The Role of Age in Social Cognition:
Comparison of New, Middle-Aged and Elderly In Understanding Sarcasm

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Contents

Summary

This study aimed to examine the relationship of age - social cognition. The sample consisted of 72 people aged 20 to 82 years, divided into three age groups: the "Young Adults" (mean = 25 years, SD = 3.7 years), the "Middle-aged" (mean = 51.2 years, SD = 7.5 years) and "Senior" (mean =72.1 years, T.A. = 4.9 years). The three groups were equalized gender and educational level. Participants benefited from the Social Inference Test (Simple) [PCM (A). Social Inference (Minimal) - SI (M): Part 2 of the TASIT, McDonald, Flanagan, Rollins & Kinch, [1]], which examines whether the participant understands sarcasm and can distinguish it from honesty. In the older group further administered the test Short Cognitive Assessment (DSGE, Mini Mental State Examination, MMSE, Folstein, Folstein, & McHugh, [2], adapting the Greek population: Fountoulakis, Tsolaki, Chatzi & Kazis, [3]) and the Geriatric Depression Scale -15 (GKK-15, Geriatric Depression Scale-15, GDS-15, Yesavage, et al. [4], adapting the Greek population: Fountoulakis, Tsolaki, Iacovides, et al. [5]). The results for the elderly have shown that the lower the rating the DSGE and the higher the GKK-15, the lower the performance of the PCM (A). For the entire sample, the results showed that the age negatively associated with the ability to understand sarcasm and self-reported hypercholesterolemia is an aggravating factor in the above equation.

Keywords: Cognitive aging; Theory of Mind; Understanding sarcasm

Abstract

The present study aimed at investigating the association between age and social cognition. The sample consisted of 72 persons between 20 and 82 years of age, equally distributed to three age groups, the "Young Adults" (M = 25 years, SD = 3.7 years), the "Middle-aged Adults" (M = 51.2 years , SD = 7.5 years) and the "Older Adults" (M = 72.1 years, SD = 4.9 years). The three groups were matched according to gender and educational level. The participants were examined with the test "Social Inference (Minimal) - SI (M): Part 2 of the TASIT (McDonald, Flanagan, Rollins, & Kinch, [1])", which examines whether the participant understands sarcasm and is able to differentiate sarcasm from sincerity. Moreover, the Mini Mental State Examination - MMSE (MMSE, Folstein, Folstein, & McHugh,[2], Greek adaptation: Fountoulakis, Tsolaki, Chatzi & Kazis, [3]) and the Geriatric Depression Scale-15 (GDS-15, Yesavage, et al ., [4], Greek adaptation: Fountoulakis et al. [5]) were administered to older adults. The results for older adults showed that the lower the performance on the MMSE and the higher the performance on the GDS-15, the lower the performance on the SI (M). Concerning the whole sample, the results showed that age is negatively associated with sarcasm understanding, and self-reported hypercholesterolaemia plays an aggravating role in the aforementioned relation.

Import

Social cognition

The term social cognition is a fairly broad term, which is not well defined and clearly yet. According to the definitions of recoverable, social cognition is recognized as a factor that contributes significantly to the social functioning of individuals. In particular, the Brothers ([6], p. 28) defines social cognition as "cognitive subject and support social interactions, including the human ability to understand the intentions and moods of others". Similarly, the Adolphs ([7], p. 231) defines social cognition as "the ability to build intellectual constructs representations of the relationship between the self and others, and to use these flexibly representations in order to shape social behavior". The same definition appear to adopt and Green, Olivier, Crawley, Penn and Silverstein ([8] p. 882), defining social cognition as "cognitive subject of social interactions and include processes involved in perception, interpretation and production reactions, according to the intentions, beliefs and behaviors of others."

Therefore, the theory involves a close relationship between social cognition and social functioning, as well as the ability to properly process social stimuli is essential for social interactions (Couture, Penn, & Roberts, [9]). On the other hand, deficits in social cognition appear to be important factors contributing to the creation of dysfunctional behaviors (Green et al. [8]).

Lough et al. [10]. It has been suggested that social cognition makes people able to interact effectively in their social environment and specific deficits in social cognition will lead to erroneous social interpretations, unexpected / irrational reactions to others and ultimately to social withdrawal (Green et al. [8]).

The ambiguity with regard to the individual aspects of the concept of social cognition seems to be a problem. However, most experts agree that social cognition consists of individual capabilities, simpler, such as emotions recognition, and more complex, as the perception of social signals, the overall style causative yields one adopts and the Theory of Mind (ThtN) [8].

Theory of Mind (ThtN)

Awareness of self is one of the main characteristics that distinguish human beings from other species and children two years younger. The concept of "Theory of Mind" as a dimension of social cognition, introduced by Premack and Woodruff [11], in their efforts to investigate if this ability occurs in monkeys. Defined as the individual's ability to understand the mental processes of self and others as well as the beliefs and desires of others, and understand that these are likely to differ from its own. Characteristic and perhaps the first example test that examines the Theory of Mind is that of false belief test (false belief), which examines the understanding of the person that one can have false representation of external reality and act according to.

This representation (Baron-Cohen, Leslie, & Frith, [12]. Perner & Lang, [13]. Perner & Wimmer, [14]).

In developmental level, research conducted by Baron-Cohen and colleagues [12] showed that children with autism failed to ThtN tests, a finding associated with the inability of these children to give thoughts to others and predict their behavior. In view of such findings, the Allen Leslie [15] proposed the existence of a "Mind Theory Processor", while trying to combine, on the one hand, the evidence that autism is a specific cognitive disorder and, on the other, the information that there are certain biological abnormalities associated with this developmental disorder (Baron-Cohen et al. [12]). Besides pathology, the "normal" development of ThtN as formulated in the various stages of age, has also employ extensively the international literature. According to Angeleri and Airenti [16], children aged under five have the ability to understand jokes and often irony, while the full understanding of irony lies in early childhood and seems to have a direct relationship with language development. The research carried out by Dumontheil, Apperly and Blakemore [17] showed that children aged seven to fourteen years is not marked differences in their performance on tests ThtN while teenagers made more errors than adults. These results highlight the possibility of improving theory of mind in adulthood.

