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Colonoscopy and the psyche – pain and discomfort associations with affect and cognitive functions

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Abstract

Introduction: Colonoscopy is an important diagnostic and therapeutic procedure, however it causes considerable discomfort in patients. Their psychological functioning is sometimes not sufficiently taken into account by the medical staff, preoccupied with somatic conditions. The aim of this study was to reveal affective and cognitive aspects of how patients undergoing colonoscopy function in order to better understand periprocedural discomfort and pain and suggest interventions to reduce them.

Material and methods: A total number of 101 patients, undergoing colonoscopy during their stay at the internal ward, were asked to participate in this prospective, observational study. Three measurements were made: the day before the examination, on the colonoscopy day (after bowel cleansing, before the procedure) and the following day. The State-Trait Anxiety Inventory, Beck Depression Inventory II, Montreal Cognitive Assessment, short version of The Illness Perceptions Questionnaire , as well as analog scales (measuring pain, sadness, anxiety, irritability, general discomfort and distress) were used. Ultimately, 50 people completed the study.

Results: It has been shown that pain and discomfort on the colonoscopy day correlate positively with all measured aspects of negative affect. On the colonoscopy day 18% of the subjects revealed depressive symptoms matching a depressive episode, while 56.6% of the subjects displayed a high level of state anxiety. The worse the patient's understanding of the disease, the more periprocedural pain he/she experiences. Their cognitive functioning is worse on the colonoscopy day.

Conclusions: The results suggest that it is advisable to educate patients early enough (not on the day of the procedure) about their ailments and planned colonoscopy.

Keywords: psychiatry, colonoscopy, pain, emotions, cognitive function

Streszczenie

Wstęp: Kolonoskopia jest ważną procedurą diagnostyczną i terapeutyczną, jednak powoduje znaczny dyskomfort u pacjentów. Ich funkcjonowanie psychologiczne bywa brane pod uwagę w niewystarczającym stopniu przez personel medyczny, zaabsorbowany dolegliwościami somatycznymi. Celem tego badania było ujawnienie afektywnych i poznawczych aspektów funkcjonowania pacjentów poddawanych kolonoskopii, aby lepiej zrozumieć dyskomfort i ból okołozabiegowy oraz zasugerować zmniejszające je interwencje.

Materiał i metody: O udział w tym prospektywnym badaniu obserwacyjnym poproszono 101 pacjentów poddawanych kolonoskopii podczas pobytu na oddziale wewnętrznym. Wykonano trzy pomiary: dzień przed badaniem, w dniu kolonoskopii (po oczyszczeniu jelit, przed zabiegiem) i następnego dnia. Wykorzystano Inwentarz Stanu i Cechy Lęku, Inwentarz Depresji Becka II, polską wersję Montreal Cognitive Assessment, krótką wersję Kwestionariusza Postrzegania Choroby, a także skale

analogowe (mierzące ból, smutek, niepokój, drażliwość, ogólny dyskomfort i dystres). Ostatecznie badanie ukończyło 50 osób.
Dyskusja: Wykazano, że ból i dyskomfort w dniu kolonoskopii korelują pozytywnie ze wszystkimi mierzonymi aspektami negatywnego afektu. W tym dniu u 18% badanych stwierdzono nasilenie objawów depresyjnych, odpowiadające epizodowi depresyjnemu, a 56,6% z nich wykazywało wysoki poziom lęku. Pacjenci odczuwają w okresie okołozabiegowym tym większy ból im gorzej rozumieją swoją chorobę. Ich funkcjonowanie poznawcze jest gorsze w dniu kolonoskopii.
Wnioski: Wyniki sugerują, że wskazane jest odpowiednio wczesne edukowanie pacjentów (nie w dniu zabiegu) na temat ich dolegliwości i planowanej kolonoskopii.

