

AKADEMIA PEDAGOGIKI SPECJALNEJ
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Rozprawa doktorska na temat:

**Rola patologicznych domen osobowości w negatywnych i wrogich
zniekształceniach poznawczych u osób z objawami depresji**

Rozprawa doktorska przygotowana pod kierunkiem:
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i dr Izabeli Kaźmierczak

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.....

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Temat rozprawy doktorskiej:

Rola patologicznych domen osobowości w negatywnych i wrogich zniekształceniach poznawczych u osób z objawami depresji

Słowa kluczowe:

objawy depresji, zniekształcenia poznawcze, wrogie atrybucje, patologiczne domeny osobowości

Streszczenie

Nadrzędnym celem projektu było zbadanie związku między zniekształceniami poznawczymi a symptomami depresji, ze szczególnym uwzględnieniem roli, jaką w tej relacji odgrywają patologiczne domeny osobowości. Niniejsza praca proponuje nowe, zintegrowane ujęcie, w którym patologia osobowości - ujęta zgodnie z Alternatywnym Modelem Zaburzeń Osobowości (AMPD) z DSM-5 - stanowi fundamentalne podłoże dla rozwoju zniekształceń poznawczych oraz wtórnych wobec nich objawów depresyjnych.

Rozprawa doktorska opiera się na cyklu pięciu powiązanych tematycznie artykułów, w tym czterech opublikowanych w recenzowanych czasopismach naukowych. Dzięki zastosowaniu wieloaspektowego podejścia metodologicznego, obejmującego badania podłużne, eksperymentalne oraz zaawansowane techniki pomiaru (okulografia, EEG), a także

włączeniu do analiz zróżnicowanych grup (populacja ogólna, pacjenci z diagnozą kliniczną, osoby osadzone - w tym sprawcy zabójstw), możliwe było nie tylko opisanie poszczególnych korelatów depresji, ale przede wszystkim empiryczne ugruntowanie zintegrowanego modelu teoretycznego.

W publikacjach poświęconych komponentowi poznawczemu i społecznemu (Artykuły 2, 3, 4) wykazano, że symptomy depresji wiążą się ze stabilną tendencją do używania negatywnej narracji, specyficznymi wzorcami uwagowymi w kontekście porównań społecznych, a także z trudnościami w rozpoznawaniu niejednoznacznych emocji oraz frustracją potrzeby relacyjności. Badania te, wykraczając poza standardowe metody samoopisowe, pozwoliły na pogłębioną analizę mechanizmów przetwarzania informacji charakterystycznych dla depresji.

Kluczowe znaczenie dla wniosków końcowych rozprawy miały analizy dotyczące roli osobowości (Artykuł 5, wsparty wynikami z Artykułu 1). Potwierdzono w nich, że bezpośredni związek między wrogimi atrybucjami a depresją traci istotność statystyczną po uwzględnieniu patologicznych domen osobowości, takich jak Negatywna Afektywność i Dystans. Wyniki te, zreplikowane również w specyficznej grupie sprawców zabójstw, stanowią argument na rzecz tezy o ważnym znaczeniu struktury osobowości.

Przeprowadzone badania dały podstawę do sformułowania nowego, hierarchicznego modelu teoretycznego. Zakłada on, że patologiczne domeny osobowości stanowią fundament, na którym rozwijają się zniekształcenia poznawcze oraz towarzyszące im objawy depresji. Model ten niesie istotne implikacje dla praktyki klinicznej, wskazując na zasadność integracji interwencji ukierunkowanych na patologiczne domeny osobowości i procesy mentalizacji. Skuteczność takiego podejścia została wstępnie potwierdzona w badaniach uzupełniających (Artykuł 8, spoza głównego cyklu), dotyczących adaptacji treningu mentalizacyjnego w warunkach penitencjarnych.

Summary of the Ph.D. Thesis

Name of the author of the thesis:

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Academic title of the doctoral supervisor of the thesis:

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The title of the thesis:

Role of Pathological Personality Domains in Negative and Hostile Cognitive Distortions in Individuals with Depressive Symptoms

Key words phrases:

depression, cognitive distortions, hostile attributions, pathological personality domains

Abstract

The primary aim of this project was to examine the relationship between cognitive distortions and depressive symptoms, with particular emphasis on the role played by pathological personality domains in this relationship. This study proposes a new, integrated framework in which personality pathology - conceptualized according to the Alternative Model for Personality Disorders (AMPD) in DSM-5 - constitutes the fundamental basis for the development of cognitive distortions and the depressive symptoms resulting from them.

The doctoral dissertation is based on a series of five thematically linked articles (four published in peer-reviewed scientific journals). By employing a multifaceted methodological approach, including longitudinal and experimental studies as well as advanced measurement techniques (eye-tracking, EEG), and by including diverse groups in the analyses (general population, clinically diagnosed patients, incarcerated individuals - including homicide

offenders), it was possible not only to describe specific correlates of depression but, above all, to empirically ground an integrated theoretical model.

Publications dedicated to the cognitive and social components (Articles 2, 3, 4) demonstrated that depressive symptoms are associated with a stable tendency to use negative narration, specific attentional patterns in the context of social comparisons, as well as difficulties in recognizing ambiguous emotions and relatedness frustration. These studies, going beyond standard self-report methods, allowed for an in-depth analysis of information processing mechanisms characteristic of depression.

Analyses regarding the role of personality (Article 5, supported by results from Article 1) were of key importance for the final conclusions of the dissertation. They confirmed that the direct relationship between hostile attributions and depression loses statistical significance after accounting for pathological personality domains, such as Negative Affectivity and Detachment. These results, also replicated in the specific group of homicide offenders, provide an argument for the thesis regarding the overarching, explanatory role of personality structure.

The conducted research provided a basis for formulating a new, hierarchical theoretical model. It posits that pathological personality traits constitute the foundation upon which cognitive distortions and the accompanying depressive symptoms develop. This model carries significant implications for clinical practice, pointing to the rationale for integrating interventions targeting personality mechanisms and mentalization processes. The effectiveness of such an approach was preliminarily confirmed in supplementary studies (Article 8, outside the main series), concerning the adaptation of mentalization training in a penitentiary setting.

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Podziękowania

Pragnę podziękować wszystkim osobom, które towarzyszyły mi w mojej naukowej drodze i przyczyniły się do powstania niniejszej rozprawy. Szczególne podziękowania kieruję do mojej Promotorki, **Profesor Anny Zajenkovskiej**. Anno, dziękuję Ci za setki poświęconych godzin, za Twoją cierpliwość i nieustanne wsparcie. Dziękuję, że podzieliłaś się ze mną swoim płomieniem do nauki i roznieciłaś moją własną pasję badawczą.

Równie ciepło dziękuję mojej Promotorce pomocniczej, **Doktor Izabeli Kaźmierczak**. Izabelo, dziękuję Ci za bycie iskrą zapalną mojej przygody z doktoratem. Twoje wsparcie na każdym etapie doktoratu i umiejętności, które dzięki Tobie zdobyłam stanowią solidny fundament, na którym oparłam moją pracę naukową.

Dziękuję również **Profesor Joannie Rajchert**, która była moją cichą trzecią promotorką, oferując mi nie tylko wsparcie merytoryczne, ale również i to mentalne.

Dziękuję ówczesnej Kierownik Szkoły Doktorskiej, **Profesor Aleksandrze Tłuściak-Deliowskiej** za jej otwartość na pomoc na każdym etapie mojej naukowej drogi. Słowa wdzięczności kieruję również do obecnej Kierownik Szkoły Doktorskiej, **Profesor Anny Odrowąż-Coates**, za serce, jakie wkłada w rozwój Szkoły, za wspieranie moich inicjatyw i zaangażowanie w sprawy doktorantów.

Serdeczne podziękowania składam również moim mentorom ze staży zagranicznych: **Doktor Ninie Gehrler**, **Profesorowi Jeanowi Gagnonowi**, **Profesorowi Philipowi Tsengowi** oraz **Profesorowi Bertramowi Malle**, których merytoryczne wsparcie poszerzyło mój warsztat badawczy i otworzyło na międzynarodową perspektywę naukową.

Pragnę również podziękować **Pani Profesor Joannie Uryniuk**, która jako pierwsza zaszczerpiła we mnie miłość do nauki i obudziła wiarę w moje możliwości.

Na koniec, z całego serca dziękuję moim **Przyjaciółom** i **Rodzinie**, a w szczególności **Rodzicom** i **Mężowi**, stanowiącymi główne źródło siły w mojej naukowej drodze.

Omówienie Osiągnięć Naukowo-Badawczych

Głównym przedmiotem moich zainteresowań naukowych oraz celem projektu doktorskiego jest analiza związku między zniekształceniami poznawczymi a symptomami depresji. Zniekształcenia te, rozumiane jako sztywne i nieadaptacyjne wzorce myślowe, analizowane były w moich badaniach przede wszystkim przez pryzmat tendencji do wrogiej interpretacji niejednoznacznych sygnałów społecznych (tzw. wrogie atrybucje). Pomiar zniekształceń poznawczych miał charakter wieloaspektowy i obejmował: analizę narracji o doświadczeniach życiowych (Artykuł 2), procesy uwagi badane za pomocą metody okulograficznej (Artykuł 3), interpretację niejednoznacznych ekspresji mimicznych (Artykuł 4), jak i zaawansowane pomiary z użyciem elektroencefalografii (EEG), gdzie analizowałam potencjał wywołany N400 jako wskaźnik zaskoczenia na informację o niewrogich intencjach (Artykuł 5). Ta część badań została szczegółowo przedstawiona w Części I autoreferatu. Drugim fundamentalnym celem projektu było zweryfikowanie roli patologicznych domen osobowości w relacji między wrogimi atrybucjami a depresją. W wyniku przeprowadzonych analiz wskazano, że to właśnie struktura osobowości może stanowić pierwotne podłoże dla rozwoju obu badanych zjawisk, co zostało opisane w Części II autoreferatu.

Powyższe cele zrealizowano w ramach serii siedmiu współprowadzonych przeze mnie badań naukowych o zróżnicowanym charakterze: przekrojowym, podłużnym (trzy pomiary w odstępie trzech miesięcy), korelacyjnym oraz eksperymentalnym (z manipulacją w postaci prymowania porównań społecznych). W badaniach wykorzystano szerokie spektrum metod: od kwestionariuszy samoopisowych, przez ustrukturyzowane wywiady kliniczne i zadania behawioralne, aż po techniki neurokognitywistyczne, takie jak okulografia (eye-tracking) i elektroencefalografia (EEG). Grupy badawcze obejmowały nie tylko populację ogólną, ale także osoby w żałobie, pacjentów z kliniczną diagnozą depresji oraz osoby osadzone, w tym sprawców zabójstw. Łącznie we współprowadzonych przeze mnie projektach udział wzięło ponad 2000 osób.

Mój dorobek obejmuje 8 publikacji w recenzowanych czasopismach i wydawnictwach naukowych (m.in. *Personality and Individual Differences*, *Cognition & Emotion*, *The Journal of Forensic Psychiatry & Psychology*), przy czym w połowie z nich pełnię rolę pierwszego autora. Pięć publikacji stanowi trzon niniejszej rozprawy, a trzy to prace dodatkowe. Wyniki swoich badań prezentowałam na licznych konferencjach krajowych i międzynarodowych. Do najważniejszych wystąpień należą prezentacje na zjazdach: International Society for Research on Aggression (ISRA) w Ottawie (Kanada, 2022), International Society for the Study of Individual Differences (ISSID) w Belfaście (Wielka Brytania, 2023) oraz na Międzynarodowym Sympozjum Psychologii Sądowej w Tajpej (Tajwan, 2024). Realizacja większości wyjazdów konferencyjnych była możliwa dzięki uzyskanym stypendiom. Jednym z wyróżnień w tym obszarze jest nagroda Błażej Szymura ISSID Award, przyznana mi przez towarzystwo ISSID.

Od 2022 roku pełnię funkcję koordynatorki w grantie Sonata BIS, gdzie zarządzam pracami zespołu w ramach czterech modułów badawczych, w tym longitudinalnych badań okulograficznych nad skutecznością psychoterapii u pacjentów z zaburzeniami osobowości. Warsztat metodologiczny doskonaliłam m.in. podczas stażu w Polskiej Akademii Nauk (2022), zdobywając praktyczne umiejętności w zakresie badań EEG. Kompetencje te wykorzystałam następnie w autorskim projekcie w ramach grantu BNS (Akademia Pedagogiki Specjalnej), kierując badaniem EEG wśród pacjentów korzystających z pomocy psychiatrycznej.

Moja działalność naukowa od początku posiadała wymiar międzynarodowy, co odzwierciedla współpraca z ośrodkami zagranicznymi:

1. Uniwersytet w Tybindze, Niemcy, gdzie rozwijałam umiejętności zaawansowanej analizy danych okulograficznych, implementowane następnie we własnych projektach badawczych.
2. Uniwersytet w Montrealu, Kanada, gdzie jako badaczka i koordynatorka międzynarodowego zespołu w grantie SSHRC Partnership Engage Grant prowadziłam

badania weryfikujące skuteczność treningu mentalizacji (MBT) w populacji kobiet osadzonych.

3. Narodowy Uniwersytet Tajwański, gdzie jako kierowniczka projektu w ramach stypendium Visegrad-Taiwan Scholarship 2024, zaprojektowałam i przeprowadziłam badania okulograficzne na populacji azjatyckiej.

Współpraca z ośrodkami zagranicznymi pozwala mi na weryfikację dotychczasowych modeli w odmiennych kontekstach kulturowych, a także na dalszą integrację zróżnicowanych metod pomiarowych w badaniach nad zniekształceniami poznawczymi.

1. Wykaz artykułów i monografii

Artykuły wchodzące w skład pracy doktorskiej

- Jakubowska, A., Zajenkowska, A., & Garofalo, C. (2023). Depression and personality disorders among incarcerated offenders convicted of impulsive versus premeditated homicide. *The Journal of Forensic Psychiatry & Psychology*, 34(5–6), 502–520. Impact Factor (IF): 1.1; 70 pkt MEN. (Artykuł 1).
- Kaźmierczak, I., Jakubowska, A., Pietraszkiewicz, A., Zajenkowska, A., Lacko, D., Wawer, A., & Sarzyńska-Wawer, J. (2024). Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study. *Cognition & Emotion*, 39(7), 1693–1702. IF: 2.2; 100 pkt MEN. (Artykuł 2).
- Kaźmierczak, I., Jakubowska, A., Zajenkowska, A., Nowakowska, I., Duda, E., Bodecka-Zych, M., & Zarazińska, A. (2024). *Through the Looking Glass... Impact of priming social comparisons on automatic and volitional attention processes in depression: An eye-tracking experimental study Attentional biases in depression* [Preprint]. OSF. (Artykuł 3).
- Jakubowska, A., Zajenkowska, A., Kaźmierczak, I., Zarazińska, A., Olechowska, A., Molińska, W., & Pinkham, A. E. (2023). Anger sensitivity and relatedness frustration as predictors of depression. *Personality and Individual Differences*, 215, 1–6. IF: 2.6; 100 pkt MEN. (Artykuł 4).
- Jakubowska, A., Zajenkowska, A., & Gagnon, J. (2025). The role of borderline pattern in the relationship between hostile attributions and depression: Studies including electroencephalography method. *Advances in Cognitive Psychology*, 21(1), 40–52. IF: 1,0; 100 pkt MEN. (Artykuł 5).
- Relatedness frustration (Rozdział w Encyklopedii Elgar Encyclopedia, przyjęty do druku).

Dorobek dodatkowy (nieskładający się na pracę doktorską)

- Kaźmierczak, I., Zajenkowska, A., Rajchert, J., Jakubowska, A., & Abramiuk-Szysko, A. (2023). The Role of Anger Expression in Unmet Expectations and Depressive Symptoms. *Depression Research and Treatment*, 8842805. IF: 0.738; 70 pkt MEN. (Artykuł 6).
- Zajenkowska, A., Jakubowska, A., Rajchert, J., Koszałkowska, K., Bodecka-Zych, M., & Gehrler, N. (2025). Psychopathy and hostile attributions in impulsive and premeditated homicide offenders. *Personality and Individual Differences*, 247, 113400. IF: 2.6 100 pkt MEN (Artykuł 7).
- Bodecka, M., Jakubowska, A., Zajenkowska, A. (2021). Warsztat psychoedukacyjny z elementami mentalizacji i jego rola w redukowaniu wrogości wśród osób osadzonych. [Psycho-educational workshop with elements of mentalization and its role in reducing hostility among inmates] *Psychologia Wychowawcza*, 62(20). 40 pkt MEN (Artykuł 8).

Najważniejsze wystąpienia konferencyjne

- The Interplay of Hostile Attributions, Depression and Borderline Personality Disorder in Homicide Offenders – Tajpej, Tajwan, listopad 2024
- The mediating role of borderline personality disorder in the relationship between hostile attribution and depression. Studies including electroencephalography method in Poland and Canada – Belfast, Wielka Brytania, lipiec, 2023
- Depression and personality disorders among those who committed impulsive vs premeditated homicide Ottawa, Kanada, lipiec 2021

2. Wstęp

Szacuje się, że około 5% dorosłych, czyli niemal 280 milionów ludzi na świecie cierpi na depresję (World Health Organization, WHO, 2025). Depresja jest czwartą przyczyną śmierci wśród osób w wieku 15-29 lat, co przekłada się na śmierć samobójczą ponad 700 000 osób każdego roku (WHO, 2025). Należy przy tym zaznaczyć, że oficjalne statystyki są najprawdopodobniej niedoszacowane. Znaczna część osób z objawami depresji nigdy bowiem nie korzysta z profesjonalnej pomocy (WHO, 2025). Problem ten mogą dodatkowo pogłębiać nowe zjawiska, takie jak popularność internetowych poradników czy rozwój narzędzi wsparcia psychicznego opartych na sztucznej inteligencji, które potencjalnie zmniejszają motywację do szukania profesjonalnej pomocy. Co więcej, prognozuje się, że w dobie rosnącej izolacji społecznej wskaźniki depresji będą nadal wzrastać (van der Sloot i Vauclair, 2023). Istnieje zatem potrzeba dalszego rozwoju badań nad depresją, zwłaszcza w obszarze jej niezdiagnozowanych przypadków. Aby wyjść poza sam opis objawów depresji, kluczowe jest zbadanie jej korelatów. W tym kontekście, systemy diagnostyczne, poza katalogiem objawów depresji, takich jak obniżony nastrój czy zaburzenia snu, podkreślają znaczenie procesów poznawczych (APA, 2013). W szczególności zwraca się uwagę na rolę zniekształceń poznawczych, które wpływają na dysfunkcjonalne zachowania i jakość relacji społecznych, będących kluczowym czynnikiem podtrzymującym symptomy depresyjne (APA, 2013; WHO, 2024). Coraz więcej badań sugeruje, że identyfikacja i restrukturyzacja zniekształceń poznawczych może być kluczowa w redukcji objawów depresyjnych a nawet reorganizacji struktury osobowości (Hofmann i in., 2012; Jacob i in., 2013). Mimo, iż rola omawianych trzech komponentów - poznawczego, relacyjnego i osobowościowego - wydaje się fundamentalna w depresji, podejścia badawcze często traktują te komponenty w sposób rozłączny. Niniejsza rozprawa wychodzi naprzeciw potrzebie ich syntezy, proponując sekwencyjną analizę każdego z nich.

Nadrzędnym celem mojego projektu doktorskiego jest zatem analiza związku między zniekształceniami poznawczymi a objawami depresji, zaczynając od kontekstu poznawczego, przez wymiar społeczny, aż po kluczowy dla tej pracy kontekst osobowościowy. Analiza wskazanych korelatów służy zaproponowaniu nowego modelu integracyjnego. Zakłada on, że patologiczne domeny osobowości - w ujęciu Alternatywnego Modelu Zaburzeń Osobowości (AMPD) zawartego w klasyfikacji DSM-5 (APA, 2013, 2022) - stanowią podłoże, na którym rozwijają się zniekształcenia poznawcze prowadzące do symptomów depresji, a te z kolei są podtrzymywane przez trudności interpersonalne.

3. Ramy koncepcyjne i teoretyczne projektu

3.1 Kryteria diagnostyczne i klasyfikacja zaburzeń depresyjnych

Termin „depresja” (ang. „*depression*”), choć powszechnie stosowany, nie występuje w klasyfikacjach zaburzeń psychicznych takich jak Międzynarodowa Klasyfikacja Chorób ICD-11 (ang. *International Statistical Classification of Diseases and Related Health Problems*, 2024¹) oraz Diagnostyczny i statystyczny podręcznik zaburzeń psychicznych (ang. *Diagnostic and Statistical Manual of Mental Disorders*, DSM-5; APA, 2013, 2022). W obu systemach stosuje się nadrzędny termin „zaburzenia depresyjne” (ang. *Depressive Disorders*), który dzieli się na specyficzne kategorie diagnostyczne. Światowa Organizacja Zdrowia w ICD-11 (2024) wymienia wśród nich m.in.: jednoepizodowe zaburzenie depresyjne (*Single Episode Depressive Disorder*), nawracające zaburzenie depresyjne (*Recurrent Depressive Disorder*), zaburzenie dystymiczne (*Dysthymic Disorder*), mieszane zaburzenie depresyjno-lękowe (*Mixed Depressive and Anxiety Disorder*) czy inne określone zaburzenie depresyjne. Z kolei Amerykańskie Towarzystwo Psychiatryczne w DSM-5 (APA, 2013, 2022) jako kategorie

¹ W Polsce oficjalnie stosowana jest dalej Międzynarodowa Klasyfikacja Chorób w dziesiątej rewizji (ICD 10). Polska, podobnie jak inne kraje, ma okres przejściowy na pełne wdrożenie jedenastej rewizji do krajowych systemów, wynoszący 5 lat.

zaburzeń depresyjnych wskazuje między innymi: zaburzenie z dysregulacją nastroju (*Disruptive Mood Dysregulation Disorder*), duże zaburzenie depresyjne (*Major Depressive Disorder*; *MDD*) czy uporczywe zaburzenie depresyjne/dystymię (*Persistent Depressive Disorder/Dysthymia*). We wszystkich kategoriach zaburzeń depresyjnych zawarte są kryteria dotyczące obniżonego i/lub drażliwego nastroju oraz poczucia pustki, którym towarzyszą objawy somatyczne i poznawcze, istotnie utrudniające jednostce codzienne funkcjonowanie (APA, 2013, s. 155; WHO, 2024, s. 244). Główna różnica między poszczególnymi kategoriami dotyczy przede wszystkim czasu trwania oraz nasilenia symptomów.

Według Amerykańskiego Towarzystwa Psychiatrycznego (APA, 2013, 2022), jedną z najczęściej występujących i najbardziej klasycznych kategorii jest duże zaburzenie depresyjne (*MDD*). Aby spełnić kryteria diagnozy *MDD* w *DSM-5*, osoba musi wykazywać przez co najmniej dwa tygodnie, przez większość dnia lub niemal każdego dnia, pięć (lub więcej) z poniższych symptomów:

- Obniżony nastrój
- Wyraźne zmniejszenie zainteresowania lub przyjemności z robionych rzeczy
- Bezsenna lub nadmierna senność
- Pobudzenie lub spowolnienie psychoruchowe
- Zmęczenie lub utrata energii
- Utrata lub wzrost masy ciała
- Poczucie bezwartościowości lub nadmierne/nieadekwatne poczucie winy
- Zmniejszona zdolność myślenia lub koncentracji,
- Myśli samobójcze

Należy przy tym zaznaczyć, że warunkiem koniecznym diagnozy jest występowanie co najmniej jednego z dwóch głównych objawów: obniżonego nastroju lub utraty zainteresowań i zdolności odczuwania przyjemności (*anhedonii*).

3.2 Procesy poznawcze w depresji

Amerykańskie Towarzystwo Psychiatryczne (2013, 2022) oraz Światowa Organizacja Zdrowia (2024) zgodnie podkreślają, iż w obrazie klinicznym depresji kluczową rolę odgrywają procesy poznawcze. Zaburzenia procesów poznawczych przejawiają się w zniekształceniach poznawczych, rozumianych jako sztywne i często automatyczne wzorce myślowe, prowadzące do nieadaptacyjnej interpretacji rzeczywistości (Moritz i Woodward, 2007). Na takim rozumieniu tych mechanizmów oparł się Aaron Beck, twórca teorii triady poznawczej depresji (ang. *Cognitive Triad Theory of Depression*; Beck, 1967). Według tej teorii, depresja manifestuje się w zniekształconym postrzeganiu trzech obszarów: siebie, świata (innych ludzi) i przyszłości. Te negatywne wzorce myślenia, aktywowane często przez stresory środowiskowe (Tsolakis, 2025), wynikają zdaniem Becka i Haigh (2014) z dysfunkcji dwóch systemów poznawczych: automatycznego i refleksyjnego. Przetwarzanie automatyczne charakteryzuje się szybkością i bazowaniem na utrwalonych schematach. Z kolei przetwarzanie refleksyjne jest procesem bardziej świadomym, angażującym większe zasoby poznawcze i umożliwiającym pogłębioną analizę sytuacji. Błędy powstające na etapie przetwarzania automatycznego mogą zakłócać procesy refleksyjne, prowadząc do utrwalenia negatywnych interpretacji oraz dysfunkcjonalnych zachowań społecznych. W celu lepszego zrozumienia tych mechanizmów w kontekście interpersonalnym, warto odwołać się do Teorii Przetwarzania Informacji Społecznych (ang. *Social Information Processing Theory*, SIP). Jej autorzy, Crick i Dodge (1994), postulują, że zachowanie społeczne jest efektem sześciu następujących po sobie etapów przetwarzania informacji. Badania wskazują, że do zniekształceń poznawczych dochodzi najczęściej już na najwcześniejszych etapach tego procesu: podczas kodowania (czyli selektywnej uwagi na sygnały takie jak wyraz twarzy czy postawa ciała) oraz interpretacji (obejmującej analizę przyczynową i wnioskowanie o intencjach innych) (Smeijers, 2023).

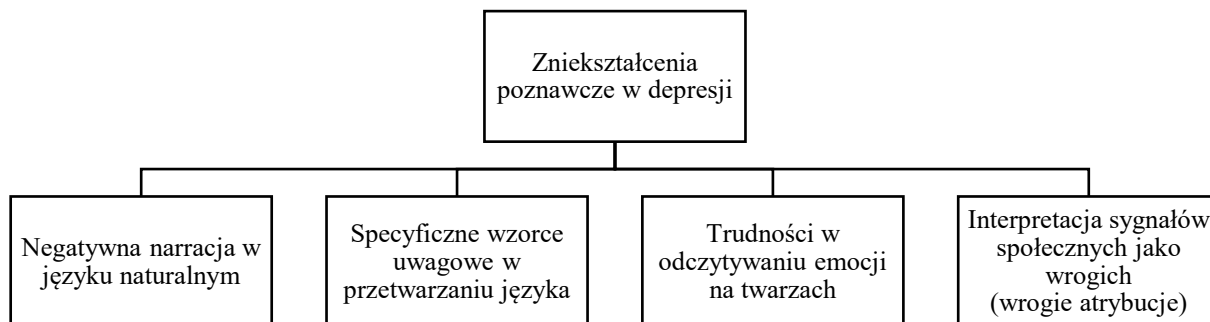
Pierwotna wersja modelu SIP, skoncentrowana na racjonalnych aspektach przetwarzania, spotkała się z krytyką za niedostateczne uwzględnienie roli emocji. W odpowiedzi na te ograniczenia, Lemerise i Arsenio (2000) zaproponowali rozszerzenie modelu, zakładając, że na każdy etap przetwarzania informacji społecznych może wpływać aktualny nastrój oraz zdolność do regulacji emocji. W tym ujęciu, doświadczanie trudnych stanów emocjonalnych lub deficyty w zakresie ich regulacji - charakterystyczne dla zaburzeń depresyjnych - mogą zakłócać odbiór wskazówek społecznych, zwiększając tym samym ryzyko wrogiego postrzegania otoczenia (Smeijers, 2023).

4. Cel i podstawy teoretyczne badań własnych

Zasadniczym celem niniejszego projektu doktorskiego była wielowymiarowa analiza związku między zniekształceniami poznawczymi a objawami depresji, ze szczególnym uwzględnieniem roli struktury osobowości. W ramach tak zdefiniowanego problemu badawczego wyodrębniono następujące cele szczegółowe:

1) Eksploracja i pogłębienie wiedzy na temat specyfiki zniekształceń poznawczych

- realizacja tego celu przebiegała wieloaspektowo i obejmowała analizę zniekształceń na różnych poziomach przetwarzania informacji: od negatywnej narracji w języku naturalnym, przez specyficzne wzorce uwagowe oraz trudności w dekodowaniu emocji mimicznych, aż po tendencję do interpretowania niejednoznacznych sygnałów społecznych jako wrogich (tzw. wrogie atrybucje, Klein Tuate i in., 2019). Model koncepcyjny tego podejścia przedstawiono na Rysunku 1. Cel ten został osiągnięty poprzez serię zróżnicowanych metodologicznie badań, w tym: badania podłużne z wykorzystaniem analizy języka naturalnego (**Artykuł 2**), badania okulograficzne (eye-tracking) z manipulacją eksperymentalną (**Artykuł 3**) oraz eksperymenty z użyciem bodźców wizualnych (**Artykuł 4**).



Rysunek 1. Typologia zniekształceń poznawczych w depresji uwzględniona w badaniach własnych.

