RESEARCH ARTICLE

ACTA Vol. 12, No. 4, 2014, 459-468
NEUROPSYCHOLOGICA

Received: 12.04.2014
Accepted: 28.12.2014

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

DOI:10.5604/17307503.1138847

COGNITIVE FUNCTIONING OF PATIENTS WITH IRRITABLE BOWEL SYNDROME AND FUNCTIONAL DYSPEPSIA

Agata Rudnik[1(A,B,C,D,E,F)], Grażyna Piotrowicz[2(A,B,C,D,E,F)]
[1] Institute of Psychology, University of Gdansk, Gdansk, Poland
[2] Gastroenterology Sub-department, MSW Hospital, Gdansk, Poland

SUMMARY

Background: The cognitive sphere (including, among others, memory and attention) plays an extremely important role in an individual's life. Problems in this sphere of functioning may be concomitant with other somatic disorders, along with gastrointestinal diseases such as irritable bowel syndrome or functional dyspepsia. The goal of the current study was to assess the cognitive functioning of patients suffering from the diseases and make a comparison between the sexes.

Material/ Methods: The research was carried out on a group of 40 subjects. The experimental group contained 10 men and 10 women with a clinical diagnosis of functional dyspepsia or irritable bowel syndrome, and the control group contained 10 men and 10 women who were not suffering from any chronic ailments. The Word List Recognition Test – I and II and the Logical Memory Test from the Wechsler Memory Scale ® (Third Edition, WMS-III) as well as a socio-demographic questionnaire were used.

Results: The study revealed no statistically significant differences in terms of auditory memory and the number of remembered words after a 30-mintute delay between men and women with a diagnosis of irritable bowel syndrome or functional dyspepsia. Healthy subjects performed better at recalling correctly remembered narrative units.

Conclusions: No differences were found in terms of auditory memory and the number of remembered words after a 30-minute delay between men and women diagnosed with IBS and functional dyspepsia. Healthy subjects performed better at recalling correctly remembered narrative units.

Key words: cognitive functioning, irritable bowel syndrome, IBS, functional dyspepsia, sex

INTRODUCTION

The cognitive functioning of patients with irritable bowel syndrome (IBS) and functional dyspepsia has not been widely described in the subject literature. It is difficult to find research that would directly deal with memory, attention or executive functions of people with IBS. There is, however, a body of data regarding the cognitive functioning of patients suffering from other psychosomatic diseases (Biechowska, Witkowska, Jodzio, 2009; Chojnacka-Szawłowska, 2012). Hence our motivation to undertake research into the cognitive functioning of patients suffering from chronic gastrointestinal tract ailments such as IBS and functional dyspepsia.

Irritable Bowel Syndrome

Irritable Bowel Syndrome is a functional disease of the gastrointestinal tract characterised by issues with defecation (diarrhoea, constipation) that are often accompanied by pain and/or abdominal distension that becomes less severe or discontinues after defecation (Jarosz, 2006; Thompson, Longsterth, Drossman, Heaton, Irvine, Müller-Lissner, 1999). It is estimated that between 12% and 22% of the population suffer from this ailment. The span of morbidity is caused by differences arising as a result of the region of residence and the fact that not everybody will report the problems to the doctor and many will do so only when the pain becomes very intense (Mulak, Waszczuk, 2007). Available data indicates a higher morbidity among women than men, and that the highest percentage of cases occur in the third or fourth decade of life (Camilleri, 2001; Jakubowska-Burek, 2011; Marlicz, 2011). The disease is diagnosed on the basis of the Rome III Criteria, a medical classification describing the physical symptoms of the disease and their occurrence in the previous 12 months (symptoms include abdominal pain, bloating, diarrhoea and constipation) (Jerndal, 2010; Trinkley, Nahata, 2011; Drossman, Douglas, 2006). In the Rome III Criteria, Irritable Bowel Syndrome is described as recurrent pain or discomfort in the abdomen, lasting for at least 3 days in a month and continuing for at least 3 months. Moreover, it is associated with the incidence of at least two of the following features: the pain becomes less severe after defecation, the start of the ailment is associated with a change in the frequency of defecation and the consistency of faeces changes at the beginning of the problems. There is a distinction between the intestinal and parenteral symptoms of IBS. The first group involves the previously mentioned abdominal pains and problems with defecation associated with bloating. The remaining symptoms of IBS include the sensation of incomplete defecation as well as the sensation of a sudden urge to defecate. Another type of IBS symptoms are the parenteral symptoms. The most common parenteral symptoms include: headaches (23-53% patients), back aches (28-81%), anxiety and depressive disorders (46-60%), sexual problems (9-42%), sensation of general fatigue (36-63%), disuric disorders (11-61%), sleep disorders (30%) and other symptoms classified as Dysregulation Spectrum Syndrome (DSS) functional disorders (Yunus, 2007). Similarly to dyspepsia, IBS is diagnosed only in the case of a lack