Słowa kluczowe: psychiatria, kolonoskopia, ból, emocje, funkcje poznawcze

Introduction

Colonoscopy is an important diagnostics and therapeutic procedure [1], performed in a wide range of bowel diseases. It is used in many countries as an integral part of national colorectal cancer screening programmes [2]. However, it causes significant discomfort in patients [3,4]. Many of them decide not to undergo the procedure [5,6]. Interventions alleviating the unpleasant sensations have been sought [7,8]. Nevertheless, patient's psychological condition is sometimes not sufficiently taken into account by the medical staff, preoccupied with the subject's somatic state.

The topic of pain and discomfort in the context of colonoscopy has been addressed before [9], however there has not been comprehensive focus on linking the aforementioned factors with the patient's affective functioning. It seems necessary, given the increasingly well-documented relationship between psychological factors and ailments of direct interest to gastroenterology [10,11]. It is even more important, considering the fact that many studies show an increased level of anxiety before colonoscopy [3,12].

It has been shown that anxiety can be reduced by educating the patient about the planned invasive medical procedure [13]. In case of colonoscopy, it can result in better bowel preparation [14,15], improved procedure satisfaction [16] and potentially increased participation rates [17]. Educating patients about their illnesses can be of vital importance as well. Indeed, some links between the perception of illness and the experience of pain have been found [18]. Proper cognitive functioning is essential for education to be effective. Its deterioration on the day of invasive medical procedures has previously been shown [19].

The aim of this study was to reveal affective and cognitive aspects of how patients undergoing colonoscopy function in order to better understand periprocedural discomfort and pain and suggest interventions to reduce them.

Material and methods

Patient enrollment

A prospective, observational study was designed. A total number of 101 patients, who were due to undergo colonoscopy during their hospitalization in the Department of Internal Medicine, Angiology and Physical Medicine (Medical University of Silesia, Bytom, Poland) were asked to participate. The recruitment took place from June 2016 to December 2017.

Indications for the procedure were identified as follows:

- colorectal cancer screening,
- follow-up examinations after earlier detection or removal of precancerous lesions,
- lower gastrointestinal bleeding of unknown etiology,
- diagnosing the causes of sudden weight loss.

The following exclusion criteria were adopted for our study:

- dementia, regardless of cause,
- schizophrenia and schizotypal, bipolar, delusional disorders,
- intellectual disability,
- intake of psychotropic medication during the colonoscopy period and up to 3 months prior to the procedure,
- cognitive impairment preventing from the completion of questionnaires,
- other reasons preventing from the completion of questionnaires.

Of the 101 patients, 26 refused to participate in the study. After complete description of the study to the subjects, informed consent was obtained from 75 of them. When it comes to 25 patients, they were excluded:

- 11 withdrew their consents during the course of the study,
- 7 took psychotropic medication,
- 4 suffered from cognitive impairment,
- 2 had a visual impairment that prevented them from completing self-assessment questionnaires,
- one person suffered from schizophrenia.

Measurements

The study consisted of three measurements (Table 1).

The first measurement took place on the day prior to the colonoscopy, before starting the bowel cleaning. A general psychiatric examination was conducted, basic data (age, sex) was collected and test forms were completed (research tools description in Table 2). This stage included: The State-Trait Anxiety Inventory (STAI) [20,21] – state anxiety, Beck Depression Inventory II (BDI II) [22,23], Montreal Cognitive Assessment (MoCA) [24,25] – version 1, The Brief Illness Perception Questionnaire (B-IPQ) [26,27], original analogue scales, with a scale taken from the Distress Thermometer [28,29]. The second measurement was taken after bowel cleansing, in the morning on the colonoscopy day. STAI (trait anxiety), Montreal Cognitive Assessment (MoCA) – version 2 and analog scales were used. The third measurement was conducted on the day after the procedure and included: MoCA – version 1, analogue scales.

Table 1. The list of research tools used in various stages of the study.

