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The relation between gender, age, depression and anxiety and the valence of memories among the general population

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Abstract

Background. Life stories consist of many experienced life events which are linked to strong feelings of emotions. The valence of people's memory changes during lifetime, differs between gender and can further be influenced by psychological diseases which underlines that life stories are an important part of every single person in this world.

This study addresses the emotional differences in those stories between age and gender as well as analyzing how self-defining memories are connected to mental illnesses, wherefore mental health care might profit by taking the results more and more into account during therapy.

Method. In this study, the data of a longitudinal Internet Studies in the Social Sciences (LISS) panel, conducted by CentERdata in the Netherlands was used where 1742 participants were ask to write down one self-defining memory. These participants had to fill in demographical questions as well as questionnaires about depression and anxiety. In order to analyze the relationships between these variables, a chi-square and cross-table as well as One-way-ANOVA were executed. At least, a multinomial logistic regression analysis was conducted to check whether these relationships still persist if they will be interconvertible controlled.

Results. Analyses showed that there was no difference in the valence of memory according to gender. A significant difference between age-groups was found, namely younger adults reported more negative memories than middle-aged or older adults, whereas middle-aged respondents reported more positive memories than older people. Furthermore, depressed people reported fewer positive memories, whereas negative memories were associated with higher anxiety scores.

Conclusion. The results indicate that age, depression and anxiety are related to the valence of memories. Furthermore, it gives indication that depressed people do have deficits in processing positive material as well as the assumption that anxiety might also be influenced by the valence of memories. Therefore, further research about the role of memories in depression and anxiety will be recommended which might lead to a beneficial change of treatment in mental health care, such as improving the deficits in processing positive material in depressed people or working with positive memories against anxiety.

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Introduction

The paragraphs ahead. Life stories contain important memories people do remember during their lives (McAdams, 2001). Therefore, one important aspect is the autobiographical memory which consists of a great database of knowledge about peoples self and it comprises recollections of personal, specific events. Conway and Rubin (1993, pg. 103) simply described it as a 'memory for the events of one's life' which do have a number of different functions. It has got a great impact on people, whereby many researchers tried to examine different characteristics, functions and neural underpinnings during the last decades (McAdams, 2001). Because of its complexity much research is already done, but nevertheless there are also a lot of gaps which will be analyzed and discussed in this study.

First of all, the following sections will give an overview of the onset of the importance of life stories, followed by a more detailed description of the autobiographical memory and its self-defining memories during the span of life. After that, gender and age differences will be examined as well as crucial relationships of life stories on depression and anxiety.

This study tries to reveal the importance of life stories and self-defined memories and their relation on peoples mental health. Literature showed that positive memories might have positive influence on depressive symptoms, wherefore this study will focus on the relationship of the valence of memories on depression and anxiety.

'My Life'. The following paragraph will introduce the term' life story' and shows the onset of the importance of life stories in psychological therapy.

When thinking about the word 'life', people usually will have different associations (McAdams, 2001). A life consists of many life events which happen during the span of life. These events can vary in their importance which means that some of them do have great influence on people's personality and wellbeing, such as the birth of a child and others to a lesser extent (McAdams, 2001).

During the last decades more and more research is done concerning the influence of life events and nowadays, it is evidenced that life stories do have an important value for psychological therapy to improve individual's well-being and mental health (McAdams, 2001). However, this was not always the case. When looking back to earlier periods, psychologists had a different view according to the effectiveness of life stories (McAdams, 2001). Although they viewed them differently from fairy tales and pondered about their clients stories, scientists were not committed to use them effectively. In the 1980s, the field of personality psychology began to change the former point of view (McAdams, 2001). Research showed that notions

such as 'narrative' and 'story' were useful in conveying the coherence and the meaning of lives. At the same time, even scientists in developmental, social, cognitive, clinical, industrial-organizational psychology developed interest according to narrative methodologies and story concepts. Back then, especially for clinical work with families, whereas todays psychologists investigate family stories, stories of intimate relationships and individual lives (McAdams, 2001). Meanwhile, narrative analysis makes it possible to get a continuous narration of a process of action of one's person (Küsters, 2009) which enables psychologists to get detailed insights in experiences and the possibility to explore the character of cultural and social narratives and their interpenetration (Murray & Sools, 2015).

All in all, life stories gained more and more attention during the last decades and many fields of psychology got interested in narratives.

Life stories as Identity. A previous study by McLean (2017) showed that already in the early childhood, children learn to tell their stories in past-event conversations. During childhood it is important how parents talk to their children because their manner of talking predicts how their children will represent their own narrative identity in adolescence (McLean, 2017).

Across the adolescence the autobiographical reasoning grows in order to create coherence and meaning to different life stories (Linde, 1993). People begin to combine temporally ordered stories with causal connections between events and periods. For example, an older men tells a story about the second world war and how they were searching for food every day. He underlines that his appreciation for getting food as easily as nowadays is that high because of his past experiences and that this difficult time period caused his character and personality. This shows that past events can have a big influence on who one is now. Some life events were automatically rated as being more important than others. This process leads to our self-understanding and identity, creating a sense of who we are (Linde, 1993). Furthermore, it can be observed that the identity can be described in terms of 'story elements'. As known from a story, character, setting, theme, plot and scene are of importance. Thus, when people start constructing a personalized story, a coherent narrative framework starts to exist where events and different life roles of a person can be embedded and given meaning (Linde, 1993).

In addition to that, McAdams (2008) explained that people are able to construe their lives as ongoing narratives in the beginning of the adolescent years. In midlife, psychological sophistication and complexity tend to increase, whereas in the later years, stories will also emphasize positive emotional themes. Hence, they start to vividly convey their experiences by expressing how they find purpose and meaning in their lives (McAdams, 2008).

Shortly, life stories do develop over time and especially adults do have influence on the representation of their children's' narrative identity. During life time, coherence and meaning are given to the life stories as well as temporally ordered stories with causal connections. Some events do have more influence on people's character and personality because they are rated as being more important than others. The reason of the different priorities of life stories are directly linked to the autobiographical memory which will be explained in the following paragraph.

The autobiographical memory in life stories. As it was already mentioned, especially during adolescence, people begin to create coherence and meaning to their life stories (McAdams, 2008). One possible way of giving meaning is by linking emotions to different life events. By only thinking about different emotions, different memories should already be elicited. Maybe somebody is thinking about the emotion happiness and directly the birth of his child will come up to his mind. Another person thinks about sadness because a few days ago he lost an important person. People feel different emotions in life and these emotions are connected to different life events.

When focusing on emotions in life stories, there is an important aspect we need to take into account; the autobiographical memory.

The autobiographical memory. The autobiographical memory is a memory system collecting all consisting episodes from an individual's life (Rubin, 1988). People do make a lot of experiences, but not every experience is mentioned as an important life event. Conway and Holmes (2000) described that memories which are linked to emotions or provide a motivational explanation for later developments can be considered as being autobiographical. Hence, memories which are encoded as being relevant for people and/or maintain significance at the time of retrieval are likely to be considered as being a crucial life event (Conway & Holmes, 2000). Therefore, memories are truly autobiographical when they are linked to the self through motivational or emotional significance (Conway & Holmes, 2000).

