sample and advanced analytical method in my group conducted by one of my students who recently graduated from the Master of Neuroscience program also confirmed these findings once again.

As we grow older, our bodies and minds go through many changes. Some of these changes can affect how we feel, act, and decide. But here is an interesting twist: our ability to control our emotions often stays strong or even gets better as we age. But obviously not everyone experiences the same level of control or emotional well-being. So, for this study, we had this question **“what are the factors that make some people more resilient and ultimately they have better mental health than others?”** Here is a brief summary of some of our findings.

Stress and Loneliness in Aging!

We are interested in understanding how and why some brain areas and connections between areas change as we get older. In one of the studies, we showed different emotional images to individuals and asked them to recognize if the faces display happy or fearful expressions. We found that older adults are more engaged with happy expressions, they recognize these emotions faster and they show less errors in recognizing the “positive” emotions.

We also found that they engage a network that is important for controlling and regulating emotions better than younger adults. One student in my lab, Leona Batz, investigated this effect further across a large population of younger and older adults. To do this, she used a special method to look at how different parts of our brains talk to each other. Imagine it like different neighborhoods in a city - are they all separate or closely connected? This can show us how our brains process information and how older adults use their brains to manage their emotions. She also used a large dataset from the Human Connectome Project



What Leona discovered was fascinating. As people get older, their brains become better at connecting the parts that help with both feeling and controlling emotions. But that’s not all. Leona

also found a connection between feeling lonely and being stressed, which is linked to how well people can control their emotions. . In simpler terms, older adults who are better at controlling their emotions tend to feel less lonely and less stressed. This suggests that changes in how our brain networks work might have a big impact on our mental health as we get older.

“The way we perceive the world becomes different as we get older. This is the beauty of becoming older and wiser.”

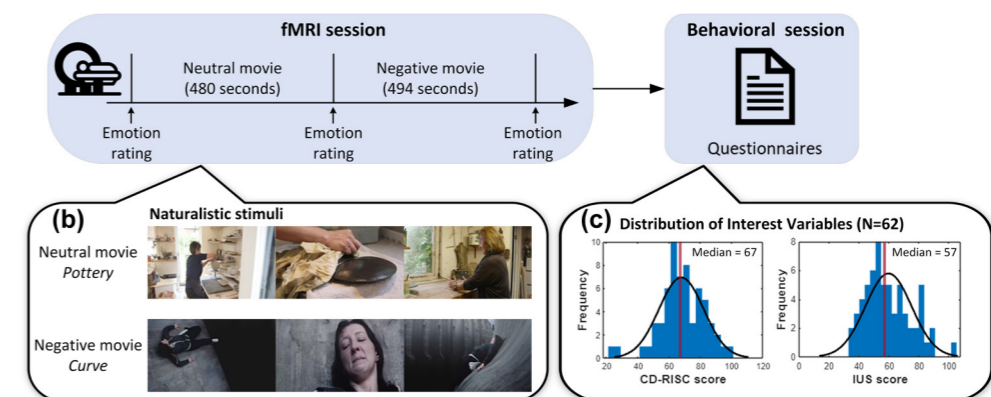
Processing Naturalistic Movies and Resilience!

When you participated in our research, you watched some videos while in the scanner. Using a naturalistic movie provides us with a tool that can help to identify underlying neural correlates that are not easily detectable if other methods are used. One of my PhD students, Shuer Ye, used this method combined with an advanced technical and analytical method and found that people who scored high in resilience, ability to bounce back from a negative situation, show similar brain responses than individuals who are low in resilience. In other words, people who show higher ability to bounce back from negative events, showed ability to control their emotions during watching a negative movie. This is fascinating as it tells us our ability to be resilient can show on the way we process naturalistic movies.

Shuer also found that the intolerance to uncertainty was a main factor contributing to these differences in neural activity. In other words, individuals are different in how they respond and tolerate uncertain situations around them. Reflect on the COVID-19 situation. Some people were quite devastated by the situation while others managed to maintain their mental health at a reasonable level. Individuals who are not able to handle uncertainty and who show low resilience, the network of brain is differently activated than those who are capable of controlling uncertainty.