Modern literature has dealt with the Theory of Mind in the elderly. Basic question of many investigations is whether that the abilities based on other cognitive skills, such as information processing and cognitive control, as well as whether any discount abilities ThtN reflects discount on metacognitive abilities of the individual. Alternatively, from very recent investigations alleging that the Mind Theory skills may be banked somehow as accumulated knowledge (crystallized intelligence) so as to be associated with a kind of wisdom, with increasing age (Duval et al. [18] & Moran, [19]).

Specifically, the first study examined the theory in Mind "Normal" aging, he suggested that performance on cognitive tests with content processing does not require Theory of Mind, decreases with increasing age but remains intact or even improve, with regard to tests requiring ThtN (Happe, Winner, & Brownell, [20]). However, very recent research by Moran [19], skills ThtN seemed to suffer a discount, with increasing age, and this reduction was related, at least partially, with discount on executive functions and flowing but not in crystallized intelligence. It also appeared that the elderly who showed performance similar to those of young people themselves conspicuous in hedging strategies, although they showed off the capabilities ThtN. The same results reached and investigation of Rakoczy, Harder-Kasten and Sturm [21], in which the superiority of the new ThtN, compared with older, appeared to be associated with reduction in executive functions and processing speed of the latter. However, another study conducted in young, middle-aged and elderly, demonstrated excellence in new false belief test (false belief), regardless of language ability, the executive functions, processing speed and memory. It

was found, namely, that the Theory of Mind deteriorates with the passage of time, regardless of changes occurring in cognitive functions with the end of the age (Bernstein, Thornton, & Sommerville, [22]). The export different results from existing research merits further discussion and investigation on the matter, in order to propose clearer and safest places on the nature and the lifelong changes in Mind Theory. In this light, the following theoretical modules, presented the most important cognitive and affective changes that occur in the elderly, as recorded by experimental studies and neuropsychological studies.

Cognitive aging: Dimensions of "gignoskein" hit the light of changing age, underlying brain changes and "vascular Case cognitive aging '

In "World Assembly of Ageing", held in 1982 in Vienna, following a decision of the General Assembly of the UN, the age of 60 was considered as the chronological limit for the "introduction" of people in old age. However, most of Gerontology and giropsychologoi perceive as relevant limit the age of 65 years. Indeed, because of the rapid increase in life expectancy and the number of elderly in the world, preferred the separation of people over 65 years in distinct age groups (eg, elderly, elders, centenarians), arguing that the various problems health incurred significantly vary, depending on the progress of age (Greek National Committee for the World Age Convention, 1982 in Kostaridis - Euclid, [23]).

Beyond the physical changes, the elderly show changes that have to do with the functioning of the cognitive system, ie the system, which is responsible for the creation and use of knowledge. This system is based on the brain and is responsible for the cognitive functions of perception, learning / memory and thinking (Kostaridis - Euclid, [23]). In relation to age, there is no consensus on the degree and the universal nature of cognitive impairment as a result of normal aging, as it is generally accepted that many cognitive abilities remain relatively intact (Kostaridis - Euclid, [23]. Moraitou & Efklides, [24]). Many of the problems faced by elderly -as problems with memory; and considered that are inevitable consequences of the process of aging may be due to secondary and exogenous factors, such as depression, inactivity or the side effects of prescription drugs. Indeed, even when fading occurs in cognitive functions, place hedges, so that impairment has little impact on the daily lives of older people (Salthouse, [25]).

On the other hand, a well-documented negative change, which takes place in old age, is the reduction of information processing speed. This reduction leads to an increase in reaction time when a person is confronted with the solution of a problem, making a decision or execution of a transaction (Kostaridis - Euclid, [23]). The slowing of information processing may be due to difficulty of process attention, showing the elderly compared with young people in difficulty inhibiting irrelevant information, and the difficulty sharing attention between two or more projects simultaneously. Thus, older people need more time to watch an information

to decide which data should contain and what not, and to reach a decision.

Another function that is affected by the passage of age and has been studied thoroughly, perhaps more than any inter- is memory. Research shows that working memory and the memory episodes are those susceptible to higher discount in the elderly compared to semantic and implicit memory, which seems to remain relatively intact with age (Kostaridis - Euclid, [23]. Peters, [26]). H low performance on the working memory tasks appear directly linked to the difficulty of the elderly in encoding and in-depth processing of information and the difficulty inhibiting disruptive stimuli (Kostaridis - Euclid, [23]). Regarding the events memory, the information on this event is recorded in memory along with its frame of reference, where, when, how. The difficulty of the elderly compared with younger adults to recall the frame, located mainly when work requires conscious learning and recall effort (Riddle, [27]).

On a more general level, the intelligence -which is essentially identical to the

"Gignoskein" - psychology lifelong cognitive development and aging distinguished in flowing and crystallized intelligence. The flowable intelligence has to do with developing new, unfamiliar information, and has a biological background, while crystallized intelligence reflects the knowledge and the experience acquired by the person in life. The flowable intelligence increases up to about 20 years, and thereafter tends consistently and relatively rapidly be reduced. In contrast, the crystallized intelligence increases with age, until after 60 years, while exhibiting relatively slow off after 80 years "(Kostaridis - Euclid, [23]. Moraitou & Efklides, [24]).

From the perspective of cognitive neuroscience of aging, the number of inquiries has increased noticeably in recent years. Most of these studies have found many similarities in the patterns of brain activity in young and older adults, demonstrating that the basic neural mechanisms are maintained with the passage of age. Despite the general similarities, however, older adults often show decreased brain activity in certain regions, such as medial temporal regions in visual areas (Grady, [28]). It is clear that age-related declines in cognitive function may be associated, at least in part, these decreases in brain activity. On the other hand, it is noteworthy that there is increased activity in some regions of the brain of the elderly, compared to younger subjects such as the ventral and dorsal prefrontal cortex, in mnemonic processing, or the frontal and parietal regions, when the elderly brain deals with complex cognitive tasks (Grady, [28]). This can be interpreted as the conscription of the aging brain additional brain regions in order to compensate for the decreased activity of the default support regions' gignoskein »(Grady, [28]. Kryla-Lighthall & Mather, [29]).