Additionally, when a person also begins with autobiographical reasoning, which means that he creates relations between his past, present or future events and his personality and developments, a life story schema is implemented (Habermas, 2011). This schema can be described as a basic template which is used in order to consider their life by interpreting and selecting relevant episodes which finally will be included in their current life narrative (Bluck & Habermas, 2000). 'It sets parameters on how goals and memories might be linked in the personality and leads individuals to see certain memories as more developmentally critical and

thematically central to their immediate life story and its exigencies' (Singer & Blagov, 2004, p. 232).

Furthermore, Habermas and Paha (2000) explored how people create narratives of their life. They found that life stories (autobiographies) are not only important events, but the meaning and structure in the context of their lives given to them determine whether they are integrated in a flowing life story. If these autobiographical memories are related to critical goals during a lifetime period, these memories can be described as life-story memories, which can become self-defining memories (Habermas & Paha, 2000). These so called self-defining memories are characterized by having enduring impact on one's concerns (Singer et al., 2013). Thus, self-defining memories shape who people are as individuals, they are the most important memories of one's life (Jobson & O'Kearney, 2008). It is 'a reminiscence that is vivid, affectively charged, repetitive, linked to other similar memories and related to an important unresolved theme or enduring concern in an individuals's life' (Singer & Blagov, 2004, p. 232). Shortly, self-defining memories help people to define how they see themselves and help to describe others who they are (Singer, 2005).

To conclude, autobiographical memories are those who are linked to emotions and therefore, being relevant for people as crucial life events. Their meaning and structure determine whether they are integrated in a flowing life story. Memories which are related to critical goals during a lifetime period become self-defining memories, which help people to define themselves. Therefore, the following paragraphs will examine the most important variables (age, gender, depression and anxiety) of this study in a more detailed way, starting with differences during lifetime.

Life stories and age. As literature showed, life stories change over time which gives indication that there might be several differences between age groups and life stories. A study by De Vries & Watt (1996) showed that especially older participants could identify fewer future events, whereas the focus of life time events of younger participants lies more on the future. Future and past are both important terms when focusing on younger and older people because research showed that younger people do focus more on their future and elderly on their past by reason that when thinking about life, their thoughts also include the end of life (De Vries & Watt, 1996). Furthermore, elderly do look back to old relationships, friends and family. In comparison to younger people, elderly are not that willing to find new friends and form new relationships with new people like youngers do (De Vries & Watt, 1996). In addition to that, younger people often focus more on how their future will look like, experiences they would like to make, therefore the end of life mostly do not play a role in their thoughts, whereas older

people look back to what they experienced in their past instead of having plans for their future (De Vries & Watt, 1996).

Another study by Singer, Rexhaj & Baddeley (2007) showed that self-defining memories do differ among younger and older adults because older adults do have more positive self-defining memories in emotional tone with less details, more summarized and they are more likely to comprise integrative meaning. Their stories present stability and thematic coherence, whereas younger people remember more stories representing change (McLean, 2008). In total, younger adults recall more negative memories than older adults (Ros & Latorre, 2010). This can be explained by the positivity effect in the memory of older adults. The older people get, the fewer negative emotions they perceive which leads to 'a more emotionally gratifying memory distortion for past choices and autobiographical information' (Mather & Carstensen, 2008, pp. 496). Simply, older adults rate their past events less negative in comparison to younger adults.

All in all, there are a lot of differences in the content of memories and only a few studies concerning the valence of memories among younger, middle-age and older adults. Younger people focus more on the future whereas older people focus more on the past. The older they get, the fewer negative emotions they perceive, leading to a greater number of negative memories among younger adults than older adults.

But not only age seem to play an important role concerning differences in self-defining memories, meanwhile also gender-specific distributions are slightly analyzed. The following paragraph will gain insight in these differences.

Life stories and gender differences. In comparison to the multitude of studies according to age differences, there are only a few studies done exploring the distribution of positive and negative self-defined memories regarding to gender differences.

Research with young, middle-aged and older adults showed that women in general reported more life events in comparison to men. A study using the autobiographical memory test (AMT) examined that men remembered less negative memories than women (Ros and Latorre, 2010). This findings suggest that men do have stronger positivity effects in their autobiographical memory than women which means that they tend to favor positive stimuli in cognitive processing (Ros & Latorre, 2010). Therefore, men attend to remember more positive memories than negative ones. Additionally, another possible reason might be that statistically speaking, more women suffer from depression than men and therefore women are more likely to remember negative events than positive ones (Girgus & Yang, 2015).

All in all there were only a few studies done showing gender differences in self-defining memories which underlines that the following study is an important step to gain more insight in gender-related differences. To conclude, there are differences in the quantity and valence of memories because women in total reported more life events than men but also more negative ones. If a possible explanation of this phenomenon might be the mental disorder 'depression' will be examined in the following paragraph.

Life stories and depression. As research showed there are differences in age and gender concerning life stories. Furthermore, negative memories influence people's well-being as the downward spiral of depressive symptoms show (Hermans & Putte, 2004). Additionally, Liao et al. (2017) suggests that positive memories might antagonize against these depressive symptoms, wherefore it is interesting to examine the relationship between the valence of memories and depression.

Depression can be described as a mood disorder which is the second highest cause of disability (Murray & Lopez, 1996). It is characterized as loss of energy and suffering from fatigue, concentration difficulties, feelings of sadness, anhedonia, suicidal thoughts and the lack of emotion (MacFarlane, 2003). The behavior is changing, but there are also changes in bodily functions like sleeping, sexual activity, eating, aches and pain (MacFarlane, 2003).

Previous research showed that people suffering from a depressive disorder do suffer from depressive biases, which means that they remember general memories more easily than specific ones (Moore, Watts & Williams, 1988). A study by Hermans and Putte (2004) recruit these findings and explained that depressed people lose their interest in activities and/or feel unhappy which causes change in their autobiographical memory which leads to difficulties in recalling autobiographical experiences (Hermans & Putte, 2004). In addition, feeling unhappy leads to an increased amount of negative memories about oneself. Negative thoughts automatically occur which intensify the feeling of being unhappy (Hermans & Putte, 2004). A vicious circle occurs because the intensified feeling of unhappiness causes more automatic negative memories which lead to an even more intense feeling of unhappiness resulting in a so called downward spiral of depressive symptoms (Hermans & Putte, 2004).

This can be explained by the term 'mood-congruence memory' which can be described as a heuristic response tendency (Mineka & Nugent, 1995). This means that memories are consistent with the mood of the patient. One possible example is when people do feel happy, they are willed to report memories which match their current mood (Fiedler et al., 2001). The mood-congruence theory might be an explanation for research findings that depressed people recall less positive memories. However, researchers still do find mixed results concerning

mood-congruency (Mineka & Nugent, 1995) therefore, this theory is still a speculation and needs further research.