of symptoms indicating an organic illness (fever, anaemia, weight loss etc.). The aetiology of IBS is not entirely known. It is supposed that there are three main factors directly contributing to the development of IBS. The first is visceral hypersensitivity co-occurring with impairments of the regulatory mechanisms on the neuro-enteric axis. Changes in the reactivity of the immune system of gastric mucosa play an important role. The third pathomechanism involved in the development of IBS is associated with an abnormal response to stress signals stimulated by psychological factors and psychosocial conditions. Dysregulation of the serotonin system is an important part of the IBS pathogenesis (Mulak & Waszczuk, 2007). Further causes of the occurrence of IBS include the onset of its symptoms as a reaction to organic problems such as a presence of a malignant tumour localized in proximity to the intestine. The symptoms can be caused by an impaired blood supply to the intestine, which is most common in elderly patients and can be the result of a past history of bacterial or virus infection of the large intestine or hepatitis (Wojtczak, 1982). Nehring, Mrozikiewicz-Rakowska, Krasnodębski and Karnafel (2011) point at the genetic determinants of the ailment. Patients with IBS are often also affected with dysregulation of the autonomous nervous system (Paradowski, 2007).

Functional Dyspepsia

Functional dyspepsia is one of the common gastrointestinal tract disorders. It is estimated that the problem of dyspepsia affects 20-40% of the population (Bartnik, 2011; Smith, Koch, 2000; Ziółkowski, Pacholec, Kudlicka, Ehrmann & Muszyński, 2012). Dyspepsia – formed from the Greek words dys and peptin and literally means 'bad digestion', however, as Piotrowicz and his colleagues have written (Piotrowicz, Stępień, Rydzewska, 2005) the term is clinically used with regard to adults suffering from 'ailments of the upper gastrointestinal tract, such as pain or discomfort in the mid epigastrium'. Therefore it actually has little to do with the process of digestion or absorption. Dyspepsia might be a result of an organic disease (organic dyspepsia), but it can also occur despite a lack of evidence of organic disorders (functional dyspepsia); the latter occurs in about 75% of cases (Ksiądzyna, 2007). According to the Rome III Criteria, dyspepsia manifests itself as a paroxysymal or continuous pain or discomfort in the epigastrium within the retrosternal area. The pain or discomfort can be accompanied by heartburn or other symptoms characteristic to the upper gastrointestinal tract. The aforementioned discomfort refers to a subjectively unpleasant sensation, which is not equivalent to pain, and which may be composed of symptoms such as: early satiation, bloating, reluctance to eat, nausea, vomiting and a sensation of fullness in the epigastrium (Radzewicz – Winnicki, 2009; Piotrowicz et al., 2013). In order to diagnose dyspepsia, and every syndrome within this disease entity, it is necessary for the symptoms to occur for the previous 3 months, where the onset of the disorder has occurred 6 months before diagnosis itself (Paradowski, 2007). The exact aetiology of the disease remains unknown. Potential

pathogenetic factors include: noxious stimuli, dysfunction in the CNS (such as hypersensitivity to serotonin), psychogenic factors (e.g., an increase in reaction to stress, aggression, conflicts), motor dysfunction and environmental factors (e.g., Helicobacter pylori infection, smoking tobacco) (Piotrowicz, 2011). The pathomechanism of functional dyspepsia is not entirely clear. Hypotheses involve the importance of gene mutations, psychosocial factors, the multifactor influence of diet, and the efficiency of the immune system. The complexity of the causes and symptoms requires an individual treatment of each patient (Saunjoo & Yoon). One of the theories includes the involvement of neurotransmitters between CNS and receptors in the intestines. Serotonin is one of the more active neurotransmitters that take part in the regulation of the intestines. Research indicates reduced activity of serotonin in patients diagnosed with dyspepsia, which causes dysregulation of the intestinal processes (Yoon, Grundmann, Koepp, Farrell, (2011).

