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ORIGINAL RESEARCH

The Pain Paradox of Borderline Personality and Total Knee Arthroplasty (TKA): Recruiting Borderline Personality Organization to Predict the One-Year Postoperative Outcome

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Background: TKA is a common treatment for arthropathies of the knee; however, its results are compromised by psychosocial equivalents of pain: prior research suggests persistent pain and dysfunction after TKA not only to be linked to psychological symptoms such as depression or anxiety but also to psychodynamic determinants of borderline personality, namely borderline personality organization. Osteoarthritis (OA) and Rheumatoid arthritis (RA), the main indications for TKA, are themselves linked to personality factors and disorders, e.g. borderline. The present study investigates the influence of borderline personality organization (BPO) on the outcomes of TKA one year postoperatively.

Methods: We studied 144 patients scheduled for primary TKA before and after the operation using the IPO-16 and the WOMAC for the assessment of knee pain and function.

Results: Non-parametric correlations were found between primitive defenses and knee-pain, not function. Linear regression showed prediction of knee pain and knee function by the preoperative WOMAC scores ($p<0.01$), whereas there was additional prediction of knee-pain by gender ($p=0.03$) and primitive defenses ($p=0.04$).

Discussion: The results suggest a psychodynamic mechanism of maladaptation after TKA apparently representing the bodily manifestations of fundamental psychic defenses.

Keywords: total knee arthroplasty, borderline, personality organization, chronic pain

Plain Language Summary

Borderline personality is associated with chronic pain. There are several models that try to explain, how an individual possibly develops this personality disorder. One of them is termed borderline personality organization. Therefore, we have studied people who undergo knee-surgery for chronic knee-pain, using an assessment scale which reflects the concept of borderline personality organization. The results show that the perception of pain after TKA is shaped by psychological defense mechanisms. This means that chronic pain can result from the mind rather than the body as a consequence of a certain constellation of the personality. The results suggest psychotherapy for individuals who are at risk of postoperative maladaptation to be a reasonable add-on to the surgical procedure. Aims of such psychotherapy pertain to the perception and tolerance of one´s own as well as others´ emotionality (mentalization) and to being more psychologically minded as far as psychosomatic, psychosocial and interactional issues are concerned.

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Introduction

Total knee arthroplasty is the ultima ratio therapy for knee osteoarthritis. Although promising as regards the individual´s pain-relief, this intervention leaves some patients unsatisfied with the postoperative algofunction. Against the background of a lack of objective complications in this subgroup of individuals with TKA, this phenomenon of postoperative maladaptation has been suspect of representing psychosomatic mechanisms since the turn of the century.[1] Subsequent research demonstrated psychopathological distress to be involved in dysfunctional processes leading to an unsatisfactory algofunction which persists postoperatively.[2] However, the assessment practices regarding not only the endpoints (measures of knee-pain), but also the psychic and psychosomatic suffering, are not consistent across studies with many authors reporting Quality of life (QoL) equivalents of psychometric constructs, such as the mental component score of the SF36.[3] This notwithstanding, the findings converge towards the general characteristic of TKA to be effectively undermined by negative affect,[4] which is mainly composed of depression and anxiety with some authors also subsuming aggression, alienation or absorptive detachment thereunder.[5] Depression and anxiety occur as entities of their own right, yet the dimensional load of these symptoms is nested with other psychologic phenomenology.[6] Pending surgery itself is an inductor of negative affect,[7] and the latter an adequate psychological reaction to facing invasive surgery. Yet, some individuals generate negative affects based on their structural vulnerability, which infers a systematic inclination for interpersonal and psychosocial problems, for example within the framework of a personality disorder.[8] Interestingly, some personality disorders, including borderline personality disorder (BPD) are also in linkage disequilibrium with the medical conditions necessitating TKA,[9] namely rheumatoid and osteoarthritis (OA). BPD is characterized by recurrent relational problems and rapid, as well as frequent mood changes. Furthermore,[10] it is associated with an increased health care utilization which, at least partly, results from the also comparatively higher prevalence of pain disorders in borderline personality.[9] From a psychoanalytic point of view, it is seen as a condition involving primitive (i.e. not properly matured) defenses, confusion of the identity and intact reality testing. According to psychoanalytic thinkers, defense mechanisms are employed unconsciously in order to prevent distressful mental contents from being perceived consciously.[11] Moreover, psychological defensive capacities are believed to develop over time leading to more sophistication over the years, as regards the adaptation to conflictual inner and interpersonal situations.[12] According to this point of view, mature defenses represent intrapsychic manouvers directed at minimizing distress and optimizing social functioning.[13,14] On the contrary, immature defenses make use of others in order to cope with intrapsychic distress and are therefore also referred to as interpersonal defenses.[15] Within the concept of borderline personality organization (BPO),[15] these immature defenses entail projection (viewing one`s own motifs in another person), splitting (inability to integrate different aspects of a person into a coherent total picture) and denial (inability to recognize certain aspects of the own or other´s psyche, that is not recognizing one´s own aggressive undercurrent or someone´s tendency to exploit other people). In addition, BPO comprises identity confusion and reality testing. The former refers to the blurriness of inner pictures and definitions. Reality testing refers to the capacity to differentiate intrapsychic from external stimuli, and to maintain empathy with ordinary social criteria of reality.[16] The constellation of BPO likely influences coping strategies and the mind set in the face of chronic pain and its therapy, which includes TKA for knee-OA. Indeed, personality characteristics have been linked to the outcomes of TKA, e.g. intro- and extraversion,[3] neuroticism, and, also, borderline features.[17] Specifically, a prior study found identity confusion to predict postoperative pain levels after TKA, at which pain eight weeks postoperatively was inversely associated with identity confusion. This finding is in-line with the so-called pain paradox of BPD,[18] which implies borderline personality to exert an anesthetic effect on acute, but the opposite impact on chronic pain. Transferred to TKA, the results of which are known to be undermined by psychosocial and psychosomatic problems, the pain paradox of BPD creates the expectation that pain levels in the longer follow-up would be predictable by BPO features. The present study tests this hypothesis based on a one-year follow-up.