2) Weryfikacja związku między symptomami depresji a wrogimi atrybucjami - cel ten obejmował analizę związku objawów depresji i specyficznego typu zniekształceń poznawczych (wrogich atrybucji) przy użyciu zróżnicowanych metod pomiaru, takich jak narzędzia kwestionariuszowe oraz technika EEG (**Artykuł 5**), a także weryfikację tych zależności w zróżnicowanych grupach badawczych w tym wśród sprawców zabójstw (wystąpienie konferencyjne 1).

3) Synteza teoretyczna badanych czynników - cel ten polegał na określeniu roli patologicznych domen osobowości jako potencjalnego podłoża dla związku między wrogimi atrybucjami a objawami depresji, co w konsekwencji pozwoliło na zaproponowanie nowego, integracyjnego modelu teoretycznego.

W realizacji projektu przyjęto paradygmat poznawczy, opierając definicję objawów depresji na kryteriach zawartych w klasyfikacjach DSM-5 oraz ICD-11, przy jednoczesnym zastosowaniu dymensjonalnego ujęcia osobowości. W dalszej części niniejszego rozdziału szczegółowo omówiono kontekst teoretyczny oraz kluczowe koncepcje stanowiące fundament

dla każdej z podjętych linii badawczych. Opis metodologii, procedur oraz szczegółowe wyniki badań własnych, dokumentujące realizację powyższych celów, przedstawiono w rozdziale pt. „Wyniki badań własnych”.

4.1. Koncepcje teoretyczne leżące u podstaw celu 1: Specyfika zniekształceń poznawczych

Symptomy depresji

Część osób, także w środowiskach z łatwym dostępem do pomocy psychologicznej, nie rozpoznaje u siebie objawów depresji, interpretując je zaś jako zmęczenie czy drażliwość (Tylee i Gandhi, 2005). Objawom tym towarzyszą często trudności społeczne (Simon i in., 1999). W konsekwencji wiele przypadków pozostaje niezdiagnozowanych, a zaburzenie przyjmuje postać tzw. depresji maskowanej (Prisco i in., 2023). Zjawisko to jest szczególnie istotne w kontekście specyfiki depresji u mężczyzn, która może różnić się w obrazie klinicznym od depresji u kobiet, częściej manifestując się drażliwością i skłonnością do agresji (Katz i in., 1993). Mimo to, w literaturze wciąż brakuje badań nad symptomami depresji w grupach o nasilonej tendencji do zachowań agresywnych, w tym skrajnych, takich jak sprawcy zabójstw. Wychodząc naprzeciw tej luce, w badaniu opisanym w **Artykule 1**, przeprowadzono pomiar nasilenia objawów depresji w grupie osób skazanych za zabójstwo. Podłożem zachowań agresywnych mogą być natomiast zniekształcenia poznawcze charakterystyczne dla depresji (Beck, 1967).

Perspektywa poznawcza

Badania nad zniekształceniami poznawczymi osób z depresją wskazują, że osoby te opisują siebie mniejszą liczbą pozytywnych, a większą liczbą negatywnych przymiotników (Auerbach i in., 2015) oraz szybciej akceptują negatywne niż pozytywne informacje na swój temat (Connolly i in., 2016). Jednocześnie skala tego zjawiska może być niedoszacowana. W warunkach laboratoryjnych schematy myślowe bywają trudne do aktywowania (Disner i in., 2011). Dodatkowym ograniczeniem większości prac w tym obszarze jest ich przekrojowy

charakter, oparty na jednorazowym pomiarze i metodach samoopisowych. Odpowiadając na te ograniczenia metodologiczne, wraz z zespołem badawczym przeprowadzono badanie podłużne, obejmujące trzy pomiary w odstępach trzymiesięcznych. Analizie poddano związek między sposobem narracji o doświadczeniach życiowych a dynamiką objawów depresyjnych. Grupę badaną stanowiły osoby doświadczające żałoby po stracie (rozumianej jako zakończenie związku lub śmierć bliskiej osoby) - czyli silnego stresora, który zwiększa prawdopodobieństwo aktywacji latentnych schematów myślowych (Beck, 2008). Wyniki tego projektu zostały przedstawione w **Artykule 2**.

Procesy uwagowe i interpretacja sygnałów

Zgodnie z hipotezą zgodności schematów, ludzie dążą do utrzymania spójności swoich struktur poznawczych (Meyers-Levy i Tybout, 1989). Mechanizm ten może ujawniać się już w fazie kodowania sygnałów społecznych - pierwszym etapie przetwarzania wg modelu SIP (Crick i Dodge, 1994). Metaanaliza Armstronga i Olatunji (2012), oparta na badaniach okulograficznych (eye-tracking), wykazała, że osoby z depresją poświęcają mniej uwagi wskazówkom pozytywnym, a dłużej koncentrują wzrok na bodźcach negatywnych. Autorzy tej metaanalizy podkreślają jednak, że większość dostępnych badań opierała się na niewielkich próbach, a część z nich skupiała się wyłącznie na bodźcach odnoszących się do własnej osoby (self-referential). Aby uzupełnić tę lukę, przeprowadzono badanie na dużej próbie (N = 209), gdzie ponad połowa badanych miała zdiagnozowaną wcześniej depresję. W badaniu porównano wzorce uwagowe osób spełniających kryteria diagnozy depresji z osobami niespełniającymi danych kryteriów wobec pozytywnych i negatywnych informacji o osobie nieznajomej. Wyniki tego badania opisano w **Artykule 3**.

Badania dotyczące drugiego etapu przetwarzania informacji społecznych (interpretacji), wskazują z kolei, że osoby z depresją mogą przejawiać deficyty w odczytywaniu stanów mentalnych innych ludzi, w tym emocji z ekspresji mimicznej (Lee i in.,

2005; Soto i Beevers, 2024). Wyniki w tym obszarze są jednak niejednoznaczne: niektóre z nich sugerują wręcz zwiększoną wrażliwość osób z depresją na emocje negatywne (Gollan i in., 2008), inne zaś wskazują na brak deficytów w rozpoznawaniu radości (Mo i in., 2021). Na tej podstawie sformułowano hipotezę, że osoby z symptomami depresji nie mają trudności z rozpoznawaniem emocji wyraźnych (jednoznacznych), natomiast ze względu na negatywne schematy myślowe, napotykają trudności w dekodowaniu ekspresji niejednoznacznych (Joormann i Gotlib, 2006). Weryfikacji tego założenia poświęcono badanie opisane w **Artykule 4**, w którym sprawdzono związek symptomów depresji z trafnością rozpoznawania emocji na twarzach o niejednoznacznym wyrazie.

Objawy depresyjne - kontekst społeczny

Rozpoznawanie emocji stanowi kluczową umiejętność w procesie budowania i utrzymywania satysfakcjonujących relacji interpersonalnych. Ich jakość jest powszechnie uznawana za jeden z filarów zdrowia psychicznego, co znajduje odzwierciedlenie również w kryteriach diagnostycznych zawartych w DSM-5 (APA, 2013), gdzie trudności w funkcjonowaniu społecznym traktowane są jako istotny wskaźnik zaburzeń psychicznych. Znaczenie więzi społecznych akcentuje również Teoria Podstawowych Potrzeb Psychologicznych (ang. *Basic Psychological Needs Theory*; BPNT), będąca składową Teorii Samodeterminacji (ang. *Self-Determination Theory*; Ryan i Deci, 2000). Koncepcja ta wyróżnia trzy fundamentalne potrzeby: relacyjności (poczucia więzi i przynależności), autonomii (poczucia sprawstwa i kontroli) oraz kompetencji (poczucia skuteczności). Choć zaspokojenie wszystkich trzech jest istotne dla rozwoju jednostki, badania sugerują, że to właśnie zaspokojenie potrzeby relacyjności wykazuje najsilniejszy związek z ogólnym dobrostanem psychicznym (Tindall i Curtis, 2019). Potrzeba relacyjności definiowana jest przez twórców teorii jako „pragnienie poczucia więzi z innymi - kochania i troszczenia się oraz bycia kochanym i otoczonym troską” (Ryan i Deci, 2000). Jak wskazano w składającym się na

daną rozprawę doktorską **opracowaniu encyklopedycznym** dotyczącym zagadnienia potrzeby relacyjności, realizacja tej potrzeby prowadzi do tzw. satysfakcji z relacyjności (ang. *relatedness satisfaction*), natomiast jej chroniczne niezaspokojenie skutkuje frustracją relacyjności (ang. *relatedness frustration*), której towarzyszy dojmujące poczucie odrzucenia lub wykluczenia. Niska jakość relacji oraz brak wsparcia społecznego, będące korelatami frustracji relacyjności, są uznawane za istotne czynniki ryzyka rozwoju symptomów depresji (Teo i in., 2013). Mimo to, w literaturze wciąż brakuje badań, które analizowałyby bezpośredni związek między tak rozumianą frustracją relacyjności a nasileniem objawów depresyjnych. Lukę tę wypełnia badanie, którego wyniki przedstawiono we wspomnianym wcześniej **Artykule 4**.

4.2 Koncepcje teoretyczne leżące u podstaw celu 2: Wrogie atrybucje

Negatywne schematy myślowe oraz potencjalne trudności w odczytywaniu emocji mogą sprzyjać przypisywaniu innym wrogich intencji - tendencji określanej w literaturze mianem błędu wrogiej atrybucji lub wrogich atrybucji (ang. *hostile attribution bias*, Klein Tuerke i in., 2019). Wrogie atrybucje uważane są za jedne z kluczowych czynników sprzyjających agresji (Orobio de Castro i in., 2002; Dodge, 2006; Martinelli i in., 2018; Klein Tuerke i in., 2019). Mimo iż modele teoretyczne jednoznacznie wskazują, że wrogie atrybucje wynikają ze zniekształceń poznawczych (Crick i Dodge, 1994), zaskakująco niewiele badań empirycznych poświęcono analizie ich związku z objawami depresji (Gasse i in., 2020). Próba uzupełnienia tej luki zostało podjęta w naszych badaniach, których wyniki przedstawiono w **Artykule 5**. Analizie poddano związek między nasileniem objawów depresyjnych a skłonnością do wrogich atrybucji, weryfikując te zależności zarówno w populacji ogólnej, jak i w grupie o podwyższonym ryzyku zachowań agresywnych, tj. wśród osób osadzonych w zakładach karnych (wyniki cząstkowe z tej grupy prezentowano również w ramach wystąpień konferencyjnych nr 1 i 2).

4.3 Koncepcje teoretyczne leżące u podstaw celu 3: Kontekst osobowościowy

Deficyty w zakresie regulacji emocji, trudności w relacjach społecznych oraz tendencja do przypisywania innym wrogich intencji są charakterystyczne nie tylko dla depresji, ale również dla patologicznych domen osobowości (Beblo i in., 2012; Sharp i in., 2015; Vittengl i in., 2023). Współczesne systemy diagnostyczne, takie jak DSM-5, zalecają stosowanie - obok tradycyjnego podejścia kategoryjnego - podejścia dymensjonalnego (wymiarowego). W tym modelu zaburzenia osobowości opisywane są w kategoriach pięciu głównych domen: negatywnej afektywności (*Negative Affectivity*), dystansu (*Detachment*), antagonizmu (*Antagonism*), rozhamowania (*Disinhibition*) oraz psychotyczności (*Psychoticism*), na które składają się bardziej szczegółowe cechy (aspekty). Co warto podkreślić, najnowsza klasyfikacja ICD-11 (WHO, 2024) całkowicie rezygnuje z podejścia kategoryjnego na rzecz modelu dymensjonalnego. W tym ujęciu depresyjność - obejmująca uczucia smutku, beznadziejności i niskiej samooceny - jest traktowana jako jedna ze szczegółowych cech, przynależąca głównie do domeny negatywnej afektywności, choć objawowo powiązana jest również z domeną dystansu (APA, 2013, 2022).

Opierając się na podejściu dymensjonalnym do zaburzeń osobowości, przeprowadzono dwa badania (opisane w **Artykule 5**), w których analizowano związek między objawami depresji, domenami osobowości a skłonnością do wrogich atrybucji. W pierwszym etapie analizy wykorzystano metodę elektroencefalografii (EEG) do pomiaru potencjału N400 - neurofizjologicznego wskaźnika zaskoczenia poznawczego - w reakcji na słowa sugerujące niewrogie intencje. W drugim badaniu skoncentrowano się na pełnym profilu osobowościowym, mierząc nasilenie pięciu patologicznych domen według modelu DSM-5 za pomocą Inwentarza Osobowości PID-5-BF (ang. *The Personality Inventory for DSM-5, Brief Form*; Rowiński i in., 2019).

5. Wyniki badań własnych

Najważniejsze wyniki omawiane w niniejszym rozdziale zostały szczegółowo opisane w cyklu pięciu artykułów naukowych oraz zaprezentowane na międzynarodowych konferencjach. Zasadniczym celem przeprowadzonych analiz było zbadanie poznawczych, społecznych oraz osobowościowych korelatów depresji. W pierwszej kolejności skoncentrowano się na weryfikacji związku między objawami depresyjnymi a zniekształceniami poznawczymi i trudnościami interpersonalnymi. Dalsze etapy projektu poświęcono analizie roli patologicznych domen osobowości w relacji między objawami depresji a wrogimi atrybucjami, rozumianymi jako specyficzna kategoria zniekształceń poznawczych.

Podstawę teoretyczną projektu stanowiły założenia modelu przetwarzania informacji społecznych (SIP; Crick i Dodge, 1994) oraz dymensjonalne ujęcie zaburzeń osobowości (zgodne z DSM-5 i ICD-11). Badania objęły zróżnicowane grupy: populację ogólną oraz osoby osadzone w zakładach karnych (skazane za przestępstwa z użyciem przemocy). Z wyjątkiem jednego projektu zrealizowanego w Kanadzie, wszystkie analizy przeprowadzono na populacji polskiej.

Wyniki zrealizowanego cyklu badawczego można uporządkować w ramach trzech głównych, wzajemnie powiązanych linii badawczych, dotyczących:

- (1) poznawczych korelatów objawów depresji,
- (2) kontekstu relacyjnego (frustracji potrzeby relacyjności) i emocjonalnego w obrazie depresji,
- (3) roli domen osobowości w związku między objawami depresji a wrogimi atrybucjami.

5.1 Linia badań dotycząca poznawczych korelatów objawów depresji

Zasadniczym celem pierwszej linii badawczej była analiza związku między objawami depresyjnymi a zniekształceniami poznawczymi na różnych poziomach przetwarzania

informacji, zgodnie z modelem SIP (Crick i Dodge, 1994). Badania objęły trzy kluczowe obszary: narrację językową, procesy uwagowe (kodowanie) oraz interpretację sygnałów społecznych.

Negatywna narracja w języku

Opierając się na modelu poznawczym Becka, przeprowadzono badanie podłużne w warunkach naturalnego stresora (**Artykuł 2**). W projekcie wzięło udział 40 osób (23 kobiety i 17 mężczyzn), które w okresie do dwóch miesięcy przed badaniem doświadczyły krytycznego wydarzenia życiowego. Kryterium włączenia do badania był brak korzystania z profesjonalnej pomocy psychologicznej. Procedura obejmowała trzy indywidualne wywiady, realizowane w odstępach trzymiesięcznych, oparte na Wywiadzie Strukturalnym dotyczącym Krytycznych Wydarzeń Życiowych (First i in., 2010; Popiel i in., 2008). Nagrania wywiadów poddano transkrypcji i analizie językowej. Zastosowanie uogólnionych mieszanych modeli liniowych (ang. *generalized linear mixed models*) pozwoliło wykazać, że częstsze używanie słów o nacechowaniu negatywnym w opisie krytycznego wydarzenia wiązało się z narastaniem objawów depresyjnych w czasie. Zgodnie z teorią poznawczą, taki wzorzec narracyjny odzwierciedla leżące u jego podstaw nieadaptacyjne schematy poznawcze (Beck, 1976). Odwrotną, choć słabszą zależność odnotowano dla słów pozytywnych. Co kluczowe, efekty te nie ujawniły się na poziomie wewnątrzsobowym - dynamiczna zmiana narracji u danej jednostki nie przekładała się bezpośrednio na zmianę nasilenia jej objawów. Sugeruje to, że „negatywność językowa” może być wskaźnikiem stabilnej, dyspozycyjnej cechy poznawczej, a nie jedynie odzwierciedleniem chwilowego stanu emocjonalnego po kryzysie. Warto na koniec zaznaczyć, że dynamiczna ocena schematów poznawczych poprzez analizę narracji w warunkach naturalnego stresora jest rzadkością w badaniach.

Procesy uwagowe (etap kodowania)

W celu zbadania pierwszego etapu przetwarzania społecznego - kodowania - zaprojektowano eksperyment z wykorzystaniem metody okulograficznej (eye-tracking, **Artykuł 3**). Jego innowacyjność polegała na wprowadzeniu manipulacji kontekstem porównań społecznych. W badaniu uczestniczyło 209 osób: 107 z populacji ogólnej oraz 102 osoby z diagnozą depresji klinicznej. Uczestnicy wykonywali zadanie komputerowe, w którym dokonywali porównań społecznych w oparciu o listę przymiotników (ang. *Adjective Checklist*). Procedura obejmowała trzy warunki eksperymentalne: porównanie w górę (do osoby wypadającej lepiej), w dół (do osoby wypadającej gorzej) oraz porównanie na zasadzie podobieństwa. Analizie poddano czas pierwszej fiksacji oraz całkowity czas fiksacji na określonych przymiotnikach. Wyniki wykazały, że osoby z depresją - w porównaniu do grupy kontrolnej - szybciej kierowały uwagę na przymiotniki opisujące drugą osobę. Co ciekawe, w warunkach porównania w górę oraz podobieństwa, osoby z depresją krócej koncentrowały wzrok na bodźcach negatywnych niż osoby zdrowe. Jednakże analiza wewnątrzgrupowa ujawniła, że w warunku porównania w dół i podobieństwa, osoby z depresją dłużej fiksowały wzrok na informacjach negatywnych o drugiej osobie niż na pozytywnych. Dłuższą fiksację na negatywnych informacjach o osobie „gorszej” można interpretować jako przejaw trudności w przetwarzaniu danych niezgodnych z negatywnymi schematami na temat Ja (Fiske i Taylor, 2013).

Proces interpretowania sytuacji społecznych

Badania nad drugim etapem modelu SIP - interpretacją - skoncentrowano na dwóch obszarach: rozpoznawaniu niejednoznacznych emocji oraz atrybucji intencji. W badaniu dotyczącym pierwszego z tych obszarów wykorzystano paradygmat „morphingu”, polegający na prezentacji zdjęć twarzy wyrażających emocje mieszane (powstałe z cyfrowego połączenia dwóch podstawowych emocji, np. 50% złości i 50% radości lub 30% strachu i 70% radości). Badanie przeprowadzono za pośrednictwem panelu badawczego Ariadna na reprezentatywnej

próbie 1241 osób z populacji ogólnej. Do oceny nasilenia symptomów depresji zastosowano Szpitalną Skalę Lęku i Depresji w wersji zmodyfikowanej (ang. *Hospital Anxiety and Depression Scale*, HADS-M; Zigmond i Snaith, 1983; de Walden-Gałuszko i in., 1994). Przeprowadzone analizy wykazały istotną negatywną korelację między nasileniem objawów depresyjnych a wrażliwością na sygnały emocjonalne: osoby z wyższym poziomem depresji charakteryzowały się obniżoną zdolnością do trafnego rozpoznawania emocji (zarówno złości, jak i radości czy strachu). Sugeruje to, że większe nasilenie depresji wiąże się z ogólnymi trudnościami w dekodowaniu ekspresji mimicznej, a nie - jak sugerują wyniki niektórych badań - ze specyficzną nadwrażliwością na bodźce negatywne (Gollan i in., 2008). Drugi obszar badań dotyczył związku depresji z wrogimi atrybucjami (**Artykuł 5**). Przeprowadzono dwa niezależne badania. Pierwsze (N=189), zrealizowane w Polsce - na populacji ogólnej oraz osobach osadzonych skazanych za przestępstwa z użyciem przemocy - wykorzystywało metody kwestionariuszowe: Kwestionariusz Zdrowia Pacjenta pomiaru symptomów depresji (*Patient Health Questionnaire*, PHQ-9; Kroenke i in., 1999; Tomaszewski i in., 2011) oraz tak zwany Ambiguous Intentions Hostility Questionnaire (AIHQ; Combs i in., 2007) do oceny wrogich atrybucji. Drugie badanie (N=54), przeprowadzone w Kanadzie, wykorzystywało metodę elektroencefalografii (EEG) do pomiaru potencjału wywołanego N400 (wskaźnika zaskoczenia semantycznego; Gagnon i in., 2017) – w badaniu rozumianego jako wskaźnik zaskoczenia na niewrogie intencje. Wyniki obu badań potwierdziły istotny, dodatni związek między nasileniem objawów depresji a tendencją do przypisywania innym wrogich intencji - niezależnie od zastosowanej metody pomiaru.

Podsumowanie

Analiza powyższych wyników ukazuje złożoność profilu poznawczego w depresji. Potwierdzono, że negatywna narracja wiąże się z nasileniem objawów depresji w czasie, a wzorce uwagowe są zależne od kontekstu porównań społecznych. Wykazano również, że

depresja może wiązać się z osłabioną zdolnością rozpoznawania niejednoznacznych emocji. Najsilniejszym i zreplikowanym wnioskiem z całego cyklu pozostaje jednak ścisły związek między objawami depresyjnymi a wrogimi atrybucjami.

5.2 Linia badań dotycząca kontekstu społecznego

Zniekształcenia poznawcze są ściśle związane z funkcjonowaniem społecznym jednostki (Crick i Dodge, 1994), co stało się przesłanką do wyodrębnienia kolejnej linii badawczej.

Rola potrzeby relacyjności

W tej części analiz odwołano się do Teorii Podstawowych Potrzeb Psychologicznych (BPNT, Ryan i Deci, 2000), która postuluje, że potrzeba relacyjności - rozumiana jako pragnienie więzi, bycia docenianym i otoczonym troską - jest fundamentalna dla dobrostanu psychicznego. W ramach projektu opisanego w **Artykule 4**, zweryfikowano hipotezę o związku między frustracją tej potrzeby a nasileniem objawów depresyjnych. Należy podkreślić, że była to jedna z pierwszych prób empirycznej weryfikacji założeń BPNT w kontekście symptomów depresji. Przeprowadzone analizy wykazały silny, dodatni związek między badanymi zmiennymi: wyższy poziom frustracji potrzeby relacyjności istotnie korelował z większym nasileniem objawów depresji. Wynik ten sugeruje, że deficyty w obszarze więzi społecznych mogą stanowić istotny mechanizm współwystępujący z depresją. Teoretyczną charakterystykę tego zjawiska przedstawiono szerzej w autorskim opracowaniu encyklopedycznym terminu frustracji potrzeby relacyjności, stanowiącym uzupełnienie dorobku publikacyjnego rozprawy.

Wyniki wskazujące na ścisły związek między frustracją potrzeby relacyjności a depresją stały się punktem wyjścia do dalszej eksploracji, wykraczającej poza główny nurt rozprawy. Niespełnione potrzeby w relacjach wiążą się bowiem nierozdzielnie z przeżywaniem złości (Ryan i Deci, 2000). Wątek ten podjęto w badaniu uzupełniającym

(**Artykuł 6**, publikacja dodatkowa), zrealizowanym na grupie 97 par (N=194). Przeanalizowano w nim, w jaki sposób symptomy depresji (mierzone skalą HADS-M) wiążą się z ekspresją złości w bliskich związkach w sytuacji niezaspokojenia oczekiwań wobec partnera. Wyniki ujawniły, że im silniejsza tendencja do tłumienia złości (kierowania jej do wewnątrz) w reakcji na niespełnione oczekiwania wobec partnera, tym wyższy poziom depresyjności. Z kolei w sytuacji odwrotnej - gdy to oczekiwania partnera pozostawały niezaspokojone - z nasileniem objawów depresyjnych korelowała ekspresja złości skierowana na zewnątrz.

5.3 Linia badań dotycząca roli osobowości jako fundamentu dla depresji i wrogich atrybucji

Problemy interpersonalne i emocjonalne, a także leżące u ich podłoża zniekształcenia poznawcze, stanowią objaw nie tylko dla zaburzeń nastroju (depresji), ale również dla patologii osobowości (APA, 2013; WHO, 2024). Co więcej, badania sugerują, że interwencje ukierunkowane na restrukturyzację osobowości mogą prowadzić do redukcji objawów depresyjnych (Boritz i in., 2016). Przesłanki te stały się podstawą końcowego etapu projektu doktorskiego, w którym zweryfikowano rolę patologicznych domen osobowości jako czynnika wyjaśniającego związek między depresją a wrogimi atrybucjami.

Rola patologicznych domen osobowości

W dwóch badaniach (kwestionariuszowym oraz z wykorzystaniem elektroencefalografii) opisanych w **Artykule 5** potwierdzono istnienie silnej korelacji między wrogimi atrybucjami a symptomami depresji. Aby zgłębić naturę tej zależności, w kolejnym kroku przeprowadzono analizę regresji, wprowadzając do modelu patologiczne domeny osobowości (zgodnie z modelem AMPD DSM-5; APA, 2013, 2022). Kluczowym wynikiem tej analizy było wykazanie, że po uwzględnieniu struktury osobowości, bezpośredni związek między depresją a wrogimi atrybucjami tracił istotność statystyczną. Wrogie atrybucje okazały się najsilniej powiązane z dwiema domenami:

1. Negatywną Afektywnością (*Negative Affectivity*) - rozumianą jako tendencja do doświadczania trudnych stanów emocjonalnych (w tym depresyjności, lękowości i chwiejności);
2. Dystansem (*Detachment*) - obejmującym unikanie bliskości, anhedonię oraz podejrzliwość (*Suspiciousness*; APA, 2013).

Szczególną uwagę należy tu zwrócić na cechę podejrzliwości, definiowaną jako nadwrażliwość na wrogie sygnały społeczne i zakładanie złych intencji u innych (APA, 2013, 2022). Wynik ten prowadzi do najważniejszej, konkluzji teoretycznej całej rozprawy: wrogie atrybucje i depresyjność nie są jedynie niezależnymi, skorelowanymi konstruktami, lecz mogą stanowić wspólną manifestację głębszej patologii osobowości. Wniosek ten integruje perspektywę poznawczą z osobowościową, wskazując na potencjał uwzględniania diagnozy osobowości w kontekście leczenia depresji.

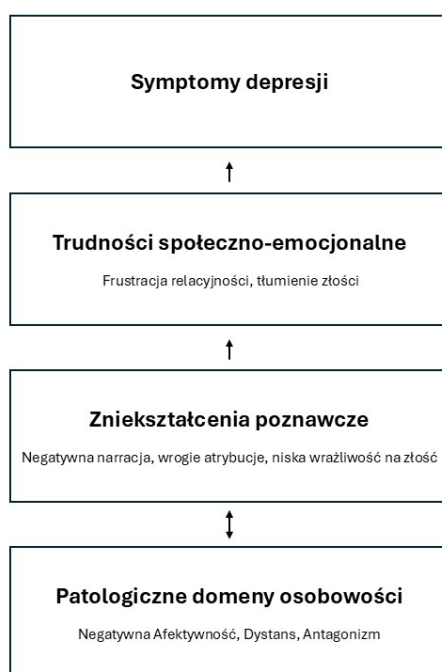
Weryfikacja w grupie o skrajnym nasileniu agresji

Ze względu na fakt, iż wrogie atrybucje stanowią istotny predyktor zachowań agresywnych, podjęto próbę zbadania roli patologicznych cech osobowości w tym obszarze w grupie o skrajnie wysokim poziomie agresji. Badanie przeprowadzono wśród 83 mężczyzn osadzonych w zakładach karnych, w tym sprawców zabójstw z premedytacją (n=45) oraz działających pod wpływem impulsu (n=38). Co istotne, wyniki (opisane w **Artykule 1**) ujawniły, że objawy depresji - mierzone kwestionariuszem PHQ-9 - występowały u połowy badanych sprawców, mimo braku wcześniejszej formalnej diagnozy psychiatrycznej. Co istotne, sprawcy zabójstw z premedytacją wykazywali wyższy poziom depresyjności w porównaniu do sprawców działających impulsywnie. Potwierdzono również związek między wrogimi atrybucjami (mierzonymi kwestionariuszem AIHQ) a nasileniem symptomów depresji (Wystąpienie konferencyjne 2). Analiza szczegółowa wykazała zróżnicowanie w zależności od typu sprawcy: w grupie „z premedytacją” symptomy depresji korelowały

dodatkowo ze wszystkimi domenami patologii osobowości, podczas gdy u sprawców „impulsywnych” związek ten ograniczał się głównie do domen Antagonizmu i Psychotyczności.

5.4 Model teoretyczny

Wyniki uzyskane w serii badań przeprowadzonych w ramach niniejszego projektu doktorskiego pozwoliły na sformułowanie zintegrowanego modelu, wyjaśniającego złożone zależności między analizowanymi konstruktami (Rysunek 2). Należy podkreślić, że model ten stanowi teoretyczną syntezę wyłaniającą się z przeprowadzonych analiz (post hoc), nie był zaś zakładaną a priori strukturą hipotez. Zaproponowana koncepcja zakłada hierarchiczną organizację zmiennych, w której patologiczne domeny osobowości stanowią fundamentalne podłoże dla rozwoju zniekształceń poznawczych. Te z kolei prowadzą do wtórnych trudności w funkcjonowaniu społeczno-emocjonalnym oraz manifestacji objawów depresyjnych.