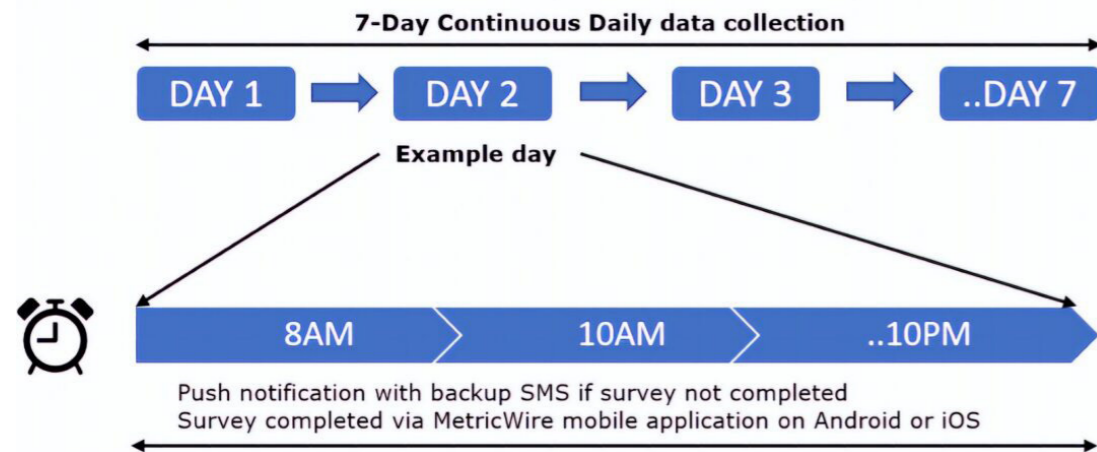
As you probably remember, we had this pipeline in which first you went to the MRI scanner and then you had a behavioral session. We looked at the brain activity during MRI session and correlated the activity of the brain with some of questionnaires you filled in the behavioral session. The results mentioned above are driven from questionnaires you filled in and your brain activity while watching movies. In the following figure you see that we used resilience (CD-RISC) and intolerance to uncertainty (IUS). *Isn't this fascinating to see how our brain while watching a movie can tell us a lot about how we process and handle emotional situations?*

a)

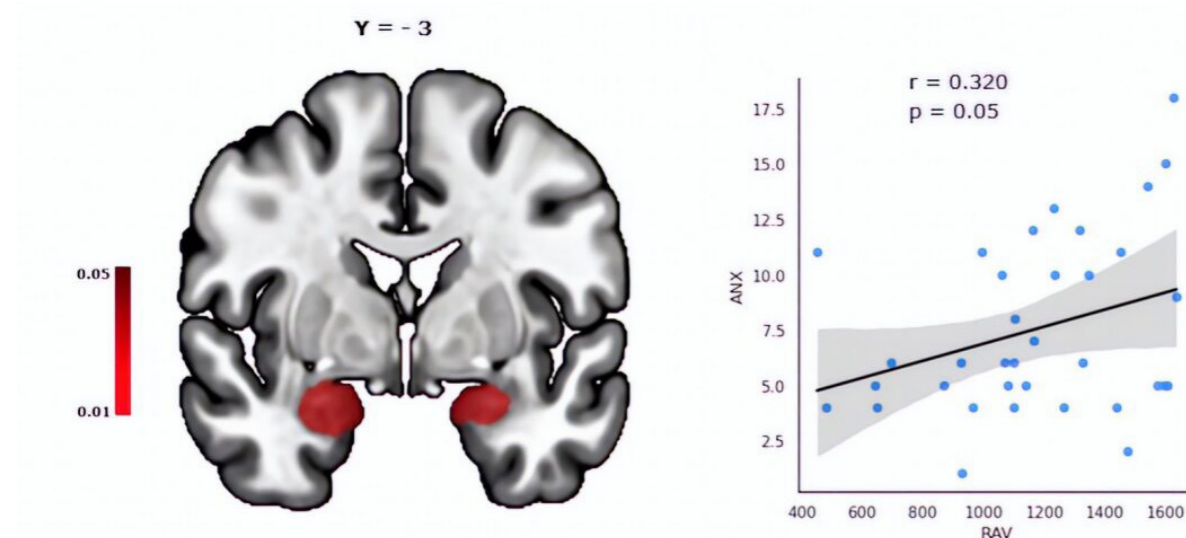


Daily Life Emotions and Brain Size

You also participated in a 7-day follow up in which you filled some questions regarding how you feel and whether anything happened to you during the past couple of hours. This was how we collected data for our experiment that you took time to fill surveys throughout the 7 days. We really appreciate your effort and engagement!



One of my Master students, Avneesh Jain, analyzed these data and found that the more control over negative emotions, the more structural volumes for some areas. In other words, the way individuals process emotions throughout their days are related to the structural size of their brain. Specifically, Avneesh found that individuals who scored higher in anxiety had larger amygdala size. The amygdala is an emotional centre of the brain and is related to processing events in our environments.



There is a link between our emotional responses and structure and function of our brains and this link changes as we get older.



You contributed to a fascinating science project!

We are proud of what we have achieved during this study. We collected multi dimensional data from 80 younger and 80 older adults over 18 months and there are already very fascinating results coming out of the study.



Thank you message from the leader of the study

I wanted to take a moment to express my heartfelt gratitude to you for participating in our recent neuroimaging study, which involved 80 young and 80 older adults. Your willingness to dedicate your time and energy to our research is invaluable, and it has made a significant contribution to advancing our understanding of social-emotional processes in aging.