A study by Bohlmeijer et al. (2017) showed that meanwhile, psychologists also use the power of reminiscence during therapy, which is the process of recalling personal memories because research showed that it has an effect on psychological well-being. Furthermore, they found that using life-review, which means applying reminiscence is a more structured way, even enhance the effect on psychological well-being in older adults. Life review uses the whole life story of a person by actively asking them to remember memories which shall enhance their problem-solving ability and positive identity (Bohlmeijer et al., 2011). It integrated psycho-therapeutic techniques, such as cognitive therapy, narrative therapy and problem solving therapy in order to decrease boredom and bitterness revival and to change one's viewpoint concerning his past in a more positive way (Pinquart & Forstmeier, 2012).

Additionally, a study by Bohlmeijer et al. (2011) showed that cognitive behavioral therapy and life review therapy are the most effective treatments for depression among older adults. This shows that working with memories will play an important role in the future in order to reduce depression, wherefore it is necessary to firstly understand how memories (life stories) are created. The following section will give a detailed overview of its development and importance during life time.

Shortly, people suffering from depression do remember fewer positive and more negative memories because unhappiness causes change in their autobiographical memory. Feeling unhappy causes automatic negative thoughts which leads to an intensified feeling of being unhappy, whereby the amount of negative thoughts increase which again causes unhappiness and results in a downward spiral. Furthermore, depressed people remember more general memories than specific ones than non-depressed people. In order to decrease depression, life stories are important during psychotherapy by using live reviews. It is striking that there are also a few studies done concerning self-defining memories and taking both, depression and anxiety into account because anxiety is a symptom of depression. Therefore, the following paragraph will give more insight in the differences of self-defining memories for people suffering from anxiety.

Life stories and anxiety. Anxiety can be defined as an emotion which is characterized by worried thoughts, physical changes and feeling of tension, which can result in an anxiety disorder that requires medical attention (Akın, Baloğlu & Karslı, 2014). It is also a symptom of several disorders that cause for example worrying, nervousness, apprehension and fear (Akın,

Baloğlu & Karslı, 2014). There are differences in the severity of anxiety, while severe anxiety can even affect one's day-to-day living.

In total, there are only a few early researches done concerning anxiety and different valence of memory (negative, neutral or positive memories). These findings include that people suffering from social anxiety do had more accurate memory for negative information than people who are not socially anxious (O'Banion & Arkowitz, 1977). Another study showed that a state of anxiety relates to higher anxiety-related cue words than depression because depression was associated with a slower response of happiness-related cue words (Richards & Whittaker, 1990). A study by Harmer et al. (2004) found that people suffering from depression or anxiety disorders changed in processing information after getting effective medical treatment. These findings showed that depression and anxiety do ameliorate negative biases which are part of these two disorders (Harmer, Shelley, Cowen & Goodwin, 2004).

To conclude, there are only a few findings concerning differences in life stories and anxiety. Findings showed that anxious people do have more accurate memory for negative information and that they information processing differs among anxious in comparison to non-anxious people.

These studies, although there are only a few done, indicate that there is a scientific reason to further explore the consequences of anxiety concerning memories, whereby this study tries to make a first step in the direction of further and more recent research.

Current study. As literature research showed, the subject 'life story' is a very complex one where many researches try to find an evidence-based answer on how a life story is created, for example if there is actually a life story scheme, as well as answers to questions about which differences they have in terms of age and gender as well as their relationships on mental illnesses, such as depression and anxiety. Life stories are a natural phenomenon everybody knows and they are important because they serve a motivational need to strive for purpose in life, justify values and actions, maintain a sense of efficacy and control, set goals and bolster self-worth (Baumeister and Newman, 1994). Hence, life stories are such an important part of every single person of the world, which makes it being an important topic to be further explored and discussed.

This study will analyze data of western Europe, especially the Netherlands, using data recruited by the Longitudinal Internet Studies in the Social Sciences (LISS) panel, where almost no research was done beforehand. Additionally, mental health care might profit from further findings, because working with life stories is already an important part of psychology, which can be more and more take into account for therapy of different ages and different mental

disorders.

Mostly, research was done concerning the autobiographical memory and younger people, whereas less research is done concerning older people. This study uses a random sample with a representation of the Dutch population, taking older people into account.

Therefore, the aim of this study is to explore emotional differences in life stories between gender and age and their relationships on depression and anxiety in a sample of the general Dutch population. Specifically, four hypothesis were examined.

H1: Younger adults do recall more negative memories than older adults.

H2: Women report more negative memories than men.

H3: More depressed people recall more negative memories.

H4: More anxious people recall more negative memories.

As literature findings showed, all these variables are related to one another, such as older people reporting more negative memories as well as men reporting more negative one in comparison to women. Additionally, depressed people remember more negative memories, whereas anxious people have more accurate memory for negative information. Therefore, in order to examine these findings, one last explorative questions was examined.

RQ: Do these relationships still persist if the relationships will be interconvertible controlled?

Method

LISS panel

Participants of this study were recruited by the Longitudinal Internet Studies in the Social Sciences (LISS) panel, conducted by CentERdata in the Netherlands. 5000 randomly chosen households, which means around 11000 people, were covered by the LISS panel, a representative sample of the Dutch population.

3076 people were asked to participate in a study about identity memories with an overrepresentation of older adults. 2065 people responded and finally 1742, one per household, completed the questionnaires in a comprehensible manner.

Procedure and participants

In this study, 1742 respondents completely filled in the questionnaires. Participants who reported low effort like incomplete or incomprehensible memories, were excluded from analyses.

Table 1 gives an overview of the main characteristics of the participants. In total, 795 (45.6 %) men and 947 (54.4 %) women took part in the survey. The oldest respondent was 92, whereas the youngest one was 16 years old. On average the respondents were 56 years old (*SD* = 16.5). A histogram showed that there was a unimodal age distribution with a peak between the ages 65 to 75 .

86,6 % of all participants were of Dutch background, the others reported that their first or second generation were of western and non-western background. More than half of the respondents were married, whereas one-fifth were unmarried. The others were divorced, widowed or separated. Furthermore, more than one half of the participants wrote down positive memories, whereas the amount of negative and neutral memories were almost equal.

Table 1. Characteristics of participants

Characteristics	Experimental Group (N=1.742)
Age	
Minimum	16
Maximum	92
Mean (SD)	56.4 (16.5)
Gender, N, (%)	
Male	795 (45.6)
Female	947 (54.4)
Origin, N, (%)	
Dutch	1509 (86.6)
First generation, western background	55 (3.2)
Second generation, western background	89 (5.1)
First generation, non-western background	46 (2.6)
Second generation, non-western background	13 (0.7)
Civil status, N, (%)	
Married	963 (55.3)
Never married	369 (21.2)
Divorced	218 (12.5)
Widowed	180 (10.3)
Seperated	12 (0.7)
Memories, N, (%)	
Negative	342 (19.6)
Neutral	401 (23.0)
Positive	999 (57.3)

Measures / Instruments

The recruited respondents firstly completed different demographical questions. Additionally, they had to fill in the Self – Defining Memory Task (SDMT). In addition to that, respondents had to fill in the Hospital Anxiety and Depression Scale (HADS) as well.

