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## Predictors of anxiety during the COVID-19 pandemic in Poland

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### ABSTRACT

A coronavirus pandemic hit the world and Poland was no exception. The present research sought to investigate different factors associated with coronavirus-related anxiety during the COVID-19 outbreak in Poland. More specifically, COVID-19-related risk perceptions, beliefs, precautionary actions, information sources, and anxiety level were studied on general population ( $N = 1069$ ) in Poland between March 29th and April 17th 2020. Multiple regression was used to examine the significant predictions of anxiety. Data revealed that anxiety in response to the COVID-19 was common in the sample. Major predictors of higher anxiety related to the pandemic outbreak included demographic factors, like being female, being older, being married or cohabiting, and having children. Additionally, greater anxiety was reported among people who reported chronic illnesses and generally worse health condition. From COVID-19 related factors, higher frequency of recommended protective behaviors, greater perceived risk of infection, greater likelihood of contacting COVID-19 during the current outbreak, greater amounts of information about COVID-19 received from various sources, and very little or lack of belief that degree of catching COVID-19 depends on one's own behavior predicted greater anxiety among individuals.

### 1. Introduction

The 2019 novel coronavirus (COVID-19) pandemic, believed to have originated in a wet market in Wuhan, China at the end of 2019, has gained intense attention nationwide and globally. The emergence of the COVID-19 pandemic has parallels with the 2003 outbreak of severe acute respiratory syndrome (SARS), which was caused by another coronavirus (Brug et al., 2004; Fung & Cairncross, 2006; Leung et al., 2003). Although the diseases have different clinical presentations the infectious cause, epidemiological features, fast transmission pattern, and insufficient preparedness of health authorities to address the outbreaks are similar (Cao et al., 2020; Wang, Di, et al., 2020). As of 3rd July 2020, the World Health Organization reported 11,018,636 laboratory confirmed cases of COVID-19 and 524,825 deaths (WHO, 2020). Poland was no exception and many deaths were reported (35,405 total cases and 1507 total deaths as of 3rd July 2020; WHO, 2020). Given the seriousness of the situation and lack of any specific vaccine against COVID-19, mitigation measures around the world have so far focused on identifying, treating, and isolating people who have the disease and educating the public about the steps that individuals can take to reduce the risk of transmission.

COVID-19 could be seen as a stressor that elicited a strong anxiety response among people in the epidemic regions (Cao et al., 2020; Wang,

Pan, et al., 2020; Xiang et al., 2020). Understanding the psychological factors that predict anxiety in response to such phenomena is important because for some people this results in clinically significant anxiety (Xiang et al., 2020). Thus, the main objective of our study was to investigate different factors associated with coronavirus-related anxiety. Additionally, we wanted to examine how members of the general population in Poland perceived different aspects of COVID-19, their views and beliefs about the COVID-19, as well as precautionary actions and information sources about the COVID-19. This study represents a unique opportunity to better understand pandemic concerns. As this study is the first of its kind, we considered our analyses to be exploratory in nature and thus did not have specific a priori hypotheses regarding which variables would emerge as independent predictors of coronavirus-related anxiety.

### 2. Methods

#### 2.1. Participants and procedure

The sample was composed of 1069 Polish adults (610 female and 459 male) of all ages ranging from 18 to 74 years ( $M = 38.54$ ,  $SD = 15.95$ ). Participation was voluntary and anonymous. Data were collected in an online study administered via a tool for online surveys:

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SosciSurvey facility. Individuals were recruited through advertisements posted on social media (i.e., Facebook, Twitter). A web-based approach has several advantages—in particular, high efficiency and low cost (Best & Krueger, 2002). Additionally, results from a number of studies indicate that the administration of anxiety-related assessment measures using Internet-based and paper-and-pencil formats yield highly comparable results (e.g., Coles et al., 2007). All participants provided a consent which was obtained online after a detailed instruction describing main purposes and approximate duration of the study. Study was approved by the appropriate ethics review committee of the University of Economics and Human Sciences in Warsaw, Poland, prior to initiation. The data were collected in the period between March 29 and April 17, 2020. During this period, the COVID-19 pandemic was still present in Poland in terms of infections and deaths.