Stage 1. The day before colonoscopy	**Stage 2.** On the colonoscopy day, before the procedure	**Stage 3.** The day after colonoscopy
Montreal Cognitive Assessment (MoCA) – version 1	Montreal Cognitive Assessment (MoCA) – version 2	Montreal Cognitive Assessment (MoCA) – version 1
Analog scales, measuring: anxiety, sadness, irritability, anger, pain and general discomfort.	Analog scales, measuring: anxiety, sadness, irritability, anger, pain and general discomfort.	Analog scales, measuring: anxiety, sadness, irritability, anger, pain and general discomfort.
Analog scale: distress thermometer	Analog scale: distress thermometer	Analog scale: distress thermometer
The State-Trait Anxiety Inventory (STAI) state anxiety	The State-Trait Anxiety Inventory (STAI) trait anxiety	-
Beck Depression Inventory II (BDI II)	-	-
The Brief Illness Perception Questionnaire (B-IPQ)	-	-

According to the decision of the Bioethics Committee of the Medical University of Silesia in Katowice, the study did not require its evaluation (decision number: KNW/0022/KB/99/16). All participants gave informed consent in writing before data collection.

Statistical analysis

Statistical analysis of the collected data was carried out using the computer programs Excel 2016 and Statistica version 13.3. The Shapiro-Wilk test was used to

Table 2. Description of the psychometric tools used during the study.

Psychometric tool	**Description**
The State-Trait Anxiety Inventory (STAI)	It consists of 20 affirmative statements to assess anxiety as a state (a currently experienced emotion) and 20 to assess anxiety as a trait (a relatively stable personality characteristic). The statements are scored on a four-point scale – the respondent assesses how much (in the case of the state) or how often (in the case of the trait) he or she identifies with them. The psychometric properties of both scales, also in its Polish version, are fully satisfactory.
Beck Depression Inventory II (BDI II)	It consists of 21 headings referring to depressive symptoms. They are accompanied by sentences reflecting a gradation of these symptoms from their absence to serious severity. The respondent is asked to select the sentence that best describes his or her condition over the past two weeks. Good psychometric characteristics, also for the Polish adaptation of the questionnaire, have been demonstrated.
Montreal Cognitive Assessment (MoCA) – versions 1 and 2	It consists of sections to assess: visuospatial and executive functions, naming, attention, language functions, abstraction, delayed recall and allopsychic orientation. Two versions were used to reduce the possibility of subjects learning the correct answers. The utility of this tool in screening for cognitive impairment of different etiologies and in detecting dementia has been proven.

The Illness Perceptions Questionnaire – short version (B-IPQ)	The applied part of this questionnaire consists of eight questions. The answer options have a spread of 11 points on a Likert scale (from 0 to 10), between complete denial and confirmation. The questions relate to patient's beliefs about: the strength of the impact of the illness on the respondent's life and emotional state, anticipated persistence of the disease and the ability to control it by both patients and the treatment. In addition, the questions concern: the degree of worry about the illness and the severity of the symptoms, as well as the sense of understanding of one's illness. The scale has been shown to have good reliability – also in the Polish adaptation.
Original analogue scales, with a scale taken from the Distress Thermometer	They consist of vertical bars with individual parameters assigned. The parameters are: distress, anxiety, sadness, irritability, anger, pain and general discomfort. The respondent assesses their intensity by giving a value from 0 to 10 (where 0 means no occurrence and 10 means the highest possible intensity). The Distress Thermometer has been adopted in many countries because of its rapid administration and ease of interpretation.

assess whether the variables have a normal distribution. Kendall's tau correlation coefficient was used to assess the correlation. Significance testing for differences in repeated measures of psychological characteristics within the study group was performed using Friedman's ANOVA with the Dunn-Bonferroni post-hoc test. To assess the severity of the anxiety variable, scores normalized on a sten scale (1-10) were used. This allowed low, moderate and high anxiety to be assessed. A significance level of $p<0.05$ was used in the statistical procedures. Correlations were also assessed using $p<0.01$ and $p<0.001$.