      Demographical questions. In order to analyze the different research questions, demographical information about gender and age were of importance. Participants could

answer if they are a 'male' or a 'female', whereas they had to fill in their year of birth by themselves, so that they later can be divided into three different categories of age; < 25 years, 25 - 54 years, 55 years and older. This division is based on a mental hospital classification from Germany.

Self - Defining Memory Task (SDMT). The Self – Defining memory Task by Jefferson Singer includes that respondents had to fill in one self-defining memory which should be at least one year old. This personal memory should be crucial for the respondent and either positive or negative (Blagov & Singer, 2004). In order to make the instructions comprehensible, standard instructions, like the following one, were used: '*When we tell other people about who we are, we often tell something about our past. We would like to ask you to illustrate some personal memories that display who you are. These are memories which define you as a person. What kind of memories are we asking about? We are asking about memories that are crucial to you. They vividly appear in your consciousness. They are related to strong negative or positive feelings. They came frequently into your mind. We would like to ask you to name one memory of this description which date back at least one year.*' Firstly, participants should name the memories shortly, such as 'birth'. After that, they needed to describe them in more detail and mention the reasons for their importance.

In order to categorize the memories of the respondents as negative, neutral and positive ones, guidelines were used (Westerhof, 2013). For example, having a marriage or getting children were coded as being positive memories, like the following one: 'The birth of my daughter is the most important memory for me'. Death and illness were examples of negative memories, like: 'The sudden death of my father' and moving from one apartment to another is an example of a neutral memory, like: 'The first time I went with my car to Germany, 24 hours on my way'. (Westerhof, 2013).

The SDMT is rated as being a reliable and valid instrument (Blagov & Singer, 2004). Furthermore, Liao et al. (2017) described that the intercoder reliability was tested by two coders using 50 narratives and a Cohen's kappa of .85 showed that this intercoder reliability is good.

Hospital Anxiety and Depression Scale (HADS). The Dutch version of the HADS was used which measures severity of anxiety and depression, which can be described as the most prevalent mental illness of the Dutch population (Spindhoven et al., 1997). It is used in different countries around the world with a good reliability and validity. In total, there are 14 statements which can be rated on a 4-point scale about how often they perceive an anxious or depressive symptom (Spindhoven et al., 1997). In total, there were seven items for the depression symptoms, e.g. *'I have lost interest in my appearance'* and seven items for the

anxiety symptoms, e.g. '*I get a sort of frightened feeling like something awful is about to happen*'. The sum-scores of the seven items were added and resulted in a total depression and anxiety symptom score ranging from 0 to 21. No clinical relevance was indicated by a score of less than 7. A score between 8 to 10 indicated a mild depression/anxiety, whereas scores of 11 to 14 indicated a moderate depression/anxiety score and scores between 15 to 21 a severe depression/anxiety (Bjelland, Dahl, Haug & Neckelmann, 2002). Furthermore, research showed that the HADS has a good reliability and validity. The internal consistency of this study is good as well with a Cronbach's α of .81 for depression and a Cronbach's α of .75 for anxiety.

Statistical analysis

In order to analyze the data, the IBM SPSS statistic program was used. To examine whether there is a relationship between gender and negative, neutral and positive memories and whether there is a relationship between age and these memories. In order to analyze the first and second hypothesis, a chi-square and cross-table because frequencies needed to be explored, was conducted. The independent variables were gender and age and the dependent variable valence of memory. The association between two variables is significant if Asymptotic Significance is $p < .05$ (Norušis, 2006).

The third and fourth hypothesis were answered by using a One-Way-ANOVA because there were more than two groups included. The independent variable was valence of memory and the dependent variable the total depression (H3) and anxiety (H4) score measured with the HADS. There were some outliers, one extreme outlier, according to inspection with a box-plot (Appendix B). Furthermore, it was examined whether the data were normally distributed or not (Appendix A). The Shapiro-Wilk-Test showed that there was no normal distribution and the and Levene-Test showed that there was no homogeneity of variance, therefore the Welch-ANOVA and Games-Howell post-hoc-Tests were elected. A p-value under .05 represents a statistical significance (Cohen, 1988).

At last, a multinomial logistic regression analysis was done to answer the explorative research question because the dependent variable is nominal with more than two levels. The dependent variable was 'valence of memory', the independent variables were 'gender and age' as well as the continuums 'depression' and 'anxiety'. In order to examine the power of explanation of the model, the Nagelkerke R^2 is important. If the Nagelkerke R^2 is < 0.1, the power of explanation is poor. If the Nagelkerke R^2 is between 0.1 and 0.3, there is a moderate power of explanation. A Nagelkerke $R^2 > 0.5$ means that the power of explanation is good. Furthermore, to get to know which variables are significantly related to the valence of memory,

the odds ratio plays an important role. The odds ratio helps to quantify how strongly the absence or presence of property A is associated with the absence or presence of property B, in this study for example the chance that a neutral or negative memory is given in comparison to the chance that a positive memory is given. If the odds ratio = 1, there is no difference between the groups. Is the odds ratio > 1, the chance of the first group is higher. Is the chance < 1, the chance of the first group is smaller (Bland & Altman, 2000).

Results

Age and memories. Analyzing the first hypothesis 'Younger adults do recall more negative memories than older adults.' showed that there was a significant association between age and whether participants reported a negative, neutral or positive memory $\chi2$ (4) = 12.98, $p < .05$."". That means that there is a significant relationship between age and valence memories.

This significant difference can be seen in the group of younger adults. 27 participants (32.5 %) of the younger adults noted negative memories. This deviates from the expected number, $z = 2.7$; $p < .05$. In comparison to the other groups, younger adults wrote down more negative memories than participants from the middle-age or older age. hence the hypothesis is confirmed.