Cognitive processes

The effective functioning of attention, perception or any kind of memory is vital to modern living. Sometimes problems in the cognitive sphere of functioning co-occur with other somatic disorders, which, due to their specificity, distort relations with the social environment and the daily functioning of the patient – both at home and at work. The area of executive functions is situated in the structure of cognitive processes on the border between thinking and acting (Pąchalska, 2007; Pąchalska, Kaczmarek, Kropotov 2014). Executive functions include the programming, initiation and control of deliberate actions. They are in a close relationship with attention dysfunctions such as impaired control and the coordination of actions (Domańska, Borkowska, 2009; Kropotov, Pąchalska, Mueller, 2014). They are a kind of internal system for controlling one's own behaviour, as they are responsible for choosing the goal of action, planning its subsequent stages , control of the accuracy of action and change in the strategy of action (if it proves ineffective) (Jodzio, 2008). Dysfunctions on the executive level have a destructive influence on all of the cognitive processes and the mental functioning of an individual. Ways in which cognitive functioning disorders can be manifested include: apathy, indecision, lack of spontaneity, increased susceptibility to distractions, and purposeless agitation with features of disinhibition, the immediate interruption of initiated actions and impulsivity (Jodzio, 2008).

The aim of the study

The aim of the study was to verify whether there are differences between men and women diagnosed with IBS or functional dyspepsia in terms of cognitive functioning. Differences in terms of cognitive functioning between healthy subjects and those with the aforementioned diagnoses were also analysed. The research was carried out in the area of memory and attention.

Subjects

There were 40 subjects divided into 2 groups:

1) Experimental – 10 men and 10 women with a diagnosis of functional dyspepsia or IBS, where 9 people were suffering from IBS and 11 from functional dyspepsia
2) Control – 10 healthy men and 10 healthy women who were not suffering from any chronic diseases. The control group was matched with the experimental group in terms of gender, age, level of education and area of residence.

The mean age of all subjects equalled 34.42 (SD=5.1) – 34.55 (SD=4.9) in the control group and 33.76 (SD=5.3) in the experimental group.

METHODS

The following tools were used:

1) The Word List Recognition Test I and II from the Wechsler Memory Scale (r) – Third Edition (WMS- III)
2) Logical Memory Test from the Wechsler Memory Scale (r) – Third Edition (WMS- III)
3) Sociodemographic questionnaire

RESULTS

The Logical Memory Test from the Wechsler Memory Scale Third Edition (WMS- III) was applied in order to verify the hypothesis that men diagnosed with IBS or functional dyspepsia are characterised by better auditory memory than women diagnosed with the same disorder. Auditory memory was divided into the number of remembered narrative units and the number of remembered thematic units. The Student t-test for independent variables was used to verify the hypothesis.

The analysis of results indicated small differences in the mean remembered narrative and thematic units between men and women with a medical diagnosis of IBS or functional dyspepsia. However, those differences were not statistically significant.

The second hypothesis assumed that men with a diagnosis of IBS or functional dyspepsia remember more words after a time delay than women with the same diagnosis. Remembered words came from the Word List Recognition Test from the Wechsler Memory Scale Third Edition (WMS- III). The Student t-test for independent variables was used to verify the hypothesis. Only the subjects from the experimental group were compared.

Table 1. Performance in the auditory memory test divided between men and women with a medical diagnosis of IBS or functional dyspepsia.

