DECISION-MAKING IN PANIC DISORDER. PRELIMINARY REPORT

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SUMMARY

   Background: *The impaired decision-making with high risk-aversive behavior and elevated impulsivity are reported as a trait feature in anxiety disorders including panic disorder (PD). It is hypothesised that PD patients exhibit difficulties in executive functions which can influence patients behavioural strategies e.g. problem solving, decision making, planning, impulse control. The aim of this study was to asses decision making process, risk-taking and impulsivity in PD patients as compared to healthy controls.*

   Material and methods: *Twenty-one psychotropic drug-naïve PD outpatients and 20 healthy subjects matched by age and sex were examined. Cognitive decision-making and risk-taking behaviour was measured with CGT (Cambridge Gambling Task) from CANTAB battery. The PD severity was assessed with Panic and Agoraphobia Scale (PAS). The level of anxiety and depression was assessed with HADS (Hospital Anxiety and Depression Scale). Impulsivity was evaluated with the Barratt Impulsiveness Scale, 11th version (BIS-11).*

   Results: *There were no statistically significant differences on CGT in PD patients as compared to healthy control. However, having observed more closely, there are some differences between patients and healthy control. PD patients with higher anxiety level in HADS exhibited lower percentages of risky decisions comparing to PD with lower anxiety in HADS. PD patients with higher depression level in HADS demonstrated slowed decision-making when compared to PD patients with low level of depression in HADS. Total impulsivity and its attentional and motor dimensions were significantly higher in panic disorder patients versus healthy controls.*

   Conclusion: *There were no statistically significant differences with regard to CGT assessed decision-making between drug-naïve PD patients and healthy controls. The PD patients with higher HADS-D depression level demonstrated slowed decision-making as compared to PD patients with low level of depression.*

Key words: *decision-making - risk-taking - Cambridge Gambling Task (CGT) - impulsivity - Barrat Impulsiveness Scale (BIS) - Panic disorder (PD)*

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INTRODUCTION

   Cognitive theories of anxiety disorders indicate the risk-related decisions play a role in maintenance and precipitation of anxiety (Rahman 1988, Maner 2006, Jakuszkowiak-Wojten 2015). Some studies demonstrated neuropsychological impairment in panic disorder (PD) with regard to decision-making processes including attention and information processing (Kaplan 2006). There is also evidence for intolerance of uncertainty in PD with reduced risk-taking behaviour, increased latency in speeded decision making, heightened sensitivity to errors (Wolk 2013). In unmedicated PD patients no differences in the psychomotor speed, visual recognition memory, sustained attention were reported (Asmundson 1994, Gladsjo 1998, Jakuszkowiak-Wojten 2015). However, past pharmacotherapy and/or psychotherapy may substantially contribute to the observed cognitive functioning.

   The aim of our study was to asses decision making process, risk taking and impulsivity in treatment-naïve PD compared to healthy control. It was hypothesised that PD patients would exhibit difficulties in executive functions what can influence patients behavioural strategies including problem solving, decision making, planning and impulse control.

MATERIAL AND METHODS

Materials

   The demographic and clinical variables for study population are presented in Table 1 with detailed description presented elsewhere (Jakuszkowiak-Wojten 2017). In brief, 21 psychotropic drug-naïve outpatients with PD were studied. The inclusion criteria were 18-60 years of age and the diagnosis of Panic Disorder without agoraphobia based on SCID-I (DSM-IV-TR) (First 2002). The exclusion criteria were the presence of unstable somatic illness, any past history of psychotropic medication or psychotherapy. The control group comprised of 20 healthy subjects matched by age and sex. They were interviewed using the structured clinical interview for DSM-IV-TR, non patient edition (First 2002). None of them had history of unstable medical illnesses. Exclusion criteria were: positive history of any exposure to psychotropic medication, Axis I or II disorders.

   The study was carried out in accordance with the Declaration of Helsinki with the approval of the Ethic Research Committee of the Medical University of Gdańsk. For each participant, written consent was obtained.

