

Age and sex dependencies of anxiety and depression in cardiologic patients compared with the general population

Alters- und Geschlechtseffekte von Angst und Depression bei kardiologischen Patienten im Vergleich zur Allgemeinbevölkerung

Abstract

Objective: The aim of this study was to test age and sex effects on anxiety and depression using the Hospital Anxiety and Depression Scale HADS.

Method: Sample 1 consisted of 2037 subjects of the German general population, and sample 2 comprised 2696 cardiologic patients.

Results: In the group of the general population we observed a linear increase of depression and (to a lower extent) of anxiety with age. In contrast to that, the patients reached their anxiety and depression maxima in the range of 50 to 60 years, with decreasing mean values for older patients. This effect was observed in both sexes and was proved by an ANOVA interaction between age category and population ($P < 0.001$). In the age range over 70 years the mean depression scores of the patients were even lower than those of the general population. Especially high anxiety and depression scores were found for retired males under 60 years of age.

Conclusion: Premature retirement is associated with anxiety and depression in cardiologic patients which partly accounts for the different age effects of the samples. Longitudinal studies are needed to explain the underlying mechanisms of the age effects in more detail.

Keywords: anxiety, depression, cardiology, age, sex

Zusammenfassung

Zielstellung: Mit der vorliegenden Studie werden Alters- und Geschlechtseffekte bei Angst und Depression mittels der Hospital Anxiety and Depression Scale HADS untersucht.

Methode: Stichprobe 1 besteht aus 2037 Personen der deutschen Allgemeinbevölkerung, und Stichprobe 2 umfasst 2696 kardiologische Patienten.

Ergebnisse: Bei der Stichprobe der Allgemeinbevölkerung zeigte sich ein linearer Alters-Anstieg von Depression und (zu einem geringeren Ausmaß) von Angst. Im Gegensatz dazu erreichten die Patienten ihr Angst- und Depressions-Maximum im Altersbereich von 50-60 Jahren, mit niedrigeren Werten für ältere Personen. Dieser Effekt war bei Männern und bei Frauen nachweisbar, er erreichte eine Signifikanz von $p < 0.001$, ermittelt mit einer ANOVA-Interaktion zwischen Population (Allgemeinbevölkerung vs. Patienten) und Alterskategorie. Im Altersbereich über 70 Jahre waren die mittleren Depressions-Werte der Patienten sogar niedriger als bei der Allgemeinbevölkerung. Besonders hohe Angst- und Depressionswerte hatten berentete männliche Patienten unter 60 Jahren.

Schlussfolgerungen: Vorzeitige Berentung ist bei den kardiologischen Patienten eng mit Angst und Depressivität assoziiert. Longitudinalstudien sind nötig, um die Mechanismen, welche den unterschiedlichen Alterseffekten zwischen Patienten und Gesunden zugrundeliegen, näher aufzuklären.

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Schlüsselwörter: Angst, Depression, Kardiologie, Alter, Geschlecht

Introduction

Increased degrees of anxiety and depression are frequently observed in cases of severe diseases. This has been intensively studied in the area of oncology [1], [2], [3], [4], [5], [6], [7], [8], [9], [10] and cardiovascular diseases [11], [12], [13], [14], [15], [16], [17], [18], [19]. However, in clinical practice even extreme degrees of anxiety and depression are often not even detected which has the consequence that the patients cannot receive adequate psychological help or treatment [20], [21].

A suitable screening instrument which can be used to assess anxiety and depression is the Hospital Anxiety and Depression Scale (HADS) [22], [23]. It is a self-assessment questionnaire with 14 items. In a review article, Herrmann [24] reports on the use of the HADS in more than 200 clinical samples. The psychometric quality of the HADS was proved to be good in several studies [25], [26]. Though the HADS was designed to discover psychological comorbidity in somatically ill patients, it can also be used in the general population. In contrast to other instruments (e. g., Beck Depression Scale), the items do not stress severe psychopathological symptomatology, therefore omitting the 'floor' effect and making the scales sensitive also in the range of mild forms of anxiety and depression. This contributes to the acceptance of the questionnaire in epidemiological studies. Symptoms with possible organic origins (e. g., sleep loss, weight loss) are not covered by the scale in order to avoid confounding effects with clinical aspects.

When different subject samples have to be compared, one is often faced with the problem that age and sex distributions are not identical in the samples [27]. It is therefore necessary to gain some knowledge about age and sex dependencies of anxiety and depression in patients and in the general population. Another age related effect is that longitudinal studies have sometimes found an attenuation of pathopsychological symptomatology in the long-term process after diagnosis and treatment of severe diseases like breast cancer [28], [29]. Though many examinations have been conducted using the HADS in clinical samples, studies on sex and age effects on anxiety and depression in patients and in healthy persons are rare and contradictory.