	Gender	N	Mean	SD	T	Df	Significance (two-tailed)	Difference of means	SD of difference
Remembered narrative units	M	10	46.5	13.25	0.33	18	0.74	1.8	5.44
	W	10	44.7	10.99					
Remembered thematic units	M	10	19.4	2.59	0.09	18	0.92	0.1	1.04
	W	10	19.3	2.057					

Table 2. Difference of mean percentages of words remembered after a time delay between men and women with a clinical diagnosis of IBS or functional dyspepsia.

Percentage of words remembered after a time delay	Gender	N	Mean	SD	T	Df	Significance (two-tailed)	Difference of means	SD of difference
	M	10	90.3	12.90	1.26	18	0.22	9.3	7.32
	K	10	81	19.23					

Table 3. Differences between mean scores Table 3. Differences between mean scores

	Group	N	Mean	SD	T	Df	Significance (two-tailed)	Difference between means	SD of the difference
Recalled narrative units	Healthy	20	54.35	7.46	2.79	38.00	0.01*	8.75	3.14
	Diagnosed	20	45.6	11.88					
Recalled thematic units	Healthy	20	18.65	1.26	-1.20	38.00	0.24	-0.70	0.58
	Diagnosed	20	19.35	2.27					

The analysis of the results presented in Table 2 shows small differences in the percentage of words remembered after a time delay between men and women diagnosed with IBS or functional dyspepsia. This could indicate that the working memory buffer was more effective in the examined men as they could list more words remembered after 30 minutes. However, the Student t-test revealed that these differences were statistically insignificant.

The third hypothesis assumed that the condition of IBS or functional dyspepsia decreases the efficiency of auditory memory. In order to verify this hypothesis, the results of subjects from the experimental group were compared to the results of subjects from the control group, which are presented in Table 3.

The results in Table 3 show differences in the auditory memory between healthy subjects and those diagnosed with IBS or functional dyspepsia. The mean number of recalled narrative units is higher in the control group than in the experimental group. This result is statistically significant (p=0.01). We can reasonably assume that healthy subjects are better at remembering information which allows for an understanding of the substance of the stories read aloud by the researcher. The mean number of recalled thematic units is higher in the experimental group. The result suggesting better memory for information about the plot of the story appears quite surprising if one takes into account the cognitive limitations arising due to the illness. However, we cannot assume that this is the case, as the result proved to be statistically insignificant. Summarizing the above results, we can state that the condition of IBS or functional dyspepsia decreases the efficiency of auditory memory, only in the case of narrative units.

DISCUSSION

There is an increasing incidence of chronic, functional diseases of the gastrointestinal tract, such as IBS or functional dyspepsia. Therefore, there is an increase in research interest in the area – both with regards to the somatic and

psychological aspects (Wrzesińska, Grzyb, Kocur, 2008; Orzechowska, Harasiuk, Talarowska, Zboralski, Chojnacki, Florkowski, 2010).

Research carried out by our group focused on cognitive functions. This area, though important for the correct functioning of an individual, is not widely described in the context of somatic maladies. Psychology defines cognitive processes (including executive functions, perception processes, attention processes, learning, language and thought processes) as activities allowing for orientation in one's environment, gaining information about oneself or analysis of a situation, forming conclusions and decision making (Falkowski, 2000; Walsh, 2000). Executive processes are tightly correlated with information processing, solving problems with a high level of difficulty, making effective decisions and the ability to adjust the plan of action to the actual conditions. They remain in a close relationship with the working memory (Borkowska, Rybakowski, 2005).

Psychological differences between men and women have been the subject of investigation by scientists and philosophers for centuries (Swaab, Hofman, 1984). The differences with regards to the emotional sphere (e.g. the levels of aggression) as well as cognitive abilities including mathematical, language and visuospatial skills are particularly evident (Wood, Flowers, Naylor, 1991). It is widely believed that women are more skilled in the area of language than men. However, research indicates that adult women do not have a broader vocabulary nor a higher verbal IQ, though they are better at orthography. Nevertheless, men perform worse in verbal memory tests, including both tasks aimed at recalling unrelated words and meaningful content (Kimura, 2006).