Forty-two of these respondents had been diagnosed with the COVID-19 infection. They were omitted from data analyses because, due to their immunity, they would not be expected to have any motivation for protective behaviors. Additionally, seven control items (e.g., “Please answer ‘Disagree’ to this question”) were included throughout the full-length survey to screen for inattentive and negligent responding. Because previous research has demonstrated that removing inattentive participants improves reliability and power (Maniaci & Rogge, 2014), eight participants who failed to provide correct responses to two or more of these control questions were consequently excluded from the data analysis. Hence, a total of 1019 (441 men, 578 women) respondents were included in the analyses. Their average age was 37.72 years (SD = 15.22).

## 2.2. Demographic characteristics

The research form included questions regarding the following demographic factors: gender, age education, socioeconomic status, marital status, and having children. In addition, the respondents' were questioned about their health conditions with the following two questions: “How good is your health generally?” with the choices of “Very good”, “Good”, “Bad” and “Very bad”, and “Do you have any of the following chronic illnesses?” with the choices of “cancer”, “heart disease”, “lung disease”, “liver or kidney disease” and “any other illness” (Table 1).

## 2.3. Anxiety sensitivity index-3

Anxiety sensitivity scores have been found to be more predictive than trait anxiety (Martin et al., 2014; Schmidt et al., 2006). Thus, the anxiety levels were measured using the Anxiety Sensitivity Index-3 (ASI-3). The ASI-3 (Taylor et al., 2007), the most widely used self-report measure of anxiety sensitivity, is an 18-item version of the original ASI (Reiss, Peterson, Gursky, & McNally, 1986) that measures beliefs about the feared consequences of symptoms associated with anxious arousal (e.g., “It scares me when I become short of breath”, “It is important for me not to appear nervous”). Respondents were asked to indicate the degree to which they agree with each item on a 5-point Likert-type scale ranging from 0 (very little) to 4 (very much). Scores range from 0 to 72. The ASI-3 has been found to be a psychometrically sound and valid measure of anxiety sensitivity (Taylor et al., 2007). Within the current investigation the total measure demonstrated excellent internal consistency ( $\alpha = 0.96$ ).

## 2.4. Perceptions and beliefs regarding COVID-19

The perceptions and beliefs regarding the COVID-19 pandemic were measured with four questions (Table 2). These included questions about susceptibility, the severity of the long-term consequences of the epidemic, prediction of the situation surrounding the COVID-19 epidemic two months in the future, and the belief/disbelief that COVID-19 infection depends on one's own behaviors. Additionally, we evaluated

**Table 1**  
Frequency (N) and percentage (%) of answers to demographic questions.

	N	%
Gender		
Male	468	45.9
Female	551	54.1
Age		
< 30	379	37.2
30–39	295	29.0
40–49	203	19.9
> 50	142	13.9
Education		
Primary	127	12.5
Secondary	285	28.0
Higher	607	59.5
Monthly personal income		
< 3000 PLN	331	32.5
3000–4999 PLN	389	38.2
≥ 5000 PLN	299	29.3
Marital status		
Single	282	27.7
Married	421	41.3
Cohabiting	195	19.2
Divorced	104	10.2
Widowed	17	1.6
Children		
No	386	37.9
Yes	633	62.1
Presence of chronic illness		
No	766	75.2
Yes	253	24.8
General health condition		
Very bad	63	6.2
Bad	93	9.1
Good	698	68.5
Very good	165	16.2

respondents' risk perception in terms of their self-perceived likelihood of contracting COVID-19 and survival if diagnosed with the disease. Respondents were also asked about their confidence in physicians' ability to diagnose the disease. Next, because an earlier study has demonstrated that a citizen's trust of information regarding COVID-19 and trust in the recommendations of health authorities are significant predictors of protective behavior (Rubin et al., 2009), we measured the public's trust of health authorities with three questions (see Table 2). More specifically, these three questions included belief/disbelief in the accuracy of the government's COVID-19 information, government's success in managing pandemic, and likelihood that government will be able to effectively control pandemic in the future.

## 2.5. Specific actions to prevent COVID-19

Respondents were asked which actions they had taken to avoid getting the coronavirus (Table 3). The total number of actions taken was regarded as an overall COVID-19 precautionary behavior score (range 0–13,  $\alpha = 0.79$ ). Sample items included: washing hands more often; using disinfectants; wearing facemasks, avoiding shaking hands or kissing.