A Swedish study [30] found an increase of depression with age in the general population, but no such increase for anxiety. A similar result was obtained in a Dutch investigation [31] with a correlation between age and depression of $r=0.15$, while the corresponding correlation for anxiety was only -0.04 . A British investigation [32] detected only minimal age effects of anxiety and depression. The authors gave norm values, separately for males and females, without considering age. The most comprehensive study was conducted in Norway [33] with more than 62,000 persons filling in the HADS depression scale. In this study a clear and linear increase of depression with

age was proved. From the amounts of explained variance it can be concluded that the correlation between age and depression was about $r=0.24$.

A Danish study [34] compared the HADS results between breast cancer patients and women from the general population with the surprising result that the mean anxiety and depression scores were higher in the sample of the general population compared with the patients. Furthermore, in this study anxiety decreased with age, while depression showed an increase. This was true for both samples. A comprehensive German study with more than 5000 cardiologic patients [35] found an inverted-u-shaped curve for anxiety and depression with highest values in the range of 50 to 60 years of age.

The objective of this study is to contribute to the knowledge about age and sex effects on HADS anxiety and depression in the general population and in patients.

Methods

Sample of the general population

Using the random route-technique, a sample of 3020 subjects from the German general population was used based on 216 sample points (random selection of street, house, apartment and target subject in the household). In 132 cases, no interview could be performed (4.4%) because nobody could be met in the apartment after three tries. Of the remaining households, 2081 persons (72.1%) agreed to participate. People with insufficient command of the German language ($n=40$ in total) were excluded. Sociodemographic variables were obtained (age, sex, profession, income, education, marital status, number of family members, etc.), and several standardized psychological questionnaires were filled in, one of them being the HADS. 99% of the subjects responded to the HADS without omitting any item. One missing item per scale was tolerated and replaced with the mean of the remaining items of the subscale. When in at least one subscale more than one item was missing, the subject was excluded from the sample. This procedure yielded 2037 complete data sets, 895 males and 1142 females, with mean ages of 49.3 ± 16.9 and 49.2 ± 17.7 years, respectively. This sample can be assumed to be representative for the adult German population living in private households.

Sample of cardiologic patients

The second sample consisted of all cardiologic patients who began a rehabilitation treatment between beginning of 1999 and beginning of 2001 in the rehabilitation clinic Koenigsfeld (Germany). The indication of the majority of the patients ($N=1887$) was an acute cardiac event (MI or CABV). $N=809$ patients suffered from a chronic