At an even deeper level, they have been several theories about the factors that might underlie cognitive changes and the corresponding changes in the structure and brain

function, with age (see. For a summary Hofer & Alwin, [30]). The most obvious factor is the state of health, which decreases with age, is often bent. With the prevailing theoretical approach that links it to the cognitive aging in health, therefore, is known as "Vascular hypothesis (vascular hypothesis)» (Anstey, [31]. Spiro & Brady, [32]). According to this, the main risk factors for the development of vascular diseases such as hypertension, hypercholesterolemia and diabetes, affecting in cognitive functions that are supported by the frontal cerebral system, such as, for example, the working memory (Elias, Elias, D ' Agostino, Sullivan, & Wolf, [33]. Okusaga et al. [34]). As age passes, increases the probability of biomarkers they get pathological values, and therefore, cognitive aging could substantially be interpreted broadly to underlying cardiovascular pathology and damage it causes to the brain.

In support of the "vascular hypothesis', research Kivipelto and colleagues [35] found a direct relationship between high cholesterol and blood pressure in middle age and the appearance of mild cognitive impairment in old age.

Known long habits and situations that act cumulatively for the occurrence of cardiovascular pathology, with age, are smoking, physical inactivity and obesity. Smoking induces morbidity of heart and blood vessels via several mechanisms, causes vasoconstriction and cholesterol production, which promotes atherosclerosis (Okusaga et al. [34]. Panza et al. [36]). On the other, physical exercise is associated with longevity. Even in old age, can contribute significantly to reducing the risk of developing coronary heart disease, onset of diabetes mellitus, hypertension and obesity. It also helps to reduce anxiety and depression and improves the lipid profile (Lautenschlager et al. [37]). Conversely, obesity is a serious risk of developing cardiovascular disease agent and a major risk factor for diabetes, hypertension, hyperlipemia and metabolic syndrome (Okusaga et al. [34]. Panza et al. [36]).

Apart from relating to the age of the changes in health and in the structure and function of the brain, both the cognitive decline and changes in ThtN, age light of changing, they could be explained also under thymic factors such as senile depression.

Depression in old age

While the dominant perception among the public wants seniors presented helpless, lonely and subdued, modern literature seem to support the improvement of emotional experience, age light of changing. Recent survey results contradict the established view of the negative thymic governing old age, emphasizing the superiority of the positive mood. Research shows that the presence of clinical features, including depression, anxiety disorders and dysthymia, are now more common in young adults than in the elderly (see. Moraitou & Papantoniou, [38], Moraitou, Papantoniou, Gkinopoulos, & Nigritinou, [39]).

Leading theory in the field of lifelong thymic development is the theory of socio-emotional selectivity (Carstensen, Fung,

& Charles, [40]). According to this theory, when people are moving away from the idea of "Unlimited lifetime" and realize that the lifetime decreases left them redefine their priorities, set short-term goals and focus on the emotional well-being of this. In light of this theory, aging is associated with increased motivation for emotional balance, so the person changes the way we see and treat its problems, led to different socio- emotional choices, while at the same time changes the way cognitive processes positive and negative information (Carstensen et al. [40]. Moraitou & Efklides, [41]).

However, there are factors that are likely to halt or even reverse the positive emotional old age, such as depression. While, in the case of positive mood, the person looks and constantly finds motives for action and satisfaction in the case of existence of depressive symptoms or depression, the person loses interest and motivation to act and be active, and focuses on the negative side things around him. Number of studies have dealt with the relationship between depression and cognitive impairment. Indicatively, longitudinal survey showed that the presence of high levels of depressive symptoms include a strong risk of cognitive decline after some years (Paterniti, Verdier-Taillefer, Dufouil, & Alperovitch, [42]). According to research of Thomas and O'Brien [43], the neurocognitive damage continues to exist in the elderly with depression and even after treatment, a fact confirmed by the low processing speed information, discount on executive functions, and vascular risk factors as they emerge and are measured in solving cognitive works (Thomas & O'Brien, [43]). Conversely, research Beaudreau and O 'Hara on the relationship of anxiety and depressive symptoms with cognitive performance in the elderly showed that with increased anxiety participants showed poor performance in processing speed projects, alternating attention and intelligence suspension, while depressive symptoms alone their not associated with cognitive decline. Also, although the coexistence of anxiety and depressive symptoms was associated with cognitive deficits in three areas (attention, memory, verbal fluency), deficits in inhibition information associated only with the presence of anxiety (Beaudreau & O 'Hara, [44]). Finally, the presence of depressive symptoms seem to reduce the incentives for action and attention, thus resulting in reduced performance in social cognition works (Fredricson & Branigan, [45]).

This research

Based on the theoretical framework presented, in particular, given the multifaceted nature of ThtN and the ambiguity that exists on the basis of existing research on the role of age on ThtN, this research was designed to contribute to the investigation of relationship of age to ThtN. To achieve this objective, age measured as "aged" group variable that had three levels: "Young Adults", "Middle-aged" and "Elderly". The tested as ability to understand the 'indirect speech', particularly as the ability to understand sarcasm and diversification of the honesty. The choice to study this dimension based because, on the one hand there is little research on the ability of "indirect speech understanding"

in adulthood, while, on the other, the "indirect discourse" dominates everyday interactions when people joke, use transport or speak sarcasm and irony (Harada et al. [46]).

The irony and sarcasm, which is a more caustic form is verbal reports are used in order to impart negative emotions in a roundabout way. The indirect meaning arises because there is a conflict between the real significance of the words and what is suited to the particular social circumstances (Channon, Pellijeff, & Rule, [47]). The ability to understand the various forms of 'indirect speech' is a basic social cognition ability and deficits in this lead to difficulties in communication (Winner, Brownell, Happé, Blum, & Pincus, [48]). To understand the "indirect speech" must (a) to understand the intent of the speaker, (b) to understand why semantically and syntactically, and (c) to process non-verbal information (such as intonation and expressions person) and the frame information (Shany-Ur et al. [49]). According to the Winner [50], the understanding of "indirect speech" takes place in three stages. The first step is carried out by detection of the literal intent of the speaker. The second stage involves the detection of the relationship between what was said and what is implied. In the third stage it should be understood what the speaker means, ie to draw conclusions about the "message" that wants to express. In the perception of 'indirect speech', for going beyond the literal meaning of what was said, you must understand, beyond the intentions of the speaker, and other mental state, such as beliefs and feelings (Martín -Rodríguez & León-Carrión, [51]. Shibata, Toyomura, Itoh, & Abe, [52]). In particular, to understand sarcasm required representation of the speaker's beliefs, not to pin down what was said as wrong (Shamay-Tsoory, Tomer, & Aharon-Peretz, [53]). Still, to understand the intentions of the speaker, one to represent the beliefs that the speaker has for the listener. Proper representation of these intentions contributes to not misinterpreted as sarcasm lie (Dews & Winner, [54]. Shamay-Tsoory et al. [53]. Winner & Leekman, [55]).

