Get screened! The role of fear and disgust in the activation of behavioural harm avoidance in medical settings

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Abstract

Although adaptive defence mechanisms are useful in helping us avoid getting injured, they are also triggered by medical interventions and procedures, when avoidance is harmful. A body of previous results showed that both fear and disgust play a pivotal role in medical avoidance. However, the underlying mechanisms are not fully understood. Thus, the aim of the current study was to examine the effects of experience, perceived control and pain on medical avoidance with disgust and fear as mediating factors from an evolutionary perspective. We accessed participants' knowledge of and experience with medical procedures and former negative medical experiences, lack of health-related information; their life history strategy variation; pain-related fear and anxiety of medical procedures; perceived control over emotional reactions and extreme threats; disgust sensitivity; blood-injury-injection phobia and medical treatment avoidance. We found that more knowledge, experience and a slower life strategy were linked to a greater level of perceived control and attenuated emotional reactions. Further, better ability to control affective and stress reactions to negative experiences was linked to reduced disgust and fear of pain, and thus might mitigate the level of perceived threat, and diminish fear and disgust reactions. Altogether this might decrease the probability of avoiding medical situations. Implications to treatment are discussed. Results support the importance of targeting these contextual factors in preventions to increase the likelihood of people attending regular screenings or seeking medical care when needed.

Introduction

Adaptive defence mechanisms facilitate recognition and appropriate responses to potential environmental threats that may cause injuries or even death (e.g., Coelho & Purkis, 2009; LeDoux, 2012; Zsido, et al, 2020). Evolved defensive strategies include learned avoidance behaviours that are aimed to reduce the probability of close encounters with the individual's natural enemies (Buck, Weinstein & Young, 2018), pathogens (Kavaliers & Choleris, 2018) and dangerous situations in general(Coelho & Balaban, 2015). Most current research has as basic premise that adaptations and selection mechanisms build physiological and behavioural traits to enhance the adjustment of the organism to the environment in which they live. Life History Theory (LHT) (Kaplan & Gangestad, 2005) provides a framework to describe different fitness maximizing strategies, such as this refinement (West & Gardner, 2013). According to LHT, animals (including humans) have to balance the needs to allocate energy to survival and reproduction as well as to the actual organismic conditions and environmental context (Dunkel, et al., 2021; Bjorklund & Ellis, 2014; Kaplan & Gangestad, 2005). For example, if an infection is present, the immune system is activated, requiring substantial energy (e.g., fever; see Straub, 2012). Hence, the energy expenditure regulation and the behavioural strategies of the individual change during this period. Unpredictable conditions favour the utilization of faster LHT strategies, whereas more predictable conditions facilitate the activation of slower LHT strategies (Kaplan & Gangestad, 2005). Faster life strategies can be characterized by an elevated sensitivity to reward and more impulsive behaviours, while slower life strategies are more future oriented, adopting controlled behaviours (Birkás, Csathó, Gács & Bereczkei, 2015; Del Giudice, Gangestad & Kaplan, 2015).

Avoidance strategies to pathogens and injuries include mechanisms associated with fear and anxiety (e.g., predation or injury risk), and disgust (Buck, Weinstein, & Young, 2018; Weinstein, Buck & Young, 2018; Coelho et al., 2020). Conceptualizing fear as a defensive response to eminent threats and anxiety as response to potential threats (Lang, Davis & Öhman, 2000), these notions share similarities with disgust propensity. As suggested by the *disease-avoidance model* (Matchett & Davey, 1991), disgust is an adaptive response to sources of potential contaminants and pathogens, protecting from infectious diseases (Oaten, Stevenson & Case, 2009; Tybur, Lieberman, Kurzban & DeScioli, 2013). Both direct encounters with natural enemies and indirect cues associated with various sources of risks (e.g., without the actual presence of enemies) can activate physiological mechanisms and behavioural strategies of avoidance leading to certain fitness costs to the individual through physiological (e.g., stress) and behavioural (e.g., aversion of certain places) effects (see Doherty & Ruehle, 2020). The neurobiological basis of approach and avoidance behaviour, suggested by the revised Reinforcement Sensitivity Theory (Gray and McNaughton, 2000; McNaughton and Corr, 2004) consists of three overlapping, but different affective-motivational systems. The *Fight-Flight-Freeze System* (FFFS) is the primary system responsible for active avoidance and escape behaviours in response to fear, thus, it is sensitive to aversive stimuli, both unconditioned (innate) or conditioned (learned). The activation of the FFFS is associated with a desire to escape and an emotional state corresponding to anxiety and fear. At the behavioural level the FFFS is expressed in active avoidance and escape. Together, these are related to panic and phobia on a psychopathological level (Smillie, Pickering & Jackson, 2006).