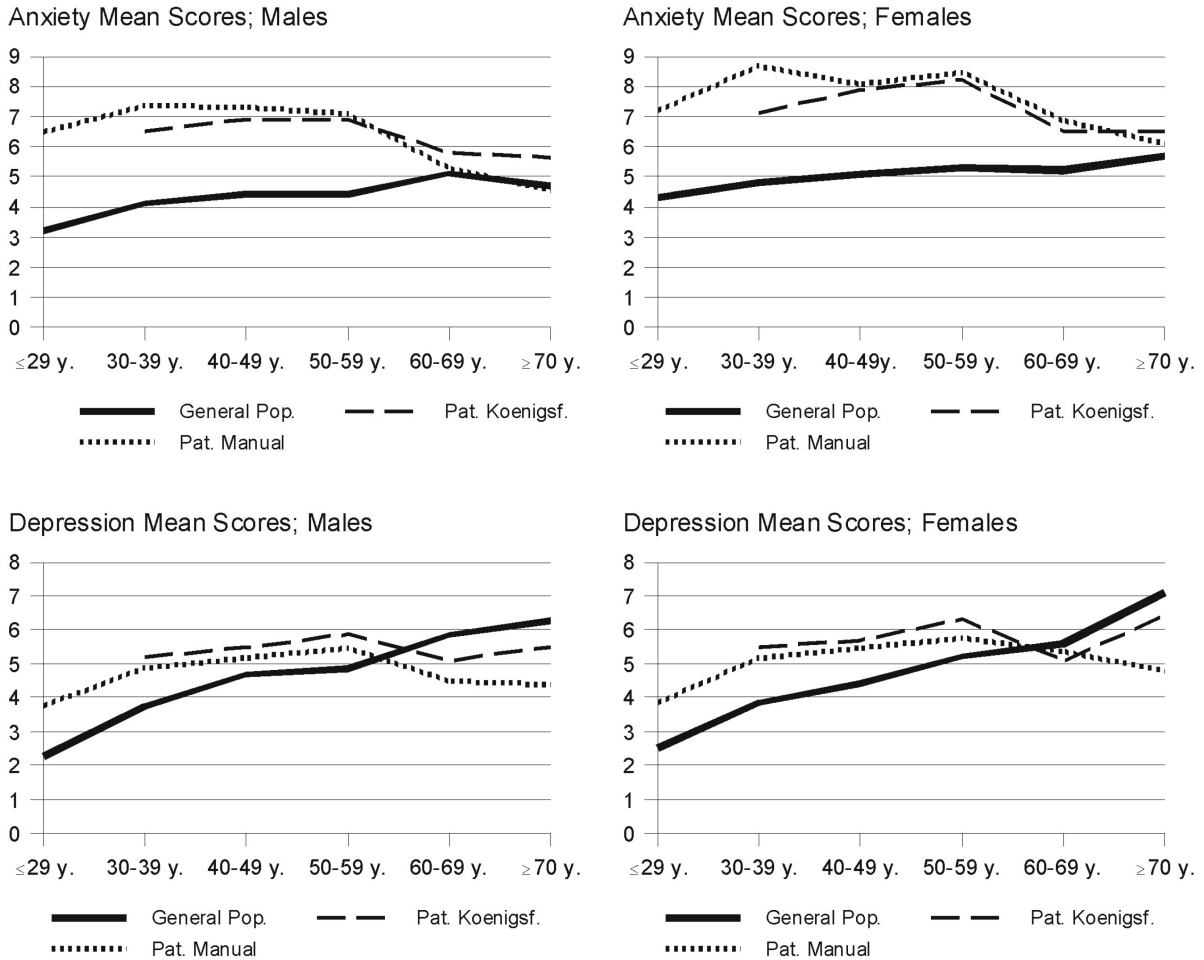


Figure 1: Mean HADS scores by age group and population

General Pop.: General population; Pat. Koenigsf.: Cardiac patients of the own study (Koenigsfeld); Pat. Manual: Cardiac patients of the German HADS manual [35]

cardiovascular disease (coronary heart disease or hypertension). The HADS was filled in at the beginning of the stay in the clinic. From the original sample 19.2% of the patients did not fill in the questionnaire. The handling of missing data was like in the sample of the general population. 22 subjects (0.8%) had questionnaires with more than one missing item in one scale and were therefore excluded. The final sample consisted of 2116 males and 580 females. The mean age was 56.3 ± 10.7 years for males and 61.0 ± 12.8 years for females.

The HADS

The HADS is recommended by the German Society for Prevention and Rehabilitation in Cardiology as a standard instrument to test the process quality. The official German version of the HADS [35] was used in this study. The questionnaire consists of 14 items, seven anxiety and seven depression items, thus forming two subscales. The response format of the items has four degrees scored with values between 0 and 3. The anxiety and depression scores are obtained by simply summing up the scores of the seven items, yielding values between 0 (minimal symptomatology) and 21 (maximal symptomatology).

Statistical procedure

The effects of age, sex, and population (patients vs. general population) on anxiety and depression were tested with three-factorial ANOVAs (analysis of variance). Two-factorial ANOVAs were performed to test the effects of age group and professional status (retired vs. non-retired) for both males and females.

Results

Figure 1 shows the mean values of anxiety and depression for both samples, broken by age decades. Because there were too few subjects in the patients' sample in the age range below 30 years, the corresponding values are not shown in Figure 1 and Table 1. Additionally, the Figure presents the data reported in the German manual of the HADS [35]. These data also refer to a sample of cardiologic patients (N=5417). For the patients (males and females, both clinical samples), an inverted u-shaped relationship between age and anxiety and depression can be observed, with maxima mostly in the age range of 50-59 years. In contrast to that, in the general population we

Table 1: Mean values and standard deviations for anxiety and depression in different age groups