Considering the requirements for successful understanding of sarcasm, as described above, the first case of this study was that the three groups of age will differ in their ability to understand sarcasm and distinguishing by sincerity, the elderly show the lowest performance of the relevant work and young adults the highest (Case 1).

Since the effect of age on the "gignoskein 'can at least partially be explained by the increasing incidence of risk factors for developing cardiovascular disease, age light of changing, according to the second case in the present study, self-reported diagnosis of hypercholesterolemia will commonly found elderly compared to middle-aged and middle-aged, compared to young adult (Case 2). Apart from the self-reported diagnosis of hypercholesterolemia directly associated with reduced ability to understand sarcasm, because of the possible effects of hypercholesterolemia on the cardiovascular system and, through it, the brain structures that support social "gignoskein 'relationship with age (case 2b).

Regarding only the group of elderly, under the theoretical framework, it was expected that the general cognitive ability will be positively associated with the ability to understand sarcasm (Case 3). On the other, it was expected that the number of depressive symptoms negatively associated with both general cognitive ability (Case 4), and with the ability to understand sarcasm (Case 4b).

Method

Participants

The sample recommended 72 people, 36 women (50%) and 36 men (50%) aged 20-82 years. Sampling took place in Thessaloniki and Florina. Participants were divided into three groups of twenty-four persons depending on their age. The three groups were equalized gender and educational level. In the group of Young Adults (1) were aged 20-35 years (M.O.I. = 25 years, SD = 3.7 years). In the middle-aged group (2) were aged 36-63 years (M.O.I. = 51.2 years, SD = 7.5 years). The Elderly group (3) included participants aged 66-82 years (M.O.I. = 72.1 years, SD = 4.9 years). The 24 participants in each age group were divided according to their educational level in three sub-groups of eight people, depending on their years of training: a) Low Educational Level: 0-9 years Education (n1 = 8, n2 = 8, n3 = 8) b) Average educational Level: 10-12 years of education (n1 = 8, n2 = 8, n3 = 8), and c) highly educated: 13 years of education or more, at university or TEI (n1 = 8, n2 = 8, n3 = 8). Therefore, in each age group was represented by the same number of participants low, average and high educational level. Moreover, in each subset according to the educational level, they included four women and four men. Thus, the sample of 72 subjects were equally divided into three groups of age (n1 = 24, n2 = 24, n3 = 24), each of which was divided into three subgroups of eight people depending on the educational level, and at each of these subgroups equally represented the male and female gender.

With regard to the related to cardiovascular pathology, self mentioned biomarkers, only 6 people (8.3%) reported that they had diabetes, 19 (26.4%) of hypertension, while 25 (34.7%) reported that diagnosed with hypercholesterolemia, as opposed to the remaining 47 (65.3%).

About other characteristics and habits reported by the participants, 33 of the total of participants (45.8%) were engaged in some form of exercise at least three times a week, while 39 (54.2%) do not. For daily alcohol consumption and obesity negatively responded 91.7% and 72.2% of participants, respectively. The 44 (61.1%) participants smoked, while 28 (38.9%) do not. Almost all were living in urban areas (90.3%).

Note that in terms of the Elderly group, were used as exclusion criteria for potential participants with depression and dementia symptoms, Abridged Geriatric Depression Scale (GKK-15, Geriatric Depression Scale-15, GDS-15, Yesavage, et al. [4], adapting the Greek population: Fountoulakis, Tsolaki, Iacovides, et al. [5]) and the Test

Short Cognitive Assessment (DSGE, Mini Mental State Examination, MMSE, Folstein, Folstein, & McHugh, [2], adapting the Greek population: Fountoulakis , Tsolaki, Chatzi & Kazis, [3]), respectively. So elderly with scores> 6 on GKK-15 and older with a score <27 (strict criterionexclusion) in DSGE were excluded from the sample of this research. At this point it should be emphasized that both tools are not only used as exclusion criteria as well as the main tools of this study, in terms of the Elderly group. Thus, information on the performance of that group to them are given below. Regarding the total survey sample, there was no other exclusion criteria, except diagnostic existence of serious neurological or psychiatric illness and addiction.

Tools

Social Inference Test (Simple) [PCM (A). Social Inference (Minimal) - SI (M): Part 2 of The Awareness of Social Inference Test - TASIT, McDonald, Flanagan, Rollins, & Kinch, [1]]

The array TASIT test is a clinical tool that was constructed to assess the social perception after traumatic brain injury (McDonald et al. [1]). It includes videotaped scenes from everyday reality and consists of three parts with different form. The first part / test (TASIT-Part 1: Emotion Evaluation Test - EET) examines the recognition of basic emotions. The other two parts / tests of TASIT [TASIT-Part 2: Social Inference (Minimal) - SI (M) and TASIT-Part 3: Social Inference (Enriched) - SI (E)] relating to social inference and examine the ability of viewer and listener to determine intent, mood and meaning of the speaker's words. The determination of these elements is based on the Theory of Mind and capabilities of the person associated with it. For the purpose of this study was used in the second part / test TASIT.

In the second part [Social Inference Test (Simple) - PCM (A). Social Inference (Minimal) - SI (M)], the viewer - listener, based on emotional expressions and paraglossikes indications of the speaker, is called to recognize the speaker's intentions with regard to the message you want to metadoseikathefora. Eidikotera, parousiazontaidyovasikes forms of conciliation, which cover three different occasions:

a) Sincere Dealings

In honest dealings, the objective omilitis- really means what it says, that is the reason, expressions and signs paraglossikes match.

Honest Conciliation Example

-Michael: Sorry, I can not do the course I said I would do Friday.