Rysunek 2. Proponowany zintegrowany model poznawczych, społecznych i osobowościowych korelatów depresji – synteza wyników badań własnych.

6. Konkluzje

Głównym celem niniejszego projektu doktorskiego było nie tylko zbadanie związku między wrogimi zniekształceniami poznawczymi a symptomami depresji, ale przede wszystkim zaproponowanie i empiryczna weryfikacja zintegrowanego modelu, w którym patologiczne domeny osobowości stanowią wspólne podłoże dla rozwoju obu tych zjawisk. Realizując ten cel, w toku prowadzonych badań skoncentrowano się na następujących aspektach:

- Zastosowanie obok standardowych narzędzi samoopisowych zaawansowanych technik pomiarowych, w tym badań podłużnych z analizą języka naturalnego, metodą okulograficzną (eye-tracking) oraz elektroencefalografią (EEG).
- Włączenie do analiz populacji rzadko uwzględnianych w badaniach psychologicznych, a charakteryzujących się potencjalnie wysokim nasileniem zniekształceń poznawczych (sprawcy zabójstw i innych przestępstw z użyciem przemocy).
- Zaproponowanie i empiryczne ugruntowanie modelu, w którym patologiczne domeny osobowości pełnią funkcję nadrzędnego konstruktu wyjaśniającego mechanizm związku między zniekształceniami poznawczymi a depresją.

6.1 Implikacje

Wykazane w niniejszym cyklu powiązania między objawami depresyjnymi, wrogimi atrybucjami a domenami osobowości prowadzą do pytania o możliwe kierunki oddziaływań terapeutycznych. Zgodnie z modelem SIP (Crick i Dodge, 1994), kluczowym momentem dla interwencji jest etap interpretacji sygnałów społecznych, na którym dochodzi do procesów mentalizacji. Rozwijanie tej zdolności, rozumianej jako trafne odczytywanie stanów umysłu własnych i cudzych (Bateman i Fonagy, 2004), może stanowić skuteczną metodę redukcji wrogich atrybucji i poprawy jakości relacji, co potwierdzają liczne badania nad skutecznością Terapii Opartej na Mentalizacji (ang. *Mentalization Based Treatment*, MBT; m.in. Bateman i

Fonagy, 2008; Rossouw i Fonagy, 2012). Wątek ten podjęto w badaniach uzupełniających (spoza głównego cyklu doktorskiego), których wyniki przedstawiono w **Artykule 8**. Opisano w nim adaptację treningu opartego na MBT do warunków penitencjarnych, wskazując na nową w polskim systemie resocjalizacyjnym ścieżkę interwencji, celującą w fundamentalne mechanizmy poznawcze. Wstępne analizy wykazały, że już po pierwszych etapach treningu uczestniczki (kobiety osadzone) częściej przyjmowały perspektywę innych osób oraz prezentowały szerszy wachlarz interpretacji w sytuacjach niejednoznacznych. Wyniki te wyznaczają kierunek mojej dalszej pracy naukowej. Obecnie, we współpracy z zespołami badawczymi w Polsce i Kanadzie, prowadzę badania nad efektywnością treningu mentalizacyjnego zarówno w grupach pacjentów klinicznych, jak i wśród kobiet odbywających karę pozbawienia wolności.

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Artykuły składające się na cykl pracy doktorskiej oraz oświadczenia współautorów



Depression and personality disorders among incarcerated offenders convicted of impulsive versus premeditated homicide

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ABSTRACT

Depression and personality disorders, such as Borderline Personality Disorder and Antisocial Personality Disorder, have been identified as common factors among homicide offenders. However, existing research often adopts a limited categorical approach and treats homicide offenders as a homogeneous group. In this study, we utilized a dimensional approach to investigate the differences in depression and personality disorders between impulsive and premeditated homicide offenders. A total of 83 homicide offenders, aged 20–74 (45 premeditated and 38 impulsive offenders), from two prisons in Poland participated in the study. They completed three questionnaires assessing depression and personality disorders using both categorical and dimensional approaches. No significant differences were found between the groups, suggesting that type of homicide alone should not guide clinical decision-making. However, premeditated homicide offenders demonstrated relatively higher levels of Detachment and Psychoticism, as well as above cut-off depressive symptoms. These findings tentatively suggest that the Psychoticism and Detachment domains may play an important role in premeditated homicide offenders. Considering the study's limited sample size and utilization of abbreviated research instruments, a more comprehensive exploration in future studies using refined measures seems warranted. Moreover, the high prevalence of depressive symptoms as well as their associations with PD traits emphasizes the need for future studies to prioritize the investigation of depression within this group.

ARTICLE HISTORY Received 26 March 2023; Accepted 19 September 2023

KEYWORDS Murder; homicide; depression; personality disorders; inmates

Introduction

Mass media portrayals and public perceptions of homicide offenders often revolves around their mental illness or personality disorders, contributing to the perpetuation of stereotypes and discrimination against individuals with mental health problems (Fioritti et al., 2006; Pavez et al., *in press*). However, it

is crucial to recognize that the majority of psychiatric patients are not prone to violence or at an increased risk of committing homicide (Fioritti et al.). Nevertheless, more than half of homicide offenders receive a diagnosis of depression, personality disorder (McCallion & Farrimond, 2018), or dual disorders (Sher et al., 2015). In comparison, among the general inmate population, approximately 20–10% have been diagnosed with depression, while more than 10% receive a diagnosis of personality disorder (e.g. Fazel et al., 2016; Stringer, 2019). It is evident that depression and personality disorders play a significant role in the behavior of homicide offenders, warranting further in-depth examination.

In this context, it is important to acknowledge that personality disorders commonly observed in homicide offenders, such as Antisocial Personality Disorder (ASPD) and Borderline Personality Disorder (BPD), represent a broad spectrum of conditions that are not uniformly associated with criminal behavior (McCallion & Farrimond, 2018). Inmates exhibit a higher prevalence of ASPD and BPD, ranging from 12% to 30% (Black et al., 2007; Douglas et al., 2007; Eronen et al., 1996; Trestman et al., 2007; Yang et al., 2022), compared to the general population where the prevalence ranges from 1% to 2% (Gunderson et al., 2018; Holzer et al., 2022; Kraus & Reynolds, 2001). However, the research on ASPD and BPD in the context of homicide offenders is limited and often relies on a categorical approach to personality disorders, merely focusing on the presence or absence of the disorder. This approach overlooks the possibility that specific symptoms of ASPD and BPD may be more relevant as risk factors for committing homicide. Although a categorical operationalization of personality disorders is present in DSM-5, the shortcomings of this approach are well-known, such as neglecting the fact that individuals do not typically exhibit symptom patterns that align with only one specific personality disorder (APA, 2013, 2022). Recognizing the limitations of the categorical approach, the APA introduced the Alternative Model of Personality Disorders (AMPD) in Section III of the DSM-5 (Krueger & Markon, 2014).

The AMPD considers distinct symptoms of personality disorders on a continuum of severity, comprising five domains of maladaptive personality with specific traits (APA, 2013, 2022). This alternative approach offers an opportunity to explore the link between maladaptive personality domains and homicide from a more nuanced perspective (APA). According to the AMPD, both ASPD and BPD are primarily characterized by traits such as impulsivity and risk-taking, which fall under the Disinhibition domain (DI). DI refers to an orientation toward immediate gratification, leading to impulsive behaviors (APA, 2013, 2022, p. 770). Moreover, both ASPD and BPD exhibit traits of hostility, which are part of the Antagonism domain. This domain includes behaviors that put individuals at odds with others, such as an exaggerated sense of self-importance, an expectation of special treatment,

callous antipathy toward others, and a readiness to use others for self-enhancement (APA). It is worth noting that ASPD includes additional Antagonism traits, such as manipulateness, which are not representative of BPD. On the other hand, BPD encompasses traits of emotional lability and depressivity, belonging to the Negative Affect (NA) domain. NA refers to frequent and intense experiences of a wide range of negative emotions (APA).

Understanding the actions of homicide offenders and providing appropriate treatment may require consideration of the specificity and comorbidity of different disorders (Talevska & Stefanovski, 2011). It is important to recognize that homicide offenders are not a homogeneous group. Based on the timing and planning of the homicide, offenders can be categorized into predatory/premeditated (also called instrumental) and impulsive groups (Balcioglu et al., 2023; Meloy, 1997).

Individuals who engage in impulsive aggressive behavior, particularly in situations involving emotional arousal or provocation, may display certain traits commonly associated with Borderline Personality Disorder (BPD; Jin et al., 2023; Siever, 2008). Both offenders who act impulsively and individuals with BPD share common traits such as strong emotions (e.g. anger) and difficulties in regulating emotions (Krause-Utz et al., 2019; Levy et al., 2010). According to the AMPD model, these characteristics can be attributed to the DI domain (which includes impulsivity) and the NA domain (which includes emotional lability; APA, 2013, 2022). It is noteworthy that high levels of anger and poor emotion regulation are significant risk factors for impulsive homicide among individuals with BPD (Yoon et al., 2012). In contrast, individuals who engage in premeditated aggression, characterized by purposeful and goal-directed behavior, demonstrate heightened executive control processes (Cornell et al., 1996; Cruz et al., 2020) and do not align with BPD characteristics (Levy et al.). Instead, research has shown that people who acted with premeditation or instrumental motives tend to exhibit more traits associated with Antisocial Personality Disorder (ASPD) compared to impulsive individuals (Azevedo et al., 2020; Tweed & Dutton, 1998). Specifically, studies indicate that premeditated perpetrators scored significantly higher than impulsive perpetrators on measures of psychopathy, including the psychopathy total score, Fearless Dominance (which includes traits like stress immunity, social potency, and fearlessness), and Impulsive Antisociality (which includes traits like blame externalization, impulsive nonconformity, Machiavellian egocentricity, and carefree nonplanfulness) (Stanford et al., 2008).

As previously mentioned, depression is frequently diagnosed in homicide offenders (e.g. Swedish National Council for Crime Prevention, 2020). Homicides are predominantly committed by men, accounting for approximately 90% of cases (UNODC, Global Study on Homicide, 2019). However,

research indicates that depression is reported more frequently in women than in men (Salk et al., 2017). This inconsistency may be due to the inadequate measurement of depression in men, as they may exhibit different symptoms compared to women (Branney & White, 2008; Call & Shafer, 2018). Men often display externalizing behaviors, such as hostility (e.g. becoming angry, appearing resentful) and aggression towards others, as typical signs of depression (Cheng & Jaffe, 2021; Katz et al., 1993). Importantly, incorporating these criteria in measurement tools helps reduce the disparity in depression rates between men and women (Call & Shafer, 2018; Martin et al., 2013). In the Swedish population, a study revealed that committing a violent crime, including homicide or assault, is common in 2% of women with depression and 14% of men with depression (Fazel et al., 2015). Additionally, risk-taking behaviors are characteristic of individuals with Borderline Personality Disorder (BPD; APA, 2019). Both depressed individuals and those with BPD often exhibit irritability, hostility, and anger (Gasse et al., 2020). Due to these shared characteristics, depression frequently co-occurs with BPD (APA, 2013, 2022; Yoshimatsu & Palmer, 2014).

Current study

A common distinction in homicide cases relates to the affective and behavioral state during the act of violence (Balcioglu et al., 2023; Meloy, 1997). However, only a limited number of studies have examined the differences in psychopathology between these groups (Felthous, 2008; Hachtel et al., 2021). Understanding these differences is crucial for developing appropriate interventions for each group (Siever, 2008). Therefore, the objective of this study was to investigate the variations in psychopathology between impulsive and premeditated homicide offenders. Based on previous research indicating similarities between impulsive homicide offenders and individuals with BPD (e.g. Krause-Utz et al., 2019; Levy et al., 2010), we hypothesized that compared to premeditated homicide offenders, impulsive homicide offenders would score higher on BPD scale, as well as the relevant domains in the Alternative Model of Personality Disorders (AMPD): Disinhibition and Negative Affect (H1). Additionally, we expected that premeditated offenders, compared to the impulsive group, would exhibit higher levels of ASPD and Antagonism, as indicated by the AMPD model (APA, 2013, 2022) (H2). While BPD and ASPD are the most prevalent and extensively studied personality disorders in the context of homicide (Fakhrzadegan et al., 2017; Jamison, 2005), we also aimed to explore potential differences between the groups in other personality disorders, such as Narcissistic, Avoidant, Dependent, Obsessive-compulsive, Paranoid, Schizotypal, Schizoid, and Histrionic Personality Disorder, even though they are not specific to homicide offenders

(Jamison). Given the high prevalence of depression in homicide offenders (McCallion & Farrimond, 2018), its comorbidity with BPD (Yoshimatsu & Palmer, 2014), and its association with NA (Iqbal & Dar, 2015), we hypothesized that impulsive perpetrators would exhibit greater levels of depression, both in terms of symptom severity and categorized using conventional thresholds, compared to premeditated offenders (H3). Finally, we analyzed the correlation coefficients between the pathological personality domains and depression in both groups to explore potential differences in patterns of associations across groups.

Method

Participants and procedure

A total of 88 male prisoners were initially recruited for the study. However, due to missing data, four participants were excluded from the analysis. In addition, one extreme outlier, whose data deviated more than three standard deviations from the mean, was identified and also excluded from the analysis. As a result, the final sample included 83 prisoners, aged 20–74 years ($M = 35.02$, $SD = 10.08$; one participant refused to disclose their age). Among the 83 participants, 45 [45/83 (54.2%)] were classified as premeditated homicide offenders, while 38 [$N = 38/83$ (45.8%)] were classified as impulsive homicide offenders. The classification of the participants into these groups was based on court judgments. The premeditated homicide group consisted of individuals whose actions were deemed intentional by the court, with the explicit goal of causing death (e.g. using a knife with a 40 cm blade and delivering two strikes). On the other hand, the impulsive homicide group comprised individuals whose actions indirectly resulted in death (e.g. a fatal outcome resulting from a physical altercation). Detailed descriptive statistics of the study sample are presented in [Table 1](#).

In Poland, impulsive murderers and premeditated murderers are defined according to the Penal Code. Impulsive murderers are individuals who kill as a result of sudden and uncontrollable actions, often stemming from anger, rage, or impulse. In Polish criminal law, such behavior is treated as the crime of homicide, which is punishable under Article 148 of the Penal Code. Premeditated murderers are individuals who plan and deliberately carry out a killing. They act knowingly and with the intention of depriving someone of their life. This type of behavior is punished under Articles 148–150 of the Penal Code.

Participants for this study were recruited from two prisons with the assistance of local prison psychologists. During the initial meetings, individuals who expressed their willingness to participate were provided with comprehensive information about the study, including details about its voluntary

Table 1. Detailed descriptive statistics of the study sample.

	impulsive		premeditated	
	N = 38		N = 45	
Age	31.79	(7.69)	37.89	(11.11)
Education				
Elementary	7.9%		2.0%	
Lower secondary	26.3%		22.2%	
Vocational	15.8%		2.0%	
Upper secondary	42.1%		31.1%	
Higher in progress	2.6%		2.2%	
Higher	2.6%		4.4%	
Other	2.6%		0.0%	
Marital status				
Single	71.1%		6.0%	
Married	0.0%		11.1%	
In informal relationship	18.4%		15.6%	
Widowed	0.0%		4.4%	
Divorced	7.9%		8.9%	
Other	2.6%		0.0%	
Place of living				
Countryside	23.7%		31.1%	
City below 100 000 residents	44.7%		4.0%	
City above 100 000 residents	31.6%		28.9%	
Depression level				
without symptoms	48.6%		45.5%	
mild depression	24.3%		22.7%	
moderate depression	16.2%		2.5%	
moderately severe depression	1.8%		4.5%	
severe depression	0.0%		6.8%	

nature and the guarantee of complete anonymity. Subsequently, the participants completed all the questionnaires individually.

The study procedure received approval from the ethical committee of the university as well as the relevant prison authorities, ensuring compliance with ethical guidelines and regulations.

Measures

Personality disorders were assessed with the Structured Clinical Interview SCID for DSM-5 (First et al., 2015), Screening Modules for Axis II Disorders. This self-report questionnaire consists of 106 yes-not items referred the DSM criteria for 10 personality disorders (e.g. BPD and ASPD). In our study, scales beyond Dependent PD, Obsessive-compulsive PD and Schizoid PD (Cronbach's alpha ranged from the ranged from .5 to .54) had acceptable and good reliability (Cronbach's alpha ranged from the ranged from .62 to .88).

Domains of maladaptive personality (e.g. *Negative Affect*, *Disinhibition*) were measured with Polish version of Personality Inventory for DSM-5 Brief Form (PID-5 BF; Rowiński et al., 2019). It consisted of 25 items tool measure 5

pathological domains of personality (e.g. NA, Detachment). Participants respond on a 4-point Likert scale how much each of the statements are true for them (1 = definitely or very often untrue; 4 = definitely or very often true). PID-5 BF is a reliable (Cronbach's alpha ranged from .85 on Antagonism to .89 on NA; Thimm et al., 2016) and valid tool (e.g. Suzuki et al., 2017). In our study, scales beyond NA (Cronbach's alpha = .48) have acceptable and good reliability (Cronbach's alpha ranged from .69 to .8).

Depressive symptoms. Depressive symptoms were assessed with the Patient Health Questionnaire (PHQ-9; Polish validation: Tomaszewski et al., 2011). Each of 9 items of the tool refer to criteria for diagnosis of depression in *DSM-IV* as well as *DSM-5* (Kroenke et al., 2001; Mitchell et al., 2020). Participants respond on scale from 0 ('not at all') to 3 ('nearly every day'). The tool provides a dimensional score while also suggesting cut-offs to measure depression severity (1–4 none, 5–9 mild, 10–14 moderate, 15–19 moderately severe, 20–27 severe). The tool has good reliability (Cronbach's alpha = .86 in our study).

Data analysis

The SPSS statistical software package, version 27.0 was used for the analysis.

The differences between impulsive and premeditated homicide offenders were investigated by using t-tests for independent samples (two-tailed; with consideration for equality of variances using Levene's Test) and Cohen's d effect size. The relationships between depression, domains of maladaptive personality and personality disorders were examined using Pearson's correlation.¹

Results

Correlates of psychopathology in homicide offenders

Avoidant, Paranoid, Schizoid, Schizotypal, and Borderline Personality Disorder, as well as all domains of maladaptive personality, were positively and significantly correlated with depressive symptoms in premeditated homicide offenders. In addition, Avoidant, Dependent, and Borderline Personality Disorder, as well as Antagonism and Psychoticism, showed a significant correlation with depressive symptoms in impulsive homicide offenders (Table 2).

Differences in psychopathology between impulsive homicide and premeditated homicide offenders

The analysis did not yield any significant differences in terms of personality disorders, PID-5 BF domains, or depression between the two groups. However, noteworthy findings emerged, indicating that premeditated

Table 2. Pearson's coefficients for all study variables in premeditated homicide offenders.

	PHQ	NA	DE	AN	DI	PS	AVPD	DPD	OCD	PPD	STPD	SzPD	HPD	NPD	BPD
PHQ	-														
NA	.439**	-													
DE	.339*	.554**	-												
AN	.327*	.584**	.432**	-											
DI	.435**	.523**	.383*	.626**	-										
PS	.614**	.532**	.529**	.468**	.574**	-									
AVPD	.553**	.347*	.454**	.349*	.408**	.508**	-								
DPD	.267	.277	.425**	.301*	.172	.354*	.444**	-							
OCD	.652**	.512**	.429**	.446**	.511**	.618**	.580**	.116	-						
STPD	.517**	.246	.234	.270	.289	.357*	.665**	.468**	.432**	-					
ScPD	.543**	.377*	.306*	.292	.289	.391**	.529**	.234	.423**	.676**	-				
HPD	.244	.129	.041	.127	.187	.139	.349*	.185	.323*	.576**	.317*	-			
NPD	.295*	.348*	.296	.564**	.365*	.442**	.450**	.423**	.427**	.456**	.617**	.231	-		
BPD	.561**	.432**	.383*	.450**	.458**	.540**	.635**	.385**	.362*	.741**	.743**	.356*	.324*	.706**	-
ASPD	.211	.119	.108	.407**	.472**	.326*	.384**	.277	.128	.382**	.580**	.134	.270	.596**	.661**
PHQ	-														
NA	.319	-													
DE	.402	.485*	-												
AN	.451*	.536*	.345	-											
DI	.405	.516*	.265	.803**	-										
PS	.681**	.536*	.526*	.625**	.467*	-									
AVPD	.712**	.218	.132	.500*	.236	.444	-								
DPD	.469*	.120	.191	.090	.314	.341	.378	-							
OCD	-.083	-.038	.017	.022	-.334	-.013	.184	.256	-						
PPD	.175	.072	.241	.248	-.069	.144	.362	-.249	.215	-					
STPD	-.003	.067	.197	-.187	-.460	-.142	.182	-.122	.262	.350	-				
ScPD	.364	.148	-.021	.263	.011	.206	.663**	.091	.278	.577*	.542*	-			
HPD	.375	.402	-.016	.508*	.407	.503*	.630**	.598**	.337	.017	-.084	.241	-		
NPD	-.082	.194	.257	.722**	.429	.598**	.307	.010	.391	.424	.030	.271	.342	-	
BPD	.494*	.486*	.220	.403	.156	.499*	.806**	.417	.338	.357	.376	.619**	.682**	.368	-
ASPD	.452	-.024	.607**	.379	.167	.458	.584*	.356	.312	.465	.189	.489*	.340	.610**	.510*

* $p < .05$; ** $p < .001$ PHQ – depression, AVPD – Avoidant Personality Disorder; DPD – Dependent PD; OCD Obsessive-Compulsive PD; PPD – Paranoid PD; STPD – Schizotypal PD; ScPD – Schizoid PD; HPD – Histronic PD; NPD – Narcissistic PD; BPD – Borderline PD; ASPD – Antisocial PD; ASPD – Avoidant Personality Disorder; DPD – Dependent PD; OCD Obsessive-Compulsive PD; PPD – Paranoid PD; STPD – Schizotypal PD; ScPD – Schizoid PD; HPD – Histronic PD; NPD – Narcissistic PD; BPD – Borderline PD; ASPD – Antisocial PD; NA – Negative Affect; DE – Detachment; AN – Antagonism; DI – Disinhibition; PS – Psychoticism.

homicide offenders scored higher, albeit with a statistical tendency, on the Detachment and Psychoticism domains compared to impulsive homicide offenders. Further details and scores can be found in [Table 3](#).

Depression

Furthermore, following the PHQ-9 scoring thresholds, a division into two groups was established: those with no depression symptoms and those with depression symptoms (where a score of 5 or higher indicated the presence of depression symptoms; Kroenke et al., 2001). Participants who scored below 5 on the PHQ-9 were categorized as the group without depressive symptoms, while those with a score of 5 or higher were classified as the group with depressive symptoms. In the entire sample, 46.9% of participants exhibited no depressive symptoms, while 53.1% of participants displayed depressive symptoms. A detailed breakdown of depression frequency within the groups can be found in [Table 1](#).

A chi-square test of independence was conducted to examine the relationship between the type of committed homicide and the proportion of offenders with depression symptoms (categorized as either no depression symptoms or depression symptoms). The results indicated that there was no significant difference in the proportion of offenders with depression symptoms based on the type of committed homicide ($p > .05$).

Discussion

The primary objective of this study was to compare premeditated and impulsive homicide offenders. We hypothesized that Borderline

Table 3. Means of each personality disorders' and domains' scores of impulsive and premeditated homicide offenders.

Variable	Impulsive N = 38		Premeditated N = 45		t(81)	p	Effect size (Cohen's d)
	M	SD	M	SD			
Avoidant	1.61	1.62	1.58	1.84	-.07	.942	-.02
Dependant	1.61	1.52	1.36	1.38	-.78	.439	-.17
Obsessive-compulsive	3.53	1.9	3.78	1.66	.64	.527	.14
Paranoid	3.08	1.73	2.93	2.11	-.35	.731	-.08
Schizotypal	2.66	2.42	2.62	2.73	-.06	.950	-.01
Schizoid	1.63	1.58	1.73	1.4	.31	.760	.07
Histrionic	2.47	1.81	1.96	2.02	-1.23	.222	-.27
Narcissistic	3.53	3.53	3.38	2.93	-.21	.837	-.05
Borderline	3.84	2.85	3.89	3.5	.07	.947	.02
Antisocial	4.13	3.82	3.69	3.94	-.52	.606	-.11
Negative Affect	1.06	.47	1.18	.59	1.02	.312	.22
Detachment	.7	.58	.92	.63	1.7	.093	.37
Antagonism	.49	.64	.4	.5	-.7	.487	-.16
Disinhibition	.86	.68	.94	.63	.57	.569	.13
Psychoticism	.55	.51	.76	.61	1.73	.088	.38

Personality Disorder, depression, and specific domains of the Alternative Model of Personality Disorder (AMPD), namely Disinhibition and Negative Affect, would be more prevalent in the impulsive group. Conversely, we expected that Antisocial Personality Disorder and the Antagonism domain would be more prominent among premeditated homicide offenders. Additionally, we investigated differences in other personality disorders (e.g. Avoidant PD, Dependent PD) and examined correlations between depression, maladaptive personality domains, and personality disorders.

No statistically significant differences were found between the groups in terms of personality disorders assessed using SCID, PID-5 BF domains, and depression. This could suggest that inferring differences in clinical factors based on type of homicide may be unwarranted and should not be used to guide decision making such as treatment allocation. Premeditated homicide offenders showed higher scores, approaching statistical significance with medium effect sizes according to Cohen's criteria, on the Detachment and Psychoticism domains compared to impulsive homicide offenders. The Detachment domain is characterized by an avoidance of socioemotional experiences, including withdrawal from interpersonal interactions and restricted affective experience and expression, as described in the DSM-5 (APA, 2013, 2022; Krueger et al., 2013). Emotional numbing in psychopathic violent offenders is similar to symptoms of depersonalization and dissociation (Moskowitz, 2004; Shin et al., 2019). It is possible that a state of detachment, which may arise from high anxiety levels and inhibition of emotional processing by the medial prefrontal cortex, leads to depersonalization or dissociative symptoms (Holmes et al., 2005; Murphy, 2023). While the PID-5 BF does not directly assess dissociation symptoms in the Detachment domain, characteristics of dissociation are more typical of the Psychoticism domain, which also approached statistical significance in premeditated homicide offenders. The Psychoticism domain involves cognitive and perceptual dysregulation, including odd or unusual thought processes, depersonalization, derealization, and dissociation. Notably, dissociation is common in violent offenders, including homicide offenders who exhibit a pattern of violence-related identity (Bourget et al., 2017; Moskowitz, 2004). Emotional withdrawal and dissociation may serve as responses to the crimes committed, but they may also underlie the capacity for premeditated acts of violence (Moskovitz). Our findings suggest that higher levels of Psychoticism and Detachment, associated with severe psychopathology, may be particularly relevant in the case of premeditated homicide offenders. Because in case of our study the differences did not reach significance level, future studies should test the assumption including also other measures. Psychopathy is known to be associated with planned and calculated violent behavior, characteristics often found in premeditated homicides (James et al., 2020). Therefore, incorporating

psychopathy measures in future studies could provide a more comprehensive understanding of the factors contributing to different types of homicidal acts.

It is worth noting that our study replicated the finding of a high prevalence of depression among homicide offenders, consistent with previous research (McCallion & Farrimond, 2018), although also this finding was not statistically significant. This finding aligns with the 'Big build' model, which suggests that as emotional distress, including depression (Brownhill et al., 2005), increases in men, so does the risk of aggressive behavior (Winkler et al., 2005). In men, depression has been associated with higher levels of hostility (Katz et al., 1993). Therefore, factors such as hostility and aggression should receive increased attention when dealing with men who have depression, with relevance for both impulsive and premeditated homicide. Notably, levels of depression were significantly and positively correlated with several PDs categories as well as with domains of maladaptive personality in both groups. The substantial overlap between depression and personality pathology stresses the importance of a dual focus on psychopathology symptoms that are more acute as well as symptoms that characterize the habitual functioning of individual offenders.

Limitations

It is important to acknowledge certain limitations and potential areas for further investigation in our study. Firstly, we utilized a brief version of the PID-5, which does not provide a comprehensive assessment of pathological personality traits within the domains. Examining these traits in more detail could reveal additional nuanced differences between premeditated and impulsive homicide offenders.

Additionally, considering the significant role of dissociation in the planning and commission of homicides, future studies involving violent prisoners should include an examination of dissociative experiences. Understanding the extent to which dissociation influences violent behavior can contribute to a more comprehensive understanding of the underlying factors associated with different types of homicides.

Furthermore, the statistical tendency level differences observed in the Detachment domain highlight the importance of interpersonal relationships in this context. While our study did not specifically inquire about the relationship between the offender and the victim, exploring the characteristics of this relationship could provide valuable insights into the motives and triggers for the homicides. Investigating the nature of these relationships may help shed light on the underlying causes and dynamics involved in different types of homicides (Decker, 1993).

Lastly, it is crucial to acknowledge the relatively small sample size in our study, as is often the case in research involving homicide offenders

(Catanesi et al., 2011). Given that various variables, including age, may be naturally linked to depression or pathological personality traits, conducting a study on a larger sample would enable the examination of differences concerning these variables. Therefore, it is important for future research to replicate our findings with larger and more diverse samples to ensure the robustness and generalizability of the results. Moreover, the lack of differences between the groups may be attributed to participant self-selection. Nearly 50% of premeditated homicide offenders agreed to participate in the study, while 20% of impulsive homicide offenders did so. It is possible that those who genuinely exhibit impulsivity opted not to participate. In the future, screening studies, such as assessing the Big Five personality traits, could help identify non-participating individuals. Research has shown that traits like agreeableness and conscientiousness are negatively correlated with impulsivity (Mao et al., 2018) and BPD (Brud & Cieciuch, 2023). Additionally, considering the complexity of the psychopathological profiles and the potential interplay of contextual factors, such as socio-economic background, life experiences and early relational traumas a mixed qualitative/quantitative design might provide valuable insights into the underlying mechanisms contributing to different types of homicidal behavior.