Results

A total number of 50 patients were included in the study. All of them were Caucasian, from Central Europe (Poland). The group characteristics are shown in Table 3.

Table 3. Study group characteristics.

	Female	**Male**	**Total**
Number of subjects	31	19	50
Minimum age	24	38	24
Maximum age	77	75	77
Median age	61	63	63
Age standard deviation	11.55	10.65	11.23

Perception of pain and discomfort on the day of colonoscopy, as well as experiencing discomfort on the day after the procedure correlates positively with all measured aspects of negative affect (depressiveness, anxiety, sadness, irritability, anger, distress) across all measurements (Table 4).

Table 4. Affective functioning in relation to pain and discomfort experienced by patients undergoing colonoscopy.

Affective functioning	**Somatic ailments**					
	Pain			**Discomfort**		
	τ1	**τ2**	**τ3**	**τ1**	**τ2**	**τ3**
State anxiety (STAI; τ1)	0.217	0.439***	0.339**	0.363**	0.453***	0.551***
Trait anxiety (STAI; τ2)	0.291**	0.335**	0.356**	0.491***	0.437***	0.484***
Anxiety (τ1)	0.192	0.263*	0.147	0.511***	0.484***	0.372**
Anxiety (τ2)	0.193	0.350**	0.184	0.306**	0.525***	0.417***
Anxiety (τ3)	0.322**	0.503***	0.587***	0.299*	0.407**	0.678***
Depressiveness (BDI II; τ1)	0.310**	0.444***	0.288*	0.303**	0.337**	0.395**
Sadness (τ1)	0.241*	0.303**	0.193	0.491***	0.425***	0.385**
Sadness (τ2)	0.223*	0.564***	0.387**	0.306**	0.569***	0.541***
Sadness (τ3)	0.298*	0.528***	0.547***	0.335**	0.554***	0.683***

Irritability (τ1)	0.218*	0.328**	0.151	0.624***	0.498***	0.410***
Irritability (τ2)	0.164	0.467***	0.361**	0.386***	0.637***	0.419***
Irritability (τ3)	0.285*	0.529***	0.497***	0.323**	0.463***	0.776***
Anger (τ1)	0.182	0.411***	0.127	0.237*	0.407***	0.295*
Anger (τ2)	0.266*	0.468***	0.358**	0.167	0.297**	0.419***
Anger (τ3)	0.177	0.434***	0.492***	0.183	0.274*	0.545***
Distress (τ1)	0.157	0.340**	0.116	0.286**	0.417***	0.370**
Distress (τ2)	0.368***	0.504***	0.269*	0.260*	0.547***	0.533***
Distress (τ3)	0.189	0.403**	0.446***	0.386**	0.525***	0.628***

** p<0.05; ** p<0.01; *** p<0.001; τ1 – measurement on the day before colonoscopy; τ2 – measurement on the day of colonoscopy; τ3 – measurement on the day after colonoscopy.*

In 18% of the subjects, on the day before colonoscopy, there was an intensity of depressive symptoms that would allow them to be diagnosed with a depressive episode (Table 5).

Table 5. Severity of depressive symptoms in patients as measured by the Beck Depression Inventory II on the day before colonoscopy.

Severity of symptoms	Number of respondents	Percentage of respondents
None or minimal	41	82%
At the level of a mild depressive episode	4	**8%**
At the level of a moderate depressive episode	4	**8%**
At the level of a severe depressive episode	1	**2%**

When it comes to 56.6% of respondents, they had a score indicating high state anxiety on the day of the colonoscopy, before the procedure was performed (Table 6).

Table 6. Group characteristics in terms of anxiety (STAI) measured before colonoscopy.