Your commitment to the study is deeply appreciated, and your enthusiasm and cooperation throughout the research process were truly remarkable. Without your participation, this study would not have been possible, and your contributions will undoubtedly have a lasting impact on the field of cognitive and affective neuroscience.

Not only did you contribute to the advancement of science, but you also demonstrated the importance of community engagement and the power of collaboration between researchers and public. Your dedication to this study has been inspiring, and we are genuinely grateful for your involvement.

We hope that the summary of our findings inspired you to stay in touch with us and help our future studies too. Once again, thank you for your invaluable time in our neuroimaging study. Your contribution will undoubtedly contribute to furthering our understanding of how to maintain mental health in our community and pave the way for future breakthroughs in the field.



Maryam Ziaei, PhD

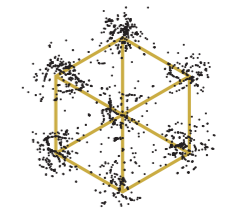
Associate Professor

Leader of Emotion and Aging Neuroscience Group

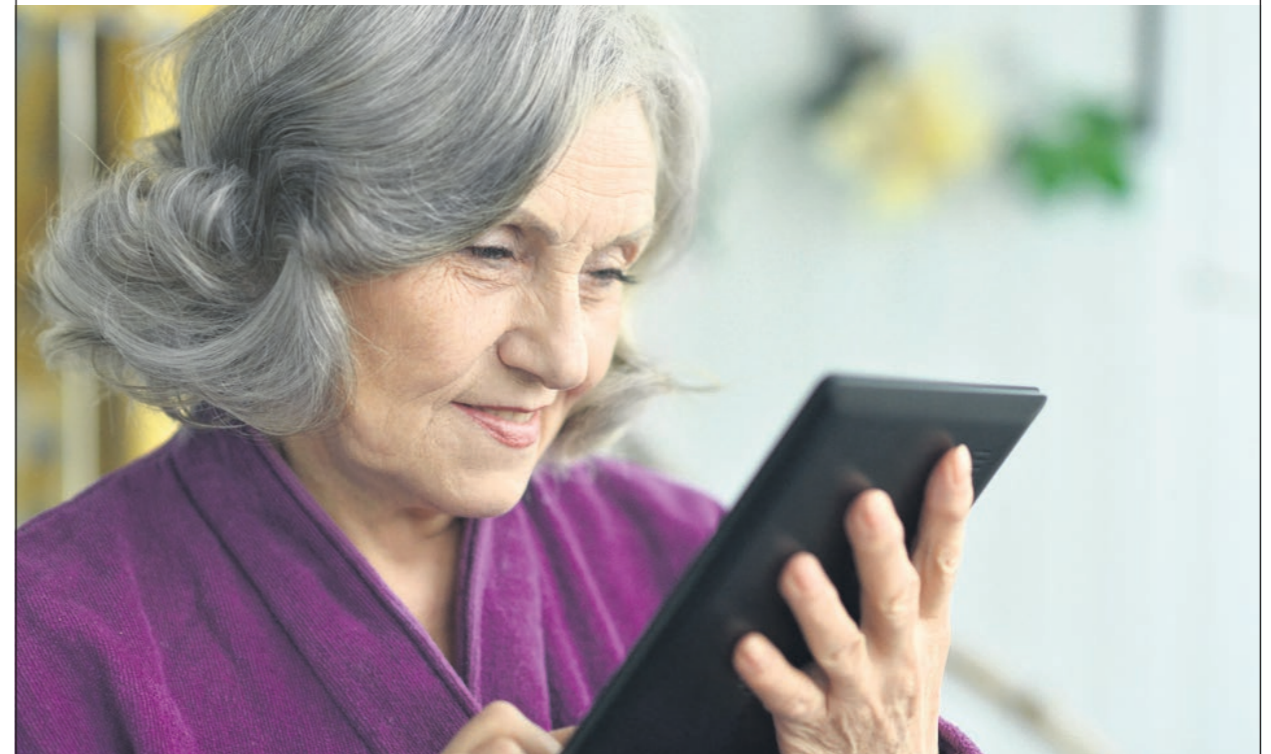
Email: maryam.ziaei@ntnu.no

DELTA

i hjerneforskning!



Kavli Institute
for Systems Neuroscience



Vi ønsker deltakere fra 65 til 85 år til en studie om hvordan aldring påvirker hjernen og følelsene våre.

Hvorfor blir noen mennesker følelsesmessig overveldet, mens andre føler seg mer lykkelig?

Som takk for ditt bidrag, får du et gavekort på 500 kr og bilde av hjernen din.

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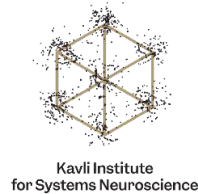




We love the work we do and appreciate that you let us continue with the science and discoveries we make in the lab by participating in our study!

If you would like to be considered for future studies please email:

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