Conclusions and implications

The lack of statistically significant differences between the two groups suggests that the treatment and management of offenders convicted of homicide should not be based only on knowledge about the impulsive vs. premeditated nature of the homicide. Further scrutiny of the underlying personality and psychopathology of individual offenders appears necessary to guide decision making for offender management and treatment allocation. Specifically, the findings highlight the potential implications for the treatment and management of individuals with depression, detachment, and psychoticism. Firstly, recognizing that these factors often stem from enduring highly stressful or traumatizing experiences highlights the importance of addressing the underlying emotional aspects in individuals with a history of aggression (Longden et al., 2020). By helping individuals develop a greater understanding and recognition of their emotions, therapists can empower them to navigate their emotional experiences more effectively (Honkalampi et al., 2001). This can lead to improved treatment outcomes and a reduction in depression symptoms (Kim et al., 2017). Moreover, addressing anger experiences within psychotherapy has been shown to specifically alleviate depression symptoms (Town et al., 2022). Therefore, incorporating strategies to enhance emotional awareness, including the exploration and management of anger feelings, could be valuable in promoting overall well-being

and reducing the risk of dissociation states and violent behaviors (Garofalo et al., 2018; Robertson et al., 2015).

Secondly, these findings have implications for the prevention of aggressive behavior, particularly in individuals with depression. Understanding the relationship between emotional distress, such as depression, and the propensity for aggression is important. By recognizing that hostility and aggression can be associated with depression, interventions can be tailored to address these specific factors in men with depression (Gasse et al., 2020; Katz et al., 1993). Providing support and therapeutic interventions that focus on emotional regulation and anger management may help mitigate the risk of aggressive behaviors in this population (Velotti et al., 2017). Moreover, an equally significant consideration pertains to the potential impact on the reintegration of prisoners into society, particularly concerning the advancements in targeted assessment and treatment programs. These programs quite often focus on decreasing aggressive behaviours (Arbour et al., 2023), however considering high rate of mental health problems (i.e. depression, personality disorders) in incarcerated populations, focusing on psychopathological and personality factors, should also be of great concern. The transition from prison to the community is particularly vital for individuals with mental health problems, underlining the necessity for effective treatment (Dixon, 2000). Sustaining active and consistent mental health treatment stands as a resilient defense against relapse and a proactive path to recovery, thereby acting as a barrier against recidivism (Beck & Maruschak, 2001)

Due to the limited size of the sample, there could be actual differences between groups that the study didn't identify as statistically significant. The achieved power in a post hoc power calculation of 0.72, while acceptable, may carry the risk of not detecting significant effects. Therefore, we particularly recommend conducting a replication of the study with larger sample sizes.

Overall, by addressing the emotional aspects underlying depression, detachment, and psychoticism, interventions can aim to improve treatment outcomes, reduce dissociation states, and potentially prevent violent behaviors. Notably, depression was positively correlated with several PD diagnosis and with all maladaptive personality domains, highlighting the substantial overlap among symptoms of psychopathology. These implications stress the importance of a comprehensive and integrated approach that considers the interplay between emotional experiences, mental health, and aggressive tendencies.

Note

1. Although responses in SCID are symptom-counts rather than continuous, Pearson's correlation are reported because significance of its results did not differ from Spearman's correlation.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The study was partially founded by National Science Centre (UMO-2021/42/E/HS6/00018)

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To cite this article: Izabela Kaźmierczak, Adrianna Jakubowska, Agnieszka Pietraszkiewicz, Anna Zajenowska, David Lacko, Aleksander Wawer & Justyna Sarzyńska-Wawer (2025) Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study, *Cognition and Emotion*, 39:7, 1693-1702, DOI: [10.1080/02699931.2024.2351952](https://doi.org/10.1080/02699931.2024.2351952)

To link to this article: <https://doi.org/10.1080/02699931.2024.2351952>



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Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study¹

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ABSTRACT

The study tested how the use of positive- (e.g. beautiful) and negative-valenced (e.g. horrible) words in natural language and its change in time affects the severity of depression and anxiety symptoms among depressed and non-depressed individuals. This longitudinal mixed methods study ($N = 40$ participants, $n = 1440$ narratives) with three measurements within a year showed that at the between-person level the use of negative-valenced words was strongly associated with the increase in anxiety and depression symptoms over time while the use of positive-valenced words was slightly associated with the decrease in anxiety and depression symptom. These effects were not supported for within-person level (i.e. changes in word usage). No significant differences were observed in the effects between depressed and non-depressed groups. Summing up, the overall use of positive- and negative-valenced words (particularly negative-valenced words) had a stronger effect on the severity of psychopathological symptoms than their change over time. The results were discussed in the context of natural language processing and its application in diagnosing depression and anxiety symptoms.

ARTICLE HISTORY

Received 16 January 2024

Revised 13 April 2024

Accepted 30 April 2024

KEYWORDS

Depression; anxiety;
language; valence; word
sentiment

Depression stands as one of the most prevalent psychological disorders, prompting concerted efforts over recent decades to prioritise its prevention as a public health imperative (World Health Organization, 2008). Despite the existence of effective treatments, obstacles to screening and diagnosis persist. Concurrently, manifestations of this affective disorder resonate through natural language usage (Bernard et al., 2016; Kaźmierczak et al., 2022), revealing shifts in word sentiment. The utilisation of negative emotionality in speech escalates in tandem with the severity of depression ($r_s = .05$ to $.12$; Tackman et al., 2019), with individuals grappling with depression demonstrating notably higher frequencies compared to their non-depressed counterparts (Baddeley et al.,

2013; Krejtz et al., 2020). This trend extends to both individuals experiencing dysphoria (Rude et al., 2004) and those subjected to experimentally induced negative moods (Bernard et al., 2016).

Prior investigations have also investigated the relation between the expression of positive emotionality and depression. However, their conclusions are somewhat contradictory; while one study indicates that individuals grappling with depression tend to utilise positive expressions less frequently than non-depressed individuals (e.g. Molendijk et al., 2010), another study suggests no significant disparity (e.g. Baddeley et al., 2013). These inconsistencies may stem from methodological variations, such as the examination of language usage in real-time (Baddeley

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 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/02699931.2024.2351952>.

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et al., 2013) versus its analysis within essays as part of a diagnostic process (Molendijk et al., 2010). Nonetheless, it seems that among young adults, those experiencing dysphoria employ fewer positive-valenced words compared to their non-dysphoric peers (Rude et al., 2004), particularly evident when recounting their most uplifting life experiences (Sloan et al., 2005).

Examining the dynamics of depressive symptoms, the research conducted by Park and Conway (2017) pointed to longitudinal alterations in psychological states, specifically focusing on linguistic expressions within an online depression community. Their investigation found enhancements across various linguistic dimensions concerning emotions among participants within the depression community. These findings resonate with the Meaning Making Model (MMM; Park & Folkman, 1997), a theoretical framework delineating how individuals navigate and derive significance from challenging life circumstances. The MMM holds particular relevance within the sphere of stress, loss, or adversity adaptation. The model underscores the imperative of actively engaging with and processing demanding life events to uncover meaning, bolster coping mechanisms, and foster psychological adaptation and well-being. Significantly, it underscores the dynamic and continual nature of meaning construction as individuals negotiate the intricacies of their encounters and endeavour to craft cohesive narratives of their existence. The process of modifying the iteration and narrative framework of social experiences, termed cognitive restructuring related to narrative change, serves as a pivotal tool in depression treatment and psychotherapeutic interventions for both depressed individuals and those grappling with traumatic events (e.g. Santos et al., 2013). Particularly, narrative therapy accentuates the remoulding of individuals' cognitive appraisal and interpretation of their experiences (Etchison & Kleist, 2000).

Drawing from the aforementioned studies, it is imperative to devise methodologies facilitating the diagnosis of depression through analysis of natural language use, thereby fostering progress in potential treatment modalities. This endeavour is particularly significant given the escalating reliance on language for communication across social media platforms. Notably, young adults, the most prolific users of such platforms, are identified as a demographic at heightened risk of depression (Lin et al., 2016). With artificial intelligence (AI) increasingly permeating our psychological landscape, the capability to forecast

depression based on linguistic patterns holds considerable promise. Natural Language Processing (NLP), a subset of AI dedicated to facilitating computer comprehension and generation of human language, presents fertile ground for enhancing risk prediction and bolstering frameworks for suicide prevention. Indeed, the integration of NLP techniques could yield cost-effective and streamlined alternatives to resource-intensive suicide prevention methods (Arowosegbe & Oyelade, 2023). Thus, the present project addresses potential markers of depression as evidenced in natural language utilisation.

Current study

The primary objective of this study is to extend upon existing research by examining the association between the utilisation of negative – and positive-valenced words in describing life events and the manifestation of depression symptoms among individuals both with and without clinically diagnosed depression. It is worth noting that the present investigation specifically addresses the deployment of positive- and negative-valenced vocabulary, encompassing words imbued with positive or negative connotations or semantic import, such as “successful”, “beautiful”, “unbeneficial”, and “prosperous”. These lexemes may not necessarily overtly articulate emotions akin to traditional positive or negative emotion words like “happy”, “joyful”, “bored”, or “ungrateful” (cf. Cacioppo & Berntson, 1999).

Furthermore, given the frequent comorbidity of depression and anxiety disorders (Marian et al., 2023), this study also assesses anxiety symptoms. By incorporating evaluations of both depression and anxiety symptoms, it aims to offer a comprehensive understanding of the dynamic interplay between these mental health conditions and their correlation with language usage patterns.

In order to address gaps and constraints observed in prior research endeavours, our methodology centres on the analysis of spoken narratives emerging from naturalistic settings, in contrast to the scripted texts crafted within controlled laboratory environments (e.g. Bernard et al., 2016). This approach offers a nuanced understanding of natural language deployment in everyday scenarios, furnishing invaluable insights transferrable to the examination of linguistic patterns across diverse platforms, including social media. Moreover, our methodology facilitates

the capture of genuine shifts in language usage through the utilisation of indirect inquiries, potentially unveiling alterations that may elude participants' self-awareness.

Furthermore, our study operationalises depression within the framework of a formal diagnostic criterion, diverging from the methodologies adopted in preceding investigations (e.g. Baddeley et al., 2013). Past studies predominantly focused on cohorts characterised by self-reported depressive symptoms (Loveys et al., 2018), participants engaged in depression-oriented online forums (Ramirez-Esparza et al., 2021), or individuals exhibiting depressive affect (Newell et al., 2018). While these approaches harbour distinct merits tailored to their specific research objectives, it is imperative to acknowledge their inherent limitations when extrapolating findings to the clinical context of depression diagnosis.

By methodically addressing these lacunae in methodology, our study furnishes substantial insights into the intricate interplay between shifts in language usage and manifestations of depressive and anxiety symptoms across clinically diagnosed depressed individuals and their non-depressed counterparts.

Consistent with prior research findings demonstrating an association between the use of more negative- and fewer positive-valenced words and depressive symptoms (e.g. Baddeley et al., 2013; Tølbøll, 2019), we posited the following hypothesis: *The higher general usage of negative-valenced (positive-valenced) words, the higher (lower) levels of depression and anxiety symptoms* and considering the well established in the literature impact of cognitive impairment on depression (e.g. Peckham et al., 2010; Perini et al., 2019; Rock et al., 2014) we also assumed that *the relationships would be stronger in the clinical group than healthy controls* (Hypothesis 1).

Additionally, prior research has elucidated that fluctuations in word sentiment, particularly shifts in the frequency of negative- and positive-valenced word usage across various assessments, exert a significant influence on changes in the intensity of depressive symptoms over time (Park & Conway, 2017). To some extent the change of meaning of life events may happen naturally in time according to the Transition Cycle (Hopson & Adams, 1976). We hypothesise that changes observed in stories on critical life events over time, spanning from up to 2 months post-event to 8 months or more, will be associated with

fluctuations in depressive and anxious symptoms among participants, potentially exacerbating them. Initially, individuals experience a state of equilibrium, which transitions into the "Shock" phase characterised by the acknowledgment of impending change, often accompanied by feelings of disbelief. This phase may manifest in discussions featuring more negative word valence. Subsequently, individuals may adopt a defensive stance, resisting or denying the inevitability of the transition. As the transition unfolds, the stage of "Adaptation" emerges, during which individuals grapple with the new circumstances and develop coping mechanisms. This phase may be reflected in discussions featuring more positive word valence. Following Adaptation, the process advances into "Internalisation", wherein individuals integrate the changes into their identity and worldview. Ultimately, this integration leads to the "Integration" phase (Hopson & Adams, 1976).

While this framework offers a structured understanding of the psychological journey during transitions, it also underscores the variability and non-linearity of individual experiences within this process. Therefore, we aim to investigate whether potential progression through these stages and any corresponding alterations in the use of negative- and positive-valenced words impacts on the severity of depression and anxiety symptoms. Accordingly, we hypothesise a causal relationship between these variables, which we aim to explore through our longitudinal study, i.e. *The escalation of negative-valenced (or decrease of positive-valenced) words across three assessments is anticipated to correspond with heightened (or diminished) symptoms of depression and anxiety over time. Moreover, these effects are expected to be more pronounced within the clinical group compared to healthy controls* (Hypothesis 2).

Method

Participants and design

The recruitment process relied on a recruitment advertisement distributed across multiple websites offering paid surveys. Participants were rewarded by a voucher of \$50 for their participation at the end of the project. One of the most important recruitment criteria was being up to 2 months after the occurrence of a recent negative critical life event (CLE; i.e. a situation of significant imbalance between the resources of an individual and some elements of the

environment that required immediate changes to the so-called ordinary pattern of life; Sęk, 1991). Moreover, we recruited only volunteers who were seeking neither for psychotherapy nor pharmacotherapy directed by professional interventions but preferred rather a “spontaneous adaptation path” to a recent CLE. Meeting criteria of personality disorders or post-traumatic stress disorder was an exclusion criterion of this study (see Appendix A for additional recruitment criteria).

Among the 77 volunteers who applied for the study, 40 met the criteria (23 women and 17 men) aged from 22 to 44 ($M = 30.43$; $SD = 5.82$). The sample size was determined based on pragmatic recommendations by Albers and Lakens (2018) and Lakens (2022) to maximise participation within the available resource constraints. Moreover, the sample size is considered sufficient according to heuristics, as a similar sample size is quite often used in this kind of research (e.g. Lakens, 2022). All of participants were of Polish nationality, Caucasian, 50% had a high education level, 32.5% were undergraduate/postgraduate students, 15% participants completed high school and 2.5% of them completed primary school. Among CLEs, the participants reported the loss of either a long-term relationship (46.2%), their own health (17.9%), a loved one's health (10.3%), work (23.1%), or unborn child (2.6%).

Among the depressed individuals (D) there were 8 men and 12 women from 22–39 years old while among the non-depressed (nD): 9 men and 11 women from 24 to 44 years old. These both groups were matched in terms of sex and age. Moreover, they were similar but not equal in terms of proportion of education: a high education level (40% nD, 60% D), undergraduate/postgraduate students (40% nD, 25% D), high school (20% nD, 10% D) and primary school (2.5% D only). There were no significant changes in the frequency of the loss of a long-term relationship (45% D, 45% nD), which was the dominant CLE. However, the loss of own health was reported more often by non-depressed (25%) than depressed (10%) individuals, similarly to the loss of a loved one's health (15% nD, 5% D), while depressed (30%) reported more often the loss of work than non-depressed (15%) individuals. Summing up, the study design was 2 between (nD, D) $\times$ 3 within (Time of Measurement: T1, T2, T3) participant design.

Procedure

Participants were individually surveyed in the university lab on a recruitment meeting, where they underwent diagnosis for depression by a trained clinician. To be eligible for the clinical group, individuals had to meet criteria for major depression, while for the non-depressed group, they had to be diagnosed as not meeting criteria for major depression. The same procedure was used for both groups.

A longitudinal repeated narration study was conducted at three different times of the year, which corresponded to subsequent stages of the Transition Cycle of Hopson and Adams (1976): the first measure up to two months after a recent CLE (*the provisional adjustment phase*), the second measure around five months from the event (*the inner crisis phase*) and the third measure 8+ months from the event (*the reconstruction and recovery phase*).

At each measure time, the participants were interviewed (for about one hour per session) with the same Structured Critical Life Events Interview (see Appendix B; for validity and reliability of the tool please see Kaźmierczak, 2024). Although participants were free to describe different events (1–2, 4–12) during these interviews, the Most Recent Critical Life Event (the third one in order) remained consistent across all three measurements. Each tape-recorded interview ($n = 1440$ narratives, i.e. 40 participants $\times$ 3 measurements $\times$ 12 narratives) was transcribed verbatim. Subsequently, the participants were asked to fill in a set of questionnaires (approx. 25 minutes time). Upon completion all participants were thanked, debriefed, and rewarded. Additionally, the participants diagnosed with depression recalled recent emotional states, and, regardless of the result, they were provided with a lists of mental health treatment centres offering free psychological services at the end of the project. During the course of the study, none of the participants experiencing depression were excluded on the basis of initiating treatment for their condition.

The study was a part of a larger research project, with the underlying data available for access at: https://osf.io/zvmqx/?view_only=bfe1b6428bfe4bb8ae0f25237b8ba4ce. For additional published paper based on the same dataset see Kaźmierczak (2024). As its aim was to operationalise and empirically validate the concept of actual personality development, all analyses and results reported here are novel.

Measures

The Major Depressive Episode (MDD) Module A from the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders (SCID-I, First et al., 2002) in Polish version (Popiel et al., 2018) was used to distinguish depressed and non-depressed individuals. The participants responded to nine questions with yes/no answer options (e.g. "Have you felt depressed or sad almost every day for most of the day recently?"). According to this module, the participants were diagnosed with depression when (1) at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure and (2) five (or more) symptoms (out of further seven) have occurred during the last two weeks, and which (3) is a considerable change from previous functioning.

Furthermore, the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983; Polish translation: Majkowicz & Chojnacka-Szawłowska, 1994) measures the intensity of depressive and anxiety symptoms. The questionnaire consists of 14 items (seven per depression and seven per anxiety); the participants read each item and marked their answer that came closest to how they had felt during the last week. The internal consistency for the depression ($\omega_{t1} = .885$, $\omega_{t2} = .827$, $\omega_{t3} = .874$) and anxiety ($\omega_{t1} = .824$, $\omega_{t2} = .865$, $\omega_{t3} = .871$) scales were satisfactory.

The dictionaries of negative- and positive-valenced words quantified the negative- and positive-valenced words in the narratives. We counted their sums from all narratives. This so-called dictionary-based approach is currently one of the most prominent tools for quantifying psychological content in natural language (Tausczik & Pennebaker, 2010). For instance, the Linguistic Inquiry and Word Count LIWC framework has successfully quantified psychological phenomena from language samples (e.g. Boyd & Pennebaker, 2017) such as extraversion from oral/written utterances (Mehl et al., 2006; Pennebaker & King, 1999). The dictionaries used in the current reading were developed and validated for the Polish language (Zaśko-Zielińska et al., 2015) and contain 5421 negative- and positive-valenced words, obtained from two sources. The dictionary was created manually and represents the sentiment of the most frequent sense of a word, and therefore requires no word sense disambiguation. The first source was plWordNet Emo, which contains 32

thousand lexical units manually annotated with sentiment labels on the level of word senses (Zaśko-Zielińska et al., 2015). Sentiment labels were re-assigned and verified to represent the most frequent sense only. The second source is a manually labelled dictionary of 1774 negative- and 1493 positive-valenced words, pulled from a rule-based sentiment analyzer (Buczynski & Wawer, 2008).

Data analysis

Statistical analysis was done within two generalised linear mixed models (GLMM). We applied Bayesian estimation (10 Markov chains with 10,000 iterations per chain) with cumulative family and probit link function. Please see Supplemental Materials for: specification and further information on model comparisons (Appendix C, Table S1 and S2, Figure S1), cumulative link mixed models (Appendix D, Table S1 & S2) and posterior predictive checks (Appendix E, Figure S1–S4). All analyses were done in R (v4.2.0). For details see Appendix C. Data and R syntax are available online (https://osf.io/zvmqx/?view_only=bfe1b6428bfe4bb8ae0f25237b8ba4ce).

Results

Appendix F provides descriptive statistics (Table S1). The between-person level (Table 1) refers to Hypothesis 1. The analysis revealed that the use of both negative- and positive-valenced words was associated with both depression and anxiety symptoms. Strong evidence was found that participants who generally used more negative-valenced words tended to have higher levels of depression ($b = 1.02$ [Bayesian CI: 0.39, 1.65], $BF_{10} = 7.89$, $p < .001$) and anxiety ($b = 1.03$ [Bayesian CI: 0.43, 1.64], $BF_{10} = 13.01$, $p < .001$) symptoms. In turn weak evidence was found that participants who generally used more positive words had lower levels of depression ($b = -0.59$ [Bayesian CI: -0.99 , -0.20], $BF_{10} = 3.17$, $p = .001$) and anxiety ($b = -0.56$ [Bayesian CI: -0.95 , -0.19], $BF_{10} = 2.57$, $p = .002$) symptoms. Surprisingly, there were no difference between participants with and without depression in their general level of use of negative- and positive-valenced words.

At the within-person level (Table 2), referring to Hypothesis 2, alterations in the frequency of negative-valenced words as well as shift in the frequency of positive-valenced words exhibited no impact on depression and anxiety levels. Quite on the contrary,

Table 1. Between-person fixed effects.

	Depression level				Anxiety level			
	b [95% CI]	SE	BF10 (BF01)	PP10	b [95% CI]	SE	BF10 (BF01)	PP10
Negative-valenced words	1.02 * [0.39, 1.65]	0.32	7.89 (0.13)	0.888	1.03 * [0.43, 1.64]	0.31	13.01 (0.08)	0.929
Positive-valenced words	−0.59 * [−0.99, −0.20]	0.20	3.17 (0.32)	0.760	−0.56 * [−0.95, −0.19]	0.19	2.57 (0.39)	0.720
Depression group	0.41 [−0.12, 0.95]	0.27	0.18 (5.62)	0.151	0.17 [−0.35, 0.68]	0.26	0.06 (15.79)	0.059
Covariate: Gender	−0.59 * [−1.08, −0.10]	0.25	0.81 (1.23)	0.449	−0.46 [−0.93, 0.02]	0.24	0.33 (3.07)	0.243
Covariate: Age	−0.06 * [−0.11, −0.01]	0.02	0.07 (14.78)	0.063	−0.06 * [−0.11, −0.02]	0.02	0.20 (5.05)	0.166

Note: b = posterior means of the parameters, CI = Bayesian confidence intervals, SE = posterior standard deviations, BF10 = Bayes factor in favour of H1 over H0, BF01 = Bayes factor in favour of H0 over H1, PP10 = posterior probability of H1, * = confidence intervals do not include zero.

the BF01 suggests strong evidence that the changes in the frequency of negative-valenced words did not affect depression levels (BF01 = 10.34, $p = .866$) and anxiety (BF01 = 14.45, $p = .934$) and respectively weak and strong evidence that the changes in the frequency of positive-valenced words did not affect depression levels (BF01 = 14.22, $p = .708$) and anxiety (BF01 = 3.66, $p = .094$). Regarding cross-level interactions (Table 2), our analysis did not reveal any substantiating evidence for the hypothesised cross-level interactions.

Discussion

In this study, our aim was to investigate the dynamic relationship between alterations in natural language patterns and the manifestation of depressive and anxiety symptoms in both clinically diagnosed depressed individuals and those without such clinical conditions. Our findings indicate that the overall frequency of positive- and negative-valenced words, with a notable emphasis on negative-valenced words, exerted a more pronounced effect on the

Table 2. Within-person fixed effects and cross-level interactions.

	Depression symptoms				Anxiety symptoms			
	b [95% CI]	SE	BF10 (BF01)	PP10	b [95% CI]	SE	BF10 (BF01)	PP10
Negative-valenced words	0.10 [−0.86, 1.10]	0.50	0.10 (10.34)	0.088	0.08 [−0.65, 0.76]	0.35	0.07 (14.45)	0.065
Positive -valenced words	0.07 [−0.64, 0.76]	0.35	0.07 (14.22)	0.065	−0.66 [−1.59, 0.17]	0.44	0.27 (3.66)	0.214
Negative-valenced words (level 1) X Negative-valenced words (level 2)	0.78 [−0.71, 2.34]	0.78	0.26 (3.83)	0.204	−0.24 [−1.25, 0.80]	0.52	0.11 (8.88)	0.101
Positive-valenced words (level 1) X positive-valenced words (level 2)	−0.52 [−1.29, 0.25]	0.39	0.20 (5.05)	0.165	0.22 [−0.69, 1.20]	0.48	0.98 (10.21)	0.089
Negative-valenced words (level 1) X depression group (level 2)	−0.25 [−1.73, 1.21]	0.74	0.15 (6.48)	0.134	0.20 [−0.84, 1.23]	0.52	0.11 (9.31)	0.097
Positive-valenced words (level 1) X depression group (level 2)	0.05 [−0.85, 1.02]	0.47	0.09 (10.79)	0.084	0.42 [−0.70, 1.65]	0.60	0.14 (7.13)	0.123

Note: b = posterior means of the parameters, CI = Bayesian confidence intervals, SE = posterior standard deviations, BF10 = Bayes factor in favour of H1 over H0, BF01 = Bayes factor in favour of H0 over H1, PP10 = posterior probability of H1, * = confidence intervals do not include zero.

severity of depression and anxiety symptoms compared to their temporal variability. This outcome aligns with Hypothesis 1 but contradicts Hypothesis 2. Furthermore, no discernible distinctions emerged between individuals diagnosed with depression and those without this disorder concerning their general propensity for using positive- and negative-valenced words, nor in the strength of the association between word usage patterns and the severity of depression/anxiety symptoms.

The findings from our longitudinal study suggest that fluctuations in psychopathological symptoms may be more closely associated with enduring personality factors rather than mere shifts in affect stemming from meeting diagnostic criteria for depression or progressing through Transition Cycle stages. Specifically, the general pattern of sentiment word usage appears to be linked to Negative Affectivity (Krueger & Markon, 2014), a maladaptive trait characterised by frequent and intense experiences of a broad range of negative emotions (Somma et al., 2019). Heightened levels of Negative Affectivity serve as a predictive marker for depression (Zajenkowska et al., 2023) and are associated with various personality disorders (Anderson et al., 2016).

Concurrently, certain personality traits such as narcissism (Nagel et al., 2023) have also shown connections with depressive symptoms. Therefore, it becomes crucial to investigate whether individuals grappling with depression, encompassing diverse personality profiles, exhibit discernible differences in their natural language usage. Such exploration is essential given that depressive symptoms may evoke varied responses across different personality constellations.

The findings of our study corroborate the notion that natural language patterns mirror the severity of symptoms associated with depression and anxiety, thereby accentuating their potential practical utility. The utilisation of computational linguistic methodologies to comprehend and predict psychological conditions, including depression, has garnered increasing attention (Stade et al., 2023). Automated analyses of social media platforms, coupled with the deployment of artificial intelligence in the examination of depression and anxiety, have emerged as focal points for detecting early indications of elevated depression scores among users (Guntuku et al., 2017). Nevertheless, it's essential to recognise that many linguistic features are common to both depression and anxiety (Stade et al., 2023), a facet our research also addresses. This underscores the critical importance

of meticulously delineating psychopathological constructs, particularly given the frequent co-occurrence of depressive symptoms with various other psychological issues. Overcoming these challenges and refining computational linguistic approaches grounded in textual data from social media platforms could furnish invaluable tools for the early detection of depressive and anxiety symptoms, facilitating timely interventions in mental health care.

Finally, it should be noted that our study comprised individuals who had not undergone therapy. It is conceivable that therapy could substantially alter the interpretation of events, leading to enhanced mental well-being. Consequently, a potential avenue for future research lies in conducting a study among individuals undergoing therapy to ascertain whether such interventions indeed precipitate significant shifts in the perception of events and subsequently contribute to improved mental health outcomes.

Limitations and conclusions

The study's generalisability may be compromised by its limited participant pool, warranting caution in extrapolating the findings. Furthermore, the extended intervals between measurements might not adequately capture the short-term fluctuations in word usage. Additionally, our reliance on spoken language underscores the necessity of validating these results in written communication for robustness, particularly in the context of social platforms or online communities. Subsequent investigations could benefit from more frequent and closely spaced assessments to elucidate the temporal nuances underlying language shifts and their association with depressive and anxiety symptoms. It's important to acknowledge that the measurement and coding of word usage might introduce subjectivity or bias into the analysis. Lastly, our study's correlational nature precludes definitive conclusions regarding causality between word usage and symptomatology. To ascertain causative relationships, future research endeavours could employ quasi-experimental or experimental methodologies, such as interventions or controlled manipulations of word usage, to directly assess its impact on symptoms.

Disclosure statement

The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

This work was supported by the following grants: Narodowe Centrum Nauki [grant number 2017/01/X/HS6/02022]; Maria Grzegorzewska University [grant number BNS 52/20-P].

Data deposition

The data for this study can be found on the Open Science Foundation https://osf.io/zvmqx/?view_only=bfe1b6428bfe4bb8ae0f25237b8ba4ce.