Furthermore, younger age, middle-age and older age respondents wrote down almost the same amount of neutral and positive memories.
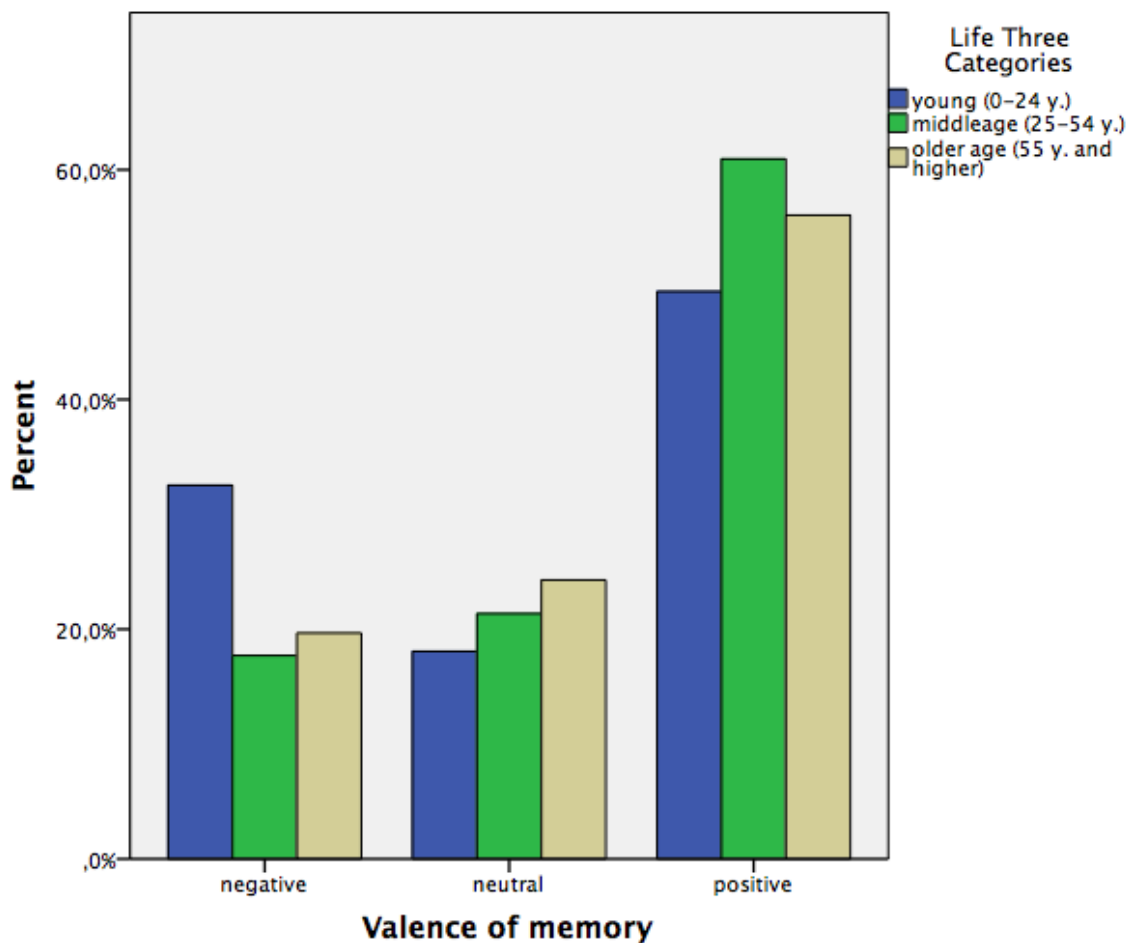

Figure 1. *Percentages age groups and valence of memory.*

Gender and memories. The following figure shows the numbers of negative, neutral and positive memories men and women wrote down.

Analyzing the second hypothesis 'Women report more negative memories than men' showed that there was no significant association between gender and whether participants reported a negative, neutral or positive memory $\chi 2\ (2) = 4.35$, $p > .05$." Hence, the hypothesis is not confirmed.
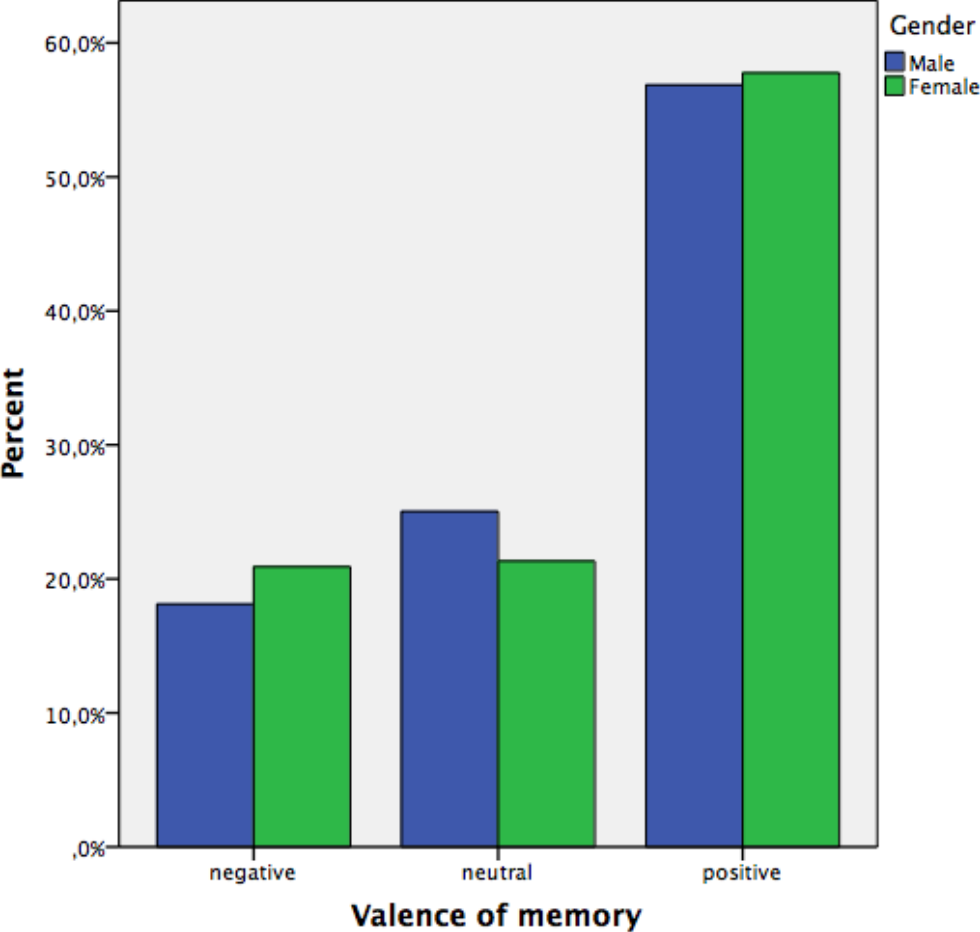

Figure 2. *Percentages gender and valence of memory.*

Negative memories and depression. Table 2 gives an overview of the means and standard deviations for each of the three groups which were taken into account by analyzing the third hypothesis 'Depressed people recall more negative memories'. A One-Way-ANOVA was conducted in order to assess the relationships of different depression scores (measured by the HADS) dependent on the valance of the reported memory. The dependent variables were the different memories (N = 1742) divided into three different groups.

Table 2. Means and Standard Deviations of Depression Scores by memory valence

Valence of memory	N	*Mean*	*SD*
Negative	342	4.93	3.47
Neutral	401	4.62	3.18
Positive	999	3.60	2.81
Total	1742	4.10	3.10

Therefore, a Welch-ANOVA and Games-Howell post-hoc-Test was conducted. The depression score measured with the HADS differed statistically significant for the different memories, $F_{(2, 693.31)} = 30.21$, $p < .01$. This means that there is a difference between the depression score and the valence of memory.