Medical interventions and procedures carry the possibility of violating the integrity of the body and increase the likelihood of infections; similarly, to getting injured. Fear of blood, injury and injections (BII) can also affect individuals' motivation to either seek or procrastinate medical help and care (Birkás et al., 2021; Dubayova et al., 2010). These medical fears are associated with excessive distress towards stimuli commonly present in medical settings (e.g.: vaccination, symptoms of illness, medical devices, see: Page, 1994; Peeters, Bennett, Donoghue, Kennelly & Kenny, 2020) as well as disgust-related responses (see Cisler, Olatunji & Lohr, 2009). Distress and disgust associated to medical situations often result in avoidance, even when medical treatment is needed (Pollock, 2016). Being one of the most common specific phobias, BII-related fears have the most serious potential consequences to health affecting a large number of people (Birkás et al., 2021; Kleinknecht et al., 1999). The evolved avoidance mechanisms to deal with potential contamination can also be triggered when they should not. The disease-avoidance model, indeed, describes the functional role of disgust in the avoidance of contamination and protection of the individual against infections (Matchett & Davey, 1991; Olatunji et al., 2014). Accordingly, a large body of studies demonstrated that disgust is a critical factor in medical fear related disorders (i.e., BII phobia; see Knowles, Jessup & Olatunji, 2018 for a review) and, consequently, underscored the relevance of this reaction in understanding medical avoidance. Medical care avoidance not only increases morbidity and mortality risk associated with treatable and preventable health conditions (Caplan, 2014; Spleen, Lengerich, Camacho & Vanderpool; 2014), but it also intensifies negative psychological outcomes such as anxiety and depression (Manne, Glassman & Du Hamel, 2001; Rosenthal, Hall, Palm, Batten & Follette, 2005), and elevates healthcare-related economic costs. Treatment avoidance is suggested to be affected by both external (e.g., socioeconomic or demographic) and internal (i.e., knowledge, experiences, pain sensitivity) factors (Abraham & Sheeran, 2015; Taber, Leyva, & Persoskie, 2015; Kannan, & Veazie, 2014; Simon et al., 2022).

One of the most straightforward signals of medical need and, at the same time, one of the most powerful aversive stimuli is pain. Consequently, humans are characterized by a vigilance to pain, that expedites escape and avoidance behaviour (Crombez et al., 2005)., and is closely related to fear (Panksepp, Sacks, Crepeau & Abbott, 1991). Pain is crucial for survival due to its signal function alerting the individual to potential damages and activating behavioural responses to prevent or limit subsequent harms or injuries (Johansen & Fields, 2004). Perception of pain is modulated by a wide range of environmental and psychological factors including previous experiences, socioeconomic factors, education, health-literacy, stressful life events, anxiety, and fear (Castelnuovo & Schreurs, 2019). Uncontrollability and helplessness are also dominant elements of fears and phobias and are strongly linked to avoidance (American Psychiatry Association [APA], 2013). Accordingly, the personal appraisal of pain and its potential consequences affects not only the perception of pain, but the associated avoidant behavioural responses as well. Perceived lack of control related to painful experiences elevate the negative orientation towards pain (i.e., pain catastrophizing; see Simon et al., 2022). This intensifies negative expectation regarding subsequent pain-related experiences and results in evaluating potential consequences of pain as more threatening and potentially harmful. Anticipation of potential threats increases the level of anxiety and may even induce disgust, and, hence, facilitates the development of pain-related fear (Markfelder & Pauli, 2020; Turk & Wilson, 2010). To sum up, the way how individuals interpret pain, and its potential consequences affects fear of pain (Algophobia) and related defence behaviours, such as avoidance enabling the person to memorize and later avoid cues associated with pain.

Health-related knowledge and former medical experiences may alter the effects of helplessness and uncontrollability in both negative and positive ways. *Fear-avoidance models* suggest that fear of pain is an important component of pain chronification and related disabilities (Markfelder & Pauli, 2020). Individuals suffering from pain commonly experience feelings of helplessness and uncontrollability, eliciting emotions of embarrassment or shame fuelled by individual and interpersonal worries (e.g., being unable to work; being a burden for the family) (Karos, Williams, Meulders & Vlaeyen, 2018). Uncontrollability and helplessness are also key determinants of cognitive pain processing and have detrimental physical and psychological health consequences (Samwel, Evers, Crul & Kraaimaat, 2006). Negative experiences or lack of understanding of symptoms enhances the level of perceived lack of control and vulnerability. However, a large body of previous evidence show that positive outcomes of former medical care and higher level of health literacy are associated with increased sense of control and resilience (Schieman & Plickert, 2008; Wulff, Donato & Lurie, 2015). Health related knowledge and medical experiences were also found to affect severity of chronic illnesses, procrastination of health-care utilization and biopsychosocial consequences of symptoms (Abraham & Sheeran, 2015; Taber, Leyva, & Persoskie, 2015; Kannan, & Veazie, 2014).