Anxiety	Statistical description				Sten scores [%]		
	M	SD	min	max	low	average	high
Trait anxiety (raw score)	41.550	9.333	23	61	-	-	-
Trait anxiety (sten score)	4.475	2.439	1	10	52.5%	27.5%	20.0%
State anxiety (raw score)	42.761	10.315	21	60	-	-	-
State anxiety (sten score)	6.391	2.090	2	9	21.7%	21.7%	**56.6%**

M – mean, SD – standard deviation, min – lowest score, max – highest score.

The worse the patient's understanding of the disease, the more periprocedural pain they experience (in all three measurements). Pain intensity on the examination day correlates positively with the belief that the illness has a negative impact on the patient's life. The weaker the patient's belief that the disease can be overcome by treatment, the greater the intensity of pain on the day after colonoscopy (Table 7).

Out of three measurements of global cognitive functioning, the second one (on the day of the colonoscopy, before it was performed) showed the worst result and the third (on the day after the procedure) the best score. That dynamic of change was particularly pronounced in delayed recall (Table 8).

Discussion

Results of this study show that experiencing pain and discomfort on the day of colonoscopy is positively correlated with the intensity of negative affect throughout the perioperative period. This includes: depressiveness, anxiety, sadness, irritability, anger and distress. Such correlations are a well-known phenomenon [30,31].

Table 7. Illness perception (B-IPQ) in relation to pain and discomfort experienced by patients undergoing colonoscopy.

Disease perception	Somatic ailments					
	Pain			Discomfort		
	τ1	τ2	τ3	τ1	τ2	τ3
The belief that the illness has a negative impact on the patient's life	0.208	**0.356***	0.260	0.160	0.041	0.232
Anticipated duration of the disease	-0.042	-0.188	-0.104	0.018	-0.262	-0.028
Patient's belief in the ability to control his or her illness	-0.047	-0.042	-0.269	-0.167	-0.223	-0.083
Belief that the disease can be overcome by treatment	-0.036	-0.230	**-0.488****	0.091	-0.053	-0.278
Experiencing symptoms of illness	0.112	0.021	-0.103	0.101	-0.290	-0.101
Worrying about illness	0.131	0.273	0.116	0.199	0.113	-0.018
Understanding of illness	**-0.398***	**-0.417***	**-0.508****	0.072	<0.001	-0.176
Belief that the patient's emotional state is negatively affected by the illness	0.108	0.189	0.127	0.121	-0.168	-0.170

** p<0.05; ** p<0.01; *** p<0.001; τ1 – measurement on the day before colonoscopy; τ2 – measurement on the day of colonoscopy; τ3 – measurement on the day after colonoscopy.*

Table 8. Dynamics of change in cognitive functioning (MoCA) in patients undergoing colonoscopy.

Cognitive functions	Dynamics of change			Statistical description		
	Measurement 1 (average)	Measurement 2 (average)	Measurement 3 (average)	Friedman's ANOVA	p-value	Dunn-Bonferroni post-hoc test
Total score	25.653	24.122	26.806	13.746	0.001	**τ1>τ2<τ3 τ1<τ3**
Visuospatial and executive functions	4.35	4.244	4.583	1.719	0.423	-
Naming	3.00	2.875	2.972	5.200	0.074	-
Attention	5.469	5.415	5.361	0.625	0.732	-
Language	2.347	2.171	2.333	0.255	0.881	-
Abstraction	1.735	1.707	1.861	0.765	0.682	-
Delayed recall	2.755	1.781	3.694	23.596	<0.001	**τ1>τ2<τ3 τ1<τ3**
Orientation	6.00	6.00	6.00	-	-	-

τ1 – measurement on the day before colonoscopy; τ2 – measurement on the day of colonoscopy; τ3 – measurement on the day after colonoscopy.

Stronger pain perception is described particularly in the context of anxiety and depression. Chronic pain is a risk factor for mood disorders [32].