The Games-Howell post-hoc-Test showed a significant difference ($p < .01$) between the HADS depression scores of the groups with negative and positive memories and neutral and positive memories. The mean score of the depression increased from negative to positive memories (1.33, 95% -CI [.84, - 1.82]) and from neutral to positive (1.03, 95%-CI[0.60, 1.45]).

Hence, people who reported negative or neutral memories scored higher on the HADS depression score than people reporting positive memories. All in all, these findings showed that the hypothesis is confirmed.

Negative memories and anxiety. Table 3 gives an overview of the means and standard deviations for each of the three groups. Analyzing the fourth hypothesis 'Anxious people recall more negative memories.' a One-Way-ANOVA was conducted in order to assess the relationships of the different levels of anxiety (measured by the HADS) dependent on the valance of the reported memory. The memories were divided into the same three different groups mentioned before.

Table 3. Means and Standard Deviations of Anxiety Scores by memory valence

Valence of memory	N	*Mean*	*SD*
Negative	342	5.96	4.00
Neutral	401	5.26	3.44
Positive	999	4.18	3.10
Total	1742	4.78	3.44

There were some outliers as well, one extreme outlier, according to inspection with a box-plot (Appendix C). Therefore, a Welch-ANOVA and Games-Howell post-hoc-Test were conducted. The anxiety score measured with the HADS differed statistically significant for the different memories, $F (2, 688.74) = 36.00$, $p < .01$.

The Games-Howell post-hoc-Test showed a significant difference ($p < .01$) between the HADS anxiety scores of the groups with negative and neutral memories, negative and positive memories as well as neutral and positive memories. The anxiety mean score increased from negative to neutral memories (.70, 95% -CI [.05, 1.35]), from negative to positive (1.77, 95%-CI[1.22, 2.33]) and neutral to positive memories (1.08, 95% -CI [.61, 1.54]).

This means that people reporting negative memories scored significantly higher on the HADS anxiety score than people reporting neutral ones. Furthermore, people who reported negative memories scored higher on the anxiety score than people who reported positive memories as well as people with neutral memories because they scored higher on the anxiety score than people with positive memories, which means that the hypothesis is confirmed.

Interconvertible controlled relationships. Table 4 gives an overview of the results for the explorative research question 'Which variable is the most important correlate of the emotional difference?'. A multinomial logistic regression analysis was conducted.

Table 4. Overview OR of all variables

Valence of memory[a]		OR	Sig.
Negative			
	Younger adults	**1.71**	.05
	Middle-age	**.072**	.02
	Older adults	.	0[b]
	Female	1.00	.97
	Male	.	0[b]
	Depression	1.04	.15
	Anxiety	**1.13**	.00
Neutral			
	Younger adults	0.83	.54
	Middle-age	**0.75**	.03
	Older adults	.	0[b]
	Female	0.79	.06
	Male	.	0[b]
	Depression	**1.07**	.02
	Anxiety	**1.06**	.02

a. The reference category is: positive.

b. This parameter is set to zero because it is redundant.

Results showed that the model including all variables was significant, $\chi2\ (8) = 99.65, p < .001$." which means that this model can make a good distinction between the different valence of memory. A Nagelkerke's R^2 of .07 shows that the regression model has got a poor power of explanation.

Additionally, as in table 4 shown, the variables younger adults, middle-aged and anxiety are significant related to the dependent variable 'negative memory'. The odds ratio shows the chance that a certain memory is given in comparison to the chance that a positive memory is given because the reference category is 'positive memory'. Furthermore, it also shows the dependent variable 'negative memory' with the same reference category 'positive memory'.

Age. Results show that the chance of reporting negative memories was greater among younger adults than reporting positive memories in comparison to people of an older age (OR: 1.72). Whereas the chance of negative memories was lower than the chance of positive memories in middle-aged respondents compared to older people. In detail, it is shown that the chance of reporting neutral memories was lower than reporting positive memories among people of middle-age in comparison to older people (OR: 0.75).

Gender. The variable gender is not significantly related to any of the dependent variables.

Depression. Findings show that the chance reporting neutral memories is greater than reporting positive memories for people with depression (OR: 1.07). Furthermore, it is striking that depression is not significantly related to the dependent variable 'negative memory'.

Anxiety. The chance of having negative memories was greater than the chance of having positive memories for people with anxiety (OR: 1.13). Furthermore, the chance reporting neutral memories is greater than reporting positive memories for anxious people (OR: 1.06).

Discussion

Conclusion. Aim of this study was to get more insight in the valence of memories and their relationship with depression and anxiety. This study showed that younger adults do recall more negative memories than older people. Furthermore, results showed that there was no significant difference between the valence of memory and gender. Additionally, there was a relationship for depression and anxiety and the valence of memories which showed that the more negative memories are, the more depressive and anxious symptoms people have. All in all, the multinomial regression confirmed these findings, except depression, because no relationship was found between negative memories and depression.

Age. Analyzing differences between age and the valence of memory it came forward that young people do report more negative events than people from middle-age or older age. This can be explained by the positivity effect. Research by Schlagman et. al (2006) on autobiographical memory showed that young and old people do recall the same amount of positive memories, however older people differ in the rating of the valence of memory. Although older people do recall fewer typical negative content, for example stressful events or accidents, they rate those events as neutral or positive ones (Schlagman, Schulz & Kvavilashvili, 2006). This can be explained by a study where neurological processes were measured. Older people do have lower interdependencies between the amygdala which are responsible for emotions and the hippocampus and therefore is important for the memory (Cabeza & St Jacques, 2007). Furthermore, older people do have a greater interaction of the dorsolateral frontal cortex which is responsible for processes like the monitoring of emotions. Therefore, rational processes like controlling emotions are more involved in older people than in younger ones, whereas emotional processes are more involved (Cabeza & St Jacques, 2007).

Furthermore, it is striking that people from middle-age reported more positive memories in comparison to older people which is contradictory to these findings. However, a possible explanation might be that people from middle-age had more positive decisive experiences during the last years, such as the birth of a child or a marriage while older participants had more negative decisive experiences such as death of a spouse or impairment to health. Events which are linked to strong emotions, such as love or grief are stored in a more detailed way in the memory, wherefore they are retrieved more easily than others (Conway & Holmes, 2000).

All in all, older adults do focus more on regulating their emotions. They have greater cognitive control mechanisms which diminish negative information while enhancing the positive ones (Mather & Carstensen, 2005). Furthermore, people from middle-age seem to

remember more positive memories than older people which might be because of their present decisive experiences which might be more positive in middle-age and more negative in older age respondents.