Hence, the overarching goal of the current study was (1) to examine the effects of medical fear and fear of pain on medical avoidance with (2) disgust sensitivity as mediating factor, whilst controlling for former experiences, level of medical knowledge, perceived control and life-history strategies. Former studies overlooked the evolutionary aspects of medical avoidance or did not include both, fear and disgust into the examination, or lack of information related to participant's medical knowledge and/or experiences. To prevent the severe consequences of medical avoidance, the identification of relevant risk factors of medical avoidance and exploring the interplay between disgust and fear is important. More specifically, based on the literature reviewed, we hypothesised that former negative medical experiences, lack of health-related knowledge, exaggerate medical fears, and fear of pain will trigger individuals to perceive medical situations more threatening and potentially harmful, which, in turn, will activate avoidance. Furthermore, disgust will enhance perceived threat, causing a biased interpretation for fear-related stimuli and overestimation of the potential negative consequences of the situation.

Methods

Participants

We recruited 906 Caucasian participants (233 males, 662 females, 11 preferred not to answer), aged 18–68 years (M = 24.83, SD = 7.87) through the Internet by posting invitations on various forums and mailing lists to obtain a heterogeneous sample. The required sample size for this experiment was determined by computing estimated statistical power with a conservative approach (RMSEA = .035, $1\text{-}\beta = .95$, df = 103) using the semPower package for R (Moshagen and Erdfelder, 2016; R Core Team, 2020). The analysis indicated a required a minimum total sample size of 458; thus, our study was adequately powered. The data were collected in January to March 2021. Regarding COVID-19 regulations, there was no curfew at the time of the data collection and medical examinations were freely available for everyone. The participants filled out the questionnaires online, using Google Forms, on a voluntary basis. None of them reported having a psychiatric disorder. Additionally, we deleted three invalid entries (two duplication and one fake), thus they were not analysed and are not included in number of participants or mean age. The research was approved by the Hungarian United Ethical Review Committee for Research in Psychology and was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). Informed consent was obtained from all participants.

Materials

Demographic information

Demographic questions included age, gender, inquiries about experience and knowledge of medical procedures, examinations, and injuries. We accessed participants *knowledge* of medical procedures, examinations, and injuries with questions about their healthcare-related studies (e.g., first aid, nursing, medical doctor) and jobs in a healthcare-related field. Participants *experience* with medical procedures, examinations, and injuries were assessed with questions about how often they go to examinations, screenings, blood draws, blood plasma donation, receive injections; how often they see serious injuries or blood in person or in the media (e.g., movies, Internet); whether they ever had a serious injury; and whether they had to provide care for a relative for at least one month.

Life history strategy variation

To indicate the adaptive strategies of the individual shaped by avoidance-related experiences and associated fitness costs during childhood, we used the Mini-K scale of the Arizona Life History Battery (Figueredo et al., 2006), a brief 20-item measuring fast–slow life history strategies. Participants responded on 7-point Likert-type scales, mean scores were calculated across all items where higher scores indicated a slower life strategy. In this study, McDonald's omega was .75.

Fear of Pain

To asses pain-related fear and anxiety of medical procedures, we used the Fear of Medical/Dental Pain (FPQ MD) scale of the brief Fear of Pain Questionnaire (McNeil et al., 2018). Participants responded on 5-point Likert-type scales, sum scores were calculated across all items, higher scores indicated higher levels of fear. In this study, McDonald's omega was .76.

Perceived Control

We used the Anxiety Control Questionnaire (ACQ) to measure perceived control over emotional reactions and extreme threats (Brown, White, Forsyth & Barlow, 2004). The ACQ is a 15-item questionnaire that has three subscales: emotion control, threat control, and stress control. Participants responded on 6-point Likert-type scales, sum scores were calculated for each subscale, higher scores indicated higher levels of perceived control. In this study, McDonald's omegas were .81 (emotion), .78 (threat), and .74 (stress).

Disgust sensitivity

To assess disgust sensitivity, we used the revised version of the Disgust Scale-Revised (DSR) (Olatunji et al., 2007). The DSR has 25 items and taps into three dimensions of disgust: core disgust, animal reminder disgust (AR), and contamination-based disgust. From the 25 questions, 13 are true–false items (scored 0 or 1) and 12 items are rated on 3-point Likert-type scales scale referring to the extent to which participants find a given experience disgusting (i.e., not, slightly, very; scored 0, 0.5, 1, respectively). Mean scores were calculated for each subscale, higher scores indicated higher levels of disgust sensitivity. In this study, McDonald's omegas were .63 (core), .60 (animal reminder), and .61 (contamination-based).