Ethical statement

The project was approved by the Academic Human Research Ethics Committee (159-2017/2018 and 183-2018-2019).

Informed consent

Interested volunteers were informed about the nature and purpose of the study and offered the opportunity to participate. When they chose to participate, they were informed that they could discontinue at any time and their responses would be confidential and not revealed to anyone.

Code availability

All analyses were done in R (v4.2.0). Data and R syntax are available online (https://osf.io/zvmqx/?view_only=bfe1b6428bfe4bb8ae0f25237b8ba4ce).

Author contributions

Conceptualisation	IK, AP
Original draft of the manuscript	IK, AP, AJ
Methodology & Research	IK, AW & JS-W (sentiment)
Data Analyses	DL
Review & Editing	IK, AZ
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Through the Looking Glass... Impact of priming social comparisons on automatic and volitional attention processes in depression: An eye-tracking experimental study

Attentional biases in depression

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Abstract: The experimental study examined attention-related processes depending on priming social comparisons and the type of information (i.e., positive, negative) about a stranger. A total of 209 individuals, including those clinically depressed and without the diagnosis, were exposed to a list of 50 adjectives in four groups (focus on upward and downward and similarities comparisons, control group). In terms of automatic attention processes, compared to healthy controls, depressed individuals paid slower attention to any information about a stranger and once they did this they looked at that stranger's positive features quicker than at their negative ones. In terms of volitional attention processes, during social comparisons (with the exception of downward) depressed individuals looked at negative information about a stranger for a significantly shorter period than healthy controls did. However, during these social comparisons (but upward) they took significantly longer time looking at negative than positive features.

Keywords: Attention; Depression; Social Comparison; Search for Similarities and Differences

Acknowledgements:

Conflicts of interest/Competing interests: We have no conflicts of interest to disclose.

Ethical Statement: The project was approved by the Academic Human Research Ethics Committee at the Maria Grzegorzewska University

Informed Consent: Interested volunteers were informed about the nature and purpose of the study and offered the opportunity to participate. When they chose to participate, they were informed that they could discontinue at any time and their responses would be confidential and not revealed to anyone.

Consent for publication: All authors have seen and approved the final version of the manuscript and are aware of the submission of the paper.

Authorship: Izabela Kaźmierczak – idea of the study, first draft of the manuscript, methodology and research, data analysis; Adrianna Jakubowska - first draft of the manuscript, methodology and research; Anna Zajekowska - first draft of the manuscript, supervision; Iwona Nowakowska - discussion & limitations; Ewa Duda – data analysis; Marta Bodecka – Zych – methodology and research; Anna Zarazińska – methodology and research. All authors approved the final version of the article.

Open data: The data were not preregistered and are available at Open Science Framework: <https://osf.io/xmptra/>. DOI 10.17605/OSF.IO/XMPRA

Code availability (software application or custom code): IBM SPSS Statistics 25.

Funding: The first author was supported by grant from the Maria Grzegorzewska University.

Introduction

Compared to healthy controls, depressed individuals attribute more negative characteristics to themselves (e.g., Lemogne et al., 2010), describe themselves in fewer positive and in more negative adjectives (e.g., Auerbach et al., 2015) and endorse negative information about themselves more quickly than positive one (e.g., Connolly et al., 2016). What is more, depressed individuals present not only reduced orienting to positive verbal stimuli (Peckham et al., 2010), but they also keep attention to a lesser extent on them (e.g., Armstrong & Olatunji, 2012). Moreover, they recognize a higher ratio of negative to neutral words than non-depressed, but the two groups do not differ in response times to negative words (Powell & Hemsley, 1984).

These cognitive biases in depression translate into social perception and strategies for dealing with diversity. The social comparison theory (Festinger, 1954) is the idea that people share a drive to look to outside reality, like in a mirror, in order to evaluate their own identity, opinions and abilities. The common negative evaluation of oneself vs. others in depression (Antony et al., 2005; Bazner et al., 2006) may be related to a tendency for spontaneous upward social comparison (i.e., individuals compare themselves to others who are deemed socially above them in some way, Suls et al., 2002), which maintains negative affect in this group. In fact, depressed individuals report more negative social comparisons, and positive ones are less important for them than for non-depressed (MacMahon & Jahoda, 2008).

Negative affect may be reduced in downward social comparison (i.e., a defensive tendency to evaluate oneself with a comparison group whose troubles are more serious than one's own, Suls et al., 2002) since this behaviour usually elicits positive feelings (Fox et al., 2004) and self-assessments (Pettit & Lount, 2010). However, it was also shown that it might paradoxically lower our mood as well (Gentile et al., 2019) because of the social distance that it generates (Wetherall et al., 2019).

At the same time, there is a great deal of data demonstrating the enormous psychological importance of noticing interpersonal similarities in relationships (Lalonde et al., 2015). It coexists with a tendency to inhibit social distance (Falomir-Pichastor et al., 2010), a greater willingness to make friends (Romero & Epkins, 2008) and predicts sympathy and love (Förster, 2009). Studies also show explicitly that perceiving similarities with others lifts mood in depression (e.g., Buunk & Brenninkmeijer, 2001).

Current study

The present study has been designed to complement existing research by examining similarities and differences between people with and without depression in automatic (how fast they look at stimuli) and volitional (how long they focus on stimuli) processes related to information about a stranger (negative versus positive) and depending on the type of social comparisons (either upward or downward, or looking for similarities).

Because depressed individuals present increased vigilance towards negative stimuli (Bourke et al., 2010; Rinck & Becker, 2005), recognize a higher ratio of negative to neutral words as compared to healthy controls (Powell & Hemsley, 1984), more quickly endorse negative than positive adjectives (Connolly et al., 2016) and show general reduced orienting to positive stimuli (Peckham et al., 2010), we hypothesized that *depressed individuals would look quicker at negative information about a stranger and later at positive information than healthy controls* (H1) and that *depressed individuals would look quicker at negative than positive information about a stranger* (H2).

Moreover, because most vivid differences in positive versus negative stimuli perception are related to maintenance of attention (Duque & Vázquez, 2015) and depressed individuals need more time to disengage from negative cues (Ferrari et al., 2016), we stipulated that *depressed individuals would focus for a shorter period on positive information*

about a stranger and longer on negative information than healthy controls (H3), and that depressed individuals would focus longer on negative than positive features (H4).

However, most importantly, we aimed to investigate whether the impact of depression and the type of the features of a stranger on attention processes (particularly on volitional attention processes, i.e., dwell time while automatic attention process, i.e., time to first fixation does not depend on higher cognitive activities) would depend on social comparisons. For this reason, we introduced the following experimental conditions: upward social comparisons, downward social comparisons, searching for social similarities and control group in both groups (i.e., depressed and non-depressed).

Upward social comparisons: Although upward comparison is a potentially ego threatening activity, depressed individuals typically use this particular type of social comparisons (Appel et al., 2015) as negative social comparison outcomes are consistent with their self-image (e.g., Lemogne et al., 2010) and maintain low mood. What is automatic and common in this group is non-specific for healthy individuals and depends on a variety of circumstances in the latter. Hence, in case of positive features of a stranger this should translate into some noticeable differences in volitional attention processes between depressed and non-depressed individuals. We assumed that *in the condition of upward social comparisons, depressed individuals would look at positive features of a stranger shorter than healthy controls (H5).* In turn, negative features of others may be atypical for this type of social comparisons and require more time to be processed in both groups: depressed (as they show relatively weak information processing, see Hertel & Mathews, 2011) and non-depressed (as upward comparisons encourage people to try and find out how others are better than themselves, which is relatively less common in this group, similarly to focusing on negative stimuli in general). However, this type of social comparisons is more common among depressed individuals and still negative comparison outcome does not disturb a relative stability of

negative self-image in this group, contrary to non-depressed one. Based on these premises, we assumed that *in the condition of upward social comparisons, the depressed individuals would look at negative features of a stranger shorter than healthy controls* (H6), and that *both groups would focus longer rather on negative than positive features* (H7).

Downward social comparisons: Depressed individuals do not actively use downward comparisons to protect their psychological well-being and positive social comparisons are relatively less common (MacMahon & Jahoda, 2008) and potentially in conflict with chronic negative self-evaluations in this group. In consequence, to use this type social comparisons, they need to reverse their social comparison tendency with limited processing capacities (e.g., Hertel & Mathews, 2011), contrary to non-depressed individuals. Additionally, positive features of others may be atypical for this type of social comparisons and require more time to be processed in both groups. Hence we assumed that *in the condition of downward comparisons, depressed individuals would look longer at all features of a stranger, regardless their type, than healthy controls* (H8) and that *depressed individuals would focus even longer on positive than negative features* (H9).

Searching for social similarities: Depressed individuals focus on differences instead of similarities (Rosenblatt & Greenberg, 1988) and tend to see rather positive characteristics of others (Bazner et al., 2006) with negative characteristics of themselves (Antony et al., 2005). They show also weaker information processing (Hertel & Mathews, 2011). Hence, we assumed that *in the condition of searching for similarities, depressed individuals would look at positive features of a stranger longer than healthy controls* as both similarity focus and positive features would not match their self-evaluation (H10) and they *would look at negative features of a stranger shorter compared to healthy controls* as the social comparisons outcomes would be more consistent with their self-image (H11). Wherein, *depressed individuals would focus longer on positive than negative features* (H12). For the summary of

all hypothesized effects related to attention processes between depressed and non-depressed groups (i.e., H1, H3, H5, H6, H8, H10 & H11) see Table 1 and for all hypothesized effects related to attention processes in group with depression depending on positive vs. negative features of a stranger (i.e., H2, H4, H7, H9 & H12) see Table 2.

Table 1

The summary of hypothesized comparative outcomes on automatic (i.e., TTFF) and volitional (i.e., dwell time) attention processes between depressed and non-depressed groups.

Social comparisons condition	Positive features		Negative features	
	TTFF	Dwell time	TTFF	Dwell time
No priming		D < nD (H3)		D > nD (H3)
Upward comparisons	D > nD (H1)	D < nD (H5)	D < nD (H1)	D < nD (H6)
Downward comparisons		D > nD (H8)		D > nD (H8)
Similarity focus		D > nD (H10)		D < nD (H11)

Note. The hypothesized times are longer or shorter in depressed individuals in comparison with healthy controls. TTFF – Time to First Fixation, D – Depressed, nD – non-depressed.

Table 2

The summary of hypothesized comparative outcomes on automatic (i.e., TTFF) and volitional (i.e., dwell time) attention processes in depressed group depending on positive vs. negative features of a stranger.

Social comparisons condition	TTFF	Dwell time
No priming		P < N (H4)
Upward comparisons		P < N (H7)
Downward comparisons	P > N (H2)	P > N (H9)
Similarity focus		P > N (H12)

Note. The hypothesized times are longer or shorter in depressed individuals in comparison with healthy controls. TTFF – Time to First Fixation, P – positive features, N – negative features of a stranger.

Method

Participants

Participants were recruited from the general population of Poland ($N = 233$) and they were recruited via online advertisements. Due to poor eye-tracking data quality in some cases, we included only records with more than 60% of valid data in the sample analysed. As a result, 209 participants¹ (68.9% women) were included in the study sample and, based on the SCID-I diagnosis for depression (see details below), assigned to two groups: depressed ($N = 102$) and non-depressed ($N = 107$). The participants were between 18 and 63 years of age ($M = 29.03$; $SD = 8.83$). The majority of them (50.7%) had a Bachelor's or Master's degree, 33.5% were undergraduate/postgraduate students, 14.8% participants completed high school and 1.0% had primary education. What is more, 45.9% of the respondents were in an informal relationship, 44.5% were single and 9.6% were married. None of the observations were excluded.

Measures & Apparatus

Participants' eye movements were measured using a Tobii Pro X3-120 remote eye tracker, with a sampling rate of 120Hz, and conventional 9-point calibration before each measurement. The stimuli were presented on a 17" monitor (1920x1080 pixels resolution) and were viewed from a distance of approximately 60-70 cm.

The presentation of the stimuli and data recording were controlled using a Dell laptop via the iMotions Attention Tool software (version 7.2; iMotions A/S, Copenhagen, Denmark). iMotions allow for the definition of areas of interest (AOI) and calculation of statistical

¹ To detect a moderate effect size (partial $\eta^2 = .04$) with .90 power *a priori* calculation of statistical power G*Power (Faul et al., 2007) recommends a minimum sample size of 92 participants.

metrics (e.g. fixation duration, saccades). In the current study, the areas of interest were adjectives, so the AOIs were frames containing words that were always displayed at the top of the board. The AOI size was the same for each adjective.

Automatic bottom-down processes cannot be controlled consciously and they are connected with the time to first fixation (TFF; Spiering & Everaerd, 2007; Thompson et al., 2019). This measure refers to the amount of time it takes a participant to look at stimuli. In turn, the total time people spend on a given area of interest (dwell time) could be consciously manipulated by the participant through more top-down volitional processes (Thompson et al., 2019). This measure refers to the amount of time a participant fixates on stimuli. In consequence, for each AOI, TFF and dwell time were calculated. Both indicators were based on fixation metrics that were qualified using the Identification by Velocity Threshold (IVT) algorithm (Salvucci & Goldberg, 2000). TFF was defined as the time stamp of the first fixation inside this AOI. Dwell Time was defined as the percentage of total available time spent in AOI calculated separately for each AOI.

To distinguish depressed and non-depressed individuals, we used the Major Depressive Episode (MDD) Module A from the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders (SCID-I, First et al., 2002). Participants were asked 9 questions with yes/no answer options (e.g., *Have you felt depressed or sad almost every day for most of the day recently? Have you had trouble thinking or concentrating?*). According to this module, depression was diagnosed when (1) at least one of the symptoms was either (1) depressed mood or (2) loss of interest or pleasure and (2) five (or more) symptoms (out of further 7) had occurred during the last two weeks, and which (3) was a considerable change from previous functioning.

To manipulate social comparisons we used positive and negative features of a stranger from the Adjective Check List (ACL; Gough & Heilbrun, 1983). The tool contains 300 person-

descriptive adjectives (e.g., self-confident, distrustful) assigned to two categories: favourable and unfavourable adjectives. Based on the classification, we randomly selected 25 positive and 25 negative adjectives (see Table 1 in Appendix A).

Procedure

Participants were surveyed individually in the university lab. At first, they were diagnosed with depression by a trained clinician. To be eligible for the clinical (non-clinical) group, individuals had to meet (not meet) criteria for major depression. In the second step of recruitment, depressed and non-depressed individuals were separately randomly assigned to the following sub-groups: control (without priming social comparisons) and 3 experimental groups (with the priming of social comparisons (1) upward, (2) downward and (3) looking for social similarities; see Table 2 in Appendix B).

Then participants were asked to complete a computer task with eye-tracker assembled, subjected to calibration test, and received the following instruction: “You are about to familiarize yourself with the list of features that describe a certain person. Determine how important it is for you to have certain characteristics in the context of making friends with people on the scale of 1 - <<completely unimportant>> to 7 - <<extremely important>>”, which served as a stimulus activating the social context of making friends. Then, depending on the condition subgroup, participants indicated which features made them worse/ better or similar to the described person (please see Appendix C).

Upon completion all participants were thanked, debriefed, rewarded (\$10) and provided with the lists of mental health treatment centres offering free psychological services.

Results

To test all hypotheses (H1-H12), we conducted Mixed-Design Analyses of Variance for the amount of time it took a participant to look at information about the stranger (TFF) and the

amount of time a participant fixated on the information about the stranger (dwell time) separately. Both of them involved the 2x4x2 design with the type of information about a stranger (positive vs. negative features) as a within-subjects variable and the type of social comparisons condition (upward vs. downward vs. focus on similarities vs. no manipulation) and diagnosis of depression (depressed individuals vs. healthy controls) as two between-subjects variables.

TTF

First, we tested our hypotheses (H1 – H2) concerning the amount of time it took participants to look at information about a stranger. The Mixed ANOVA showed that time to first fixation depended on (1) the diagnosis of depression: $F(1,201) = 6.50, p = .012, \eta^2 = .03$. Depressed individuals ($M = 595.11, SE = 41.30, 95\% CI [33.35,260.93]$) had longer TFF to any information about a stranger than healthy controls ($M = 447.97, SE = 40.30$). Furthermore, TFF depended on (2) the type of information about a stranger: $F(1,201) = 9.73, p = .002, \eta^2 = .05$. In general, participants looked quicker at positive ($M = 478.54, SE = 30.34$) than negative features ($M = 564.54, SE = 33.53, 95\% CI [31.65,140.35]$).

What is more, (3) the interaction effect of the diagnosis of depression and type of information about the stranger: $F(1,201) = 2.90, p = .09, \eta^2 = .014$ and (4) the interaction of the type of information and social comparisons condition were not significant, $F(3,201) = .346, p = .79, \eta^2 = .005$, similarly to (5) the interaction of the diagnosis of depression, the type of information and social comparisons condition, $F(3,201) = .527, p = .66, \eta^2 = .008$.

Dwell time

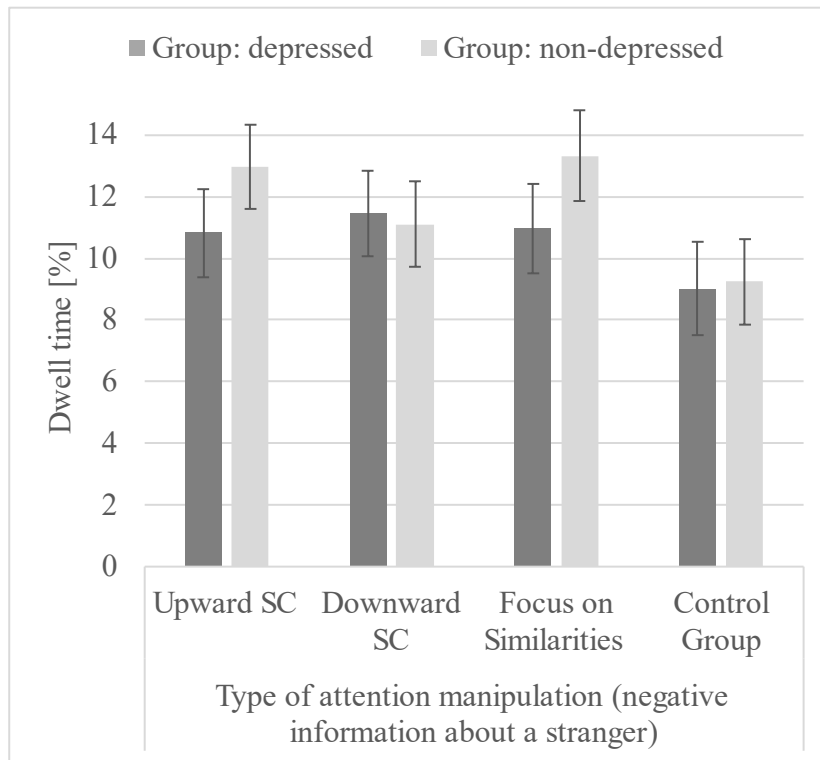
Next, we tested our hypotheses (H3 – H12) concerning the amount of time a participant fixated on information about a person. The Mixed ANOVA showed that dwell time was not differentiated by (1) the diagnosis of depression: $F(1,201) = 2.62, p = .107$, however, it depended on (2) the type of information about a stranger, $F(1,201) = 112.78, p = .001, \eta^2 =$

.36. Participants looked at negative features longer ($M = 11.11$, $SE = .26$) than at positive ones ($M = 9.77$, $SE = .23$), 95% CI [1.09,1.59]. What is more, it depended on (3) social comparisons conditions, $F(3,201) = 5.08$, $p = .002$, $\eta^2 = .07$. Post-hoc Tukey HSD tests indicated that the control group looked at all features for the shortest time ($M = 8.89$, $SE = 0.48$), shorter than the group focusing on similarities ($M = 10.93$, $SE = 0.48$), 95% CI [0.25,3.76], those who compared themselves downwards ($M = 10.63$, $SE = 0.46$), 95% CI [0.02,3.43] and upwards ($M = 11.31$, $SE = 0.46$), 95% CI [0.70,4.13].

Dwell time depended also on (4) the interaction of the diagnosis of depression and the type of information, $F(1,201) = 7.11$, $p = .008$, $\eta^2 = .03$ and (5) the two-way interaction of the type of information about a person and social comparisons condition was statistically significant, $F(3,201) = 9.81$, $p < .001$, $\eta^2 = .13$. What is more, importantly, (6) the three-way interaction between the diagnosis of depression, type of information about a stranger, and the social comparisons condition, showed a marginal trend towards significance, $F(3,201) = 2.62$, $p = .052$, therefore we decided to investigate it further. In the case of negative features of a stranger when participants compared themselves upwards, depressed individuals ($M = 10.82$, $SE = 0.725$) looked at these features for a significantly ($p < .05$) shorter period than healthy controls did ($M = 12.96$, $SE = 0.70$), $p = .035$, $d = .21$, 95% CI [0.15,4.12]. Similarly, when participants focused on similarities, depressed individuals ($M = 10.95$, $SE = 0.74$) looked at negative features about a stranger shorter than healthy controls did ($M = 13.33$, $SE = 0.70$), $p = .03$, $d = .22$, 95% CI [-4.46,-.29], while in the control group and in the group who compared themselves downwards there were no significant ($p > .05$) differences between people with and without depression. At the same time, no significant ($p > .05$) differences between people with and without depression were found in the case of positive features about a stranger, regardless of the experimental condition (Figure 1).

Figure 1

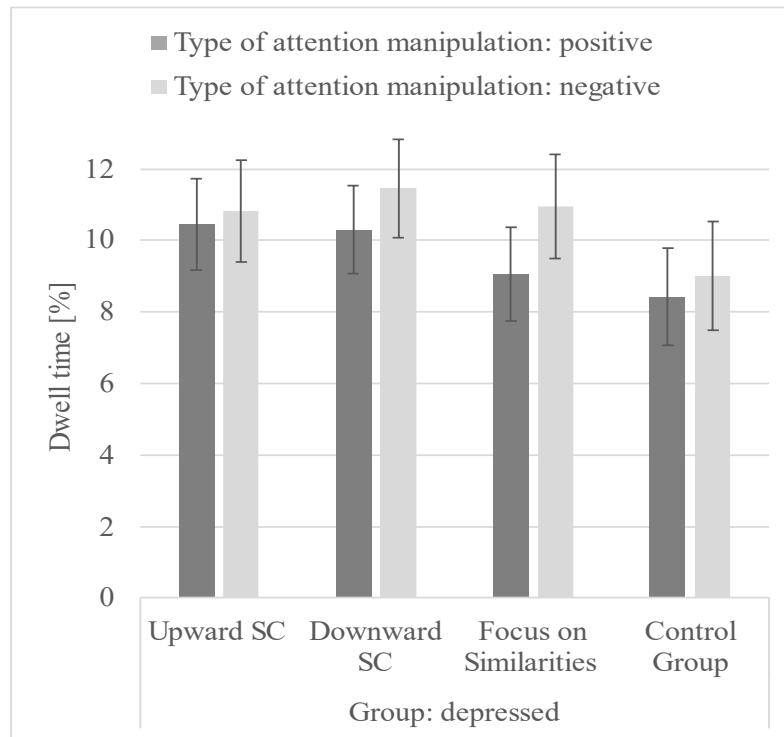
Dwell time in percentage among depressed and non-depressed groups dependent on type of attention manipulation



Moreover, when depressed individuals compared downwards and focused on similarities (but neither when they compared upwards, nor from the control group; $p > .05$), they looked for a significantly longer period at negative ($M = 11.46$, $SE = .70$; $M = 10.95$, $SE = .74$, respectively) than at positive features of a stranger ($M = 10.30$, $SE = 0.625$), $p = .001$, $d = .12$, 95% CI [0.48,1.83,]; ($M = 9.06$, $SE = 0.66$), $p = .001$, $d = .19$, 95% CI [1.17,2.61], respectively. In turn, healthy controls always looked longer at negative than positive features of the stranger, regardless the experimental condition and the difference was not significant only in the control group (Figure 2).

Figure 2

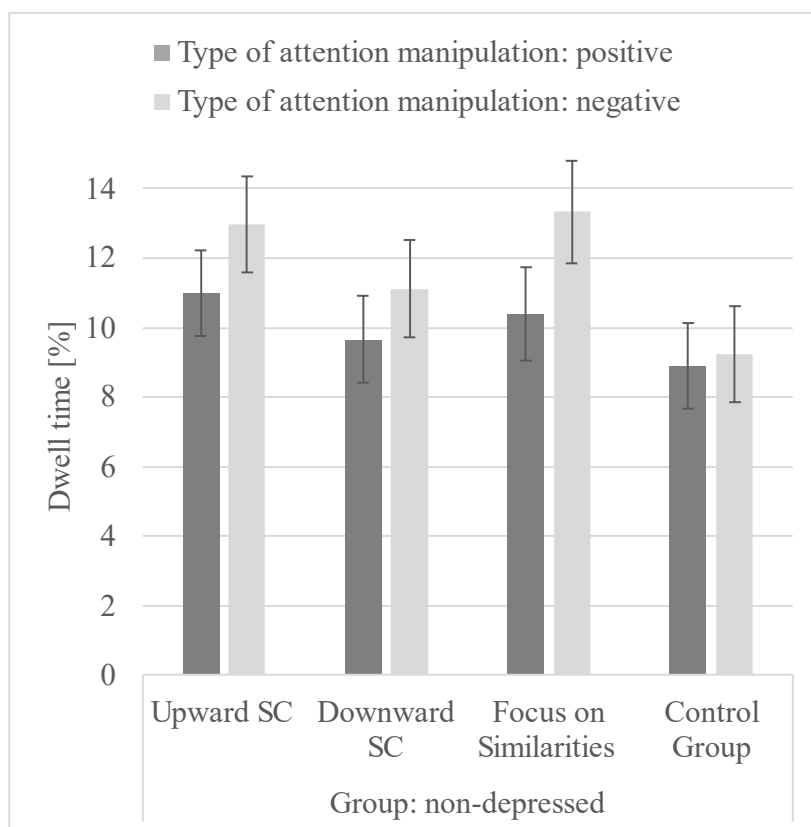
Dwell time in percentage dependent on type of attention manipulation divided into positive and negative subtype in depressed participants



Finally, the significance of the differences between groups distinguished based on the social comparisons condition was restricted to the negative type of information about a stranger and the lack of diagnosis of depression: the individuals who compared upwards ($M = 12.95$, $SE = 0.70$) looked at a stranger's features longer than the control group did ($M = 9.24$, $SE = 0.70$), $p = .001$, $d = .37$, 95% CI [-6.35,-1.09]. Similarly, the group who focused on similarities ($M = 13.33$, $SE = 0.75$) looked at the features longer than the control group did ($M = 9.24$, $SE = 0.70$), $p = .001$, $d = .39$, 95% CI [-6.83,-1.35]. At the same time, no significant ($p > .05$) differences between the remaining groups were found (Figure 3).

Figure 3

Dwell time in percentage dependent on type of attention manipulation divided into positive and negative subtype in non-depressed participants



Discussion

Although depressed individuals paid slower attention to any kind of information about a stranger than healthy controls, they looked quicker at positive features of a stranger and not at the negative ones (which is partially consistent with H1 and contradictory to H2, respectively). Stimuli such as information about a stranger promote a context for social perception (impression formation/social comparison context). Therefore, they can result in an automatic process of social comparison, which, in depressed subjects, is biased towards seeing oneself as inferior to others (Sloman et al., 2003).

Depressed individuals might have looked quicker at positive features of others first given this bias in self-perception. Because of lowered self-esteem (Orth et al., 2009; Orth &

Robins, 2013), they typically seek for how they differ from others and confirm their notion that they are “worse”. In consequence, they may prioritize perceiving the positive features of others over the others’ negative traits to confirm their own negative self-perception.

The hypotheses (H1 & H2) were stated based on research that considered socially neutral stimuli – not connected to forming impressions about people (e.g., adjectives not connected to a person and outside the context of making friends). Social stimuli, which are given in the context of socially engaging activity (impression formation, getting to know a stranger) may be perceived differently than social stimuli that do not imply social/interpersonal engagement (such as emotional expressions on photographs or adjectives which do not describe people). Our result highlights the importance of social comparisons’ processes in depressions. Specific patterns of such comparisons may be characteristic for depressed individuals and be further considered “red flags” in the diagnostic process, as well as an important topic during psychotherapeutic work.

Moreover, with regard to attention allocation (H3 & H4) as well as differences related to the social comparisons conditions and depression diagnosis (H5-H12; for Manipulation check please see Appendix D) results partially confirmed our hypotheses. Generally, people focused longer on negative than on positive features of a stranger (regardless of depression; which is consistent with H4). However, people with depression focused shorter on negative features than people without this disorder (which contradictory to H3). The explanation of the findings might be the attentional biases in depression, hindering the processes of volitional focus (Keller et al., 2019). Moreover, people with depression tend to be rather self-focused (Ingram, 1990), thus, paying attention to the outer world and forming impressions about others may be slower than the focus on internal processes (Pyszczynski & Greenberg, 1987). Another explanation is the evidence that people with depression are biased towards negative stimuli and therefore more familiarized with them, which may result in quicker endorsement

of negative adjectives (Connolly et al., 2016) – that is why they may need less time to dwell on them to use them for impression formation.