Table 1. Demographics and psychometrics of two groups

		Panic disorder	Controls
N		21	20
Women	%	65	70
Age (years)	Median (IQR)	30 (27, 34)	31 (28, 38.5)
PAS	Mean (95% CI)	26.5 (23.6, 29.4)	-
HADS-A	Mean (95% CI)	12.1* (10.2, 14.0)	2.7 (1.7, 3.7)
HADS-D	Mean (95% CI)	7.4** (5.1, 9.7)	1.3 (0.6, 1.9)
BIS attention	Mean (95% CI)	20.7*** (19.7, 22.2)	15.0 (13.7, 16.3)
BIS motor	Mean (95% CI)	23.2# (21.0, 25.4)	19.6 (18.3, 20.9)
BIS non-plan	Mean (96% CI)	26.5(25.0, 27.9)	24.9 (23.3, 26.4)
BIS total	Mean (95% CI)	70.3## (66.2, 74.4)	59.5 (56.5, 62.4)

*vs Control: p<0.0001, two-tailed unpaired t-test, mean difference (95% CI)=9.4 (7.3, 11.5);   ** vs Control: p<0.0001 , two-tailed unpaired t-test, mean difference (95% CI)=6.1 (3.8, 8.5):   ***vs Control: p<0.0001, two-tailed unpaired t-test, mean difference (95% CI)=5.7 (3.8, 7.6);   #vs Control: p=0.006, two-tailed unpaired t-test, mean difference (95% CI)=3.6 (1.1, 6.1) ## vs Control: p<0.0001, two-tailed unpaired t-test, mean difference (95% CI)=10.8 (6.0, 15.8);   PAS (Panic and Agoraphobia Scale), HADS-A (Hospital Anxiety and Depression Scale), BIS (Barratt Impulsiveness Scale), BIS-attention (attentional), BIS-motor (motor), BIS- non-plan (non-planning), IQR (Interquartile Range), 95%CI (95% Confidence Interval)

Table. 2. Cambridge Gambling Task (CGT): PD vs. Controls

	PD (N=21) Mean (95% CI)	Controls (N=20) Mean (95% CI)	p
Quality of decision making	0.83 (0.75, 0.90)	0.94 (0.83, 1.04)	0.083
Deliberation time	2694.9 (2310.1, 3079.6)	2633.7 (2081.7, 3185.8)	0.849
Risk taking	0.56 (0.49, 0.64)	0.59 (0.52, 0.65)	0.602
Risk adjustment	0.76 (0.38, 1.1)	0.98 (0.56, 1.39)	0.424
Delay aversion	0.34 (0.25, 0.42)	0.27 (0.19, 0.35)	0.246
Overall proportion bet	0.53 (0.46, 0.60)	0.55 (0.48, 0.61)	0.681

Method

The severity of Panic Disorder was assessed with Panic and Agoraphobia Scale (PAS). All subjects completed Hospital Anxiety and Depression Scale (HADS) (Zigmond 1983) and Barratt Impulsiveness Scale, 11th version (BIS-11) Neuropsychological assessment of risk-taking behavior was done using the Cambridge Gambling Task (CGT) from the Cambridge Neuropsychological Automated Test Battery (CANTAB, Cambridge Cognition Ltd., UK).

CGT was chosen as it has been known as a typical task requiring cognitive decision-making and risk-taking behaviour outside a learning context (Atkinson, 2015) and low demands for the working memory and reversal learning, since the selection of the colour and the bet option in each trial are completely independent (Mochizuki 2009).

Statistical analysis

The statistical analysis was performed using non parametrical Spearman's rank correlation test. Differences between groups for discrete variables were assessed using the chi-square test, while the Student's t-test was used for normal distributed variables. The Mann-Whitney U-test was used for the others. The Pearson's correlation coefficient was used to assess correlations between the obtained variables. All test were two-tailed. The level of significance was set at p<0.05. All analyses were conducted with Statistica v.10.0 software.

RESULTS

Sample characteristics is presented in Table 1. Patient with PD did not differ from matched controls in terms of age. Significant differences between groups were seen for anxiety [p<0.0001; 95%CI: 9.4 (7.3, 11.5)], depression [p<0.0001; 95%CI: 6.1 (3.8, 8.5)], total impulsivity [p<0.0001; 95%CI: 10.8 (6.0, 15.8)] with its attentional [p<0.0001; 95%CI: 5.7 (3.8, 7.6)] and motor dimensions [p=0.006; 95%CI: 3.6 (1.1, 6.1)]. No significant group differences between PD patients and controls were observed in CGT scores (Table 2).

In PD group the post hoc analysis revealed significant positive correlation between depression and deliberation time in CGT [0.53 (p<0.05)] and significant negative correlation between anxiety and risk adjustment in CGT [-0.50 (p<0.05)]. No correlations between CGT parameters and impulsivity dimensions in PD patients were found (Table 3). Negative correlation between deliberation time in CGT and attentional impulsivity dimension in BIS was found in controls on exploratory analysis [-0.51(p<0.05)] (Table 4).