-Maria (Sincerely): Never mind, I know you're busy. Do not worry.

b) Sarcastic Dealings

On sarcastic dealings, one of the speakers means the opposite of what it says, and wants the interlocutor to understand the true meaning of his sayings. Uses, ie, "other words" to say what he really wants to transfer to the interlocutor. There are two kinds of sarcastic conciliation presented: the dealings simple sarcasm and dealings paradox sarcasm.

In the case of simple sarcasm, one of the participants is sarcastic, but only if "read" the viewer - listener expressions and paraglossikes indications may perceive sarcasm. That is, the reason alone is not sufficient to understand the expression, as the dialogue in these scenes is similar to the dialogue in "honest" scenes. It is, therefore, the codification of extraverbal behavior.

Example Conciliation Plain sarcasm

-Michael: Sorry, I can not do the course I said I would do Friday.

-Maria (Sarcastically): Never mind, I know you're busy. Do not worry.

In this case, it is likely the viewer - listener would not be able to distinguish sarcasm, "read" the scene as sincere and misinterpreted both the intent of the speaker and the meaning of his sayings.

In paradox sarcasm, dialogue between the speakers is meaningless unless "read" by the viewer - listener as sarcastic. Otherwise, the viewer - listener will not understand the reason or will seem strange dialogue, incoherent and meaningless.

Example Conciliation paradox sarcasm

-Giorgos: Are you sure you have your passport?

-Kostas (Sarcastically): Oh, I tore it up and threw it in the trash.

-Giorgos: Well, everything is all right, then!

In PCM (A) the participant monitors in 15 scenes video - professional actors dialogues, which simulate conditions of "everyday" reality, for 20-60 each. In 5 scenes expressed sincerity. In another 5 expressed simple sarcasm and 5 paradoxical sarcasm. The videos are presented in pseudo-randomized series of participants and to provide feedback. After the end of each video, participants are asked to answer four questions about a) the emotions, b) beliefs, c) intentions and d) the meaning of the so-called speaker. Questions participants respond with "yes", "no", "do not know" (3 possible choices). The examiner records the answers to specific scoring form. In rating of the PCM (A), assessing the overall ability to recognize the sincerity and sarcasm by category (honesty, simple and paradoxical sarcasm) and per condition (emotions, intentions, beliefs and meaning). Additionally, the total score throughout the test. The score for each class can range from 0 to 20 (when the participant answered correctly and credited with one degree of each question by four for each of the five video

category). Similarly, the score per condition can range from 0 to 15. In this study, however, only used the total score in DSS (A), which may range from 0 to 60.

The literal instructions given to the participants are: "I will now watch a few short scenes. Each lasts from 20 to 60. Please carefully view each scene. After the show, you will need to answer four simple questions. For each question, just say "yes" or "no" or "I do not know". If you really can not decide if the answer is "yes"or "no", say "do not know" but try as you can, answer "yes" or "no". The test starts with a training stage - example, which is not provided any type of feedback.

In this study, the videos presented to the participants via a computer screen. However, an amendment was made the presentation as the PCM (A) is speaking the English language. For this reason, the dialogues originally translated in Greek language and then again in English and again in Greek by two specialists. Presented to the participants via cards with large font.

The procedure was as follows: initially, was reading the dialogue by the examiner with a neutral tone of voice, and then read by the participant. Then presented the corresponding video - scene. Note that in the video the actors speak in English. Not retained build process, it was considered that it would be extremely difficult to attribute precisely the paralinguistic signals. The participant were instructed that we have in front of the card with the dialogue and will be able to consult it again after the end of each video. This amendment was intended to avoid difficulties in the participants' performance, which would be due to difficulty of participants to withdraw their dialogues (mnemonic function).

The validity of the PCM (A) was studied by comparing people with deficits in understanding sarcasm, and standard population. Specifically, people performance compared with traumatic brain injury (TBI) and the typical population. The results have shown that people with TBI showed significantly lower performance in the understanding of sarcasm and total count compared to a typical sample group (McDonald et al. [56]). However, no differences were observed between the groups for the condition of honesty. Regarding the reliability of the test, tested in repeat measurements of this and correlations with similar tools (r = .88 And r = .64, respectively). The coherence of the tool, which has been found satisfactory, Cronbach's a = .84, and the validity of the factorial structure in Greek adult population was tested by Panza [36].

Test Short Cognitive Assessment (DSGE, Mini Mental State Examination, MMSE, Folstein et al. [2], adapting the Greek population: Fountoulakis, et al. [3])

The DSGE is the most common tool used worldwide to evaluate the general cognition in elderly (Ramirez, Teresi, Holmes, Gurland, & Lantigua, [57]. Shigemori, Ohgi,

Okuyama, Shimura, & Schneider, [58]). Kataskefastike by Folstein and his colleagues in [2] in order to assess the cognitive decline and diversify its pseudo-dementia really organic brain syndromes (Folstein, Robins, & Helzer, [59]). It can be used by clinicians to help diagnose dementia and to evaluate the progress and severity of the disease (Schulz- Larsen, Kreinerc, & Lomholta, [60]). It is a series of questions and tests, each of which is credited with a unit if answered correctly. The maximum total score that can be gathered the subject is 30 points. It measures memory, attention, orientation, language and praxis. Generally, score 23 to 24 correct answers is considered the critical threshold score for the diagnosis of dementia in Greece, with 90.80% sensitivity, 90.60% accuracy and positive predictive value of 92.94% (Fountoulakis, et al. [3]). This tool can be used to assess the cognitive changes that occur in a person who has just been diagnosed with dementia. May give clues to the severity of symptoms and disease expansion speed. On average, patients with Crohn Alzheimer not receiving any treatment lose two to five degrees in DSGE annually (Schulz- Larsen et al. [60]).

The DSGE presents high levels of reliability, validity, sensitivity, accuracy and predictive value in the measurements over time at global scope (Mitchell, [61]. Morales, Flowers, Gutierrez, Kleinman, & Teresi, [62]. The 'Connor et al. [63] . Ramirez et al. [57]).