Medical Fears

The short version of the Medical Fear Survey (MFS-short) is a 25-item questionnaire measuring medically related fears across five domains: injections and blood draws (IBD), sharp objects (SO), blood (BL), mutilation (MU), and examinations and symptoms (ES) (Olatunji et al., 2012). Participants rated the items using 4-point Likert-type scales. We calculated sum scores for each subscale, higher scores indicated higher levels of fear. In this study, McDonald's omegas were .88 (injections and blood draws), .83 (sharp objects), .87 (blood), .82 (mutilation), and .79 (examinations and symptoms).

Avoidance

We measured the extent to which participants have avoided medical treatment due to fear of various procedures and anticipated outcomes with two subscales (fear of finding a serious illness and fear of injections and pain) of the Medical Avoidance Survey (MAS) (Kleinknecht et al., 1996). The MAS has 21 items, rated on 5-point Likert-type scales. We calculated sum scores for each subscale, higher scores indicated higher levels of avoidance. In this study, McDonald's omegas were .85 (serious illness) and .84 (injections and pain).

Data analyses

First, we computed knowledge and experience scores separately but with the same method. We calculated the z scores for each variable and then added them up. The z transformation was necessary because not all questions were rated on the same length scale.

We performed a Structural Equation Modelling using the JASP statistical software version 0.15 for Windows (JASP Team, 2020) utilizing the lavaan (v. 0.6-1) package for R (Rosseel, 2012) to assess fit measures for our proposed models. Questionnaires with multiple scales (ACQ, DS, MFS, and MAS) were entered as latent variables. We used the diagonally weighted least squares (DWLS) estimator (Bandalos, 2014) with standard error calculation, standard model test; missing data handling was listwise deletion (zero cases were removed). To evaluate model fit, we used the relative chi-square (X^2/df), the comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square error of approximation (RMSEA) with 90% confidence intervals, and the standardized root mean square residual (SRMR). The cut-offs for good model fit were a relative chi-square < 5 (Kline, 1998), CFI and TLI values of .95 or greater (Hu and Bentler, 1998), RMSEA and SRMR values of .08 or lower (Browne and Cudeck, 1992).

Results

The test yielded a good model fit ($X^2(100)=343.28$, $p<.001$, CFI=.97, TLI=.95, RMSEA = .05, 90%CI = [.046 – .058], SRMR = .06). See Figure 1 for the model tested. FPQ MD was negatively predicted by knowledge (β = -.17, p < .001) and experience (β = -.08, p = .032), but not by MiniK (β = -.05, p = .13). ACQ scores were positively predicted by Mini-K (β = .26, p < .001), the routes from knowledge (β = .05, p = .12) and experience (β = .05, p = .12) were non-significant. DSR scores were positively predicted by FPQ MD (β = .41, p < .001) and Mini-K (β = .20, p < .001), while experience (β = -.19, p < .001) and ACQ (β = -.32, p < .001) were negative predictors. Knowledge (β = -.05, p = .26) did not have a significant effect on DSR. MFS was positively predicted by FPQ MD (β = .27, p < .001) and DSR (β = .69, p < .001), while knowledge (β = -.10, p = .010) predicted it negatively. The paths from experience (β = .004, p = .93), MiniK (β = -.01, p = .83) and ACQ (β = -.05, p = .31) were non-significant. MAS scores (R^2 = .29) were predicted positively by

MFS (β = .24, p < .001) and FPQ MD (β = .25, p < .001), while ACQ (β = -.17, p < .001) was a negative predictor.

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Figure 1 about here

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Regarding covariances, ACQ and FPQ MD (β = -.33, p < .001), and knowledge and experience (β = .28, p < .001) scores showed strong covariances as expected. We also controlled for a covariance between two of the DSR subscales, animal remainder and contamination (β = .19, p < .001). Table 1 shows the descriptive statistics of the sample on all measures used; Supplementary Table 1 shows the unstandardized coefficients and confidence intervals. See Supplementary Table 2 for correlational coefficients between the variables included in the model.

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Table 1 about here

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Discussion

It has been proposed that adaptive defence mechanisms facilitate recognition and appropriate responses, such as avoidance behaviours to potential environmental threats to reduce the probability of getting injured (Coelho & Purkis, 2009; LeDoux, 2012; Zsido, et al, 2020). However, the avoidance mechanisms may also be triggered by medical interventions and procedures, when avoidance is more harmful. BII-related fears are associated with excessive distress towards stimuli commonly present in medical settings (Peeters et al., 2020), are highly common (Birkás et al., 2021), and has the most serious potential consequences (Kleinknecht et al., 1999) as they often result in the procrastination of seeking medical help (Dubayova et al., 2010). Therefore, the aim of our study was to evaluate the impact of BII-related fears and disgust on medical avoidance with respect to individual differences in perceived control, medical knowledge, former experiences and life-history strategies. Our results showed that more knowledge of and experience with medical settings, and slower life strategies were associated with higher levels of perceived control and less intense emotional reactions. Better ability to control affective and stress reactions to negative experiences was linked to reduced disgust sensitivity and lower levels of fear of pain. These factors might mitigate the level of perceived threat, diminish fear and disgust reactions, and ultimately, might result in a decreased probability of avoiding medical screenings, examinations and care. This is in line with the disease-avoidance model (Matchett & Davey, 1991), Reinforcement Sensitivity Theory (Gray and McNaughton, 2000; McNaughton and Corr, 2004), and fear-avoidance models (Markfelder & Pauli, 2020) drawing a complex picture about the underlying mechanisms and motivations related to the avoidance of medical settings.