In the case of negative information about a stranger when participants compared themselves upwards or they focused on similarities, people with depression focused on these features for a significantly shorter period than did those without depression (which is consistent with H5 & H11). Upward social comparisons affect attention only when the comparison subject is self-threatening (Normand & Croizet, 2013), resulting in paying more attention to what threatens the self and responding longer to the stimuli. In depressed individuals, seeing oneself as inferior to others and finding negative similarities with others is cognitively easier, as it confirms what they think about themselves (Orth & Robins, 2013) and does not destabilize their low self-esteem. The mechanism underlying this phenomenon might be the automatic information processing system which is responsible for decision-making based on context (Kahneman, 2011) instead of logical reasoning. Furthermore, according to the attention load concept, the importance of the stimulus determines how the attention is allocated, and how an emotional stimulus is perceived depends on attention (Pessoa et al., 2002). Lower cognitive effort, required in the group of depressed individuals to perceive information congruent to their self-image (and thus, less important at the moment), may have resulted in shorter dwell time.

In the case of downward comparisons, generally depressed individuals did not differ from non-depressed ones in terms of dwell time (which is contradictory to H8). Interestingly, when depressed individuals compared themselves downwards or focused on similarities, they looked later at the negative features of the stranger than at the positive ones (which is contradictory to H2), but focused significantly longer on negative than on positive features of a person (which is consistent with H9 and contradictory to H12). However, non-depressed individuals also looked longer at negative than at positive features of a person, and it was

observed in all experimental conditions (but the control one). This shows that, in forming impressions about others, negative features might play a key role regardless of how one perceives oneself. Negative features may be the factors one needs to deal with to form an impression, and probably their integration with the image of another person, along with a decision on how to perceive a person globally, may be responsible for the time taken to dwell on them. This is in line with findings that negative messages are shown to be paid more attention to, e.g., in the social media (Faraon et al., 2014).

Additionally, for depressed people, the negative features might be central to the self-image, therefore, the perception bias of the similarities and factors connecting to others might be the negative traits. A downward comparison forces a person to think about how he or she is better than others, which might be an unnatural form of social comparison in depressed people, who think they bear negative traits themselves. According to the self-esteem threat model (Muller & Butera, 2007), when someone compares oneself to better others, he or she increases their attention. Believing in oneself being worse than others, characteristic for depressed individuals, during downward comparison process may result at first in exploring the positive traits of others (as they are not typical for downward comparison in general), however, a longer dwell on negative features of others (as it requires more processing to overcome the feeling of own inferiority and seeing how oneself is better in terms of lack of these negative traits). Such downward comparison might require most cognitive capacity and effort from depressed individuals, being a momentary “game-changer” in self-perception. For Practical implications and Strengths and limitations please see Appendix E.

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Anger sensitivity and relatedness frustration as predictors of depression

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ARTICLE INFO

Keywords:

Depression
Hostile attribution bias
Relatedness frustration

ABSTRACT

Depression is more prevalent in individuals raised in cold and violent families, which can lead to a lack of connection or frustration in relationships and heightened sensitivity to signs of danger, such as anger on faces. These factors can both exacerbate symptoms of depression. However, research into the links between depressive symptoms and relatedness frustration, as well as depressive symptoms and anger sensitivity, has been limited. This study aims to address this gap by investigating these relationships. The study recruited 1241 participants from the general population, who completed an online task involving the recognition of emotions on morphed faces and questionnaires measuring depression (Hospital Anxiety and Depression Scale, HADS-M) and relatedness frustration (Basic Psychological Need Satisfaction and Frustration Scale, BPNSFS). As expected, the results showed that depressive symptoms were positively associated with relatedness frustration, however, were negatively associated with anger sensitivity. Both factors were also found to be significant predictors of depressive symptoms. Our results are noteworthy especially given the fact that we are living in a time of staying in the home for extended periods of time, which is associated with cognitive decline and depression.

1. Introduction

Belongingness, or connectedness, is basic to human functioning and well-being (Deci & Ryan, 2000; Ryan & Deci, 2017). Associated with it, the need for relatedness, feeling socially connected to others as well as the sense of playing a significant role in social groups, is foundational to interpersonal relationships (Deci & Ryan, 2000). Both satisfaction and frustration of these needs are particularly vital for growth, mental health and well-being (Nishimura & Suzuki, 2016). Hence, relatedness frustration as a predictor of depression may be not surprising (Nishimura & Suzuki, 2016) especially given results suggesting that it is associated with loneliness, social withdrawal, and social alienation, all of which are commonly experienced by depressed individuals (e.g., Matthews et al., 2016). People with depression often exhibit an avoidant interpersonal style characterized by being distant, which can lead to a lack of social support, exacerbating depressive symptoms (Barrett & Barber, 2007; Fuller-Thomson et al., 2016). While the theoretical link between relatedness frustration and depression is straightforward (Ryan & Deci, 2017), studies examining this relationship are scarce.

Cacioppo and Hawkley (2005) proposed that social cognition plays a

significant role in perpetuating loneliness. Specifically, individuals experiencing loneliness are more likely to make negative attributions about others and fear negative evaluation, potentially leading to hostile social behaviors. In comparison to non-lonely individuals, lonely persons are more likely to display anxious and aggressive behaviors when interacting with others. Consequently, the possibility of being rejected is heightened, confirming negative self-attributions and encouraging hostile interpersonal behavior, resulting in increased social isolation and loneliness (Cacioppo & Hawkley, 2005). Prolonged loneliness may lead to the development of hostile attribution bias (HA), the tendency to perceive hostility in the intentions of others (Okuszek et al., 2021; Tuente et al., 2019). This phenomenon characterizes not only lonely individuals but also those experiencing depression (e.g., Schepman et al., 2014) and paranoia (Klein et al., 2018). Hostile attribution bias may manifest in behaviors such as the frequent recognition of anger in morphed faces where two emotions (e.g., anger and fear) are mixed (Wilkowski & Robinson, 2012; Zajenkowska et al., 2022). Indeed, among individuals with schizophrenia, those who were paranoid were more likely to show greater hostility biases (Pinkham et al., 2016) and to misattribute anger to neutral facial expressions compared to non-

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<https://doi.org/10.1016/j.paid.2023.112379>

Received 16 April 2023; Received in revised form 13 July 2023; Accepted 13 August 2023

Available online 6 September 2023

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paranoid individuals with the same diagnosis (Pinkham et al., 2011). Similarly, depressed individuals perceive negative emotions more frequently than non-depressed individuals, with most studies focusing exclusively on sadness rather than anger recognition (Gollan et al., 2010).

Perceiving anger on faces has been suggested as a potential risk factor for depression recurrence due to its potential impact on the interactions between depressed individuals and others (Liu et al., 2012). Given the tendency of depressed individuals towards social isolation, it is crucial to determine whether such individuals exhibit an anger recognition bias or greater anger sensitivity (Swets et al., 1961). The former refers to a tendency to perceive anger cues in faces, regardless of whether they are present or not (Macmillan & Creelman, 2004). For instance, a person may interpret a face with a slight smile as expressing anger, despite the absence of any such cues. The latter, anger sensitivity, refers to the recognition of anger only when it is actually present, even at low levels of intensity (Macmillan & Creelman, 2004). It is important to differentiate between these two constructs, as they have distinct implications for behavior. Anger recognition bias has been linked to aggressive behavior (Dodge et al., 2003), while research on sensitivity to emotions has produced mixed findings. Some studies suggest that sensitivity to anger may be related to antisocial behavior (Schönenberg & Jusyte, 2014), whereas others propose that it plays a role in socialization and the development of moral understanding (Marsh & Blair, 2008).

The social risk hypothesis posits that individuals with depression display an adaptive response to the perceived threat of social exclusion (Allen & Badcock, 2003). This adaptation can be traced back to the ancestral environment, where the risk of exclusion was reduced through heightened sensitivity to perceived social threat and disapproval (Allen & Badcock, 2006). Moreover, research has shown that being socially excluded can improve social stimulus identification (Bernstein et al., 2008), and individuals with a high need for belongingness demonstrate better recognition of emotions on faces (Pickett et al., 2004). Electroencephalography studies provide further support for these findings, indicating that people with unmet social needs may exhibit increased face processing (Williams, 2007). Notably, individuals who experience loneliness and depression often come from families that lack emotional care and support, which can render them more sensitive to angry facial expressions (Wilkowski & Robinson, 2012). This may, in part, reflect the adaptive nature of quickly perceiving threat when it is indeed present.

2. Current study

Depressed individuals are often born into families that lack support and emotional care (Brennan & Auslander, 1979), which can negatively affect their social relationships what refers to relatedness frustration. Therefore, we hypothesize that relatedness frustration will be positively associated with depressive symptoms in our study (H1). Sensitivity to a particular stimulus tends to increase with practice in perceiving that stimulus (Goldstone, 1998). Within the context of cold family environments (Brennan & Auslander, 1979), individuals with a history of depression may be more prone to anger sensitivity rather than anger bias. Therefore, our second hypothesis predicts a positive association between anger sensitivity and depressive symptoms (H2). The distinction between bias and sensitivity allows us to separate earlier perceptual processes from judgments (Syrmäki & Hietanen, 2019), providing greater clarity in our analysis. To make sure our predictions are specific to anger only and not to other negative emotions nor to positive emotions, we check the relation between depressive symptoms not only to anger but also to fear and happiness. Additionally, we will investigate the associations between anxiety and anger sensitivity and bias to determine if they are specific to depression. Lastly, we will explore whether sensitivity to anger adds value to the prediction of depressive symptoms beyond relatedness frustration. This final hypothesis is exploratory. While relatedness frustration has been shown to predict

depression (Nishimura & Suzuki, 2016), to our knowledge, sensitivity to anger has not been explored in this context. Given that early family environment has been found to predict depression in women but not men (Dalton et al., 2014), we will include gender as a predictor in our regression model. Moreover, considering the associations between depression and age, education, place of residence, and marital status (e.g., Bulloch et al., 2017), we will incorporate these variables into our regression model as well.

3. Method

3.1. Participants

Participants were recruited through an online research panel Ariadna. We only report data from participants who fully completed the survey ($N = 1241$; 585 men, 654 women, 2 others). Detailed information of the study sample is presented in Table 1.

3.2. Procedure

Before the study began, respondents were informed of the nature of the study. After confirming their acceptance to participate in the study, participants completed the emotion recognition task and demographic questions. The completion time for the survey averaged at 25 min. Following the completion of the study, participants received acknowledgement for their contribution and were provided with compensation in the form of redeemable points to be used towards prizes within the panel.

Table 1
Detailed descriptive statistics of the study sample.

	Female		Male		Other	
	$N = 654$		$N = 585$		$N = 2$	
Age	45.29	(15.37)	45.23	(14.72)	44.00	(0.00)
Education						
Elementary	0.3 %		0.8 %		0.0 %	
Lower secondary	0.3 %		0.6 %		0.0 %	
Vocational	2.8 %		5.6 %		0.0 %	
Upper secondary	21.4 %		18.5 %		0.1 %	
Higher in progress	2.6 %		1.6 %		0.0 %	
Higher	25.0 %		19.9 %		0.1 %	
Other	0.3 %		0.1 %		0.0 %	
Marital status						
Single	8.9 %		11.0 %		0.0 %	
In informal relationship with children	3.5 %		2.5 %		0.1 %	
In informal relationship without children	5.6 %		5.6 %		0.0 %	
Married with children	21.8 %		20.9 %		0.1 %	
Married without children	6.0 %		5.2 %		0.0 %	
Divorced	3.9 %		1.4 %		0.0 %	
Other	3.1 %		0.6 %		0.0 %	
Place of living						
Countryside	14.6 %		15.6 %		0.0 %	
City below 100,000 residents	18.9 %		17.9 %		0.1 %	
City above 100,000 residents	19.2 %		13.7 %		0.1 %	

3.3. Measures

3.3.1. Emotion recognition on morphed faces

To investigate the interpretation of emotional expressions in facial images, the Radboud Faces Database containing both male and female images expressing anger, fear, and happiness was used (Langner et al., 2010). These images were morphed using FantaMorph software to create three affective dimensions: angry-fearful, angry-happy, and fear-happy. From each continuum, five proportions of blended emotional expressions were exported (10:90 %, 30:70 %, 50:50 %, 70:30 %, and 90:10 %), resulting in a total of 90 images. Each image appeared on the screen for 500 ms, followed by a question requiring participants to identify the displayed emotion (anger, fear, happiness) through a forced-choice answer option. The time to answer was not limited.

3.3.2. Depressive symptoms

The Hospital Anxiety and Depression Scale (HADS-M; Zigmond & Snaith, 1983; Polish translation: De Walden-Gałuszko et al., 1994) was used to measure depressive symptoms. HADS-M consists of 14 items on a 4-point severity scale (range 1–4) and includes 2 subscales referring to depressive symptoms (7 items) and anxiety symptoms (7 items). The questions relate to how participants have felt over the past week (e.g. 'I have sad thoughts', 'I feel as if I am slowed down'). Items related to the depression subscale were summed according to the key. In the Polish version of HADS, the reliability of the depression scale was good ($\alpha = 0.78$; Watrowski & Rohde, 2014).

3.3.3. Relatedness frustration

A Polish adaptation of the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS, Chen et al., 2015; Kuźma et al., 2020) was used to measure relatedness satisfaction and relatedness frustration. The tool has 24 items on a 5-point Likert scale (1 = not at all, 5 = very well), 8 for each basic need (relatedness, autonomy and competence) including 4 items with frustration and 4 items for satisfaction of each basic need. In result, six subscales are distinguished: relatedness satisfaction, relatedness frustration, autonomy satisfaction, autonomy frustration, competence satisfaction and competence frustration. Due to the tested hypotheses, we only used scales relating to relatedness. Polish version of BPNSFS has satisfactory reliability and validity (Kuźma et al., 2020).

3.4. Statistical analysis

The SPSS statistical software package, version 28.0 was used for analysis.

The relationships between depression, relatedness satisfaction, relatedness frustration, anger sensitivity and anger bias were examined using Pearson's correlation. For the calculation of anger sensitivity we used the formula: False Alarms z - Hits z ; whereas for anger bias, we used the formula: -0.5 (False Alarms z + Hits z) (Stanislaw & Todorov, 1999).

4. Results

Table 2 displays the means and standard deviations of the study variables. Marginal estimated means (in %) for anger, fear, and happiness recognitions are presented in Table 3. Our findings suggest a positive relationship between depressive symptoms and relatedness

frustration, with depressive symptoms also being negatively related to anger sensitivity. Moreover, depression was negatively related to relatedness satisfaction and sensitivity to happiness and fear. We also found a negative relationship between relatedness frustration and sensitivity to happiness and fear. Surprisingly, depression was positively related to happiness bias. In terms of anxiety, we observed a pattern similar to depression in that it was negatively related to anger sensitivity ($r = -0.13^{**}$, $p < .001$) but not to anger bias. Additionally, anxiety was negatively related to sensitivity to happiness and fear. The correlation coefficients between the study variables are presented in Table 4.

Further a hierarchical regression analysis was performed with depression as the dependant variable. In step 1, gender (coded: 1 = men, 2 = women), age, education, place of living and marital status were added, followed in step 2 by relatedness frustration, and by anger sensitivity in step 3. The final model was statistically significant [$F(7, 1232) = 78.06$, $p < .001$]. As predictors of depression, only gender ($p < .05$) and relatedness frustration ($p < .001$) were statistically significant and explained 30.2 % of the variance in depression. Further anger sensitivity, tested in step 3, explained an additional 0.1 % of the variance in depression, and the R^2 change was significant ($p < .05$). Thus, the final model explained 30.3 % of variance in depression with both factors as significant predictors of depression.

5. Discussion

The present study aimed to investigate the relationship between depression, relatedness frustration, and anger sensitivity within the general population. Additionally, we tested relatedness frustration and anger sensitivity as predictors of depression. Our findings indicate a significant positive correlation between relatedness frustration and depression, which supports our first hypothesis (H1). However, contrary to our expectations, depression was found to be negatively related to anger sensitivity (H2). Furthermore, our results suggest that relatedness frustration and anger sensitivity are both significant predictors of depression (Nishimura & Suzuki, 2016).

Our study's results, which suggest a positive correlation between relatedness frustration and depression, are consistent with prior research findings (Ryan & Deci, 2017). Indeed, individuals with depression tend to report experiencing less satisfying and less intimate social interactions, as well as feeling less influential in their social relationships (Nezlek et al., 2000). Our findings hold particular importance given that social isolation and poor social interactions are generally linked with depression (Chou et al., 2011) and one of its most concerning symptoms, suicidal behavior (Holma et al., 2010). In fact, loneliness and social isolation have been identified as predictors of suicide (Hom et al., 2017). Therefore, our results suggest that assessing relatedness frustration may be beneficial in clinical evaluations of depression and suicidal behavior.

Interpersonal difficulties and reduced satisfaction with communication, indicative of relatedness frustration, can arise from cognitive impairment such as facial expression misinterpretation (Frank & Stenett, 2001). Studies have found that a low ability to recognize emotions can partially result in social interaction problems (Weightman et al., 2014), aligning with our findings that relatedness frustration is negatively related to sensitivity to anger, fear, and happiness. Additionally, depression often involves social withdrawal and isolation, resulting in limited exposure to emotional expressions (e.g., Matthews et al., 2016), including anger, thereby reducing sensitivity in recognizing anger on face which may explain the contradictory results with our second hypothesis. Moreover, depression is often characterized by excessive self-focus and rumination (Joormann & Gotlib, 2008). This self-focused attention can divert cognitive resources away from external stimuli, making it more challenging to accurately perceive and identify emotions in others, including anger. While research has demonstrated that emotion recognition difficulties are common in depressed individuals (Bourke et al., 2010), contradictory results exist. Some studies suggest

Table 2
Means and standard deviations for variables.

	Depression	Anxiety	RelFr	RelSat	AngSe	AngBias
<i>M</i>	1.87	2.08	2.36	3.86	0.00	0.00
<i>SD</i>	0.62	0.65	0.94	0.8	0.73	1.37

RelFr – relatedness frustration, RelSat – relatedness satisfaction, AngSe – anger sensitivity, AngBias – anger bias.

Table 3

Marginal estimated means (in %) for Anger, Fear and Happiness recognitions in Angry-Happy (AH), Angry-Fearful (AF), and Fearful-Happy faces with different intensity of anger or fear. In case of AF and AH intensity (e.g. 10 %) refers to anger intensity and in case of FH faces intensity refers to fear intensity.

Intensity	Anger			Fear			Happiness		
	AH	AF	FH	AH	AF	FH	AH	AF	FH
10 %	1.8	13.2	1.7	2.1	84.9	2.2	96.1	1.9	96.1
30 %	5.9	16.4	2.9	5.2	81.3	5.7	88.9	2.3	91.4
50 %	46.5	38.7	10.0	21.0	59.0	43.9	32.5	2.3	46.1
70 %	79.4	76.8	13.3	16.5	20.8	79.7	4.1	2.3	6.9
90 %	90.2	90.3	12.4	8.0	8.0	85.6	1.8	1.8	2.0

Table 4

Pearson's *r* coefficients for numeric study variables.

Variable	Depression	RelFr	RelSat	AngSe	AngBias	FearSe	FearBias	HapSe	HapBias
Depression	–								
RelFr	0.547 ^{*,**}	–							
RelSat	–0.441 ^{**}	–0.569 ^{**}	–						
AngSe	–0.146 ^{**}	–0.182 ^{**}	0.107 ^{**}	–					
AngBias	0.031	0.016	–0.068 [*]	0.000	–				
FearSe	–0.131 ^{**}	–0.143 ^{**}	0.137 ^{**}	0.470 ^{**}	–0.336	–			
FearBias	0.040	0.083 ^{**}	–0.009	–0.313 ^{**}	0.682 ^{**}	0.000	–		
HapSe	–0.153 ^{**}	–0.188 ^{**}	0.172 ^{**}	0.338 ^{**}	–0.230 ^{**}	0.315 ^{**}	–0.239 ^{**}	–	
HapBias	0.074 ^{**}	0.066 [*]	–0.062 [*]	–0.289 ^{**}	0.203 ^{**}	–0.230 ^{**}	0.300 ^{**}	0.000	–
Anxiety	0.738 ^{**}	0.493 ^{**}	–0.338 ^{**}	–0.133 ^{**}	0.012	–0.086 [*]	0.053	–0.132 ^{**}	0.05

Variable	Depression	RelFr	RelSat	AngSe	AngBias	FearSe	FearBias	HapSe	HapBias
Age	–0.159 ^{**}	–0.185 ^{**}	0.160 ^{**}	0.019	0.011	–0.021	–0.054	0.151 ^{**}	0.001
Gender	0.040	–0.025	0.073 ^{**}	0.038	–0.084 ^{**}	0.112 ^{**}	0.055	0.069 [*]	–0.052
Education	–0.057 [*]	–0.052	0.060 [*]	0.046	–0.073 ^{**}	0.096 ^{**}	0.037	–0.021	0.004
Marital status	–0.126 ^{**}	–0.185 ^{**}	0.158 ^{**}	0.024	–0.029	0.020	–0.002	0.114 ^{**}	–0.023
Place of living	0.006	–0.010	0.005	0.014	–0.016	–0.030	0.034	–0.028	–0.012

RelFr – relatedness frustration, RelSat – relatedness satisfaction, AngSe – anger sensitivity, AngBias – anger bias; FearSe – fear sensitivity, HapSe – happiness sensitivity, HapBias – happiness bias.

Gender coded: 1 = men, 2 = women.

^{*} *p* < .05.

^{**} *p* < .001.

no significant differences in emotion recognition ability between depressed individuals and control groups (Ridout et al., 2007). To address this issue, Krause et al. (2021) conducted a meta-analysis of 23 studies that confirmed a widespread deficit in facial emotion recognition in people with unipolar depression. The authors suggested further studies should test for additional moderators, such as gender identity. Our study responds to this call for further investigations.

In the realm of emotion recognition, previous research has demonstrated that depressed individuals exhibit a decreased ability to recognize emotions regardless of their type (i.e., anger, fear or happiness) compared to healthy controls (Surguladze et al., 2004). Our results suggest that people with depression show reduced sensitivity to emotions broadly, instead of specifically for anger, and that they appear to be biased to happiness. That is, they see happiness on morphs mixed with anger and fear. Mo et al. (2021) showed that depressed patients, compared to healthy controls, confused anger with fear and happiness, which partially might suggest some tendency to happiness bias. Additionally, it is plausible that depressed individuals may perceive angry faces as more threatening, leading to an avoidance of such stimuli and a corresponding bias towards happiness (Seidel et al., 2010). This is in line with Muller and colleagues' (2017) findings that depressed individuals are more sensitive to happiness when recognizing emotions from an individual who previously rejected them, as opposed to an individual who previously included them.

It is important to acknowledge that our study was conducted on a research platform with active users who received a reward for their participation, potentially introducing selection bias and a risk of participants participating solely for the incentive (Lehdonvirta et al., 2021).

In this context, we cannot guarantee that participants were fully attentive during the study. Additionally, we must acknowledge that our study did not include individuals with a clinical diagnosis of depression, and therefore, our findings may not be generalizable to this population. Furthermore, we did not assess medication use for depression, which may have influenced our results. It is therefore imperative include a question about drug treatment in future research on this topic.

Despite some limitations, our results are noteworthy given the recent reductions in community-based socializing and the concomitant increase in time spent at home (e.g., as a result of the COVID-19 pandemic). Indeed, staying at home for long periods of time is associated with lower cognitive abilities and severe depression (Kim & Jung, 2022). Furthermore, research has established a link between impaired emotion recognition and suicide risk (Wang et al., 2021). Therefore, our study's investigation of the relationship between relatedness frustration and emotion recognition has implications for understanding factors that may contribute to depression symptoms. Continued investigation in this area is warranted to better understand and ultimately address the interplay between relatedness frustration, emotion recognition, and depression.

CRedit authorship contribution statement

AJ, AZ: First draft of the manuscript.

AJ, AZ, IK: Introduction.

AJ: Methodology.

AJ: Data Analyses.

AJ, AZ, IK, AZ, AO, WM: Discussion & Limitations.

AP: Review & Editing.

Declaration of competing interest

All the authors declare that they have no conflict of interest.

Data availability

Data will be made available on request.

Acknowledgements

This research was funded by National Science Centre, Poland grants number 2017/26/D/HS6/00258 and 2021/42/E/HS6/00018.

Ethics statement

Research was conducted in accordance with the principles embodied in the Declaration of Helsinki and in accordance with local statutory requirements. The current study was part of an anonymous survey that was designed and conducted using the Qualtrics software (Version: December 2021; Copyright © 2020, Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA, <https://www.qualtrics.com>) and executed online using Ariadna (panelariadna.pl). The participants (previously registered members of the Ariadna panel) provided implied informed consent and received a remuneration – points which they could later exchange for rewards offered by the panel.

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The Role of Borderline Pattern in the Relationship Between Hostile Attributions and Depression: Studies Including Electroencephalography Method

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ABSTRACT

Depression, a multifaceted mental health disorder, is often associated with negative cognitive biases such as hostile attributions (HA). However, the borderline pattern, with its characteristic emotional dysregulation and complex interpersonal interactions, may have a significant role in this relationship. To better understand these associations, we analyzed data from two research studies. The first study, based on a reanalysis of data from a previous study conducted on the general population ($N = 54$), utilized electroencephalography (EEG) alongside the Personality Assessment Inventory Borderline Features (PAI-BOR) Scale. The second study ($N = 189$), conducted on the general population and prisoners, focused on negative affectivity and disinhibition, two domains of personality pathology that characterize borderline pattern. Results from both studies revealed a link between depression and HA, with features/domains of borderline pattern emerging as a key predictor of HA. Additionally, apart from negative affectivity, detachment predicted hostile attribution, and, not as hypothesized, disinhibition. Our findings suggest that in investigating hostile attributions, it is more important to consider depressive tendencies stemming from underlying personality pathology (i.e., borderline patterns) rather than mere symptoms of depression.

KEYWORDS

borderline pattern
borderline personality disorder
depression
hostile attributions
social cognition

INTRODUCTION

Depression is a complex mental health condition, often hallmarked by pervasive negative emotions like sadness and hopelessness (American Psychiatric Association, APA, 2013), coupled with a tendency towards negative cognitive biases (Nabi et al., 2009). These biases frequently manifest in the form of hostile attributions (HA, Hébert et al., 2021; Smith et al., 2016), a tendency to interpret ambiguous or neutral situations as intentionally hostile or driven by negative intentions (Bodecka-Zych et al., 2021; Tuente et al., 2019). HA becomes particularly pronounced in situations characterized by ambiguity, where feelings of being threatened may become activated (Tuent et al., 2019). Consequently, it can be viewed as a reaction of surprise to information about a person's nonhostile intentions (Gagnon et al., 2016). As the interpretation of intentions as hostile can increase the likelihood of aggressive behavior (Quan et al., 2019), HA is often studied in prisoners (e.g., Zajenkowska, Prusik, Jasielska et al., 2021). One of the most popular methods for investigating HA is vignettes (Combs et al., 2007), describing hypothetical ambiguously harmful situations. Participants evaluate the intentionality and assign blame based on these scenarios (Combs et al., 2007). However, HA assessment extends beyond self-

report questionnaires. Neurophysiological techniques, such as electroencephalography (EEG) event-related potentials (ERP), also assess it by measuring the individual's surprise to nonhostile intentions in ambiguous situations (Gagnon et al., 2016). Research exploring the link between depression and HA through these diverse methods has yielded mixed results. While some studies found a connection using self-reported HA measures (Mancuso et al., 2011; Smith et al., 2016), others did not (Gasse et al., 2020). Conversely, limited studies employing EEG suggest a relationship between HA and depression (Gasse et al., 2020). By integrating both self-report and neurophysiological methods, we can better decipher the nuances of this relationship.

With the premises for a link between HA and depression, it is important to consider why this relationship exists. Childhood experiences are particularly significant in this regard (Carvalho-Fernando et al., 2014). Emotional abuse in childhood, that communicates to a child that they are worthless or not good enough (Leeb et al., 2011)

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has been shown to significantly influence the development of depression, often more so than physical or sexual abuse (Gibb et al., 2003). Also, narratives from individuals with depression include memories of overprotective parenting (Konopka et al., 2018). This parenting style, by conveying a sense of inadequacy and danger in the world, undermines a child's sense of personal competence and autonomy (Bögels & Brechman-Toussaint, 2006; Vigdal & Brønnick, 2022). Hence, it is not surprising that self-hatred is often one of the most central symptoms of depression which emerges early in life (Kim et al., 2021; Mullarkey et al., 2019). In fact, a negative self-image has been shown to predict both current and future depressive symptoms (Connolly et al., 2016; Speed et al., 2016). Additionally, both abusive and overprotective parenting play a crucial role in a child's emotional regulation development, impacting their ability to handle emotions effectively (Perry et al., 2018; Thompson & Goodman, 2010). When children lack emotional support, they often face difficulties in regulating emotions, which can lead to problems in social relationships and adaptation (Fulton et al., 2014; Thompson & Calkins, 1996). This background contributes to a distrust towards others, driven by feelings of incompetence and unworthiness. Such perceptions may lead depressed people to interpret ambiguous behavior as hostile (Calvete & Orue, 2012). Indeed, emotional neglect as well as overprotecting during childhood may contribute to the formation of negative cognitive schemas and a worldview where ambiguity is perceived as threatening, thereby fostering HA (Richey et al., 2016; Vigdal & Brønnick, 2022) and then to interpersonal problems which are related to both HA and depression (Barrett & Barber, 2007; Hébert, et al., 2021). Therefore, it can be concluded that depression often precedes the development of HA, with negative childhood experiences and difficulties with emotional regulation laying the foundations for this progression.