## 2.6. Sources of information about COVID-19

Finally, respondents were asked to indicate how much information about COVID-19 they obtained from different sources (i.e. television, Internet, newspaper/magazines, health officials, friends/family, word of mouth) and how much confidence they had in these sources (Table 4). Answer format for all options ranged from 1 = very little to 5 = very much.

All questions mentioned above measuring perceptions and beliefs regarding COVID-19, actions to prevent infection, and sources of information about COVID-19 were taken from previously published

**Table 2**  
Frequency (N) and percentage (%) of answers to questions regarding COVID-19-related perceptions and beliefs.

	N	%
Perceived risk of COVID-19 infection		
Very low	217	21.3
Low	291	28.6
High	419	41.1
Very high	92	9.0
Perceived severity of the long-term consequences of COVID-19 infection		
Not at all severe	202	19.8
Not severe	218	21.4
Severe	471	46.2
Very severe	128	12.6
COVID-19 epidemic situation in Poland in 2 months in the future		
Much worse	55	5.4
Worse	207	20.3
The same as now	513	50.4
Better	144	14.1
Much better	100	9.8
To what degree catching the COVID-19 depends on one's own behavior		
Not at all	64	6.3
Very little	105	10.3
Little	337	33.1
Much	352	34.5
Great	161	15.8
Level of confidence in own physician's ability to diagnose or recognise COVID-19		
Very confident	294	28.9
Somewhat confident	518	50.8
Not very confident	153	14.9
Not at all confident	54	5.4
Likelihood of contacting COVID-19 during the current outbreak		
Very likely	112	11.0
Somewhat likely	387	38.0
Not very likely	349	34.2
Not likely at all	171	16.8
Likelihood of surviving COVID-19 if infected		
Very likely	356	34.9
Somewhat likely	482	47.3
Not very likely	150	14.7
Not likely at all	31	3.1
Belief in the accuracy of the government's COVID-19 information		
Mostly incorrect	285	28.0
Incorrect	457	44.9
Correct	148	14.5
Mostly correct	129	12.6
Opinion of the government's success in managing the COVID-19 epidemic		
Very unsuccessful	295	29.0
Unsuccessful	518	50.8
Successful	156	15.3
Very successful	50	4.9
Likelihood that government will be able to effectively control and manage COVID-19 epidemics in the future		
Very unlikely	382	37.5
Unlikely	256	25.1
Likely	304	29.8
Very likely	77	7.6

articles (Brug et al., 2004; Gaygısız et al., 2012; Rubin et al., 2009).

### 3. Results

#### 3.1. Demographic characteristics

The characteristics of the respondents can be found in Table 1. Table 1 shows that the sample consisted primarily of individuals under 50 years old. The respondents generally had higher level of education, were either single or married, and had children. Almost one-fourth of the respondents reported having a chronic illness, whereas the majority (over 84%) reported their health condition as “good” or “very good.”

**Table 3**  
Frequency of recommended protective behaviors and actions to prevent COVID-19.

Precautionary action	N	Percentage
Wash hands more often	816	80.1
Be more attentive to cleanliness	805	78.9
Use disinfectants	790	77.5
Do not go to school or work	774	75.9
Avoid large gatherings of people	752	73.8
Avoid traveling	719	70.6
Wear a mask	697	68.4
Avoid travel by public transport or taxis	586	57.5
Avoid shaking hands/kissing	523	51.3
Avoid particular types of people (e.g. doctors)	427	41.9
Make sure to get sufficient sleep	263	25.8
Eat a balanced diet	211	20.7
Exercise regularly	203	19.9

Note: Any items could be selected and thus proportions do not add to 100%. Items were presented in a random order.

**Table 4**  
Sources of information about COVID-19 and confidence in those sources <sup>a</sup>.

Information source	Amount of information, mean (95% CI)	Confidence in the information, mean (95% CI)
Television	4.4 (4.1–4.7)	3.9 (3.7–4.1)
Internet	4.3 (4.0–4.6)	3.7 (3.5–3.9)
Friends/Family	3.4 (3.2–3.6)	3.1 (2.9–3.3)
Newspapers/ magazines	2.5 (2.4–2.6)	3.4 (3.3–3.5)
Health officials	1.9 (1.7–2.1)	3.3 (3.2–3.5)
Word of mouth	1.5 (1.1–1.9)	2.4 (2.1–2.7)

a = Scale ranged from 1 = very little to 5 = very much. CI, confidence interval.