Our results underline the importance of examining the role of contextual factors, showing that slower life-history strategies were associated with elevated sense of control and disgust sensitivity. That is, more future oriented and less impulsive behavioural strategies are connected to increased behavioural control and more intense vigilance towards environmental cues of pathogens indicating stronger disease avoidance reactions. Similarly, medically relevant experiences and knowledge were associated with decreased disgust sensitivity and both fear of pain and medical fears, suggesting that direct and perhaps indirect encounters with environmental threats shape the frequency of avoidance reactions. These findings are in line with existing models of behavioural defence mechanisms (Doherty and Ruehle, 2020; Gray & McNaughton, 2000; Oaten et al., 2009) and support the notion, that avoidance behaviour is triggered by individual evaluation processes based on the interpretation of former and actual circumstances. Further, we also found that perceived control of emotional reactions and threats were connected to medical avoidance through direct and indirect pathways, that is, better control was linked to a lesser likelihood of medical avoidance and reduced disgust sensitivity and fear of pain. It has been posited that better ability to control affective and stress reactions to negative experiences alters pain processing (Simon et al., 2022) and therefore, mitigates the level of perceived threat, resulting in diminished fear and disgust reactions (Crombez et al., 2005; Markfelder & Pauli, 2020). However, in medical settings perceived control might be decreased and its influence on avoidance less articulated due to the potential defencelessness of the individual (Samwel et al., 2006).

Regarding disgust sensitivity, our findings suggest that different aspects of disgust may reflect a shared vulnerability for medical fears and avoidance. Accordingly, proneness to disgust may be characterized by harm avoidance, in general, and can be considered as a relevant trigger for medical avoidance in particular. This is in line with the disease-avoidance model that describes the functional role of disgust in the avoidance of contamination and protection against infections (Matchett & Davey, 1991; Olatunji et al., 2014). These results are in agreement with former studies and show that disgust, as a response to potential health-related threats, affects avoidance behaviour in a different way compared to fear (Knowles, et al., 2018; Olatunji, et al., 2014). Previous research suggests that people with BII phobia report greater disgust sensitivity than non-phobics, that exposure to stimuli related to medical and settings and BII increases disgust more for phobic compared to non-phobic participants, and that disgust returns more rapidly after extinction than fear (Olatunji et al., 2009). As suggested by the disgust law of contagion of magical belief systems, things that were once in contact always retain that connection (Rozin et al., 1986). Disgust intensifies the perception of the likelihood of negative or harmful consequences (Krusemark & Li, 2011) elevating both the level of fear and probability of avoidance in medical settings. Further, fear of pain and medical fears directly impact medical avoidance, which link was supported by several former studies as well (Asmundson & Taylor, 1996; Buer & Linton, 2002; Peeters et al., 2020). Hence, reducing medical avoidance might be a constant battle against the reoccurrence of beliefs and a strong urge of avoiding contamination and paint. Slower LHT might be useful in helping an individual to see the long-term payoff of a situation rather than the immediate danger.

Besides its significant contributions, the current study also has a few limitations. Longitudinal data would have been more informative (e.g., by measuring how avoidance behaviour changes over time), and there might be other indicators that contributed to the probability of avoiding medical care. Further work is needed to explore and validate the different behavioural aspects of disgust and fear on medical avoidance and to analyse age-related effects in more detail. Further, external factors such as the form of medical care or severity of former injuries and diseases probably affect medical avoidance might alter the connections but were not evaluated in the current study. Age may be also associated with the quality and severity of medical experiences, fear, and avoidance, but our study could not reveal this connection as the age-range of our sample was not wide enough. Furthermore, the effects of the internal factors included in our study on actual avoidant behaviours should be clarified in the practice, e.g., in real medical settings.In sum, internal contextual factors (reflected in experiences, knowledge, sense of control, disgust and fear) affect individual medical avoidance tendencies. Thus, it is crucial to reflect to these factors in order to enhance the motivation of people to regularly attend medical screenings and seek medical help if needed. Elevated avoidance spoils the adherence and favours the development of fear-related disorders (e.g., phobias) together with distortions in perceptual and decisional processes. Despite the health-related importance of pain and medical interventions, these biased cognitive-affective processes may prohibit the individual to invoke adequate help because of the activation of avoidance as part of the behavioural harm avoidance. Thus, an adaptive behavioural strategy might produce a maladaptive outcome in causing more harm to the individual than good.