Method

We enrolled 144 patients scheduled for elective primary TKA for osteoarthritis consecutively. All participants had given their written informed consent to participate in the study, which had been approved by the institutional ethical review board (Ethikkommission) of the Medical Faculty of the Otto-von-Guericke-University, Magdeburg (approval nr: 177/16). After being consented, the participants were asked to fill in questionnaires assessing the variables of interest, borderline personality features and the algofunction, either only or 1–2 days before (BPO) or 1–2 days

before and 12 months after the operation (algofunction). The sample description can be found in Table 1.

Questionnaire Measures

The algofunction (pain and function of the knee) was assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Cronbach's αs of the WOMAC range from 0.8 to 0.96 and its psychometric properties are judged good.[19] The WOMAC used in this study was the Likert version in the format of a numerical rating scale ranging from 0 to 10. The WOMAC results in the subscales knee-pain (WOMAC A), stiffness (WOMAC B), knee-function (WOMAC C) and a total score. The subscale stiffness is not reported in the present study.

The Hospital and special surgery knee index (HSS) is an observer-rated scale assessing pain and function of the knee. The scoring direction of that scale is opposite to the one of the WOMAC, i.e. higher scores indicate less pain.[20] We used it as an objective (observer-rated) measure in addition to the subjective (self-rated) WOMAC score.

The Borderline personality inventory-16 (IPO-16) is based on Kernberg´s model of personality organization and reflects the criteria of borderline personality organization, i.e. reality testing, predominance of primitive defenses and diffusion of the identity.[21] The IPO-16 is a self-rated measure in a 5-point Likert format ranging from 1 to 5 (possible range of total raw scores: 16–80). It consists of 16 items arranged in three subscales assessing reality testing (IPO-RT), predominance of primitive defenses (IPO-PD) and diffusion of the identity (IPO-ID), but also results in a total score (IPO-total). Cronbach´s α of the German version (which we used) of the IPO 16 is 0. 86 and the scale shows a good test–retest reliability.[22] The IPO-16 allows for the identification of borderline personality disorder according to DSM-criteria based on a cut-off (<2.0).[22]