Geriatric Depression Scale - 15 (GKK-15, Geriatric Depression Scale- 15, GDS-15, Yesavage et al. [4], adaptation ston Greek population: Fountoulakis et al. [5])

While there are many available depression measurement tools, the Geriatric Depression Scale (GKK), built by Yesavage and his colleagues in [4], extensively used in the elderly. The full form GKK is a questionnaire consisting of 30 questions, in which subjects are asked to respond with "yes" or "no" on their mood last week (Sheikh & Yesavage, [64]). The abbreviated form (GKK-15) was built in 1986 and consists of 15 to 30 questions GKK full form. These questions were selected because of the high correlation with depressive symptoms in the previous investigations. Of the 15 questions, the 10 indicating the presence of depressive symptoms when answered positively, while the other five state depressive symptomatology, if answered in the negative. The average of the mold filling time is about 5-7, making it ideal for people who tire easily and are unable to gather a long time. The questions require only one type of answer YES / NO and therefore, is a scale with easy application. It focuses mainly on mental concerns of the patient and how the quality perception of life, avoiding questions about physical complaints, while not.

It contains proposals for stimulating estimate or psychotic behavior (Fountoulakis et al. [5]). The score of 0-4 is considered normal, taking into account age, education and patient dissatisfaction. For the Greek population, the score 6-7 to GKK-15 was found to be the best diagnostic

threshold, sensitivity 92.23% and specificity 95.24%. The scale also shows high internal consistency with Cronbach's index alpha = .94. The exploratory factor analysis revealed four factors, a knowledge, a relating to emotion, one that relates to social isolation and functionality of the individual and one addressed to the helpless and frightened for the future ((Fountoulakis et al. [5]).

More generally, GKK-15 shows high validity and reliability, which is supported by both clinical practice and from literature (Yesavage et al. [4]). In a survey conducted by the Sheikh and Yesavage [64], comparing the GKK-15 to the GKK full form, both tools were presented equally able to differentiate depressed patients than non depressed, with high correlation index, r = .84. H research Almeida and Almeida [65] was an attempt to calculate the validity of GKK-15 for the detection of major depressive episode, according to the diagnostic criteria, as listed in ICD-10 and DSM-VI. The survey results show that the score of 4-5 points, the sensitivity and specificity were at 92.7% and 65% respectively,where the evaluation criteria was based on the ICD-10, while similar proportions occurred and the using diagnostic criteria based on DSM-VI, with the sensitivity to be 97.0% and the specificity to 54.8% (Almeida & Almeida, [65]). Another study conducted in a large sample Asia population for the reliability and validity of GKK - 15 exported similar results, indicating the scope of this tool and its utility in different cultures. Indicatively, the internal consistency Cronbach's alpha index was .80, and the reliability between raters was .94 and the retest reliability .83 (Nyunt, Fones, & Niti, [66]).

In conclusion, GKK-15 is a widely used scale worldwide for estimating elderly depression. even developed a version for use by phone and version completed by a relative or someone who has the patient's responsibility. It is essential tool in clinical practice ((Fountoulakis et al. [5]).

Procedure

This survey was conducted over 6 months. The evaluation of the participants was held in individual meetings, in a quiet environment, suitable for administering the tests. The total delivery time averaged 30, and the required tests turnaround time depended largely on the speed of the participants themselves in understanding and completing the tests. Participation was voluntary and all participants were informed from the start, signing information form and written consent to participate in research. They made clear that they could withdraw from the study at any time, and that both their personal details and the answers would give is confidential, protected by confidentiality and will only be used for the purposes of this study. Followed by the form filling for individually - demographics and biomarkers associated with cardiovascular pathology (for detailed presentation, see. "Participants"). Where possible older participants were administered the complementary GKK-15 and DSGE. The remaining participants went through to the final, common for all participants, test examination

understanding sarcasm - PCM (A).

Aged sample

With regard to the sample of aged, Table 1&2 shows the M.O. score and SD for DSGE and GKK-15. It is noted that all scores in DSGE was above dementia diagnosis limit (<23-24), and all scores at GKK-15 was below the limit (> 6) depression diagnosis in Greek population.

Table 1: Average (mean) and standard deviation (SD) of the total score in DSS (A) for each age group.

	N	Minimum	Maximum	MO	SD
Young Adults	24	37	56	49.6	4.3
Middle Aged	24	31	56	46.5	5.7
Elderly	24	28	46	37.2	5.9

Table 2: Average (mean) and standard deviation (SD) scores on the Short Test of Cognitive Assessment (DSGE) and Geriatric Depression Scale - 15 (GKK-15), for the group of Seniors.

	N	Minimum	Maximum	MO	SD
DSGE	24	27	30	28.9	1.0
GKK-15	24	1	4	2.2	1.0

For processing the data collected for the group of elderly, analysis routes used to test the relationship between general cognitive ability (DSGE), the number of depressive symptoms (GKK-15) and in understanding sarcasm [PCM (A.)]. Note that due to bending, the statistical procedure used (Robust procedure) for processing the data in this case, gives a good fit to the Index Satorra-Bentler ch² (Bentler, 2006) instead of the classical ch² index.

The route model (Model B) confirmed, had excellent fit to the data: Satorra-Bentler X2 (1) = .68, p = .41, CFI = 1.00, and RMSEA = .00 (90% CI: .00 - .50). Under Model B, the DSGE significant positive impact on the PCM (A), and hence, the higher the level of general cognitive ability, the higher the level of sarcasm comprehensibility. It is worth noting that as the DSGE used as rigorous participants exclusion criterion (see. "Participants), all ratings in DSGE were high. However, even the slightest difference between the scores in DSGE found to influence the score in DSS (A).

Also, performance in the Geriatric Depression Scale - 15 (GKK-15) appeared to correlate negatively with moderate performance in DSGE but not the performance on PCM (A). This shows that the existence of even a minimal number of depressive symptoms may be directly linked to reduced cognitive ability in elderly but not impaired social cognition ability to understand sarcasm (Figure 1).
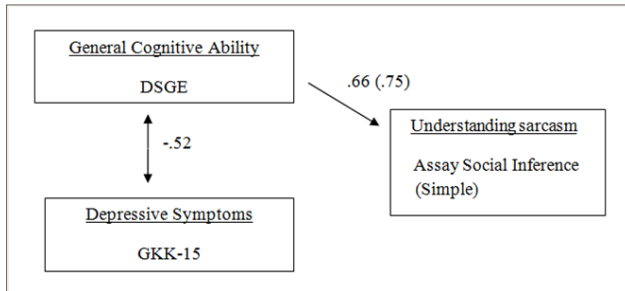
Figure 1: Model runs (Model B) for the sample of the elderly, which examines the relationship between performance in DSGE at GKK-15, and PCM (A). All relationships shown in Figure is significant at the level: p <.05. The measurement error is given in parenthesis.