Population	Sex	Variable	< 30 y.	30-39 y.	40-49 y.	50-59 y.	60-69 y.	≥ 70 y.
			M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
General Population	Males	N	141	141	152	168	193	100
		Anxiety	3.2 (2.5)	4.1 (3.1)	4.4 (3.0)	4.4 (2.9)	5.1 (3.2)	4.7 (3.5)
		Depression	2.3 (2.5)	3.7 (3.5)	4.6 (3.7)	4.9 (3.7)	5.8 (3.9)	6.3 (4.1)
	Females	N	174	222	191	182	197	176
		Anxiety	4.3 (3.2)	4.8 (3.2)	5.1 (3.2)	5.3 (3.6)	5.2 (3.4)	5.7 (3.5)
		Depression	2.5 (2.8)	3.8 (3.2)	4.4 (3.7)	5.2 (3.8)	5.6 (3.7)	7.1 (4.4)
Patients	Males	N		118	419	861	455	242
		Anxiety		6.5 (4.0)	7.0 (3.8)	7.1 (4.0)	6.0 (3.8)	5.7 (4.3)
		Depression		5.4 (4.2)	5.5 (3.8)	5.9 (4.0)	5.2 (3.8)	5.5 (4.4)
	Females	N		22	93	161	128	169
		Anxiety		6.7 (4.3)	7.7 (4.3)	8.2 (4.7)	6.7 (3.9)	6.6 (4.2)
		Depression		5.7 (3.4)	5.6 (4.2)	6.4 (4.3)	5.0 (3.7)	6.5 (4.4)

see a continuous increase of anxiety and depression with age, especially for depression. The corresponding mean values and standard deviations are given in Table 1, together with the case numbers. Further details concerning the general population are published elsewhere [23].

The effect of population (general population vs. patients), sex and age was tested with a three-factorial ANOVA. Age was dichotomized: 40 to 60 years and 61 years and above. Subjects below 40 years were not included in this ANOVA. This made age distributions in both samples nearly identical. Table 2 shows the ANOVA results.

There are highly significant differences between the samples concerning anxiety ($P < 0.001$), the mean value of the patients being markedly higher than that of the general population. In contrast to that, the differences in the depression mean scores are small ($P < 0.05$). Sex differences were also more pronounced in the anxiety subscale ($P < 0.001$; higher scores for women) than for depression. The age effect was significant for both anxiety and depression in a similar range. The most important result of this analysis, however, is the significant ($P < 0.001$) two-

way interaction between population and age group, which occurs both in the anxiety and in the depression subscale. This interaction means that the mean values increase with increasing age in the general population, whereas they do not increase in the sample of the patients (Figure 1). All other interaction effects were low and can be neglected.

In order to test whether the professional status (retirement vs. non-retirement) is important for anxiety and depression in the group of cardiologic patients, we consider the two age groups (50-59 years and 60-69 years), which comprise both retired and non-retired people with sufficient group sizes. The mean values are given in Table 3. First, we examine the anxiety values of the males. Comparing the age groups, we see lower mean anxiety scores in the older group, for non-retired as well as for retired people. However, the differences between the age groups are more pronounced in the group of retired people ($7.8 - 5.5 = 2.3$) compared to the non-retired group (0.6). A similar result is obtained for depression with differences of 1.8 (retired people) and 0.5 (non-retired

Table 2: F-values and significance levels for three-factorial ANOVAs

Sources of variance	Anxiety		Depression	
Population	182.8	***	4.7	*
Sex	30.9	***	5.3	*
Age	11.3	***	11.0	***
Population x Sex	1.3		1.2	
Population x Age	40.1	***	33.5	***
Sex x Age	1.0		0.8	
Population x Sex x Age	0.0		0.0	

*: $P < .05$; **: $P < .01$; ***: $P < .001$

Table 3: Mean values and standard deviations (in parenthesis) for anxiety and depression in non-retired and retired subjects

Sex	Variable	Non Retired		Retired	
		50-59 years	60-69 years	50-59 years	60-69 years
Males	N	828	192	33	263
	Anxiety	7.0 (4.0)	6.4 (3.8)	7.8 (3.6)	5.5 (3.7)
	Depression	5.9 (4.0)	5.4 (3.8)	6.8 (4.1)	5.0 (3.8)
Females	N	155	37	6	90
	Anxiety	8.4 (4.6)	6.9 (3.7)	5.7 (4.4)	6.5 (90)
	Depression	6.4 (4.2)	5.1 (3.5)	5.0 (3.6)	5.2 (4.1)

people). Two-factorial ANOVAs were performed with the factors age group (50-59 years vs. 60-69 years) and professional status (retired vs. non-retired). The dependent variables were anxiety and depression. Concerning the males, the degrees of freedom were $df=(1, 1312)$. For both variables (anxiety and depression) the main effect of age group was significant with $P < 0.01$ (anxiety: $F=13.1$; depression: $F=8.4$). The main effect of the professional status was not significant for both variables (anxiety: $F=0.00$; depression: $F=0.47$). The interaction between age group and professional status, however, was significant for anxiety with $P < 0.05$ ($F=4.2$), whereas the depression interaction was not significant ($F=2.6$). The corresponding analyses for females ($df=1, 284$) yielded no significant results at all, however, the sample sizes (Table 3) are too small for definite conclusions.