Gender. Contrary to previous assumptions, there was no significant evidence that women remember more negative memories than men. Men and women tended to write down almost the same amount of negative, neutral and positive memories, however it was striking that both groups reported much more positive memories than neutral or negative ones.

It is difficult to examine the reason because there are only a few studies done concerning gender and the valence of memories or confirmations that positive memories are much more present than negative ones. Most studies only focus on the extent to which women and men are perceiving emotions (Brody & Hall, 2008). In this study, the extent is not important, moreover the events itself. As mentioned above, events which are linked to strong emotions are retrieved more easily (Conway & Holmes, 2000). The birth of a child not only elicits the feeling of happiness and love in women but also in men (Brody & Hall, 2008). Therefore, if people are asked about important life events, the birth of a child is an important event for a mother as well as a father. This might be the same for negative events, like the death of a family member. However, women might feel an intensified feeling of grief, men perceive the feeling grief as well. Therefore, if women and men are asked to remember events which are important for them, both can mention the same events because they all perceive emotions such as happiness or sadness which would explain that no difference is found.

Depression. Surprisingly, this study showed that there is no relationship found between depression and negative memories. A study by Werner-Seidler and Moulds (2011) confirms the results of this study because they found that negative memories do not differ in depressed and non-depressed people; moreover, depressed people recall less vivid positive memories. These findings of Werner-Seider and Moulds (2011) show that the processing of positive memories differs among people with a depressive disorder in comparison to non-depressive people because individuals suffering from depression do have difficulties in retrieving positive memories as they are not salient to their immediate situation (Singer & Salove, 1996).

All these findings give food for thought that the focus concerning memories and depression should lie on the altered retrieval of positive thoughts and not only on an enhanced recall of negative thoughts. This findings represent an important factor which needs to be taken into account in depressive vulnerability because depression seems to be associated with a deficit in processing positive material and therefore should further be explored (Werner-Seidler & Moulds, 2011).

Anxiety. Findings of this study showed that there is a relationship between negative memories and anxiety which confirms a study by O'Banion and Arkowitz (1977) who found that people suffering from social anxiety do had more accurate memory for negative information than people who are not socially anxious. This can be explained by the cognitive model of anxiety by Beck et al. (1985) which includes that anxious people do have a biased interpretation of stimuli as threatening or dangerous. This attentional bias can cause an enhanced recall of negative memories because they rate events as rather negative instead of neutral and positive. This conclusion can be confirmed by another study of Harmer et al. (2004) who found that information processing in anxious people differ in comparison to non-anxious people. They tend to have a greater likelihood of pessimistic interpretation of ambiguous events which enhances the amount of perceived negative events as well (Mathews & Mackintosh, 1998). These findings reinforce the assumption that mood-congruence might play a role which includes that anxious people tend to recall memories that are consistent to their mood, which will be more often negative than positive ones. Additionally, research by Mineka and Nugent (1995) showed that many studies failed to find evidence for mood-congruence which gives indication to execute further research.

Strengths and weaknesses. Firstly, one strength of this study is that the LISS panel was used which gathered a great amount of data which were randomly collected. Therefore, data can be generalized because the more data collected, the less possible biases can affect the final results.

Furthermore, this study explored western Europe, especially the Netherlands, where almost no research was done. Additionally, it is one of only a few studies which included older generations which means that this study had a great representation of the Dutch population taking older people into account.

Another strength is the good intercoder reliability as well as a good internal consistency of the instruments which were used (SDMT and HADS) which means that the data is highly reliable.

According to the weaknesses of this study it is striking that the age categorization is not properly elected because the amount of older adults is greater than the other two categories. The categorizations were chosen because of personal experiences in a German mental hospital. It would have been better to divide these categories into different ones because most of the time people at an age of 55 are still at their workplace, are physically and mentally fit and cannot be formed as one group together with people suffering from mental disabilities. Hence, only people who went into retirement, thus around an age of 67 should form the 'older age' group because

then this group would have almost the same general conditions, such as more leisure or beginning of physical restrictions.

A further weakness is that only the first memory of every respondent was taken into account. The reason was to enhance the quality of memories. It was striking that the more memories people had to fill in, the more inaccurate and inapprehensible they were. In addition to that, when only one memory was taken into account there might be an attrition bias which means that there might be a greater loss of participants of one group in comparison to the others. In order to use three memories instead of only one memory, participants need to be motivated to fill in the questionnaires properly. Their motivation can be enhanced by offering them the chance to win a gift on the condition of filling in all three memories in an accurate and apprehensible manner.

Implications. In this study, the Dutch population is properly represented, however participants scored relatively low on depression and anxiety. Therefore, this study is only a first step to get a rough idea about the relationships between the valence of memories and both mental disorders. A second step to get more detailed insight could be an analysis in a clinical setting with people suffering from clinical anxiety or depression disorders in order to verify these findings. As results showed, there is a relationship between anxiety and negative memories as well as a lesser extent of positive memories in people suffering from depression. It is striking that there is no relationship found between negative memories and depression wherefore the results of this study can be seen as a starting point to further investigate the assumed deficit in processing positive materials. Additionally, literature indicated that positive memories might be an option to reduce anxiety and depression disorders (Hansch, 2013). If depressed people actually have deficits in processing positive memories, it is important to execute future research in order to construct new approaches helping depressed people to improve these processes and in fact benefit from positive memories.

Furthermore, findings of this study showed that people suffering from anxiety report more negative memories than positive ones; a result which was rather expected for people with depression. This provides room for further research if positive memories not only help depressed but also anxious people. Literature indicated that life-review therapy helps to reduce depressive symptoms in adults by changing one's point of view in a positive way. Future research on the causality of negative memories and anxiety could be a starting point to also investigate a therapy (including working with memories) for people suffering from anxiety.

Concerning the collection of self-defined memories, it would be helpful to firstly, ask participants to write down their memories and secondly, ask if they can personally rate them as

negative, neutral or positive ones in order to reduce the chance of an attribution bias. Sometimes the participant and researcher would rate life events differently because according to the guidelines a divorce is something negative, however it can be something positive for the participant. Reducing the attribution bias would ensure a more accurate analysis of relationships between self-defined memories and mental illnesses.

Take home message. The results indicate that age is related to the valence of memories, as well as depression and anxiety which reflects the aim of this study to examine the relationships of the valence of memories on demographic variables and mental illnesses. Additionally, this study gives indication for deficits in processing positive material in depressed people, which needs to be further explored. As research showed, positive memories might beneficially influence well-being of people suffering from depression. These results support this findings and give a first step to further investigate if positive memories could also influence well-being of people suffering from anxiety. This study showed that self-defining memories are connected to mental illnesses, such as depression and anxiety, wherefore it is helpful to focus on positive events in life.