Table 1 Description of the Sample

	Criterion	N (%)
Sociodemographic information	Single	30 (20.83)
	In a relationship or marriage	109 (75.69%)
	Other	5 (3.47)
Education	No degree	4 (2.8)
	Special school	2 (1.4)
	Secondary school	102(70.8)
	Highschool	36 (25.1)
Professional degree	Apprenticeship	79 (54.9)
	University	22 (15.3)
	No degree	7 (4.9)
	Master craftsmen	16 (11.11)
	Other	20 (13.9)
Job situation	Working fulltime	32 (22.2)
	Working part-time	10 (6.9)
	Housewife/-man	8 (5.6)
	Jobless	8 (5.55)
	Pension	83 (57.64)
	Unknown	3 (2.1)

Statistical Methods

We used Kendall´s tau to explore the relationships between the continuous variables knee pain and knee function and borderline pathology based on the skewed distribution of borderline personality organization in this sample. Reported results are understood as two-tailed. Stepwise multiple linear regression then served the prediction of the outcome variable (i.e. knee pain and -function). The independent variables were age and gender in addition to the IPO-16 total score and subscales (reality testing, identity diffusion and primitive defenses), the baseline WOMAC A and C, as well as HSS scores and a categorical variable coding for the presence or absence of borderline personality according to the cut-off of the IPO-16. This way, we aimed at controlling for the categorical expression of borderline personality, which might propel any of the examined relationships between BPO-features and the algofunction due to their higher severity in this category. We used SPSS 26 to compute those statistics. A previous study reported a moderate correlation (r = 0.32) between the IPO-16 and postoperative pain.[17] We used this finding as the basis of our power calculation, which we conducted by means of G*power (Version 3.1.9.2),[23] arriving at the minimum sample size of n=115 (two-tailed, power = 80). However, 146 participants were finally enrolled.

Results

Mean age was 65.82 (+10.26). Mean (SD) of knee-pain and function (Womac A and –C) at follow-up were 2.25 (2.08) and 2.60 (2.18), compared to 5.36 (2.05) and 5.28 (2.24) before TKA. Mean (SD) of the IPO total and subscale scores (identity diffusion, primitive defenses, reality testing) at baseline were 1.6 (0.46), 1.82 (0.6), 1.55 (0.51) and 1.4 (0.44). The distribution of IPO-scores was skewed (Skewness=2.65), as we had expected in this nonpsychiatric sample. Non-parametric correlations (Kendall´s tau) showed between knee-pain at follow-up and the preoperative algofunction, the preoperative HSS and the IPO-16 subscale primitive defenses. In addition, the preoperative WOMAC-C measures were correlated with the preoperative WOMAC A and HSS scores. Table 2 displays the respective correlational matrix. As regards the regression

Table 2 Correlational Matrix (Kendall´s Tau Above p) Between the Variables of Interest

		1	2	3	4	5	6	7	8	9
1) IPO total (preoperative)	T p	1	0.80 0.000	0.73 0.000	0.70 0.000	0.03 0.6	0.03 0.6	0.01 0.9	0.10 0.08	0.09 0.1
2) IPO- ID (preoperative)	T p	0.80 0.000	1	0.54 0.000	0.52 0.000	0.04 0.5	0.03 0.6	0.01 0.8	0.08 0.2	0.07 0.2
3) IPO PD (preoperative)	T p	0.73 0.000	0.54 0.000	1	0.55 0.000	0.02 0.8	0.03 0.7	0.01 0.9	0.12 0.04	0.11 0.2
4) IPO-RT (preoperative)	T p	0.70 0.000	0.52 0.000	0.55 0.000	1	0.02 0.8	0.01 0.9	−0.05 0.5	0.1 0.1	0.07 0.3
5) HSS (preoperative)	T p	0.03 0.6	0.04 0.5	0.02 0.8	0.02 0.8	1	−0.32 0.000	−0.35 0.000	−0.14 0.02	−0.14 0.02
6) WOMAC Knee-pain (preoperative)	T p	0.03 0.6	0.03 0.6	0.03 0.7	0.01 0.9	−0.32 0.000	1	0.60 0.000	0.22 0.000	0.17 0.03
7) WOMAC Knee-function (preoperative)	T p	0.01 0.9	0.01 0.08	0.01 0.9	−0.05 0.5	−0.35 0.000	0.60 0.000	1	0.25 0.000	0.22 0.000
8) WOMAC Knee-pain (1 yr. post-operative)	T p	0.10 0.08	0.08 0.2	0.12 0.04	0.10 0.10	−0.14 0.02	0.22 0.000	0.25 0.000	1	0.71 0.000
9) WOMAC Knee-knee-function (1 yr. post-operative)	T p	0.09 0.1	0.07 0.2	0.11 0.07	0.07 0.3	−0.14 0.02	0.17 0.003	0.22 0.000	0.71 0.000	1