Discussion

The crucial result of this investigation is that there are different age and sex effects on anxiety and depression, depending on the sample (general population or patients) under study. In the general population there is a nearly linear increase of anxiety and depression with age, which cannot be found in the sample of patients. This effect was proved by the high ANOVA interaction components between population and age group.

The results of the sample of the *general population* confirm the finding [30], [31], [33] that there is a nearly linear age trend of depression for both sexes. However, the mean values for depression are higher in the present study compared with the investigations mentioned above. Concerning anxiety, the age dependency was markedly lower than that of depression, but it remained positive, whereas other studies [30], [31], [34] did not detect such a positive trend. As in other studies, the mean anxiety

values for females were higher than those for males, which was not observed for depression. Generally, the mean values for anxiety and depression were comparable with the Swedish study [30], while in the Danish study [34] the mean values for anxiety were much higher.

The mean values for the *patients* agree with the corresponding mean values reported in the test manual of the German version of the HADS [35]. Like in our study, the highest values for anxiety and depression were obtained for patients between 50 and 60 years. In both cases the samples consisted of cardiologic patients. Comparing the results of our cardiologic female patients with the study of Danish breast cancer patients [34], the anxiety and depression values are higher in our cardiologic patients. Here one has to take into account that the mean values of the Danish sample were even lower than those of the Danish general population in all age groups. In our study this effect (lower values in the patient sample compared with the general population) was only found in older age ranges (60 years and above) in the depression subscale. Looking for possible *reasons* for the different age-related effects between general population and patients, regional selection effect could be one. However, such an effect is unlikely in our study. While the sample of the general population comprised all areas of Germany, a greater part of the patients came from the region of Koenigsfeld. Nevertheless, the age differences observed in the general population were found in all regions (federal states) with similar effect sizes. Another kind of selection, however, may have substantially affected the results. Among patients with cardiologic diseases, those with the most severe health problems could have died before entering a rehabilitation clinic. The sample of our study may therefore be a positive selection. But even if this effect was significant, it does not account for the occurrence of the age differences (lower mean values only for older patients).

It is also unlikely that certain diagnosis groups within the clinical sample were responsible for the age effect. If the sample of our patients is divided into subgroups according to the diagnosis, the case numbers for certain age groups become too small for definite conclusions. But in the clinical sample described in the German test manual (n=5417) the subgroup of CHD patients (n=2385) was analyzed separately [35]. The inverted-u-shaped age effect was observed in the CHD subsample in a very similar way like in the total sample. Taking into account only age and sex subgroups with 10 or more subjects of the CHD patients, the maximum mean values were always found in the age range 50-59 years (anxiety, males; depression, males; depression, females) and 40-49 years (anxiety, females).

The sample of the general population consisted of persons living in private households, including healthy and ill persons, provided that they were able and willing to take part in the investigation. If the study had included subjects from old people's homes and hospitals, we could assume that the age dependency of anxiety and depression would probably have been even more pronounced.

A further reason for different age effects on anxiety and depression could be that a cardiologic disease has a stronger potential of threat for younger men than for older ones, for whom illness and health-related restrictions are more common than for younger men. Anxiety and depression are subjective categories, which are assessed on the basis of conscious or unconscious frames of reference which can change over time. One possible reason which may contribute to the anxiety and depression peak for patients between 50 and 60 years of age can be related to concerns or worries about their *professional situation*. In the age group of 60 years and above this problem is either solved (when the status of retirement is already reached), or the transition to the retirement status is not experienced as a threat, perhaps even as a relief. The high anxiety values for retired males in the age range below 60 years can indicate a dissatisfaction with the fact that their professional future has finished. The data of Table 3 support this assumption, at least for males. The non-significant results for the women should not be interpreted because of the relatively small sample sizes. The data given here for anxiety and depression in the general population can help to compare different groups of persons (e. g., unemployed vs. employed) even when the age and sex distributions in these groups are not identical. However, age effects must be handled carefully. The differences in the European studies mentioned here show that multiple studies with large sample sizes are needed to get a valid picture of the distribution of anxiety and depression, in patients and in the general population. Furthermore, even the large cross-sectional studies showed limitations when the focus is on the underlying mechanisms of the different effects. Longitudinal investigations are needed to understand the dynamic and adaptive character of concepts like anxiety and depression in the context of health and disease.

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