Declarations

Ethics approval and consent to participate.

The research was approved by the Hungarian United Ethical Review Committee for Research in Psychology (Ref. Nr.: EPKEB 2019-121) and was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). Informed consent was obtained from all participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

B.B.: Conceptualization, Methodology, Writing – original draft & editing, Writing - review & editing, ***B.K.***: Investigation, ***C.M.C.***: Writing – original draft & editing, Writing - review & editing, ***A.N.Zs.:*** Formal analysis, Funding acquisition, Methodology, Writing – original draft & editing, Writing - review & editing

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References

Abraham, C., & Sheeran, P. (2015). The health belief model. *Predicting health behaviour: Research and practice with social cognition models*, *2*, 30-55.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Publishing, Arlington.

Asmundson, G. J., & Taylor, S. (1996). Role of anxiety sensitivity in pain-related fear and avoidance. *Journal of behavioral medicine*, 19(6), 577-586.

Birkás, B., Csathó, Á., Gács, B., & Bereczkei, T. (2015). Nothing ventured nothing gained: Strong associations between reward sensitivity and two measures of Machiavellianism. *Personality and Individual Differences*, *74*, 112-115.

Birkás, B., Csathó, Á., Teleki, S., & Zsidó, A. (2022). Confirming the factor structure and improving the screening function of the Medical Fear Survey–short in a Hungarian community sample. Anxiety, Stress, & Coping, 35(2), 248-258.

Bjorklund, D. F., & Ellis, B. J. (2014). Children, childhood, and development in evolutionary perspective. Developmental Review, 34(3), 225-264.

Brown, T. A., White, K. S., Forsyth, J. P., & Barlow, D. H. (2004). The structure of perceived emotional control: Psychometric properties of a revised Anxiety Control Questionnaire. *Behavior Therapy*, *35*(1), 75-99.

Buck, J. C., Weinstein, S. B., & Young, H. S. (2018). Ecological and evolutionary consequences of parasite avoidance. *Trends in ecology & evolution*, *33*(8), 619-632.

Buer, N., & Linton, S. J. (2002). Fear-avoidance beliefs and catastrophizing: occurrence and risk factor in back pain and ADL in the general population. *Pain*, 99(3), 485-491.

Caplan, L. (2014). Delay in breast cancer: implications for stage at diagnosis and survival. *Frontiers in public health*, *2*, 87.

Castelnuovo, G., & Schreurs, K. M. (2019). Pain management in clinical and health psychology. *Frontiers in psychology*, *10*, 1295.

Cisler, J. M., Olatunji, B. O., & Lohr, J. M. (2009). Disgust, fear, and the anxiety disorders: A critical review. *Clinical psychology review*, *29*(1), 34-46.

Coelho, C. M., & Purkis, H. (2009). The origins of specific phobias: Influential theories and current perspectives. Review of General Psychology, 13(4), 335-348.

Coelho, C. M., Suttiwan, P., Arato, N., & Zsido, A. N. (2020). On the nature of fear and anxiety triggered by COVID-19. *Frontiers in psychology*, 3109.

Coelho, C.M., & Balaban, C.D. (2015). Visuo-vestibular contributions to anxiety and fear. *Neuroscience & Biobehavioral Reviews*, 48, 148-159.

Crombez, G., Van Damme, S., & Eccleston, C. (2005). Hypervigilance to pain: an experimental and clinical analysis. Pain, 116(1), 4-7.

Del Giudice, M., Gangestad, S. W. & Kaplan, H. S. (2015) Life history theory and evolutionary psychology. In: *The handbook of evolutionary psychology. Vol. 1. Foundations*, 2nd edition, ed. D. M. Buss, pp. 88–114. Wiley. [B-BC]

Doherty, J. F., & Ruehle, B. (2020). An integrated landscape of fear and disgust: the evolution of avoidance behaviors amidst a myriad of natural enemies. *Frontiers in Ecology and Evolution*, *8*, 317.

Dubayova, T., van Dijk, J. P., Nagyova, I., Rosenberger, J., Havlikova, E., Gdovinova, Z., ... & Groothoff, J. W. (2010). The impact of the intensity of fear on patient’s delay regarding health care seeking behavior: a systematic review. *International journal of public health*, *55*(5), 459-468.

Figueredo, A. J., Vásquez, G., Brumbach, B. H., Schneider, S. M., Sefcek, J. A., Tal, I. R., ... & Jacobs, W. J. (2006). Consilience and life history theory: From genes to brain to reproductive strategy. *Developmental Review*, *26*(2), 243-275.