Abbreviations: IPO, Inventory for the Assessment of Borderline Personality Organization; ID, Identity Diffusion; PD, Primitive defenses; RT, reality Testing; WOMAC, Western Ontario and McGill Universities Arthrosis Index; HSS: Hospital and Special Surgery Knee Score.

analyses, the total models were significant (cf. Table 3), and preoperative knee-function emerged as the best predictor of the algofunction one year. postoperatively. However, the post-operative knee-pain was also predicted by gender (p=0.03) and primitive defenses (p=0.04). Table 3 shows the respective statistics.

Discussion

The present study tests the predictability of postoperative pain one year after TKA by the features of BPO. As expected in the light of prior research,[17] we found a correlation between BPO and knee-pain, and postoperative knee-pain one year after TKA proved predictable by female gender and primitive defenses. However, the strongest predictor of the postoperative algofunction was the preoperative function of the knee. Women have higher rates of OA compared to men due to a faster loss of articular cartilage.[24,25] Moreover, women with TKA report more pain than men with TKA, both before and after arthroplasty, and the preoperative algofunction is an established predictor of the postoperative algofunction.[26] This notwithstanding, the prediction of the postoperative outcome after TKA by BPO is a novel finding.

Table 3 A and B: Stepwise Multiple Linear Regression Predicting Knee Pain (A) and Stepwise Multiple Linear Regression Predicting Knee Function (B)

Multiple Stepwise Linear Regression	Predictors	B	SE	β	t	p	C.I. Lower	C.I. Upper
a) Dependent: knee pain one yr. postop. Total model: df=3; F=10.11;p<0.01; R^2=0.18	Gender	0.75	0.35	0.17	2.15	0.03	0.06	1.43
	WOMAC preoperative knee-function	0.33	0.074	0.35	4.47	0.000	0.19	0.48
	IPO-PD	0.71	0.34	0.16	2.06	0.04	0.03	1.389
b) Dependent: knee function one yr. postop. Total model: df=3; F=10.11;p<0.01; R^2=0.18	WOMAC preoperative knee-function	0.32	0.08	0.35	4.32	0.000	0.19	0.50

Abbreviation: PD, Primitive Defenses.

It supports the hypothesis expressed by Sansone & Sansone,[18] who defined the pain paradox of BPD such that this personality constellation mediates protection against acute pain, which, furthermore, might otherwise limit the pathognomonic habit of self-harm in BPD. However, according to the same authors,[18] BPD also causes vulnerability for chronic pain in the long run. Moreover, the present findings reflect the association between BPD and arthritis,[27] which obviously turns into transplant pain in the postoperative course in a subgroup of patients with TKA, possibly under the involvement of psychodynamic and psychosomatic mechanisms.