The Relationship Between Depression and Hostile Attributions in the Context of Borderline Pattern

The above-mentioned challenges in emotional regulation and social functioning are not only closely related to depression but are also central to personality disorders development, particularly borderline personality disorder (BPD; Beblo et al., 2012; Sharp et al., 2015; Vittengl et al., 2023). In fact, impaired emotion regulation in BPD and depression are both often rooted in adverse parent-child relationships marked by abuse, neglect, or overprotection (Beblo et al., 2012; Boucher et al., 2017; Carvalho-Fernando et al., 2014). This significant overlap is further underscored by the finding that up to 85% of BPD patients have a history of major depression (Yoshimatsu & Palmer, 2014; Zajenkowska, Barycka et al., 2020). Importantly, recent approaches to the diagnosis of personality disorders increasingly emphasize the impact of early childhood experiences in the development of personality pathology. The most recent classifications of personality disorders, the ICD-11, specifically highlights the significance of a person's early relationships in this context (World Health Organization, WHO, 2018). Notably, both the ICD-11 and DSM-5 classification systems have shifted away from a categorical approach to personality

disorders and focusing on a dimensional approach (APA, 2013; WHO, 2018). These dimensional approaches recognize the spectrum-like nature of personality disorders, defining them by specific domains within the broader concept of personality pathology.

The dimensional approaches to personality pathology classify BPD (in the DSM 5; APA, 2013) or the borderline pattern (in ICD-11; WHO, 2018) under negative affectivity and disinhibition dimensions, with depressiveness as a key trait within negative affectivity, encompassing feelings of sadness, hopelessness, and low self-worth (APA, 2013). This suggests that depressive symptoms may stem from underlying personality pathologies like the borderline pattern. Additionally, studies indicate that addressing personality disorders can lead to improvements in depressive symptoms, highlighting the importance of considering the borderline pattern in the treatment of depression (Boritz et al., 2016; Gunderson et al., 2004). Furthermore, the borderline pattern may play a significant role in the development of hostile attributions, just as depression does. In BPD, childhood emotional neglect leads to decreased cognitive reappraisal and difficulties in emotion regulation, often resulting in hostility and anger (Bateman & Fonagy, 2008; Carvalho-Fernando et al., 2014). This emotional dysfunction in BPD, similar to depression, may cause individuals to perceive the world as hostile, interpreting ambiguous behaviors and expressions as threatening or harmful (Smeijers et al., 2017).

Research exploring the interplay of depression, personality disorders, and cognitive schemas has underscored the difficulty in establishing their causal links without longitudinal studies due to the bidirectional nature of these variables (e.g., Carvalho-Fernando et al., 2014; Vigdal & Brønnick, 2022). Thus, determining the directional relationship between depression, hostile attributions, and domains of borderline pattern or borderline personality features is a significant challenge. In our studies, we propose that depression can emerge as a result of adverse childhood experiences (e.g., Gibb et al., 2003), closely linked to the development of personality disorders (e.g., Carvalho-Fernando et al., 2014). An initial manifestation of such disorders is a distorted self-image that may lead to maladaptive interactions with others, potentially increasing predisposition to hostile attributions (Calvete & Orue, 2012; Fulton et al., 2014; Kim et al., 2021; Thompson & Calkins, 1996).

CURRENT STUDY

A growing body of research supports the association between HA and depression (e.g., Smith et al., 2016) yet findings remain inconclusive (Gasse et al., 2020). This may arise from, firstly, methodological issues and, secondly, considering depression as a singular concept rather than recognizing its potential association with personality pathology. Therefore, the current project employed a diverse methodology, incorporating both self-report questionnaires and EEG techniques, to comprehensively examine HA (Gasse et al., 2020). Our first hypothesis posited that there is an association between depression and hostile attributions (HA) regardless of the method of measuring HA (H1). Additionally, most existing studies on depression focus on its symptomatology without considering its relationship with personality

pathology, particularly borderline pattern (Carvalho-Fernando et al., 2014; Levenson et al., 2012). In light of the dimensional approach to personality disorders (APA, 2013), symptoms of depression are not only prevalent in borderline pattern but are also a facet of the disorder. Therefore, our second hypothesis was that depression's role as a predictor of HA diminishes when domains of borderline pattern are factored into the analysis (H2). According to the alternative model of personality disorders (APA, 2013), BPD encompasses traits related to emotional instability, anxiousness, separation insecurity, and a predisposition to depressive feelings. These traits are part of the negative affectivity (NA) domain – a frequent and intense experience of various negative emotions (APA, 2013). BPD also encompasses impulsivity and risk-taking traits, within the disinhibition domain (DI) – a tendency toward seeking immediate gratification (APA, 2013). These domains also describe borderline pattern in ICD-11 (WHO, 2018). Given the potential connection of each domain to HA (Chen et al., 2012), we tested if there is a specific domain of borderline pattern which is a predictor of hostile attribution. Furthermore, to maintain a comprehensive model of pathological personality traits, we included additional domains (detachment, antagonism, and psychoticism) as control variables.

To test our hypotheses, we conducted analyses on two separate studies. Both studies examined the relationship between HA and depression. Study 1 was based on a reanalysis of data from a previous study and utilized EEG methods to assess HA, focusing on borderline personality features measured by the Personality Assessment Inventory Borderline Features (PAI-BOR). Study 2 employed a self-report measure for HA and examined the role of borderline pattern domains (NA and/or DI) in this association. To our knowledge, this is the first study to explore the specific role of borderline pattern domains in the relationship between depression and HA.

STUDY 1

Participants

The reanalyzed data of this study were gathered from 87 participants as part of a prior study on aggression and impulsivity entitled "Cognitive and neurophysiological mechanisms associated with the "Urgency" personality trait: theoretical and empirical integration." (Gagnon & Jolicoeur, 2014). Participants were recruited from the general population using local and newspaper advertisements as well as from the undergraduate student population. They were not eligible to take part in the study if they (a) were outside the age range of 18 to 55 years, (b) did not have French as their native language, (c) had an educational level below the sixth grade, (d) had previously experienced a significant head injury, or (e) had a history of psychosis. From this number, 54 people – 34 women ($M_{\text{age}} = 26.36$ years, $SD = 7.54$; $M_{\text{education}} = 16.05$ years, $SD = 3.18$) and 20 men ($M_{\text{age}} = 27$ years, $SD = 8.03$, $M_{\text{education}} = 16.19$ years, $SD = 2.82$) – completed depression and personality questionnaires and were included in the present study. A power analysis was conducted using G*Power to determine the minimum sample size required to detect a medium effect size ($f^2 = 0.15$) with a

power of 0.80 and an alpha level of 0.05. The power analysis indicated that a sample size of $N = 92$ would be optimal for testing all hypotheses (including the hierarchical regression with five predictors with a power of .80). The current sample size was smaller, which may have limited the statistical power of the results of hierarchical regression.

Individuals who met the eligibility requirements were informed that the study would last around three hours. They were also instructed not to drink alcohol within 24 hours before each session and to avoid using recreational drugs for one week before each session.

The study procedure received approval from the Comité d'Éthique de la Recherche en Psychologie et en Éducation (approval number 2014-15-126-D).

MEASURES

Hostile Expectancy Violation Paradigm (Gagnon et al., 2016) is an ERP task that assesses the attribution of hostile intention. Event-related potentials reflect the change in electrical activity produced by the brain in response to an external stimulus or an internal (e.g., cognitive) event (Lopez-Calderon & Luck, 2014). As an ERP component, the N400 is a negative shift in the ERP waveform that reaches a maximum amplitude (i.e., a greater negativity) often around 400 ms after stimulus onset (Kutas & Federmeier, 2011). It can be elicited by presenting a word that is unexpected or poorly fits within a sentence context, reflecting the participant's construction of a situation model where the information provided by the text is immediately integrated with their conceptual knowledge (Leuthold et al., 2012). In the context of the hostile expectancy violation paradigm, the N400 component makes it possible to measure the development of hostile expectations when a hostile context is followed by a behavior with ambiguous intention, and then by a final sentence revealing the intention of the character who performed the action (Gagnon et al., 2016).

More specifically, the HEVP comprises 320 scenarios that simulate typical social interactions. Each scenario consists of three sentences:

1. The first sentence is about a context, that is, whether the situation is hostile or nonhostile (e.g., Before the exam, the students are in competition. – hostile context).
2. A second sentence describing a character's ambiguous behavior (e.g., A friend walks by and does not talk to you.).
3. A third sentence revealing the character's true intention behind the ambiguous behavior, either as hostile or nonhostile (e.g., He does not want to distract you. – nonhostile intention).

The nature of the experimental task condition can be categorized as hostile or nonhostile, based on the intention target word in the last sentence. This determines the congruence (match condition) or incongruence (mismatch condition) between the initial context (1) and the character intention (3). Essentially, the character intention (3) dictates whether the overall context is perceived as hostile or not, making it a critical element of the paradigm. In a series of studies, Gagnon et al. (2016) showed that nonhostile critical words that violated hostile intention expectations elicited a larger negative-going ERP deflection compatible with an N400 effect in nonaggressive participants.

Interestingly, this effect was significantly more pronounced in aggressive individuals compared to nonaggressive ones (Gagnon et al., 2017). These results suggest that nonaggressive individuals are capable of forming hostile expectations when the context is appropriately hostile. However, aggressive individuals tend to develop greater hostile expectations than nonaggressive ones in response to hostile contextual cues.

Brief symptom inventory depression dimension subscale (BSI-II; Derogatis, 1993) - a measure used to assess the severity of depressive symptoms. This subscale covers various aspects of clinical depression and comprises six items (e.g., item 18 - "Feeling no interest in things"). These items examine the extent to which individuals experience depressive feelings, a lack of interest, sensitivity to criticism, loneliness, feelings of worthlessness, hopelessness, and thoughts of suicide. Higher scores indicate a more pronounced expression of depressive symptoms. In the BSI-II, the depression scale has good reliability (Cronbach's $\alpha = 0.83$ in our study).

Personality Assessment Inventory Borderline Features (PAI-BOR, Morey, 1991) Scale - is part of a comprehensive self-report clinical assessment instrument designed to evaluate psychopathological syndromes. The PAI-BOR scale contains the 24-items to assess borderline personality features. These features are structured to four subscales: affective instability (difficulties in regulating emotional responses), identity problems (uncertainty about significant life matters and a general lack of life purpose), negative relationships (involvement in problematic and chaotic relationships) and self-harm (impulsivity with a disregard for potential negative consequences). In our study, the PAI-BOR Scale had good reliability (Cronbach's $\alpha = 0.89$).

Procedure

Participants were given detailed information about the EEG procedure and the experimental task before they provided both verbal and written consent. The experimental task involved reading scenarios that depicted everyday social interactions with fictional characters. Participants were asked to immerse themselves in these scenarios, imagining the thoughts, emotions, and intentions of the characters, particularly when faced with ambiguous behaviors.

The testing environment was within an electrically shielded booth (Faraday cage) with low ambient lighting. The textual stimuli were displayed at the center of a 17 in. computer monitor using a white 14 pt Helvetica font on a black background. Participants maintained a consistent viewing distance of 23 inches (57 cm) from the monitor, aided by a chin rest that ensured the characters subtended 1° of visual angle. The experiment consisted of four initial practice trials, followed by ten experimental blocks, each comprising 17 trials (16 experimental scenarios and one filler scenario).

Timed breaks separated the experimental blocks, with the duration of these breaks determined by each participant. In each trial, the first two sentences, namely, the context sentence and the ambiguous behavior sentence, remained on the screen until the participant pressed the space bar to indicate they had read it, with a minimum display time of 1500 ms. Following this, a blank screen appeared for 500 ms, followed by a fixation point at the center of the screen for 1000 ms. The third

sentence, revealing the character's intention, was presented one word at a time for 300 ms, with a 200 ms blank interval between each word. During the third sentence, participants were asked to maintain fixation on the fixation point at the center of the screen. Afterward, the context sentence reappeared following a 2000 ms interval during which participants were instructed to maintain their gaze on the fixation point until it disappears.

EEG RECORDING

The EEG signal was recorded using the BioSemi Active Two system, employing 64 Ag/AgCl electrodes arranged on a flexible cap following the International 10–10 System (Sharbrough et al., 1991). These electrodes were referenced to the average signal of the left and right mastoids. To track horizontal eye movements, a horizontal electrooculogram (HEOG) measured voltage differences between electrodes placed at the sides of the outer eye corners. Additionally, eye blinks were detected through a vertical electrooculogram (VEOG), which captured voltage differences between electrodes positioned above and below the left eye.

Both the EEG and EOG signals were digitized at 512 Hz and subjected to a low-pass filter at 134 Hz. During offline signal analysis, the continuous signal was further processed with a high-pass filter at 0.01 Hz and another low-pass filter at 30 Hz. The EEG data was segmented into epochs spanning from 200 ms before the target onset (0 ms) to 1000 ms after the target onset, followed by baseline correction using the mean amplitude from -200 ms to 0 ms. Additionally, to remove electro-ocular artifacts and correct the data, an independent component analysis (ICA) statistical procedure was employed (see Drisdelle, et al., 2017, for details).

Trials that exhibited eye blinks (VEOG $> 50\mu\text{V}$ within a 150 ms interval) or substantial horizontal eye movements (HEOG $> 35\mu\text{V}$ within a 300 ms interval) were excluded from the analysis. Moreover, trials displaying EEG deflections exceeding $100\mu\text{V}$ on at least one of the 64 electrodes during the predefined segmentation window were chosen for further analysis. In instances where seven or fewer channels were detected as problematic in a particular trial, spherical spline interpolation was used to estimate these channels based on data from neighboring channels. However, trials were discarded if more than seven channels were found to contain artifacts.

EEG DATA ANALYSIS

The analysis of the EEG data was conducted using MATLAB, utilizing functions from the EEGLAB (Delorme & Makeig, 2004) and ERPLAB (Lopez-Calderon & Luck, 2014) toolboxes. EEG signals from each electrode location were separately averaged for the four experimental conditions: hostile-match, hostile-mismatch, nonhostile-match, and nonhostile-mismatch. These averages were time-locked to the onset of the target word. Following an initial visual assessment of the overall ERP, a significant negative deflection in the ERP was identified within the time frame of 450 ms to 650 ms, aligning with the N400 effect period documented in the literature (Kutas & Federmeier, 2011).

Electrode sites located laterally were grouped into six regions, categorized by hemisphere (left or right) and scalp location (anterior, central, or posterior). The left hemisphere was further subdivided into three regions: left-anterior (comprising electrodes AF3, AF7, F1, F3, F5, F7, FT7, FC1, FC3, and FC5), left-central (encompassing TP7, T7, C1, C3, C5, CP1, CP3, and CP5), and left-posterior (including P1, P3, P5, P7, PO3, PO7, and O1). Symmetrical regions were identified in the right hemisphere using homologous electrodes.

The original data analyses conducted by Gagnon et al. (2016) revealed the presence of an N400 effect component. The stronger the N400 effect, indicated by a more negative voltage, the greater the surprise exhibited by subjects in response to information about non-hostile intentions, reflecting a higher level of hostile attribution. This effect was observed when there was a mismatch between the hostile context, leading participants' expectation of a hostile intention and the nonhostile intention presented through the target word. This suggests that participants were surprised by the lack of hostility, potentially reflecting a greater tendency to attribute hostile intentions initially (hostile attribution bias). Thus, hostile attribution bias, here, the N400, effect was observed in the nonhostile-mismatch condition (violation of hostile expectations). The amplitude of this component was found to be greater in the nonhostile condition compared to the hostile condition, in the aggressive group compared to the nonaggressive group, and at central and posterior electrode sites compared to anterior sites (Gagnon et al., 2017). In a more recent study (Gasse et al., 2020) on the association between depression and HA as measured with the HEVP, it was found that depression scores were significant predictors of the right central N400 effect size for the nonhostile condition. Consequently, in the current study, we used the N400 data obtained in the right central region.

The data was analyzed in previous study (Gagnon et al., 2017). For more detailed methodology and results, please refer to a previous publication of that study (Gagnon et al., 2017). The data is available to researchers upon request.

STATISTICAL ANALYSIS

SPSS statistical software package, version 28.0 was used for analysis. The relationships between depression, hostile attribution, and bor-

derline personality disorder features were examined using Pearson's correlation. Since the assumptions of hierarchical regression, like a linear relationship between the independent variables and the dependent variable, multivariate normality ($p > .05$ in the Kolmogorov-Smirnov test), lack of multicollinearity (VIF scores below 2.4), lack of autocorrelation (Durbin-Watson = 1.84), and homoscedasticity (points in the scatterplot randomly distributed) were met, we used hierarchical regression to test statistically significant predictors of HA.

Results

HA (N400 effect) were negatively associated both with depression and borderline personality disorder features. There was also a significant positive relationship between depressive symptoms and borderline personality disorder features (see Table 1).

Further, a hierarchical regression analysis was tested with HA (N400 effect) as the dependent variable. In Step 1, gender (1 = men, 2 = women), age, and education were added, followed in Step 2 by depression, and by borderline personality features in Step 3. Depression was a significant predictor ($p < .05$) of hostile attributions in Step 2 and explained 17 % of the variance in hostile attributions. However, in Step 3, depression ceased to be a predictor ($p > .05$), and borderline personality features predicted hostile attributions at the tendency level ($p = .057$). The final model was statistically significant, $F(5, 48) = 2.815$, $p < .05$, and explained 22.7% of the variance in HA with significant R^2 change, $p < .05$. Hierarchical regression analysis results are presented in the Table 2.

Discussion

In the reanalyzed data, we found a significant association between HA and depression, thereby confirming our first hypothesis. These results are consistent with the findings of Gasse et al. (2020) who also used EEG measurement of HA. Although our study used the EEG to investigate HA, it is worth comparing our results also with studies using self-report tools to investigate HA. The results of the current study on the association between HA and depression are consistent with the results of Smith et al. (2016), but not with the results of Gasse et al.

TABLE 1.

Pearson's r Coefficients for Numeric Study Variables – Study 1

Variable	N400 (HA)	DEP	BPD	Gender	Age
N400 (HA)	–				
DEP	–.36**	–			
BPD	–.376**	.727**	–		
Gender	–.026	.044	.161	–	
Age	.166	–.058	.028	–.037	–
Educ	.147	–.112	.078	–.021	.132

Note. Gender coded: 1 = men, 2 = women; N400 (HA) = N400 effect (hostile attributions), DEP = depression, BPD = Borderline Personality Disorder features, Educ = Education.

* $p < .05$, ** $p < .001$.

TABLE 2.

Hierarchical Regression Analysis of Predictors of Hostile Attributions – Study 1

Dependent variable: Hostile attributions (N400 effect), $F(5, 48) = 2.815$, $p < .05$						
	Model 1		Model 2		Model 3	
	<i>B</i>	<i>b</i>	<i>B</i>	<i>b</i>	<i>B</i>	<i>b</i>
Gender	.02	.01	.09	.03	.24	.07
Age	.03	.15	.03	.16	.03	.16
Education	.1	.19	.08	.15	.11	.21
Depression			–1.07*	–.32*	–.15	–.04
BPD					–1.32 ^t	–.38 ^t
Adjusted R^2	.01		.1		.15	

Note. ^t = significance at the level of statistical trend. Gender: 1 = men, 2 = women; BPD = borderline personality features.

* $p < .05$.

(2020). Consequently, the divergence from Gasse et al. (2020) might be attributed to the different measurement tools used, a point we expand upon in the General Discussion. Also in line with the second hypothesis, when BPD features were incorporated into the regression model, the predictive power of depression on HA reduced significantly, indicating BPD features as the more dominant factor. This finding highlights the crucial role of BPD features in the dynamics of hostile attributions. It raises a question: Is it the overall presence of BPD or specific domains within BPD that drive this relationship?

STUDY 2

Participants

To ensure a varied distribution of borderline pattern domains and depression symptoms in our study, we recruited participants from two distinct groups: the general population (62 women, $M_{\text{age}} = 37.44$ years, $SD = 11.29$; 72.6% secondary education; 61 men, $M_{\text{age}} = 37.6$ years, $SD = 11.19$; 59.1% secondary education) and prisoners (32 women, $M_{\text{age}} = 36.35$ years, $SD = 8.74$; 75% secondary education; 34 men, $M_{\text{age}} = 38.94$ years, $SD = 8.84$; 47.1% primary education or lower secondary and 50% secondary education). The entire sample consisted of 189 participants. The calculation for an appropriate sample size to test our hypotheses (including hierarchical regression with nine predictors) with a power of .80 indicated that a sample size of $N = 114$ would be sufficient.

In initial meetings, individuals who expressed their interest in participating were given detailed information about the study, including its voluntary nature and the assurance of complete anonymity. Following this, the participants individually filled out all the questionnaires. The study procedure obtained ethical approval from both the university's ethical committee (approval number 123/2022) and the appropriate prison authorities, ensuring adherence to ethical guidelines and regulations.

MEASURES

Ambiguous Intentions Hostility Questionnaire (AIHQ; Combs et al., 2007; Zajenkovska, Barycka et al., 2020) is a self-report measure that assess the tendency to attribute hostile intentions to ambiguous social scenarios. It consists of five scenarios, each presenting a social situation with an element of ambiguity regarding the intent of the characters involved. Participants read each scenario, imagined it happening to them, and then used Likert scales to rate whether the other person/s performed the action on purpose (rated from 1 to 6, *definitely yes*), how angry it made them feel (rated from 1 to 5, *very angry*), and how much they blamed the other person/s (rated from 1 to 5, *very much*). These three scores are averaged to create a blame index (comprised of ascribing intentionality, blame and anger; Combs et al., 2007), which has previously been shown to have acceptable reliability (Cronbach's $\alpha = 0.89$ in our study) and validity and to be significantly related to clinically rated hostility and suspiciousness symptoms (Buck et al., 2017). Because the blame index is comprised of attributions of

intentionality, blame and anger, it is operationalized as a broader HA index (Zajenkovska, Prusik et al., 2020).

Patient Health Questionnaire (PHQ-9; Polish validation: Tomaszewski et al., 2011) is a measure assessing depressive symptoms. It consists of nine items, each of which corresponds to the diagnostic criteria for depression in both DSM-IV and DSM-V (Kroenke et al., 2001; Mitchell et al., 2020). Respondents rate each item on a scale ranging from 0 (*not at all*) to 3 (*nearly every day*). This questionnaire yields a continuous score, allowing for the measurement of depression severity. The suggested cutoffs for interpreting severity are as follows: 1-4 (none), 5-9 (mild), 10-14 (moderate), 15-19 (moderately severe), and 20-27 (severe). The tool demonstrated good reliability (Cronbach's $\alpha = 0.83$ in our study).

Personality Inventory for DSM-5 Brief Form (PID-5 BF; Rowiński et al., 2019) consists of 25 items designed to assess five pathological personality domains, such as NA and disinhibition. Respondents rate the extent to which each statement applies to them on a 4-point Likert scale, ranging from 1 (definitely or very often untrue) to 4 (definitely or very often true). In our study, each scale of the PID-5 BF had satisfactory reliability (Cronbach's $\alpha = 0.69$ for NA, Cronbach's $\alpha = 0.62$ for detachment, Cronbach's $\alpha = 0.68$ for antagonism, Cronbach's $\alpha = 0.69$ for Disinhibition, and Cronbach's $\alpha = 0.72$ for psychoticism).

The associated data, all study materials, and analysis code, are openly available at the Open Science Framework under the link: https://osf.io/mq2jv/?view_only=53c5736fbaab4dc9a16b06fb22ae0324

STATISTICAL ANALYSIS

The analysis was conducted using SPSS version 28.0. Pearson's correlation was employed to explore the relationships between depression, HA, and borderline personality dimensions. Given that the assumptions for hierarchical regression were satisfied, including a linear relationship between the independent and dependent variables, low correlation between predictors ($r \leq 0.4$), multivariate normality ($p > .05$ in the Kolmogorov-Smirnov test), absence of multicollinearity (VIF scores below 1.5), no autocorrelation (Durbin-Watson = 1.81), and homoscedasticity (random distribution of points in the scatterplot), we applied hierarchical regression to identify statistically significant predictors of HA.

Given the small size of the inmate group and the fact that the general population group was matched to the inmates in terms of age and education level, we decided to focus on hierarchical regression on the entire sample. However, for comparison purposes, we also performed separate hierarchical regression analyses for the general population and inmate groups (see the Appendix for details).

Results

Our results indicated significant positive relationships between depressive symptoms, HA and borderline personality domains (NA and disinhibition). All correlations are presented in Table 3.

Additionally, a hierarchical regression analysis was conducted with HA as the dependent variable. In Step 1, gender (0 = women, 1 = men), age, and education were added, followed in Step 2 by depression, and

by all five personality domains in Step 3. Depression as well as age were significant predictors ($p < .001$) of HA in Step 2 and explained 12.8 % of the variance in HA. However, in Step 3, depression ceased to be statistically significant, and NA and detachment were instead significant predictors ($p < .001$). The final model was statistically significant, $F(7, 175) = 11.867$, $p < .001$. Also age ($p < .001$) remained a statistically significant predictor of HA. The final model explained 30% of the variance in HA and the R^2 change was significant ($p < .001$). Regression analysis results are presented in Table 4.

Discussion

Consistent with our first study, we once again confirmed the relationship HA and depression, thereby supporting our first hypothesis. Furthermore, our findings revealed that the predictor of HA is linked to one of the domains of BPD, specifically NA, rather than disinhibition. Given that depressivity is one of a part of the NA domain (APA, 2013), the results suggest a potential link between hostile attributions and depression rooted in underlying personality traits associated with BPD. Interestingly, although it was not initially included in our hypoth-

eses, detachment emerged as a significant predictor of hostile attribution. This finding is consistent with the fact that this domain includes suspiciousness (APA, 2013).

GENERAL DISCUSSION

Depression is considered one of the main mental health problems in the 21st century World Health Organization (WHO, 2022). Surprisingly, it has not received much attention in the context of HA, which may be a characteristic of depression greatly related to interpersonal problems and social functioning. Research results examining the link between depression and self-reported hostile attributions have been inconclusive (Gasse et al., 2020; Smith et al., 2016). Notably, these studies often viewed depression as an isolated set of symptoms, overlooking the potential impact of underlying personality pathologies, such as BPD features, in its development (Levenson et al., 2012). Considering the above issues, we examined whether depression is related to HA regardless of its measurement method (self-report or

TABLE 3.

Pearson's r Coefficients for Numeric Study Variables – Study 2

	AIHQ	PHQ	NA	DI	DE	AN	PS	Gender
AIHQ	-							
PHQ	.264**	-						
NA	.416**	.357**	-					
DI	.185*	.402**	.295**	-				
DE	.354**	.371**	.221**	.224**	-			
AN	.169*	.128	.084	.314**	.213**	-		
PS	.129	.359**	.268**	.393**	.267**	.323**	-	
Gender	-.124	-.069	-.253**	.186*	-.064	.160	.090	-
Age	-.282*	-.090	-.065	-.113	.015	-.082	.066	.044

Note. Gender coded: 0 = women, 1 = men; AIHQ = hostile attributions, PHQ = depression, NA = Negative Affectivity, DI = Disinhibition, DE = Detachment, AN = Antagonism, PS = Psychoticism

* $p < .05$, ** $p < .001$.

TABLE 4.

Hierarchical Regression Analysis of Predictors of Hostile Attributions – Study 2

Dependent variable: Hostile attributions, $F(7, 175) = 11.867$, $p < .001$

	Model 1		Model 2		Model 3	
	<i>B</i>	<i>b</i>	<i>B</i>	<i>b</i>	<i>B</i>	<i>b</i>
Age	-.02**	-.29**	-.02**	-.27**	-.02**	-.27**
Depression			.29*	.23*	.05	.04
NA					.38**	.35**
DI					-.02	-.02
DE					.35**	.27**
AN					.12	.09
PS					-.11	-.09
Adjusted R^2	.08		.13		.30	

Note. Gender: 0 = women, 1 = men; NA = Negative Affectivity, DI = Disinhibition, DE = Detachment

* $p < .05$, ** $p < .001$.

EEG). We also investigated the role of BPD features in this relationship. Our analyses encompassed two separate studies, including one based on a reanalysis of data from a previous study, using different measures for HA, depression, and BPD/borderline pattern domains.

The relationship between depression and HA was confirmed in both of our studies. It suggests that relationship between depression and HA exists regardless of the method of HA measurement (here, self-report and EEG). This finding stands in contrast to Gasse et al. (2020), where self-reported HA did not show an association with depression. However, it is important to note that we used a different self-report measure (AIHQ in our study; SIP-AEQ; Coccato et al., 2009 in Gasse et al., 2020). The SIP-AEQ focuses primarily on the likelihood of hostile intent in socially ambiguous scenarios, whereas our measure evaluates both intentionality and blame ascription. This difference highlights the possibility that certain facets of HA may be more closely linked to depression. Future research should explore various self-reported measures of HA (including AIHQ and SIP-AEQ) to test their associations with measures of depression.

Consistent with results on HA measured with the hostile expectancy violation paradigm EEG task (Gasse et al., 2020) the relationship between HA and depression was confirmed. This supports the notion that individuals with depression may be more likely to experience surprise upon nonhostile intentions in ambiguous situations. This result emphasizes the importance of the intentionality aspect within HA, particularly in the context of depression. Understanding and addressing intentionality ascription could be crucial in mitigating HA among depressed individuals. Additionally, our result reinforces the role of N400 in the violation of hostile expectations. This is particularly significant given that hostile biases encompass four distinct types, with hostile expectation bias being one among them (Smeijers, 2023). The other three types include hostile attribution bias, hostile perception bias, and hostile interpretation bias (Smeijers, 2023). The use of EEG studies, particularly in measuring the N400 component, offers valuable insights into these nuances of HA. Continuing and expanding such studies will be instrumental in deepening our understanding of HA in the context of depression.