Note: Any items could be selected. Items were presented in a random order.

#### 3.2. Perceptions related to infection risk

A large number of the respondents in this study estimated their risk of being infected as high or very high (50.1%) and the long-term consequences of the infection to be severe or very severe (58.8%). When asked about their prediction for the COVID-19 situation in Poland in 2 months, only 23.9% of respondents expected the situation to improve, 50.4% expected it stay the same, and 25.7% expected the situation to become worse. When respondents were asked about their own behaviors and risk of COVID-19 infection, a majority of 83.4% perceived themselves to have control over their risk of infection to at least some degree (i.e., “little control”, “much control” or “a great deal of control”).

#### 3.3. Beliefs regarding COVID-19

Table 2 also shows that almost a half of the respondents (49%) believed that they were “very likely” or “somewhat likely” to contract COVID-19 during the current outbreak. Regarding the likelihood of surviving COVID-19 if they contracted the disease, fewer than 18% believed they were unlikely (14.7% “not very likely” and 3.1% “not likely at all”) to survive but over one-third (34.9%) were certain to survive COVID-19 if infected. The actual case fatality ratio in Poland as of 17th April 2020 (last day of conducting this study) was 3.9% (332 deaths of 8379 confirmed cases), whereas current best estimates vary between 4.2% to 4.6% (WHO, 2020). Most respondents were confident (28.9% “very confident” and 50.8% “somewhat confident”) that their physician would be able to recognise the symptoms and signs of COVID-19 and properly diagnose the disease.

3.4. Perceptions related to the government's role in managing the COVID-19 pandemic

The majority of the respondents (over 70%) were suspicious of the accuracy of the COVID-19 information provided by the health authorities (Table 2). Moreover, 79.8% evaluated the government's success in managing the epidemic as "very unsuccessful" or "unsuccessful." Majority of respondents (62.6%) perceived the likelihood that the government would be able to manage the epidemic in the future to be "very unlikely" or "unlikely". At the same time only 7.6% of respondents said that it is very likely that government will be able to effectively control and manage COVID-19 epidemics in the future.

3.5. Specific actions to prevent COVID-19

Many respondents reported that they took precautionary actions to reduce their risk for COVID-19. Notably, based on multiple responses, all respondents reported taking at least one precautionary action; 57.1% reported one or more specific actions, especially washing hands more often, being more attentive to cleanliness and using disinfectants. Three-fourth of people worked or studied from home. Additionally around 70% of participants avoided traveling or gathering with other people. Over 68% of respondents declared wearing facemasks. The other respondents indicated they had done something else to avoid getting COVID-19, e.g. got enough sleep, exercised regularly or had a balanced diet (see Table 3).

3.6. Sources of information about COVID-19

Based on multiple responses, in our study over 80% of respondents learned about the COVID-19 from television while about 70% came to know about the disease from the Internet. Only 20% of participants got their information from health officials and the minority of 6% of participants got their information through word of mouth. Television and Internet were also rated as the most confident sources of information, while word of mouth was the least trustworthy source of information

3.7. Regression analysis

Participants reported anxiety level with mean 39.06 (SD = 8.95). This score is higher than the established previously mean of 22.53 (SD = 9.05) for high-anxious individuals (Holas et al., 2013). We next computed a multiple regression analysis predicting anxiety scores. To determine which variables would make significant contributions in predicting coronavirus-related anxiety we computed a regression in which the ASI-3 served as the dependent variable, and the other study measures were entered simultaneously as predictors. The variables were entered into the model in two blocks: demographic factors were entered first, followed by COVID-19 related beliefs and factors (see Table 5). Prior to the analysis, "marital status" was classified into two categories, "single, divorced or widowed" and "married or cohabiting". Summary statistics for each variable in this equation are presented in Table 5. Together, the predictor variables accounted for 36% of the variance in ASI-3 scores, and the model was highly significant ( $p < 0.001$ ).