Johansen, J. P., & Fields, H. L. (2004). Glutamatergic activation of anterior cingulate cortex produces an aversive teaching signal. *Nature neuroscience*, *7*(4), 398-403.

Kannan, V. D., & Veazie, P. J. (2014). Predictors of avoiding medical care and reasons for avoidance behavior. *Medical care*, 336-345.

Kaplan, H. S., & Gangestad, S. W. (2005). Life history theory and evolutionary psychology. *The handbook of evolutionary psychology*, 68-95.

Karos, K., Williams, A. C. D. C., Meulders, A., & Vlaeyen, J. W. (2018). Pain as a threat to the social self: a motivational account. *Pain*, *159*(9), 1690-1695.

Kavaliers, M., & Choleris, E. (2018). The role of social cognition in parasite and pathogen avoidance. Philosophical Transactions of the Royal Society B: Biological Sciences, 373(1751), 20170206.

Kleinknecht, R. A., Thorndike, R. M., & Walls, M. M. (1996). Factorial dimensions and correlates of blood, injury, injection and related medical fears: Cross validation of the Medical Fear Survey. *Behaviour Research and Therapy*, *34*(4), 323-331.

Kleinknecht, R., Kleinknecht, E. E., Sawchuk, C. N., Lee, T. C., & Lohr, J. (1999). The Medical Fear Survey: Psychometric properties. *The Behavior Therapist*.

Knowles, K. A., Jessup, S. C., & Olatunji, B. O. (2018). Disgust in anxiety and obsessive-compulsive disorders: recent findings and future directions. *Current psychiatry reports*, *20*(9), 1-10.

Krusemark, E. A., & Li, W. (2011). Do all threats work the same way? Divergent effects of fear and disgust on sensory perception and attention. *Journal of Neuroscience*, *31*(9), 3429-3434.

Lang, P. J., Davis, M., & Öhman, A. (2000). Fear and anxiety: animal models and human cognitive psychophysiology. *Journal of affective disorders*, *61*(3), 137-159.

LeDoux, J. (2012). Rethinking the emotional brain. *Neuron*, *73*(4), 653-676.

Manne, S., Glassman, M., & Du Hamel, K. (2001). Intrusion, avoidance, and psychological distress among individuals with cancer. *Psychosomatic Medicine*, *63*(4), 658-667.

Markfelder, T., & Pauli, P. (2020). Fear of pain and pain intensity: Meta-analysis and systematic review. *Psychological Bulletin, 146*(5), 411–450.

Matchett, G., & Davey, G. C. (1991). A test of a disease-avoidance model of animal phobias. *Behaviour research and therapy*, *29*(1), 91-94.

McNeil, D. W., Kennedy, S. G., Randall, C. L., Addicks, S. H., Wright, C. D., Hursey, K. G., & Vaglienti, R. (2018). Fear of Pain Questionnaire-9: Brief assessment of pain-related fear and anxiety. *European Journal of Pain*, *22*(1), 39-48.

Oaten, M., Stevenson, R. J., & Case, T. I. (2009). Disgust as a disease-avoidance mechanism. *Psychological bulletin*, *135*(2), 303.

Olatunji, B. O., Cisler, J. M., Deacon, B. J., Connolly, K., & Lohr, J. M. (2007). The Disgust Propensity and Sensitivity Scale-Revised: Psychometric properties and specificity in relation to anxiety disorder symptoms. *Journal of Anxiety Disorders*, *21*(7), 918-930.

Olatunji, B. O., Ebesutani, C., Haidt, J., & Sawchuk, C. N. (2014). Specificity of disgust domains in the prediction of contamination anxiety and avoidance: A multimodal examination. *Behavior therapy*, *45*(4), 469-481.

Olatunji, B. O., Ebesutani, C., Sawchuk, C. N., McKay, D., Lohr, J. M., & Kleinknecht, R. A. (2012). Development and Initial Validation of the Medical Fear Survey–Short Version. *Assessment*, *19*(3), 318–336.

Olatunji, B. O., Lohr, J. M., Smits, J. A., Sawchuk, C. N., & Patten, K. (2009). Evaluative conditioning of fear and disgust in blood-injection-injury phobia: Specificity and impact of individual differences in disgust sensitivity. *Journal of Anxiety Disorders*, 23(2), 153-159.

Olsen, N., Moore, P. J., Hyde, S., & Fowler, L. A. (2020). Healthcare Treatment Seeking and Avoidance. *The Wiley Encyclopedia of Health Psychology*, 297-304.

Page, A. C. (1994). Blood-injury phobia. *Clinical psychology review*, *14*(5), 443-461.