Auditory memory depends on the functioning of the areas of the brain associated with auditory memory located in the mid-posterior part of the left temporal lobe (Pruszewicz 1992). Investigations of differences in auditory memory between men and women with IBS or functional dyspepsia have revealed a slight advantage for men in this aspect, however this result was not statistically significant. This could be due to the small number of subjects. There has been a lot of previous research into differences in listening, understanding and formulating utterances between men and women. It is an important factor that is worth analysing when referring to research on auditory memory in this aspect. Perhaps, the above result was influenced by reasons resulting from the biological differences between men and women (Legato, 2005).

Another hypothesis assumed that men with IBS or functional dyspepsia would remember a greater number of words after a 30-minute time delay. The word list was taken from the WMS III Word List Recognition Test. The analysis of the results revealed that men performed better at this task; however the differences were not significant. Due to this the third hypothesis was rejected.

Despite the fact that working memory has been thoroughly researched, it is worth analysing it in the context of chronically ill people suffering from the aforementioned disorders. It is a part of memory that is very important for daily functioning, making it possible to disseminate information about the current condition of the organism across all the areas of the brain (Baddeley, 1992). Any interfer-

ence in the working memory has a huge effect on one's functioning within society and the surrounding world.

The next hypothesis was formed in order to verify the existence of differences in auditory memory between subjects diagnosed with IBS or functional dyspepsia, and healthy individuals. In this aspect, the subjects were not divided into groups according to gender, but according to being diagnosed with the disorders of interest (or not). Due to the specificity of the discussed disorder, it would be logical for the healthy individuals to perform better in tasks used to investigate both of the components of auditory memory. As expected, healthy subjects performed better at recalling the correctly remembered narrative units. However, no statistically significant differences were shown for the thematic units.

Cognitive functioning is extremely important for the functioning of an individual. Everyday functioning is practically impossible without efficient memory and attention. IBS and functional dyspepsia are disorders that can hinder the functioning in those aspects. More research is needed, with a larger subject pool, in order to further investigate this issue.

CONCLUSIONS

No differences were found in terms of auditory memory and the number of remembered words after a 30-minute delay between men and women diagnosed with IBS and functional dyspepsia. Healthy subjects performed better in recalling correctly remembered narrative units.

REFERENCES

Baddeley, A.D. (1992). Consciousness and working memory. Consciousness and Cognition 1, 3-6.

Bartnik, W. (2011). Dyspepsja – co nowego na Kongresie Digestive Disease Week w Chicago w 2011 roku? [Dyspepsia – what was new at the Digestive Disease Week Congress in Chicago in 2011?] Gastroenterologia kliniczna [Clinical gastroenterology], Warsaw: Via Medica, Volume 3, nr 3, pp. 99.

Bartnik, W., (2011). Wrzodziejące zapalenie jelita grubego i choroba Leśniowskiego-Crohna: przewodnik dla lekarzy [Ulcerative coilitis and Crohn disease: a guide for physicians], Raszyn: BMA Studio.

Biechowska, D., Witkowska, M., Jodzio, K. (2009). Neuropsychologiczna charakterystyka zaburzeń pamięci i uwagi w wybranych chorobach wewnętrznych. [Neuropsychological characteristics of memory and attention disorders in selected internal diseases] Studia Psychologiczne, [Psychological Studies] 47, 21-35.

Borkowska, A., Rybakowski, J. (2005). Zaburzenia pamięci operacyjnej w schizofrenii i chorobach afektywnych, [Working memory impairment in schizophrenia and affective disorders] In: A. Borkowska (Ed.) Zaburzenia funkcji poznawczych w chorobach psychicznych. [Impairments of cognitive functions in mental disorders] ,Cracow: Biblioteka Psychiatrii Polskiej.45-56.

Camilleri, M. (2001). Management of the irritable bowel syndrome. Gastroenterology, 120 (3): 652-68.

Chojnacka-Szawłowska, G. (2012). Psychologiczne aspekty przewlekłych chorób somatycznych, [Psychological aspects of chronic somatic disorders], Warsaw: Vizja Press.

Domańska Ł., Borkowska, A.R. (eds.) Podstawy neuropsychologii klinicznej [The basics of Clinical Neuropsychology] (2009). Lublin : Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, 258.