Major predictors of higher anxiety related to the pandemic outbreak included demographic factors, like being female, being older, being married or cohabiting, and having children. Additionally, greater anxiety was reported among people who reported chronic illnesses and generally worse health condition. From COVID-19 related factors, higher frequency of recommended protective behaviors, greater perceived risk of infection, greater likelihood of contacting COVID-19 during the current outbreak, greater amounts of information about COVID-19 received from various sources, and very little or lack of belief that degree of catching COVID-19 depends on one's own behavior predicted greater anxiety among individuals.

**Table 5**  
Results of multiple regression analyses predicting the level of anxiety.

	$\beta$	$t$	$p$
<b>Background</b>			
Gender	0.19	6.40	< 0.001
Age	0.21	6.93	< 0.001
Education	-0.02	-0.40	n.s.
Monthly personal income	0.01	0.05	n.s.
Marital status	0.13	4.62	< 0.01
Children	0.22	7.09	< 0.05
Presence of chronic illness	0.25	7.81	< 0.001
General health condition	-0.18	-6.35	< 0.001
<b>COVID-19-related factors</b>			
Frequency of recommended protective behaviors	0.20	6.89	< 0.001
Perceived risk of infection	0.38	9.55	< 0.001
Perceived severity of the long-term consequences	0.03	0.10	n.s.
Epidemic situation in Poland 2 months in the future	-0.02	-0.08	n.s.
Relationship between catching COVID-19 and one's own behavior	-0.17	-5.87	< 0.001
Level of confidence in own physician's ability to diagnose or recognise COVID-19	-0.01	-0.05	n.s.
Likelihood of contacting COVID-19 during the current outbreak	0.28	8.40	< 0.001
Likelihood of surviving COVID-19 if infected	0.05	0.11	n.s.
Belief regarding the accuracy of the government's COVID-19 information	0.00	0.05	n.s.
Opinion regarding the government's success in managing the epidemic	-0.00	-0.06	n.s.
Government's ability to control and manage the epidemic	-0.04	-0.10	n.s.
Amount of information about COVID-19	0.32	9.10	< 0.001
Confidence of the information about COVID-19	-0.07	-0.14	n.s.

Note:  $\beta$  = standardized regression coefficients,  $t$  =  $t$ -test statistics,  $p$  =  $p$  value.

4. Discussion

Little research has been conducted on anxiety in response to pandemic illnesses such as the COVID-19 pandemic outbreak in East Europe. However, elucidating the factors that contribute to such anxiety may be of value in understanding how the public responds to large scale illness threats, and identifying individuals who might be vulnerable to maladaptive responses (Cao et al., 2020). Accordingly, in the present study we examined the extent of anxiety and its predictors during the outbreak of the COVID-19 epidemic in Poland. Moreover, this study aimed to report on public perceptions and beliefs about COVID-19 pandemic.

The results indicate that the Polish population was well aware of the COVID-19 outbreak, and obtained their information primarily from television and Internet, which were also rated as trustworthy sources of information. Such media attention may have been a mixed blessing. On the one hand, rapid communication of the risks of infection would seem to promote healthy behavior change and reduce the spread of contagion (Wheaton et al., 2012). On the other hand, mass media coverage of a pandemic can potentially lead to mass hysteria and fear; as was observed during the 2005 outbreak of the avian flu during which greater television exposure was associated with greater fear of this illness (Van den Bulck & Custers, 2009). Thus, it can explain why greater amounts of information about COVID-19 received from various sources predicted greater anxiety among participants.

A potential pandemic is likely to cause great anxiety to the general public. Over half of a Polish sample screened in the early stages of the COVID-19 outbreak estimated their risk of being infected as high or very high (50.1%) and the long-term consequences of the infection to be severe or very severe (58.8%), and both COVID-19 related factors were significant predictors of anxiety in response to the outbreak. Additionally, anxiety level was high in the current sample and greatly exceeded scores obtained in previous research among Polish community (Holas et al., 2013). Several reasons could explain this, including

their having contracted a new and highly infectious disorder, uncertainty about the efficacy of treatment, negative media reports, obligation being in quarantine for at least 14 days in isolation, apprehension that they might have unknowingly transmitted the virus, especially to loved ones, and constantly increasing mortality rate. Moreover, higher perceptions of risk were associated with greater anxiety, which is in line with predictions from risk perception theory and previous research (Brug et al., 2004; Leung et al., 2003).