Our study revealed that depressive symptoms in 18% of patients are severe enough to diagnose them as depression. Such a high percentage may be due to the observed bidirectional relationship between psychological factors and the occurrence of functional gastrointestinal diseases [11]. It is reflected, among other things, in the co-occurrence of irritable bowel syndrome with depressive and anxiety disorders [33]. In recent years, there has also been a growing number of reports, linking mental status (including a tendency to depression) and the gut microbiome, which are referred to as the gut-brain axis [34].

Our study showed a high level of state anxiety before colonoscopy. It was manifested by 56.6% of patients. Many papers show evidence of increased anxiety before medical procedures [35,36], including colonoscopy [3,12]. It is pointed out that in in case of colonoscopy this intensity is probably underestimated due to the fact that, in extreme cases, it can cause avoidance of attending the examination [37]. One study found similar levels of anxiety (and understanding of received information) on

the day of the invasive procedure compared to the days before it [38]. However, the authors noted that patients were twice as likely to refuse to participate in their study on that day. It can be hypothesised that those with higher levels of anxiety were less cooperative directly before the procedure. It is worth noting that anxiety has been shown to negatively affect cognitive functions [39].

Our study found that cognitive performance is reduced just before the colonoscopy. It is better on the day before the procedure. Out of three days of testing, the patient's global cognitive functioning was the best on the third day (after colonoscopy). This dynamic of change was particularly pronounced in delayed recall. In another study, there was no deterioration in cognitive functioning on the day of colonoscopy, after colon cleansing [40]. However, the control group here were patients about to undergo gastroscopy. As a result, affective determinants common to patients before these invasive medical procedures were not captured [41]. Furthermore, within the group of patients being prepared for colonoscopy, no decline in cognitive functioning was reported on the day of the procedure either. This may not be reliable which is due to the use of the same versions of tests in all measurements. As the authors of that article pointed out, this creates opportunities for patients to learn the correct answers. Analogous caveats apply to the work on dehydration induced by bowel preparation for colonoscopy, where no deterioration of cognitive functioning before the procedure was found as well [42].

The results of this study indicate that the worse the subjectively assessed understanding of the illness, the greater the pain experienced throughout the perioperative period. Furthermore, pain intensity on the day of the examination correlates positively with the belief that the disease has a negative impact on the patient's life. Moreover, the weaker the patient's belief in overcoming the disease through treatment, the greater the pain on the day after colonoscopy. The association of illness perception with the experience of pain has been previously described [18], including a particular emphasis on understanding illness [43].

The decline in cognitive functioning on the day of colonoscopy compels vigilance in assessing the effectiveness of patient education shortly before the procedure. It has already been suggested that some patients have difficulty in understanding the consent form for the procedure on that day and should receive it well in advance [19]. Another paper also suggested that patient's better understanding of the nature of screening increases the likelihood that they will turn up for it [44]. Our work showed an association between poor (subjectively assessed) understanding of the disease and perioperative pain. In addition, we found poorer cognitive functioning of the respondent on the procedure day. Taking these factors into account, patient education about their medical condition and planned colonoscopy seems essential. This should be carried out early enough – in the light of our study, the day of the procedure may be the least favourable period for effective patient education.

Limitations

A limitation of this work is a small size of the test group. A study with a larger sample will be necessary to verify the conclusions.

Conclusions

1. In subjects undergoing colonoscopy, it was revealed that:
   - the level of pain experience increases with the intensity of negative affect (depression, anxiety, sadness, irritability, anger, distress);
   - the severity of depressive and anxiety symptoms is an important aspect of psychological functioning of patients undergoing the procedure – the intensity corresponding to a depressive episode is found in 18% of patients and high levels of anxiety characterize more than half of patients;
   - poorer understanding of the illness increases the intensity of pain experience;
   - cognitive functioning decreases on the day of colonoscopy.
2. Educating patients about their disease:
   - may improve the subject's comfort in the context of colonoscopy
   - should be carried out early enough, with the day of the procedure being possibly the least favourable time for effective patient education.

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Conflict of interest

The authors have declared no conflict of interest.

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