Drossman, D.A., Douglas A. et al. (2006). Rome III: the functional gastrointestinal disorders. McLean, VA: Degnon Associates: 369-418.

Falkowski, A. (2000). Spostrzeganie jako mechanizm tworzenia doświadczenia za pomocą zmysłów, [Perception as a mechanism for creating experience using the senses] In: J. Strelau (red.) Psychologia. Podręcznik Akademicki, [Psychology. Academic Textbook], Gdańsk: Gdańskie Wydawnictwo Psychologiczne, 25-55.

Jakubowska-Burek, L., et.al. (2011). Ocena jakości życia u polskich i amerykańskich pacjentów z nieswoistymi chorobami zapalnymi jelit, [Assessment of the quality of life for Polish and American patients with inflammatory bowel diseases] Przegląd Gastroenterologiczny [Gastroenterological Digest]; 6 (6): 388–400.

Jarosz, E., Wysocka, E. (2006). Diagnoza psychopedagogiczna. Podstawowe problemy i rozwiązania. [Psychopedagogical diagnosis. Basic problems and solutions], Warsaw: Wydawnictwo Żak.

Jerndal, P., Ringström, G., Agerforz P., Karpefors, M., Akkermans, L. M. , Bayati, A., Simrén, M. (2010). Gastrointestinal-specific anxiety: an important factor of severity of GI symptoms and quality of life in IBS, Neurogastroenterology & Motility, Volume 22, Issue 6, 646–e179.

Jodzio, K. (2008). Neuropsychologia intencjonalnego działania – koncepcje funkcji wykonawczych, [The neuropsychology of intentional acting – concepts of executory functions], Warsaw: Wydawnictwo Naukowe Scholar.

Kimura, D. (2006). Płeć i poznanie. [Gender and cognition] Warsaw: Państwowy Instytut Wydawniczy, 111

Kropotov J., Pachalska M., Mueller D. (2014) New neurotechnologies for the diagnosis and modulation of brain dysfunctions. Acta Neuropsychologica 12(3): 271-287

Ksiądzyna, D. (2007). Zaburzenia czynnościowe żołądka i dwunastnicy. [Functional disorders of the stomach and duodenum] In: Paradowski L. (ed.): Zaburzenia czynnościowe przewodu pokarmowego [Functional disorders of the gastrointestinal tract], Wrocław: Cornetis.

Legato, M. J. (2005). Dlaczego mężczyźni umierają pierwsi. Jak przedłużyć sobie życie [Why men die first. How to prolong your life], Poznań: Rebis.

Marlicz, W., Łoniewski, I. (2012). Mikroflora jelitowa a otyłość i rak jelita grubego. [Intestinal microflora , obesity and colorectal cancer] Gastroenterologia Kliniczna. Postępy i Standardy [Clinical Gastroenterology. Advances and Standards], 4(2), 69-78.

Mulak, A., Waszczuk, E. (2007). Zaburzenia czynnościowe odbytu i odbytnicy. [Functional disorders of the anus and rectum] In: Paradowski L. (ed.): Zaburzenia czynnościowe przewodu pokarmowego [Functional disorders of the gastrointestinal tract], Wrocław : Cornetis.

Nehring, P., Mrozikiewicz-Rakowska, B., Krasnodębski, P., Karnafel, W. (2011). Zespół jelita drażliwego – nowe spojrzenie na etiopatogenezę [Irritable bowel syndrome – a new approach to aetiopathogenesis], Przegląd Gastroenterologiczny [Gastroenterological Digest]; 6 (1): 17–22.

Orzechowska, A., Harasiuk, A., Talarowska, M., Zboralski, K., Chojnacki J., Florkowski, A. (2010). Ocena wybranych czynników psychologicznych u pacjentów z zespołem jelita nadwrażliwego i z chorobą refluksową przełyku, [Assessment of selected psychological factors in patients with irritable bowel syndrome and gastroesophageal reflux]Postępy Psychiatrii i Neurologii [Advances in Psychiatry and Neurology]: 19 (2): 115-119.