Panksepp, J., Sacks, D. S., Crepeau, L. J., & Abbott, B. B. (1991). The psycho- and neurobiology of fear systems in the brain. In M. R. Denny (Ed.), *Fear, avoidance, and phobias: A fundamental analysis* (pp. 7–59). Lawrence Erlbaum Associates, Inc.

Peeters, G., Bennett, M., Donoghue, O. A., Kennelly, S., & Kenny, R. A. (2020). Understanding the aetiology of fear of falling from the perspective of a fear-avoidance model–A narrative review. *Clinical psychology review*, *79*, 101862.

Pollock, K. (2016). *Concordance in medical consultations: a critical review*. CRC Press.

Rosenthal, M. Z., Hall, M. L. R., Palm, K. M., Batten, S. V., & Follette, V. M. (2005). Chronic avoidance helps explain the relationship between severity of childhood sexual abuse and psychological distress in adulthood. *Journal of child sexual abuse*, *14*(4), 25-41.

Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. Journal of personality and social psychology, 50(4), 703.

Samwel, H. J., Evers, A. W., Crul, B. J., & Kraaimaat, F. W. (2006). The role of helplessness, fear of pain, and passive pain-coping in chronic pain patients. *The Clinical journal of pain*, *22*(3), 245-251.

Simon, E., Zsidó, A.N., Birkás, B., Csathó, Á. (2022). Pain catastrophizing, pain sensitivity and fear of pain are associated with early life environmental unpredictability: a path model approach. *BMC Psychology*, 10 (97), 1-13.

Smillie, L. D., Pickering, A. D., & Jackson, C. J. (2006). The new reinforcement sensitivity theory: Implications for personality measurement. *Personality and Social Psychology Review*, *10*(4), 320-335.

Spleen, A. M., Lengerich, E. J., Camacho, F. T., & Vanderpool, R. C. (2014). Health care avoidance among rural populations: Results from a nationally representative survey. *The Journal of Rural Health, 30,* 79-88.

Taber, J. M., Leyva, B., & Persoskie, A. (2015). Why do people avoid medical care? A qualitative study using national data. *Journal of general internal medicine*, *30*(3), 290-297.

Turk, D. C., & Wilson, H. D. (2010). Fear of pain as a prognostic factor in chronic pain: conceptual models, assessment, and treatment implications. *Current pain and headache reports*, *14*(2), 88–95. https://doi.org/10.1007/s11916-010-0094-x

Tybur, J. M., Lieberman, D., Kurzban, R., & DeScioli, P. (2013). Disgust: evolved function and structure. *Psychological review*, *120*(1), 65.

Weinstein, S. B., Buck, J. C., & Young, H. S. (2018). A landscape of disgust. *Science*, *359*(6381), 1213-1214.

Zsido, A. N., Csokasi, K., Vincze, O., & Coelho, C. M. (2020). The emergency reaction questionnaire–First steps towards a new method. *International journal of disaster risk reduction*, *49*, 101684.

Tables

Table 1 – Descriptive statistics (Means and Standard Deviations – SD) of the sample on Disgust sensitivity (DS) core, animal remainder (AR), contamination; Medical Fear Survey (MFS) injection and blood draw (IDB), sharp objects (SO), examinations and symptoms (ES), blood (BL), mutilation (MU); Fear of Medical/Dental Pain (FPQ MD); Life history strategy variation (Mini-K); Perceived Control (ACQ) emotion (EC), threat (TC), and stress (SC); Medical Avoidance (MAS); Age; Number of respondents (separately for genders).

	Mean	SD
Experience	4.149	1.122
Knowledge	1.649	1.078
MiniK	5.086	0.697
FPQ_MD	7.872	3.103
ACQ_EC	12.486	5.514
ACQ_TC	18.533	5.348
ACQ_SC	7.369	3.308
DSR_core	0.501	0.149
DSR_AR	0.460	0.221
DSR_contam	0.395	0.199
MFS_IBD	2.550	3.142
MFS_SO	1.480	2.301
MFS_ES	7.301	3.497
MFS_BL	2.099	2.955
MFS_MU	7.286	4.065
MAS_SI	5.397	5.967
MAS_BI	2.930	3.870
Age	24.83	7.87
Gender	233 662 11	male female did not answer

Figures

Figure 1

Our proposed model on the connection and background mechanisms of avoidance of health care due to fear and anxiety. Squares indicate measured variables; ellipses indicate latent variables (comprised of the subscale of the questionnaire). All pathways implemented in the Structural Equation modelling are presented on the figure. All reported estimates are the maximum likelihood standardized point-estimates. Statistically significant unstandardized point estimates are indicated with a star (* p < .05, ** p < .001). Significant positive predictors are indicated with red colour, significant negative predictors are indicated with blue colour. Nonsignificant routes are indicated by dashed lines and grey colour.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SuppTable1SEMstats.docx
- SuppTable2correlations.docx