Table 3. Panic disorder (N=21): correlation coefficient between CGT parameters and psychometric measures

CGT parameters:		HADS			BIS–11		
	PAS	Anxiety	Depression	Total	Attention	Motor	Non-planning
Quality of decision making	-0.25	-0.41	-0.30	0.11	0.03	0.02	0.25
Deliberation time	0.02	0.26	0.53*	0.10	0.15	0.07	0.00
Risk taking	-0.33	-0.27	-0.35	0.33	0.28	0.33	0.13
Risk adjustment	0.06	-0.50*	-0.20	-0.29	-0.30	-0.19	-0.22
Delay aversion	0.31	-0.14	-0.21	0.00	-0.17	0.23	-0.17
Overall proportion bet	-0.33	-0.20	0.681	0.30	0.29	0.31	0.08

*$p<0.05$

Table 4. Control group (N=20): correlation coefficient between CGT parameters and psychometric measures

CGT parameters:	HADS			BIS–11		
	Anxiety	Depression	Total	Attention	Motor	Non-planning
Quality of decision making	-0.09	-0.09	0.25	0.27	0.03	0.22
Deliberation time	-0.24	-0.04	-0.09	-0.51*	-0.04	0.26
Risk taking	0.38	0.10	0.07	0.04	0.01	0.10
Risk adjustment	-0.04	0.10	0.18	0.24	0.02	0.13
Delay aversion	0.06	-0.12	-0.05	-0.11	0.10	-0.09
Overall proportion bet	0.38	0.10	0.04	-0.03	0.01	0.09

*$p<0.05$

DISCUSSION

No deficits on CGT in PD were found compared to healthy controls. Exploratory analysis revealed that longer latencies in decision-making were associated with higher level of depression in PD patients while higher anxiety level was correlated with lower percentages of risky decisions. The total impulsivity score and its attentional and motor dimensions were significantly higher in PD as compared to controls.

The results are is in line with Kaplan et al. (2006) who found no cognitive deficits with CANTAB in PD subjects being unmedicated at that time. Still, PD subjects with comorbid MDD displayed longer latencies in decision-making process compared to their matched controls, that were not observed in PD group (Kaplan 2006). Also, PD subjects with higher level of depression demonstrated longer latencies in decision-making compared to PD without depression. This result is consistent with depression symptomatology for indecisiveness and consistent with previous reports in depressive patients (Murphy 2001). The study supports the findings associating anxiety level being linked to altered processing of context during decision making (Sip 2016) as PD patients with higher anxiety scores in HADS were more cautious in risk taking behaviours promoting decisions to avoid uncertain or risky consequences (Mueller 2010). Our results are consistent with numerous studies reporting higher impulsivity in anxiety disorder patients (Summerfeld 2004, Kashdan 2009, Perugi 2011, Jakuszkowiak-Wojten 2015, Jakuszkowiak-Wojten 2017).

This study demonstrates that pathological anxiety affects decision making process by leading patients to avoid risky choices as compared to less anxious patients.

Anxiety informs about potential threat and influences cognition (Giorgietta 2012). It may be hypothesized that more anxious patients protect themselves from losses by avoidant risk. According to our study and previous studies greater risk-averse behavior may be a trait feature of anxiety disorders (e.g. generalized anxiety disorder, social anxiety disorder, panic disorder), independent of treatment (Maner 2006, Giorgietta 2012).

Some research are in contrast with our findings demonstrating frequent unpredictability in PD medicated patients (Ludevig 2003). However, they included medicated PD subjects exposed to psychotropic medication.

The study has several limitations. The investigated group is relatively small. The subjects were tested only once, therefore, it is unclear whether this cognitive deficits are trait or a state-like characteristics. Further studies with larger sample sizes and wider range of methodology are required.

CONCLUSION

There were no statistically significant deficits on CGT in groups of PD patients comparing to healthy control. However, having observed more closely PD patients with higher depression level in HADS demonstrated slowed decision-making compared to PD patients with low level of depression in HADS which is consistent with previous reports on cognitive deficits in depression. The current evidence suggests that decision making dysfunctions are related to the severity of the clinical symptoms of panic disorder. Higher impulsivity seems to be an independent and persistent trait in patients with panic disorders.

Conflict of interest: *None to declare.*

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