Pąchalska, M. (2007). Neuropsychologia kliniczna: Urazy mózgu. T. I. Procesy poznawcze i emocjonalne,[Clinical neuropsychology. Brain injuries. Vol.1. Cognitive and emotional processes], Warsaw: PWN Publishers.

Pąchalska, M., Kaczmarek, B.L.J., Kropotov, J.D. (2014). Neuropsychologia kliniczna: od teorii do praktyki, [Clinical neuropsychology: From theory to practice]. Warsaw: PWN Publishers.

Kropotov, J.D., Pąchalska, M., & Mueller, A. (2014). New neurotechnologies for the diagnosis and modulation of brain dysfunctions. Health Psychology Report, 2(2), 73–82. DOI: 10.5114/hpr.2014.43913

Piotrowicz, G., Stępień, B., Rydzewska, G. (2005). Dyspepsja czynnościowa – czy dysponujemy standardami rozpoznania? Przewodnik lekarza, [Functional dyspepsia – do we have diagnostic standards? A physician's guide] 10, 21-32.

Piotrowicz, G., Stępień, B., Rydzewska, G. (2013). Socio-demographic characteristics of patients diagnosed with functional dyspepsia. Przegląd Gastroenterologiczny [Gastroenterological Digest]; 8(6):354-65

Pruszewicz, A (red). (1992). Foniatria kliniczna, [Clinical Phoniatrics] Poznań: Państwowy Zakład Wydawnictw Lekarskich

Swaab, D. F., Hoffman, M. A. (1984). Sexual differentiation of the human brain, a historical perspective. Progress in Brain Research, 61, 361-374.

Radziewicz-Winnicki, I. (2009). Dyspepsja czynnościowa w perspektywie biopsychospołecznej. Raport z badań nad dziećmi i młodzieżą, [Functional dyspepsia in the biopsychosocial perspective. A study report of children and adolescents], Bielsko-Biała: Alfa- Medica Press.

Smith, M., Koch, K. (2000). Dyspepsia. Oxford: Health Press, 5.

Thompson, W.G., Longsterth, G.F., Drossman, D.A., Heaton, K.W., Irvine, E.J., Müller-Lissner, S.A. (1999). Functional bowel disorders and functional abdominal pain; 45: 437.

Trinkley, K.E., Nahata, M.C. (2011). Treatment of irritable bowel syndrome. Journal of clinical pharmacy and therapeutics, 36(3), 275-282.

Walsh, K. (2000). Neuropsychologia Kliniczna, [Clinical Neuropsychology] Warsaw: PWN.

Wojtczak, A. (1982). Dla lekarzy: choroby wewnętrzne, Tom 2[For physicians: internal diseases, Volume 2], Warsaw: Państwowy Zakład Wydawnictw Lekarskich .

Wood, F. B., Flowers, D. L., Naylor, C. E., (1991). Cerebral laterality in functional neuroimaging. [in:] F. L. Kitterle (ed.), Cerebral laterality. Theory and research. Hillsdale: Lawrance Erlbaum Associated Publishers.

Wrzesińska, M.A., Grzyb, J., Kocur, J. (2008). Poziom agresywności i specyficznych zachowań agresywnych u chorych z zaburzeniami czynnościowymi układu pokarmowego, [The level of aggression and specific aggressive behaviours in people with functional disorders of the gastrointestinal tract] Postępy Psychiatrii i Neurologii [Advances in Psychiatry and Neurology]: 17 (1): 35-38.

Yoon, S. L., Grundmann, O., Koepp, L., & Farrell, L. (2011). Symptom management in adults with irritable bowel syndrome (IBS): Review of literature. Alternative Medicine Review, 16(2), 134-151.

Ziółkowski, B., Pacholec, A., Kudlicka, M., Ehrmann, A., Muszyński, J. (2012). Epidemiologia dolegliwości brzusznych w polskiej populacji. [Epidemiology of abdominal discomfort in the Polish population] Przegląd Gastroenterologiczny [Gastroenterological Digest] ,7(1), 20-25.

Address for correspondence:
Agata Rudnik
Institute of Psychology, University of Gdansk,
Bazynskiego 4, str.
80-952 Gdansk, Poland
e-mail: agata.rudnik@ug.edu.pl