Discussion

Relationships age - hypercholesterolemia - understanding capacity sarcasm

The present study aimed to examine the relationship of age with social cognition. For this reason, a test that examines Theory of Mind, and in particular, the ability to understand sarcasm, administered to young adults, middle-aged and elderly, equalized gender and level of education. The survey results confirm the basic case (Case 1), according to which three groups of age will differ in the ability to understand sarcasm and distinguishing by sincerity, with seniors with the lowest performance in the Project concerned and young adults are the highest.

The ability to understand sarcasm is part of the broader comprehension of 'indirect speech', which first appears around the age of six eos eight years (Winner & Leekam, [55]), ie relatively late, compared with the other skills of social cognition. According to the findings of Nazlidou [67] for an understanding of "indirect speech", all adults, from youth to old age, seem to find it difficult to properly convey the intent of the speaker and understand what form of 'indirect speech' (p .g., irony, humor, sarcasm simple, paradoxical sarcasm) is expressed. More specifically, the Nazlidou found that among the three forms of indirect speech which she examined (humor, irony, sarcasm) adult subjects experienced difficulties both in intent performance for irony and intent to return for sarcasm. Indeed, their greatest difficulty detected in the understanding of sarcasm, as the intention of the speaker to the listener sneered correctly assigned by a very small proportion of participants in the study, and a large proportion were found to sarcasm confused with irony. In conclusion, the Nazlidou [67] found that adults recognize the 'indirect discourse "in a first level of distinguishing the veracity or falsehood, but have difficulties in understanding the performance of various types of" indirect speech "expressed. It seems, then, that understanding sarcasm, at least as distinguishing it from the humor, especially irony is anyway difficult for people of all her adult life spectrum. This study, however, shows that, with the passage of age, it becomes even more difficult.

And because the work test this capacity in the case of this study, it requires only a first level discrimination sarcasm from sincerity and seems to be much less demanding than the corresponding projects Nazlidou [67], showing how the progress of age -and mainly in giras- presents deficits even this primitive ability to distinguish the "indirect" the literal word.

According to the literature, age seems to affect the ability of the 'indirect' comprehension indirectly through cognitive control (see. Nazlidou, [67]). Specifically, Nazlidou found that the ability to understand the "indirect speech" requires a high hierarchy cognitive ability, capacity planning - planning, supported by frontal brain regions, extremely sensitive to the aging process (see., And Carlson, Moses, & Claxton, [68]). Indeed, methods of neuroimaging findings demonstrate that both skills (understanding 'indirect speech' and "Design") supported by the function of the frontal lobe. specifically, when processing the "indirect speech" has been found mainly activated the medial frontal and medial orbitofrontal cortex, structures of the temporal lobe and posterior frontal gyrus (Bartolo, Benuzzi, Nocetti, Baraldi, & Nichelli, [69]. Rankin et al. [70]. Shany-Ur et al. [49]). These areas include activated and design (Lazeron et al. [71]), the exercise inhibitory control (Rubia et al. [72]), and during operation of the working memory (Cohen et al. [73]).

In addition, while older models have suggested that in order to interpret the 'Indirect speech', initially handle the literal meaning of what was said, and the performance of non-literal meaning performed in the second stage, according to more recent theoretical models, the processing of literal and non-literal meaning of 'indirect speech' is performed in parallel (eg, Champagne, Desautels, & Joanette, [74].

Gernsbacher, Keysar, Robertson, & Werner, [75]). In the latter case (parallel processing) requires exercise inhibitory control in order to effect suppression of literal interpretation to afford indirect sense (Monetta, Grindrod, & Pell, [76]). Moreover, the working memory interact with the treatment of complex speech, as is the "indirect", as in the processing of required juggling different information (Monetta, Grindrod, & Pell, [77]).

Therefore, the negative effect of age has the ability to understand sarcasm, which was found in this study can be interpreted by both the degeneration of brain regions that support this ability and cognitive skills that the assist, and under the high demands in cognitive control, to receive the parallel processing literal and non-literal sense, in the understanding of 'indirect speech'.

In support of the view that the degeneration of supporting brain regions may explain the reduction of sarcasm understanding capacity in older people, acts and finding that hypercholesterolemia is associated with the age group (Case 2). This may mean that the high levels of cholesterol are charged to the way they affect the increasing age of the understanding of sarcasm, through their contribution to the

development of cardiovascular pathology, which, in turn, negatively affect the oxygenation of the brain (see. Hofer & Alwin, [30]).

However, beyond the theoretical framework of "vascular hypothesis of cognitive aging" (see. Hofer & Alwin, [30]), the findings of the literature concerning the role of cholesterol in the cognitive decline is least confusing and contradictory. Epidemiological studies have come to different results, depending on whether the cholesterol levels were measured in middle age or later in a person's life. Research of Panza and colleagues [36] showed that high cholesterol levels in middle age is a risk factor for Alzheimer's disease in old age. Another study found that elevated levels of systolic blood pressure and hypercholesterolemia in middle age associated with increased risk of Alzheimer's disease and mild cognitive impairment in later life (Kivipelto, et al. [35]). However, research Okusaga and associates (2012) reached a different result: through a series of cognitive tests were administered to the elderly, do not find any effect of hypercholesterolemia on cognition. Moreover, very lacking the literature and research on the direct effect of hypercholesterolemia in social cognition. In this study, this was not confirmed (Case 2b), perhaps indicating that social cognition abilities and the Theory of Mind, due to the "everyday" experience, is relatively resistant against the risk factors of vascular pathology appearance and their effects on "gignoskein" . These factors appear to be, however, affect those with some indirect way, that is, through their contribution to the disorganization of the high hierarchy of cognitive skills.

General cognitive relations - depressive symptoms -ability to understand sarcasm, elderly

Examination of the relationship of the general cognition (DSGE) with the ability to understand sarcasm, sampled elderly confirmed the hypothesis that the cognitive ability of positive influence on social cognition as understanding of sarcasm (Case 3). This finding comes enhance the interpretations of the effect of age on social cognition, mentioned above.