Yet, how could those operate? Defenses, in general, are viewed as mental action enabling us to cope with frustration, to deal with conflict and to tolerate unbearable affects or emotions.[11] Conceivably, the prospect of undergoing TKA may evoke hardly bearable affects. In addition to this, BPO is linked to prior trauma, rendering it a posttraumatic condition in the eyes of at least some researchers.[28] A surgical intervention implies the violation of the bodily integrity and may, therefore, be especially difficult to cope with for the traumatized, who tend to suffer from the re-activation of experienced trauma.[29] Such activation is believed to occur due to cues reminiscent of the prior trauma which has ultimately led to the posttraumatic condition,[29] and the anticipation of knee-surgery may well fall into this category, since surgery does involve the violation of physical boundaries within an interpersonal relationship.[10] From a psychodynamic point of view, fear and inner conflict induce defensive action against the threat of the distressful and harming potential imminent to trauma-related experience. Therefore, finding primitive defenses in linkage with postoperative maladaptation is reasonable and heuristically coherent. Primitive defenses are a necessary means of coping in infancy, but their excessive and persistent use is a potential impediment to the proper development of the individual, at the same time.[11] Projection is the base of identification with the aggressor and refers to the unconscious act of turning motifs and affects of the other inward, while projecting or misaligning the own inner situation to the outer world. This mechanism is also said to increase the propensity for self-harm and to promote the loss of self by means of identity with the object.[30] Such a psychodynamic constellation could be reflective of a history of rejection,[31] at which the body may become part of the projection screen, on which the internalized object is being expressed. Generally, the maturity of the personality and its underlying psychic structures manifests as the ability to cope with tension more adaptively, whereas less maturity may not only lead to self-harm and abusive patterns of interpersonal relationships (acting-out), but also give rise to the propulsion of the excess of excitement into the body (acting-in).[32] The doctor–patient-relationship as a special form of interpersonal pairing, is a background, against which an appellative illness behavior, often characterized by binding through symptoms and their being narrated with high involvement,[33] can unfold with success. Doury-Panchout et al (2015) showed longer hospitalization to be a correlate of psychological distress in people undergoing TKA,[34] who do nevertheless not have a worse outcome à la longue. Hence, distress signaling might work out for those patients with TKA who – possibly due to psychodynamic predispositions – suffer from marked psychopathologic distress at the same time, and cannot express their unspeakable relational needs unless by acting them in physically in the form of an irregular postoperative algofunction, thus calling for care and devotion. The present findings and theorizing do have important clinical implications: Individuals with BPD have difficulty bearing the endogenous, continuous and uncontrollable nature of chronic pain.[18] Sansone & Sansone explained this phenomenon by the reference to the insufficient effectiveness of their capacity to regulate inner tension including pain. Furthermore, people with BPD have high rates of prior trauma,[28] which may lead to an intensified pain-focus.[35] Along these lines, Harper et al have highlighted the intolerance of pain associated with BPD and concluded "that the borderline patients´ tolerance of discomfort will typically be of shorter duration than other individuals".[36] Not least,[37] BPD is linked to the sustained and immoderate consumption of opioids which may be so highly estimated by people with BPD because of their psychoactive, soothing capacity. Finally, the aforementioned specific intolerance of inner tension and pain-sensations inherent to BPD has one clinical consequence as far as the reliance on self-rated pain measures is concerned. The present results demonstrate the prediction of self-rated postoperative pain by borderline features, as opposed to a prediction by observer-rated scales, underscoring the inherently subjective nature of self-rated pain measures.[26] Therefore, clinicians may prefer to rely on observer-rated scales for the assessment of the algofunction, and in addition, may wish to routinely engage psychiatrists or psychologists in the process of planning and performing surgery in people with BPD. This interdisciplinary integration would allow for the appropriate conclusions to be drawn from the subjective character of the self-report of pain in individuals whose psychological predisposition for postoperative maladaptation is shaped by inherent borderline features. Moreover, the present results suggest to offer psychosocial

support to a subgroup of patients with TKA in order to counterbalance the difficulty bearing inner tension by means of an optimized tolerance of distress and an improved mentalization (i.e. a differentiated inner and interpersonal perception). In conclusion, the present study corroborates the results of an earlier study, which showed the involvement of borderline personality characteristics in the postoperative adaptation to TKA. The nature of this interaction could be hierarchical with psychological defenses functioning as a higher-order factor in control of the generation of pain-triggers such as negative affect,[5] pain-related anxieties and, ultimately, a maximizing pain focus. Thus, the results underscore the significance of the psychotherapeutic access to chronic pain also as regards secondary prevention after TKA. The present study was prospective in nature, comprises a 12-month follow-up as well as a fairly big sample. It was, however, cross-sectional in nature and restricted to participants with primary TKA for OA. Therefore, the sample cannot be representative of all patients undergoing TKA. The prediction of postoperative maladaptation by a psychodynamic construct, however, adds to the findings linking physical outcomes to personality characteristics and lends an expedient explanation to the clinical associations between BPD and chronic pain.