Our research not only reinforces the established link between depression and HA but also illuminates the significant role of borderline pattern domains in this relationship. In our regression analysis, depression initially appeared as a predictor of HA. However, upon incorporating BPD features (in Study 1) and its domains (in Study 2), depression's predictive power diminished. BPD itself emerged as a predictor in Study 1 (albeit at a statistical trend level), while in Study 2, it was the NA domain. This domain includes emotional lability, separation insecurity, and depressivity, suggesting that depressivity as part of personality pathology may be more influential than depressive symptoms alone.

Detachment, which was not included in our original hypotheses, was also found to be a significant predictor of hostile attributions. This domain is characterized by withdrawal from interpersonal interactions and suspicion towards others. It involves heightened sensitivity to per-

ceived interpersonal ill intent or harm, doubts about others' loyalty and fidelity, and feelings of being mistreated or exploited (APA, 2013).

Detachment is a defining feature of both avoidant personality disorder and schizotypal personality disorder (Strus et al., 2017). Individuals with avoidant personality disorder tend to withdraw from social interactions and maintain emotional distance due to a fear of rejection or criticism (APA, 2013). This chronic avoidance of social engagement may foster a sense of mistrust and hypervigilance in interpersonal situations, leading them to interpret others' behaviors as hostile or threatening. Similarly, individuals with schizotypal personality disorder exhibit social withdrawal and detachment from reality, which may heighten their sensitivity to perceived slights or threats. As a result, they might be more prone to attributing negative or hostile intent to others.

Depressive symptoms commonly accompany various mental health disorders. In the case of HA, it seems that personality pathology, and especially NA as well as detachment, are vital. It would be interesting to analyze HA in other mental disorders and determine whether it is a more general factor of psychopathology (Zajenkovska et al., 2024) or whether it is typical for certain disorders such as anxiety disorders, personality disorders, or schizophrenia and other psychotic disorders (Zajenkovska, Rogoza et al., 2021).

Our results also have diagnostic implications, as the presence of depression in BPD can often lead to misdiagnosis, overshadowing the underlying borderline pattern domains (Mullen-Magbalon, 2008). This is crucial since antidepressants typically show limited efficacy in treating depression within BPD (Gunderson et al., 2004), whereas psychotherapeutic interventions targeting BPD can alleviate depressive symptoms (Boritz et al., 2016). The experience of depression in BPD, often stemming from feelings of rejection or abandonment (APA, 2013), and the associated insecurity in attachment, characteristic of the NA domain, may heighten sensitivity to perceived hostility in close relationships (Bateman & Fonagy, 2008). This aligns with HA tendencies and suggests that borderline pattern domains, especially NA, plays a pivotal role in the development of HA. Such attributions can lead to maladaptive behaviors, impairing social relationships and potentially exacerbating depressive symptoms. Therefore, depression in BPD might indicate deeper personality pathology (Mullen-Magbalon, 2008). Furthermore, in a recent study by Ursulet et al. (2023), BPD was linked not with self-reported HA but with hostile expectancy violation (N400), highlighting the importance of personality pathology in specific HA types. Importantly, the recent approaches to personality pathology are based on empirical evidence (Gutiérrez et al., 2023; Swales, 2022; WHO, 2018). To date, classifications of personality disorders have been based on clinical prototypes (Swales, 2022). Investigating the interplay between personality pathology according to recent approaches, HA, and depression is crucial for developing effective psychotherapy treatments for individuals with personality disorders, particularly borderline pattern, enhancing their social functioning.

To understand why depression ceased to be a predictor of HA in our studies, it is insightful to consider various theoretical perspectives on depression. Beck et al.'s (1979) theory of depression emphasizes the

role of childhood experiences in establishing dysfunctional, negative beliefs about oneself and the world. According to this theory, when these entrenched beliefs interact with negative life events, they may contribute to the development of depression. This is characterized by the emergence of more specific negative beliefs: a negative view of the self, the world, and the future. Thus, negative beliefs about the self and the world originating from childhood play a central role in the development of cognitive biases, personality pathology associated with depression. This could explain why this particular type of HA, that is, negative expectations seems to be particularly associated with BPD features and depression. However, negative expectations can stem from negative beliefs about the self and the world that are ingrained from childhood. Negative expectations may arise from these deeply ingrained beliefs. Other aspects of depression, such as intense sadness, somatic issues like sleep difficulties, motivational disorders like passivity, and affective disorders, stem from these beliefs combined with interpersonal problems (Beck et al., 1979). This point is crucial, as our studies primarily focused on the symptoms of depression rather than on depression in the context of a disturbed personality structure. Therefore, depression may have ceased to be a significant predictor. This is also supported by the fact that, in Study 1, depression as measured by the Brief symptom inventory depression dimension subscale (the BSI-II) ceased to be a significant predictor but at a trend level. This trend could be attributed not just to the smaller sample size but also to the use of an instrument (the BSI II) that, unlike the instrument in the second study (PHQ-9), assessed various aspects of depression related to negative self-beliefs (e.g., feelings of worthlessness).

Limitations

It is worth noting the limitations of our studies. First, we used a short version of the PID-5, which does not include a measurement of the traits that make up the personality pathology domains. It is possible that only some traits in the NA and detachment domains are associated with HA. Future research should therefore include a trait-measured extended version of the PID-5. This will enable a more comprehensive approach to the role of BPD features in the context of HA as well as depression.

Secondly, it is worth noting that the result concerning the prediction of HA by NA is at the level of statistical tendency. Hence, one should be cautious when interpreting it. However, it is worth bearing in mind that this study involved a small group of participants and the significance of the result could increase with a larger sample. Hence, we recommend continuing the study with a larger group of people.

Crucially, due to the nature of the study, we cannot speak of a cause and effect relationship. Most likely, the variables we investigated affect each other. Our explanation of the possible direction is one of many. There is a need for further research, including that focusing on children and adolescents, but also on longitudinal studies controlling also for parental care and quality of attachment, closely related to all studies variables.

When interpreting the results of our study, it is important to consider potential cultural differences. Research indicates that individuals from more collectivist cultures (e.g., Japan, Poland) often exhibit less hostile attribution towards acquaintances compared to those from

individualistic cultures (e.g., the United States). However, they may direct more hostility towards authority figures (Zajenkowska, Russa et al., 2021). Future studies should investigate whether the predictive power of pathological domains for HA varies across different cultures or socio-relational contexts.

Conclusion

The integration of self-report assessments and EEG-based measurements in our research has offered a more comprehensive understanding of the association between HA and depression. Our findings suggest that, in investigating HA, it is more important to consider depressive tendencies stemming from underlying personality pathology rather than mere symptoms of depression. Furthermore, in the context of HA, specific aspects of this bias—such as ascribing intentionality and blame, as well as the expectation of hostile intentions—should be further investigated in relation to both BPD features and depressive symptoms. Our study, by exploring the connections between depression, personality pathology, and cognitive biases, presents ideas for future research and practical interventions.

ACKNOWLEDGMENTS

This research was funded by National Science Centre, Poland grant number UMO-2021/42/E/HS6/00018.

All the authors declare that they have no conflict of interest.

DATA AVAILABILITY

None of the experiments were preregistered. The associated data, all study materials, and analysis code, are openly available from Open Science Framework under the link: https://osf.io/mq2jv/?view_only=53c5736fbaab4dc9a16b06fb22ae0324

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RECEIVED 15.04.2023 | ACCEPTED 20.10.2024

APPENDIX

For comparison purposes, we also conducted a hierarchical regression analysis for the general population and inmate groups separately. Within the general population sample, age and gender were significant predictors in Step 1, accounting for 13.2% of the variance in hostile attributions (HA). In Step 2, depression emerged as a significant predictor ($p < .001$), while age and gender remained significant ($p < .05$), with the model explaining 23.6% of the variance. In Step 3, depression was no longer a significant predictor, whereas negative affectivity (NA), detachment, and psychoticism became significant ($p < .001$). Additionally, age ($p < .01$) remained a significant predictor. The final model was statistically significant, $F(8, 110) = 10.34$, $p < .001$, explaining 38.8% of the variance in hostile attributions. However the R^2 change was not significant. Regression analysis results are presented in Table A1.

In the inmate group, no significant predictors of HA were identified in Step 1. In Step 2, depression emerged as a significant predictor of HA. However, in Step 3, depression was no longer significant, and NA emerged as a significant predictor ($p < .05$). The final model was significant at a trend level, $F(6, 57) = 2.074$, $p = .07$, and explained 9.3% of the variance in hostile attributions.

TABLE A1.

Hierarchical Regression Analysis of Predictors of Hostile Attributions for the General Population– Study 2

Dependent variable: Hostile attributions, $F(8, 110) = 10.34$, $p < .001$						
	Model 1		Model 2		Model 3	
	<i>B</i>	<i>b</i>	<i>B</i>	<i>b</i>	<i>B</i>	<i>b</i>
Age	-.02**	-.33**	-.02**	-.31**	-.02**	-.31**
Gender	-.30*	-.19*	-.28*	-.17*	-.19	-.12
Depression			.47**	.33**	.22	.16
NA					.33**	.31**
DI					.15	.12
DE					.29*	.22*
AN					.18	.13
PS					-.3*	-.24*
Adjusted R^2	.13		.24		.39	

Note. Gender coded: 0 = women, 1 = men; AIHQ = hostile attributions, PHQ = depression, NA = Negative Affectivity, DI = Disinhibition, DE = Detachment, AN = Antagonism, PS = Psychoticism

* $p < .05$, ** $p < .001$.

Relatedness frustration

Keywords: relatedness frustration, loneliness, psychological needs, mental health

1. Background

Enforced isolation and virtual interactions during the COVID-19 pandemic underscored the importance of social relationships. Research has shown that perceived loneliness during lockdown was associated with heightened anxiety and depression (Sloot & Vauclair, 2023). These findings are not surprising, considering the principles of Basic Needs Theory (BNT, Ryan et al., 1996), a part of Self-Determination Theory (Deci & Ryan, 2000). According to BNT, fulfilling three essential psychological needs: relatedness (the need to feel connected and belonging to others), autonomy (the need to feel in control of one's actions and decisions) and competence (the need to feel effective and capable) is crucial for mental health. While all three needs are important, studies suggest that the first one is the most related to wellbeing (Tindall & Curtis, 2019). This emphasis on relatedness may be explained by deep-rooted and universal human desire to connect with others and build lasting relationships (Baumeister & Leary, 1995). Better understanding relatedness may be thus crucial for developing intervention aimed to improve mental health.

2. Definition

Building on the work of previous researchers (e.g., Baumeister & Leary, 1995; Bowlby, 1958; Harlow, 1958), Deci and Ryan (2000, pp. 231) define relatedness as “the desire to feel connected to others - to love and care, and to be loved and cared for”. In other words, relatedness encompasses the desire to feel supported, valued, and included by others (Deci & Ryan, 2000). According to Deci and Ryan (2000), when relatedness needs (or other needs) are met, it leads to **relatedness satisfaction** (or autonomy/competence satisfaction) which denotes the fulfilment of social needs. Conversely, when relatedness needs (or other needs) are unmet, it leads to **relatedness frustration** (or autonomy/competence frustration), which involves an experience of social rejection, exclusion, or neglect. To measure satisfaction and frustration of relatedness, the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen, et al., 2015b) was developed. While relatedness satisfaction involves positive experiences of connection and inclusion, relatedness frustration (also called “disconnection”; Chen et al., 2021,

Sheldon et al., 2011) is characterized by negative experiences of social exclusion or interpersonal conflict (Chen et al., 2015).

3. Differentiating Relatedness Frustration and Satisfaction

BNT's assumptions suggest that relatedness satisfaction and relatedness frustration are on the same dimension - the lack of need satisfaction is equal with the presence of frustration (Deci & Ryan, 2000). Meanwhile, researchers have argued that need frustration is distinct from need satisfaction (Sheldon & Gunz, 2009; Longo et al., 2016, Tindall & Curtis, 2019). In this area, Longo and colleagues (2016) posit that satisfaction and frustration have separate theoretical foundations, suggesting that they should predict different results. This assumption has been confirmed across studies on various age group. In three longitudinal studies of Schmidt and colleagues (2020) on 9-12 years old children, relatedness satisfaction and frustration were distinct constructs and showed different relationships with positive and negative affect. Relatedness frustration was strongly associated with increased negative affect, including unhappiness, sadness, and anxiety. At the same time, it was not related to positive affect which consist of happiness, and life satisfaction. Conversely, relatedness satisfaction was linked to increased positive affect, but not to negative affect. In other words, feeling included and liked at school did not guarantee protection from feelings of exclusion or being picked on. Moreover, research indicate that children who frequently experience social rejection or exclusion may be at risk of developing maladaptive emotional patterns, including an increased susceptibility to depressive symptoms (Wichers, 2014). Similarly, studies of adolescents in China, United States and Peru showed that regardless of nationality, satisfaction of all three needs were most strongly associated with positive well-being indicators, such as life satisfaction and vitality and frustration of these needs was most closely linked to ill being, including depressive symptoms (Chen et al., 2015a). A study conducted by Ferrand and Martinent (2020) among older adults, particularly those living alone or in nursing homes, also showed that relatedness frustration significantly predicted depressive symptoms. Furthermore, this relationship was mediated by the emotional effects of social exclusion.

Since relatedness frustration is salient in important relationships, researches especially focus on romantic relationships in this area (e.g., Vanhee et al., 2016). The study of Vanhee and colleagues (2018) showed that partners with unmet relatedness needs are more likely to experience relational dissatisfaction, tend to initiate conflicts more frequently and engage in

destructive communication patterns during disagreements. The absence of emotional support and perceived neglect can heighten feelings of frustration, leading to a cycle of unresolved conflicts that further strain the relationship. Importantly, for both men and women, relatedness needs are equally crucial (Vanhee et al., 2016).

4. Challenges in Fulfilling Relatedness Needs

Undoubtedly, relatedness plays a crucial role in mental health. According to needs-as-motive hypothesis, people may be motivated to fulfil this need (Deci & Ryan, 2000, Sheldon & Gunz, 2009). Indeed, those who feel lack of social connection feel motivated to look for experiences to fulfil it, especially in situation when relatedness needs are threatened (Sheldon & Gunz, 2009). Social media platform like Facebook are one of the sources for finding these experiences (Sheldon et al., 2011). While users of social media often report greater feelings of connection, these platforms do not necessarily reduce their sense of disconnection. In other words, social media may only satisfy short-term needs and may fall short of fulfilling the deeper need for relatedness (Sheldon et al., 2011). Individuals experiencing frustration with unmet relatedness needs may struggle to maintain long-term relationships, opting instead for more casual connections. Interestingly, some studies suggest that relatedness frustration is even linked to defensive reactions on social media, such as self-protective behaviors like blocking and unfollowing others (Chen et al., 2021). This implies that people frustrated by their need for relatedness may not know how to build close relationships, which potentially leads them into a vicious cycle where their actions push them further from fulfilling their needs.

People experiencing relatedness frustration may have difficulty working towards fulfilling this need. Consequently, interventions aimed at addressing relatedness frustration could play a crucial role in breaking this pattern. By understanding relatedness frustration, professionals can better address developmental and long-term psychological challenges. Such targeted interventions have the potential to improve relational outcomes by encouraging supportive and empathetic behavior (Vanhee et al., 2018). For example, in both university and workplace settings, creating a sense of inclusion is essential for reducing depression and negative affect (Tindall & Curtis, 2019). In this area, peer-led social inclusion programs, have been shown to enhance feelings of belonging and decrease loneliness among students (Mattanah et al., 2010). The role of educators is also crucial, as genuine care, respect, and valuing students reinforce relatedness and enhance well-being (Niemic & Ryan, 2009). Furthermore, training programs aimed at cultivating respect, cohesion, and shared goals in leadership can strengthen leader-

employee relationships, thereby fostering a greater sense of relatedness and community (Kovjanic et al., 2013).

To effectively assess the impact of these strategies, a better understanding of relatedness frustration is essential, particularly through longitudinal studies (Tindall & Curtis, 2019). This exploration is especially important in light of the increasing reliance on technology and the shifts brought about by the COVID-19 pandemic, which have - as discussed throughout this entry - fundamentally transformed how people connect and interact, leading to heightened relatedness frustration and its significant implications for mental health.

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Imię i Nazwisko: Anna Zajenkowska

Afiliacja: Uniwersytet WIZJA

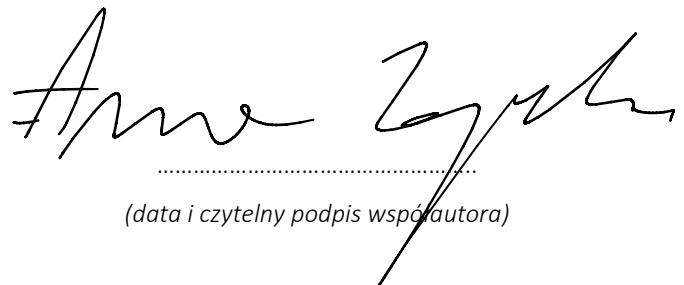
Oświadczenie o współautorstwie

A) Oświadczam, że w artykule:

Jakubowska, A., **Zajenkowska, A.**, & Garofalo, C. (2023). Depression and personality disorders among incarcerated offenders convicted of impulsive versus premeditated homicide. *The Journal of Forensic Psychiatry & Psychology*, 34(5–6), 502–520.

- Mój wkład polegał na: opracowaniu koncepcji badań, nadzorze badań, współprzygotowaniu pierwszej wersji artykułu oraz odpowiedzi na recenzje.

- Wkład Adrianny Jakubowskiej polegał na: prowadzeniu badań, przeprowadzeniu analiz statystycznych, przygotowaniu pierwszej wersji manuskryptu i odpowiedzi na recenzje - wkład procentowy: 70%.



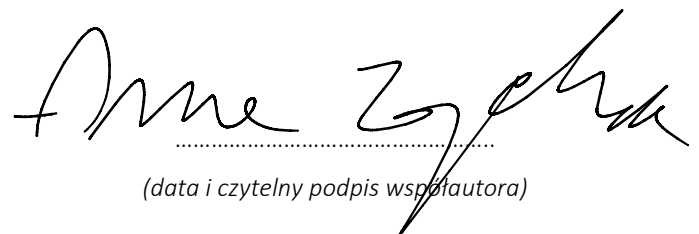
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B) Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., Pietraszkiewicz, A., **Zajenkowska, A.**, Lacko, D., Wawer, A., & Sarzyńska-Wawer, J. (2024). Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study. *Cognition & Emotion*, 39(7), 1693–1702..

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- Wkład Adrianny Jakubowskiej polegał na: współprzygotowaniu pierwszej wersji artykułu - wkład procentowy: 20%.



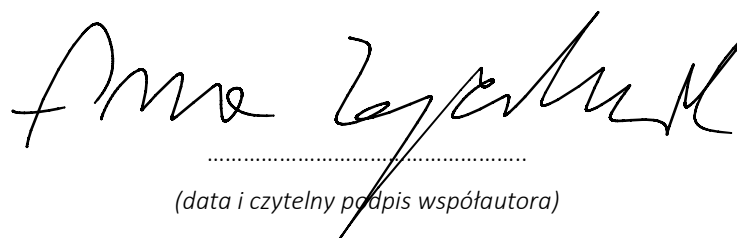
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C) Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., **Zajenkowska, A.**, Nowakowska, I., Duda, E., Bodecka-Zych, M., & Zarazińska, A. (2024). Through the Looking Glass... Impact of priming social comparisons on automatic and volitional attention processes in depression: An eye-tracking experimental study. *Attentional biases in depression* [Preprint]. OSF.

- Mój wkład polegał na: współprzygotowaniu pierwszej wersji artykułu

- Wkład Adrianny Jakubowskiej polegał na: konsultowaniu całości manuskryptu, współprzygotowaniu pierwszej wersji artykułu i odpowiedzi na recenzje - wkład procentowy: 30%.



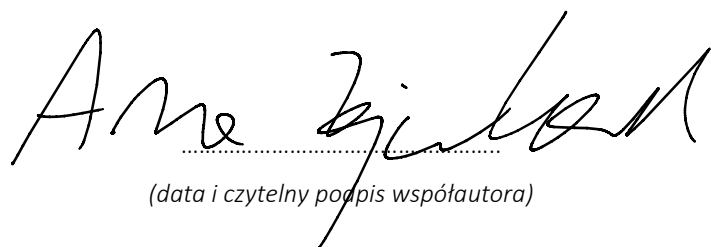
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D) Oświadczam, że w artykule:

Jakubowska, A., **Zajenkowska, A.**, Kaźmierczak, I., Zarazińska, A., Olechowska, A., Molińska, W., & Pinkham, A. E. (2023). *Anger sensitivity and relatedness frustration as predictors of depression. Personality and Individual Differences, 215*, 1–6.

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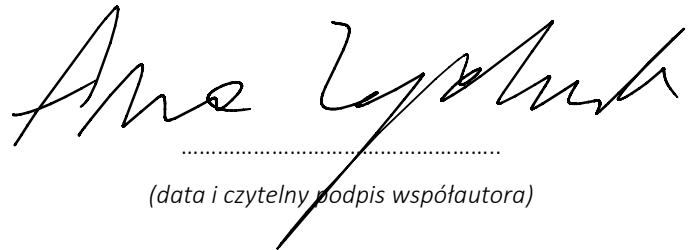


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(data i czytelny podpis współautora)

E) Oświadczam, że w artykule:

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- Mój wkład polegał na: nadzorze badań, współprzygotowaniu pierwszej wersji artykułu, odpowiedzi na recenzje.
- Wkład Adrianny Jakubowskiej polegał na: prowadzeniu badań, przeprowadzeniu analiz statystycznych, przygotowaniu pierwszej wersji artykułu i odpowiedzi na recenzje - wkład procentowy: 70%.



.....
(data i czytelny podpis współautora)

Imię i Nazwisko: Izabela Kaźmierczak

Afiliacja: Akademia Pedagogiki Specjalnej

Oświadczenie o współautorstwie

A) Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., Pietraszkiewicz, A., Zajenkowska, A., Lacko, D., Wawer, A., & Sarzyńska-Wawer, J. (2024). Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study. *Cognition & Emotion*, 39(7), 1693–1702..

- Mój wkład polegał na: opracowaniu koncepcji badań, nadzorze badań, współprzygotowaniu pierwszej wersji artykułu oraz odpowiedzi na recenzje

- Wkład Adrianny Jakubowskiej polegał na: współprzygotowaniu pierwszej wersji artykułu - wkład procentowy: 20%.

.....Kaźmierczak.....

(data i czytelny podpis współautora)

15.11.2025

B) Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., Zajenkowska, A., Nowakowska, I., Duda, E., Bodecka-Zych, M., & Zarazińska, A. (2024). Through the Looking Glass... Impact of priming social comparisons on automatic and volitional attention processes in depression: An eye-tracking experimental study. *Attentional biases in depression* [Preprint]. OSF.

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Kaźmierczak

(data i czytelny podpis współautora)

15. 11. 2025

C) Oświadczam, że w artykule:

Jakubowska, A., Zajenkowska, A., Kaźmierczak, I., Zarazińska, A., Olechowska, A., Molińska, W., & Pinkham, A. E. (2023). *Anger sensitivity and relatedness frustration as predictors of depression. Personality and Individual Differences, 215*, 1–6.

- Mój wkład polegał na: opracowaniu koncepcji badań, nadzorze badań, współprzygotowaniu pierwszej wersji artykułu

- Wkład Adrianny Jakubowskiej polegał na: współprojektowaniu badania, przeprowadzeniu analiz statystycznych, przygotowaniu pierwszej wersji manuskryptu i odpowiedzi na recenzje - wkład procentowy: 70%.

15. 11. 2025 Kaźmierczak

(data i czytelny podpis współautora)

Name: Carlo Garofalo

Affiliation: University of Perugia

Statement

I declare that in the paper:

Jakubowska, A., Zajenkowska, A., & **Garofalo, C.** (2023). Depression and personality disorders among incarcerated offenders convicted of impulsive versus premeditated homicide. *The Journal of Forensic Psychiatry & Psychology*, 34(5–6), 502–520.

- My contribution consisted of the following: Writing - Original Draft; Writing- Review & Editing; Supervision
- Adrianna Jakubowska's contribution consisted of: conducting research, statistical analysis, preparation of the first draft of the manuscript, and responding to reviews - percentage contribution: 70%

Firmato digitalmente da: Carlo Garofalo
Organizzazione: UNIVERSITA' DI PERUGIA/00448820548
Limitazioni d'uso: Explicit Text. I titolari fanno uso del certificato solo per le finalità di lavoro per le quali esso è rilasciato. The certificate holder must use the certificate only for the purposes for which it is issued.
Data: 14/11/2025 16:43:03

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Date and signature

Name: Jean Gagnon

Affiliation: University of Montreal

Statement

I declare that in the paper:

Jakubowska, A., Zajenkowska, A., & **Gagnon, J.** (2025). The role of borderline pattern in the relationship between hostile attributions and depression: Studies including electroencephalography method. *Advances in Cognitive Psychology*, 21(1), 40–52.

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Date and signature

Imię i Nazwisko: Anna Zarazińska-Chromińska

Afiliacja: Akademia Pedagogiki Specjalnej

Oświadczenie o współautorstwie

A) Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., Zajenkowska, A., Nowakowska, I., Duda, E., Bodecka-Zych, M., & Zarazińska, A. (2024). Through the Looking Glass... Impact of priming social comparisons on automatic and volitional attention processes in depression: An eye-tracking experimental study
Attentional biases in depression [Preprint]. OSF.

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-Wkład Adrianny Jakubowskiej polegał na: współprzygotowaniu pierwszej wersji artykułu i odpowiedzi na recenzje - wkład procentowy: 30%.

20.11.2025r. Anna Zarazińska-Chromińska

(data i czytelny podpis współautora)

B) Oświadczam, że w artykule:

Jakubowska, A., Zajenkowska, A., Kaźmierczak, I., Zarazińska, A., Olechowska, A., Molińska, W., & Pinkham, A. E. (2023). Anger sensitivity and relatedness frustration as predictors of depression. *Personality and Individual Differences*, 215, 1–6.

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20.11.2025r. Anna Zarazińska-Chromińska

(data i czytelny podpis współautora)

Imię i nazwisko: Iwona Nowakowska

Afiliacja: Akademia Pedagogiki Specjalnej im. Marii Grzegorzewskiej w Warszawie

Oświadczenie o współautorstwie

Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., Zajenkowska, A., **Nowakowska, I.**, Duda, E., Bodecka-Zych, M., & Zarazińska, A. (2024). Through the Looking Glass... Impact of priming social comparisons on automatic and volitional attention processes in depression: An eye-tracking experimental study
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(data i czytelny podpis współautora)

Imię i Nazwisko: Anna Olechowska

Afiliacja: Akademia Pedagogiki Specjalnej

Oświadczenie o współautorstwie

Oświadczam, że w artykule:

Jakubowska, A., Zająkowska, A., Kaźmierczak, I., Zarazińska, A., **Olechowska, A.**, Molińska, W., & Pinkham, A. E. (2023). *Anger sensitivity and relatedness frustration as predictors of depression. Personality and Individual Differences, 215*, 1–6.

- Mój wkład polegał na: współprojektowaniu badania, współprzygotowaniu pierwszej wersji artykułu
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.....*Anna Olechowska*.....

(data i czytelny podpis współautora)

Name: David Lacko

Affiliation: Czech Academy of Sciences

Statement

I declare that in the paper:

Kaźmierczak, I., Jakubowska, A., Pietraszkiewicz, A., Zajenkowska, A., **Lacko, D.**, Wawer, A., & Sarzyńska-Wawer, J. (2024). Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study. *Cognition & Emotion*, 39(7), 1693–1702.

- My contribution consisted of the following: I assisted with the preparation of the first version of the article and conducted statistical analyses.
- Adrianna Jakubowska's contribution consisted of: co-preparation of the first draft of the article
- percentage contribution: 20%.

13. 11. 2025



.....
Date and signature

Bern, 16.11.2025

Imię i Nazwisko: Agnieszka Pietraszkiewicz

Afiliacja: Uniwersytet w Bernie

Oświadczenie o współautorstwie

A) Oświadczam, że w artykule:

Kaźmierczak, I., Jakubowska, A., **Pietraszkiewicz, A.**, Zajenkowska, A., Lacko, D., Wawer, A., & Sarzyńska-Wawer, J. (2024). Natural language sentiment as an indicator of depression and anxiety symptoms: a longitudinal mixed methods study. *Cognition & Emotion*, 1–10.

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- Wkład Adrianny Jakubowskiej polegał na: współprzygotowaniu pierwszej wersji artykułu - wkład procentowy: 20%.

Agnieszka Pietraszkiewicz

.....
(data i czytelny podpis współautora)

Imię i Nazwisko: Justyna Sarzyńska-Wawer

Afiliacja: Polska Akademia Nauk

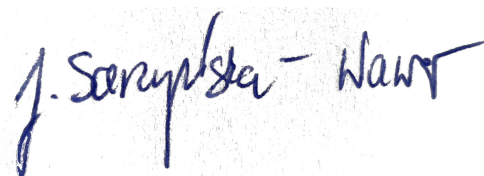
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21.11.2025

A handwritten signature in blue ink, reading "J. Sarzyńska-Wawer". The signature is written in a cursive, flowing style.

(data i czytelny podpis współautora)