In a meta-analysis of Henry, Phillips, Ruffman and Bailey [78], shows a consistent picture of the deficits of the elderly in social cognition tests and interconnecting them with cognitive skills. More specifically, the findings of these investigations indicate that the elderly have deficits in their performance in Theory of Mind tests, which rendered partially or wholly in other cognitive functions, such as executive functions and information processing speed. Of course, it is worth noting that according to these surveys, the deficits presented by the elderly in visual projects with dynamic stimuli (such as that used in the present work) appears to be relatively independent of other cognitive deficits. However, as beyond the deficits have been confirmed in the Mind Theory assays, it has been found

that older exhibit lower performance and a corresponding control assays not requiring ThtN (e.g., Keightley et al. [79]. Slessor et al. [80]), seems to reinforce the view that a good background cognition, high and low hierarchy, need to support social cognition, at least in the elderly.

Furthermore, the results of this study showed that only some depressive symptoms are able to decrease the general cognitive ability (Case 4). This view also support findings from other studies, according to which the existence of depressive symptoms reduces incentives for action and attention (Fredricson & Branigan, [45]), leading, and reduced performance in social cognition works. Research for switching from "Normal cognitive aging" to "Mild Cognitive Impairment" tends to support that depressive symptoms associated with cognitive decline, through changes performed in the volume of the hippocampus and the prefrontal cortex of the negative high intensity thymic, and the effects of these changes in memory and learning (Wrench, Wilson, Bladin, & Reutens, [81]). On the other hand, the small number of depressive symptoms did not appear to directly affect the understanding of sarcasm (Case 4b), finding also shows that the relationship of depressive symptoms with social cognition involved in "gignoskein".

Limitations of this study - Suggestions for further research

With regard to the limitations of this research, the fundamental problem touches of modern design, which is clearly a disadvantage with respect to the detection of age differences, since the participants of different age groups can be differentiated as to a number of other features. As research studies the relationship of age with social cognition, ideal would be to carry out a longitudinal survey in order to identify any changes or reductions in social cognition abilities, with the passage of age.

Since the measurements of biomarkers and depressive symptoms were based on self-reports, reasonably reduce the objectivity and reliability of the measurements. In surveys biomarkers and depressive symptoms play an important role in the export of results, it is advisable to use objective measurement tools in order to extract safest results. In the same light, useful would be the design of interventions in terms of pathology related to the cardiovascular system biomarkers to examine whether the price improvements such biomarkers can be linked to an improvement in general cognitive ability and social cognition.

In addition to the research roads opened, however, this study is one of the first steps to investigate the relationship of aging with the ability to understand the "indirect speech" as a sarcastic speech. Based on the findings, therefore, it appears that the understanding of sarcasm is a side ThtN is challenged by the aging processes. In the downward course of this capacity emerged that may help

development of cardiovascular pathology risk factors such as hypercholesterolemia.

The road, however, this contribution did not appear to be straight. Conversely, age and relevant biological factors that seem to mainly associated with deficits in cognitive abilities, and these defects, in turn, linked to deficits in social cognition advanced capabilities such as the ability to understand sarcasm.

Results

Total sample

For processing the data collected for the total sample, route analysis was used (path analysis, statistical EQS 6.1 program Ventler, 2006) in order to check the relationship between the age group, the self-reported "hypercholesterolemia" and Assay social Inference (A).

Before proceeding to the presentation of the findings, it should be noted that of the three, associated with cardiovascular pathology, biomarkers, for which information was requested (see. "Participants"), they used only one. The criterion for this decision was that there were very few people in the sample (and in some age groups there was none) who reported having been diagnosed with diabetes and hypertension. By contrast, there were 16 elderly, aged 6 and 3 young adults who reported having been diagnosed with hypercholesterolemia. As to PCM (A), the range of the total score for all of the sample ranged from 28 up to 56 degrees, by M.C. = 44.5 and SD = 7.5. Table 1, below, shows the Average and Standard Deviation in PCM (A), for each age group.

Before you present the pathways model confirmed for the whole sample (Model A), must be reported on the conversion ratios paths models that support the full goodness of fit of the model to the data, should the statistical significance level Index Good Adjustment (Goodness of Fit Index) ch² be p> .05. Price index of "root mean square error Approach (Root Mean Square Error of Approximation - RMSEA)»

<.05 means approximate a good fit of the model to the data, while the RMSEA index values between .06 and .08 suggest reasonable, and therefore acceptable error during adjustment approach. Regarding Comparative Index Adjustment (Comparative Fit Index - CFI), which considers the adaptation of the proposed model in comparison with a limited, basic model, values greater than .90 mean adequate adaptation of the model to the data, while values close to 1.00 considered indicative of good adjustment (Brown, [82], pp. 81-89).

Considering the above, the path model (Model A) was confirmed for the whole sample, it seemed to have excellent fit to the data: X2 (1) = 1.02, p = .31, CFI = 1.00, RMSEA = .02 (90 % CI: .00 - .31)

In particular, the Model A, with external variables age group (1 = Young Adults, 2 = Middle-aged, 3 = adults) and self-reported hypercholesterolemia (1 = Yes, 2 = No), showed that age affects directly and negatively in PCM (a), and hypercholesterolemia significantly correlated only with age. This may mean that pathological values of the biomarker charged or partially explain the negative effect of age on performance in DSS (A) (Figure 2).-.68 (.73) [83-85].
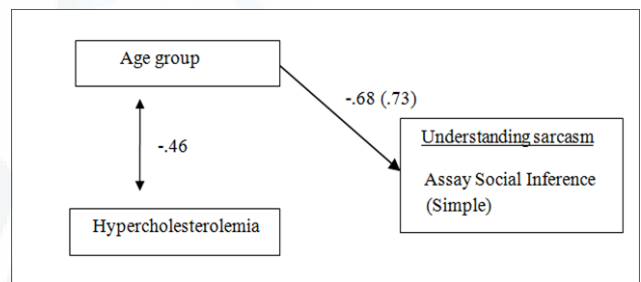
Figure 2: Model runs (Model A) for the total sample, examining the linkages age - hypercholesterolemia - understanding sarcasm [PCM (A)]. All relationships shown in Figure is significant at the level: p <.05. The measurement error is given in parentheses.

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