Ethical Approval

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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References

1. Brander VA, Stulberg SD, Adams AD, et al. Predicting total knee replacement pain: a prospective, observational study. *Clin Orthop Relat Res*. 2003;416:27–36. doi:10.1097/01.blo.0000092983.12414.e9
2. Vissers MM, Bussmann JB, Verhaar JAN, Busschbach JJV, Bierma-Zeinstra SMA, Reijman M. Psychological factors affecting the outcome of total hip and knee arthroplasty: a systematic review. *Semin Arthritis Rheum*. 2012;41:576–588. doi:10.1016/j.semarthrit.2011.07.003
3. Vogel M, Riediger C, Illiger S, Frommer J, Lohmann Z. [A review on psychosomatic factors affecting the outcome after total knee-arthroplasty (TKA)]. *Psychosom Med Psychother*. 2017;63(4):370–387. doi:10.13109/zptm.2017.63.4.370
4. Nandi M, Schreiber KL, Martel MO, et al. Sex differences in negative affect and postoperative pain in patients undergoing total knee arthroplasty. *Biol Sex Differ*. 2019;10(1):23. doi:10.1186/s13293-019-0237-7
5. Vancleef LM, Vlaeyen JW, Peters ML. Dimensional and componential structure of a hierarchical organization of pain-related anxiety constructs. *Psychol Assess*. 2009;21:340–351. doi:10.1037/a0016246
6. Lilienfeld SO, Turner SM, Jacob RG. Anxiety sensitivity: an examination of theoretical and methodological issues. *Adv Behav Res Ther*. 1993;15:147–183. doi:10.1016/0146-6402(93)90019-X
7. Yilmaz M, Sezer H, Gürler H, Bekar M. Predictors of preoperative anxiety in surgical inpatients. *J Clin Nurs*. 2011;21:956–964. doi:10.1111/j.1365-2702.2011.03799.x
8. Wrege JS, Ruocco AC, Euler S, et al. Negative affect moderates the effect of social rejection on frontal and anterior cingulate cortex activation in borderline personality disorder. *Cogn Affect Behav Neurosci*. 2019;19:1273–1285. doi:10.3758/s13415-019-00716-0
9. Frankenburg FR, Zanarini MC. The association between borderline personality disorder and chronic medical illnesses, poor health-related lifestyle choices, and costly forms of health care utilization. *J Clin Psychiatry*. 2004;65(12):1660–1665. doi:10.4088/JCP.v65n1211
10. Sansone RA, Samsone IA, Wiedermann MW. Borderline personality and health care utilization in a primary care setting. *South Med J*. 1996;89:1162–1165. doi:10.1097/00007611-199612000-00006
11. Eekhoff JK. Terrified by suffering, tormented by pain. *Am J Psychoanal*. 2018;78(4):361–369. doi:10.1057/s11231-018-9156-3
12. Cramer P. Defense mechanisms: 40 ys of empirical research. *Pers Assess*. 2014;97:114–122. doi:10.1080/00223891.2014.947997
13. Kernberg OF. *Severe Personality Disorders*. New Haven CT: Yale University press; 1984.
14. Cramer P. Understanding defense mechanisms. *Psychodyn Psychiatry*. 2015;43(4):523–552. doi:10.1521/pdps.2015.43.4.523
15. Perry JC, Presniak MD, Olson TR. Defense mechanisms in schizotypal, borderline, antisocial, and narcissistic personality disorders. *Psychiatry*. 2013 Spring;76(1):32–52. doi:10.1521/psyc.2013.76.1.32
16. Kernberg OF. A psychoanalytic theory of personality disorders. In: JF C, Lenzenweger MF, editors. *Major Theories of Personality Disorder*. Vol. (1996). New York: Guilford Press; 1996:1114–1156.
17. Vogel M, Riediger C, Illiger S, Frenzel L, Frommer J, Lohmann CH. Using borderline personality organization to predict outcome after total knee arthroplasty. *Psychother Psychosom*. 2017;86(3):183–184. doi:10.1159/000454927
18. Sansone RA, Sansone LA. Borderline personality and the pain paradox. *Psychiatry (Edgmont)*. 2007;Apr(4):40–46.
19. Bellamy N, Buchanan WW, Goldsmith CH, et al. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. *J Rheumatol*. 1998;15:1833–1840.
20. Insall JN, Dorr LD, Scott RD, Scott WN. Rationale of the knee society clinical rating system. *Clin Orthop Relat Res*. 1989;248:13–14.