Next, in the current study, many individuals reported that they took precautionary actions to reduce their risk for COVID-19. Washing hands more often, being more attentive to cleanliness and using disinfectants were reported as the most often precautionary actions. The same was reported in the latest research conducted by Wang and co-workers (2020) on the general population in China. Encouraging the public to undertake specific behaviors related to hygiene has proved useful in containing previous outbreaks of infectious disease (Fung & Cairncross, 2006; Rubin et al., 2009). Additionally, studies of how people responded to the outbreak of severe acute respiratory syndrome in 2003 suggest that perceptions or beliefs about an outbreak may be important in determining compliance with official advice (Brug et al., 2004; Fung & Cairncross, 2006; Leung et al., 2003). In addition, higher levels of anxiety or worry may be associated with an increase in behavior changes (Lau et al., 2007; Rubin et al., 2009).

Our regression analysis indicated that having chronic illnesses and generally worse health condition, emerged as significant individual predictors. Additionally, it is not surprising that greater perceived risk of infection and very little or lack of belief that degree of catching COVID-19 depends on one's own behavior predicted greater anxiety among respondents. Indeed, health anxiety is a function of how likely and how severe a feared illness is perceived to be (Wheaton et al., 2012). During the COVID-19 pandemic outbreak, the media portrayed this virus as easily communicable, suggesting a high likelihood of exposure and of becoming infected. Next, the tendency to exaggerate the likelihood of contacting COVID-19 during the current outbreak was also a significant predictor of anxiety related to the pandemic outbreak. Indeed, COVID-19 was described as a highly communicable virus, thus, people with pre-existing concerns about contamination might have been especially vulnerable to worrying about coming into contact with sources of this disease. The same is truth for people who suffer from chronic illnesses. People of any age with certain underlying medical conditions are at increased risk for severe illness from COVID-19. Thus, they might also show greater levels of COVID-19 related anxiety.

Finally, anxiety was significantly associated with demographic factors and perceptions regarding the COVID-19 epidemic. In our study, the perceived likelihood of getting COVID-19 was rated high by few persons. Women reported higher anxiety about the disease. At the same time, education level was not a significant predictor of anxiety. Earlier studies on different topics reported mixed findings on differences in risk perceptions according to level of education (Bratt et al., 2000; Erbllich et al., 2000). As would be anticipated, younger, less educated males, the traditional risk takers, were least likely to adopt appropriate preventive measures in protecting themselves and others against COVID-19 (Brug et al., 2004). However, in our study, anxiety level was not related to educational level, indicating that all sectors of the community were adversely affected. But anxiety level was significantly positively associated with age, suggesting that older participants were cognisant of poorer prognosis if infected. Lastly, having children and being married or cohabiting were related to greater anxiety. These findings may reflect individuals' heightened anxiety and concern with respect to the health of their children and partners.

#### 4.1. Limitation and future research

A number of limitations of this study should be mentioned. First, the cross-sectional nature of this investigation precludes us from drawing causal inferences regarding the relationships between the psychological

variables and concerns about the COVID-19. It is important to note that the variables found to be significant predictors of anxiety cannot be assumed to cause such symptoms. The additional limitation of this rapid survey during the COVID-19 outbreak is that it was administered at a single period in time and the stability of the responses is unknown. Future longitudinal research is needed to determine the direction of causality for these associations, as well as the presence of any intermediary factors. It would also be desirable to compare the public's psychological responses in other countries that were similarly affected. Additionally, results showed that anxiety was significantly related to perceptions about risk of infection. However, risk perception and compliance with preventive measures may have changed during the pandemic period (Wheaton et al., 2012). It was not possible to evaluate any change related with pandemic period in beliefs and perceptions with the current study. Further longitudinal studies might overcome this limitation. Finally, stress management training, which has been shown to be effective in reducing anxiety, should be provided to all individuals as a preventive measure during future outbreaks (Shapiro et al., 2000).

#### CRedit authorship contribution statement

**Marta Malesza:** Conceptualization, Methodology, Data collection, Writing- Original draft preparation, Writing- Reviewing and Editing.  
**Magdalena Claudia Kaczmarek:** Data Collection, Writing- Reviewing and Editing.

#### Declaration of competing interest

Author Marta Malesza declares that she has no conflict of interest. Author Magdalena Claudia Kaczmarek declares that she has no conflict of interest.

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