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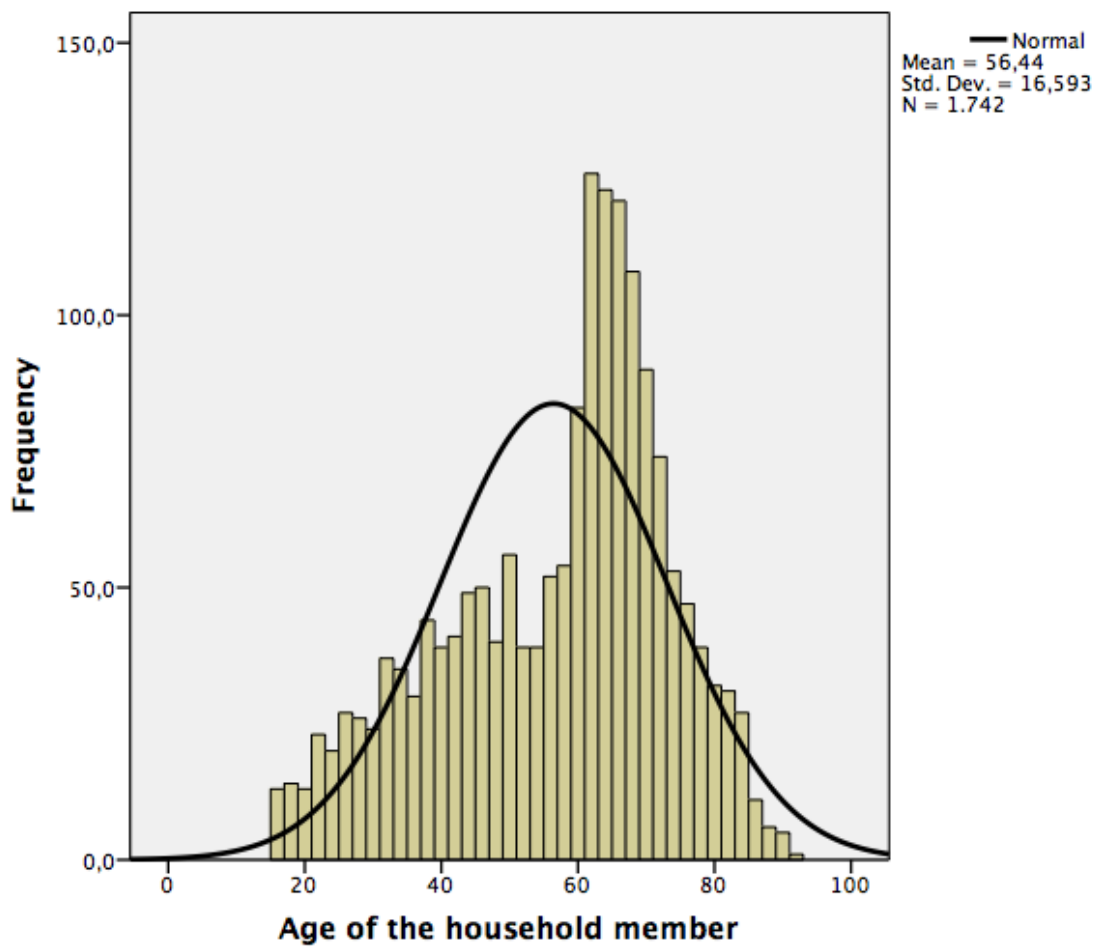
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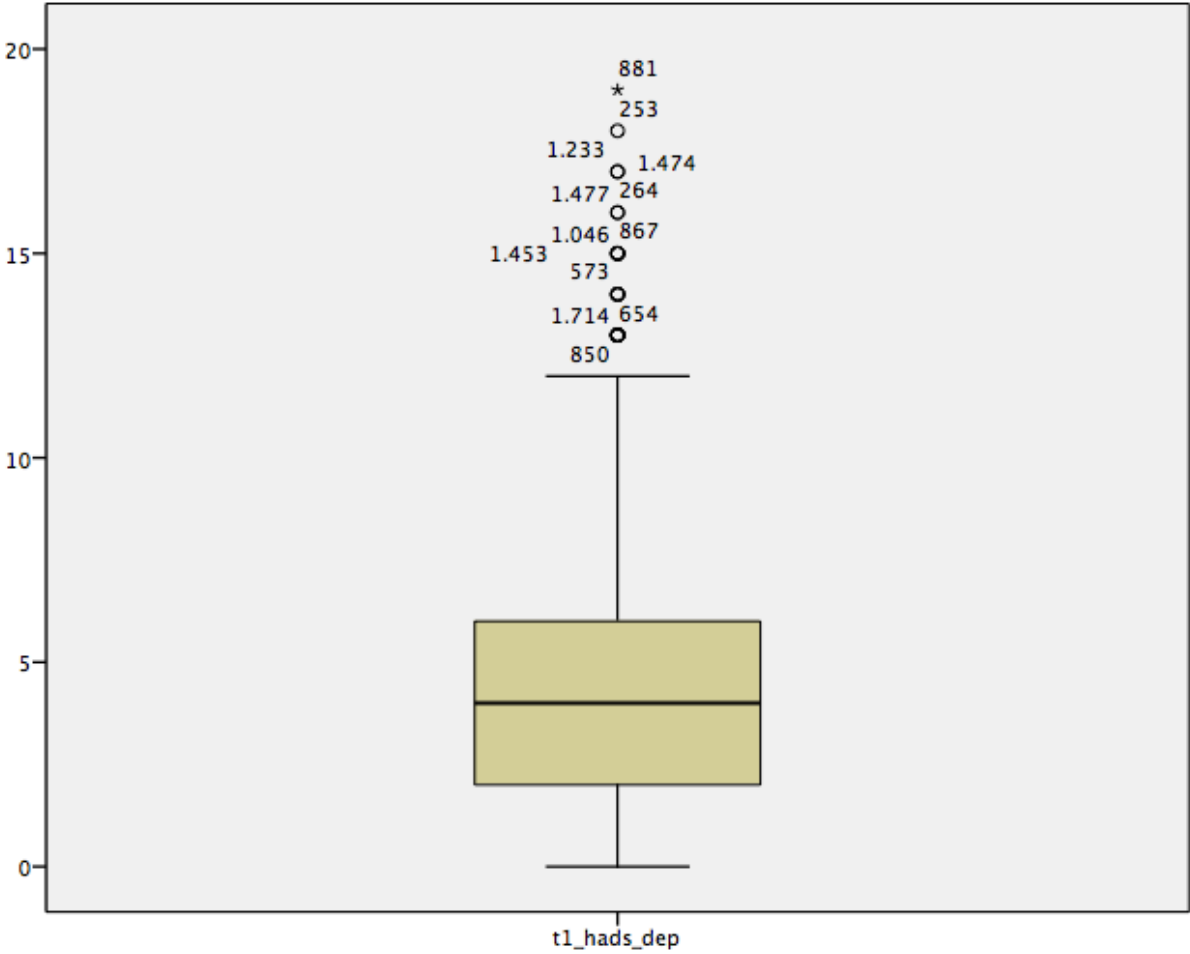
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Appendix

Appendix A

Appendix B

Appendix C