21. Lenzenweger MF, Clarkin JF, Kernberg OF, Foelsch PA. The inventory of personality organization: psychometric properties, factorial composition, and criterion relations with affect, aggressive dyscontrol, psychosis proneness, and self-domains in a nonclinical sample. *Psychol Assess*. 2001;13:577–591. doi:10.1037/1040-3590.13.4.577
22. Zimmermann J, Benecke C, Hörz S, et al. Validierung einer deutschsprachigen 16-item-version des inventar der persönlichkeitsorganisation (IPO-16). *Diagnostica*. 2013;59:3–16. doi:10.1026/0012-1924/a000076
23. Faul F, Erdfelder E, Buchner A, Lang A-G. Statistical power analyses using G*power 3.1: tests for correlation and regression analyses. *Behav Res Methods*. 2009;41:1149–1160. doi:10.3758/BRM.41.4.1149
24. Felson DT, Zhang Y, Hannan MT, et al. The influence and natural history of knee osteoarthritis in the elderly. The Framingham osteoarthritis study. *Arthritis Rheum*. 1995;39:1500–1505.
25. Srikanth VK, Fryer JL, Zhai G, Winzenberg TM, Hosmer D, Jones G. A meta-analysis of sex differences prevalence, incidence and severity of osteoarthritis. *Osteoarthritis Cartilage*. 2005;133:769–781. doi:10.1016/j.joca.2005.04.014
26. Gunaratne R, Pratt DN, Banda J, Fick DP, Khan RJK, Robertson BW. Patient dissatisfaction following total knee arthroplasty: a systematic review of the literature. *J Arthroplasty*. 2017;32(12):3854–3860. doi:10.1016/j.arth.2017.07.021
27. Frankenburg FR, Zanarini MC. Obesity and obesity-related illnesses in borderline patients. *J Pers Disord*. 2006;20(1):71–80. doi:10.1521/pedi.2006.20.1.71
28. Luyten P, Campbell C, Fonagy P. Borderline personality disorder, complex trauma, and problems with self and identity: A social-communicative approach. *J Pers*. 2019. doi:10.1111/jopy.12483
29. Bremner JD.Cognitive processes in dissociation: comment on Giesbrecht et al. (2008). *Psychol Bull*.2010;136:1–6. doi:10.1037/a0018021
30. Cramer P. *Protecting the Self. Defense Mechanisms in Action*. NY/London: The Guilfors press; 2006:96.
31. Ferenczi S. The unwelcome child and his death-instinct. In: Michael Balint, editor. *Final Contributions to the Problems and Methods of Psychoanalysis*. New York, NY: Basic Books; 1955:102–106.
32. de Senarclens B. Somatic and borderline states. In: Press J, editor. *Experiencing the Body. A Psychodynamic Dialogue on Psychosomatics*. Vols. 60–69. New York: Routlegde; 2019:62–68.
33. Jablensky A. The concept of somatoform disorders: a comment on the mind body problem in psychiatry. In: Ono Y, Janca A, Asai M, Sartorius N, editors. *Somatoform Disorders. A Worldwide Perspective*. Tokio: Springer; 1999:3–10.
34. Doury-Panchout F, Metivier JC, Fouquet B. Kinesiophobia negatively influences recovery of joint function following total knee arthroplasty. *Eur J Phys Rehabil Med*. 2015;51:155–161.
35. Vogel M, Krippl M, Frenzel L, et al. Dissociation and pain-catastrophizing: absorptive detachment as a higher-order factor in control of pain-related fearful anticipations prior to Total Knee Arthroplasty (TKA). *J Clin Med*. 2019;8(5):697. doi:10.3390/jcm8050697
36. Harper RG. Borderline personality. In: Harper RG, editor. *Personality-Guided Therapy in Behavioural Medicine*. Vols. 179–205. Washington, DC: American Psychological Association; 2004:196–197.
37. Kaplan MA, Korelitz BI. Narcotic dependence in inflammatory bowel disease. *J Clin Gastroenterol*. 1988;10:275–278. doi:10.1097/00004836-198806000-00010