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ORIGINAL RESEARCH

The experience of dysmenorrhea

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Abstract
Dysmenorrhea, or menstrual pain, is regularly suffered by 45 to 95% of menstruating women. Despite its prevalence, and despite the philosophical importance of pain as a general phenomenon, dysmenorrhea has been all but completely overlooked in contemporary analytic philosophy of mind. This paper aims at rectifying this situation. We single out three properties of what is often considered the paradigmatic case of painful experience, what we call injury-centered pains, and argue that dysmenorrhea does not have any of them, and hence that it does not neatly conform to the injury-centered model of pain. This calls into question the centrality of the injury-centered model, and suggests novel research avenues within theoretical debates on affectivity.

1 Introduction

Dysmenorrhea is commonly known as *menstrual pain*,[1] and is often operationalized, in diagnosis, as crampy abdominal pain that happens while or shortly before menstruating. Between 45% and 95% of menstruating women suffer from dysmenorrhea

[1] More specifically, dysmenorrhea divides into *primary dysmenorrhea*, which is menstrual pain in the absence of additional clinical conditions, and *secondary dysmenorrhea*, in which additional problems

†The second author defends an imperativist account of the painfulness of pain and believes that the claims made in this paper (including those in Sect. 4) are ultimately compatible with this antecedent theoretical commitment of his.

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(Iacovides et al., 2015). However, despite its prevalence, and despite the philosophical prominence of pain as a general phenomenon,[2] dysmenorrhea has been mostly overlooked in contemporary analytic philosophy of mind.[3] Even more than that, from the standpoint of mainstream contemporary philosophical theorizing about pain, dysmenorrhea, if mentioned at all, is treated as a problem case, to be considered and dealt with only after the bulk of the theory has been put forward and defended. In our view, this is so at least partly because of the very widespread idea that pain is primarily a tool for the management of bodily injury (cf. Casser, 2020; Rosàs Tosas, 2021). Since dysmenorrhea's relation to injury is tenuous and complicated, this has the consequence of relegating it to the periphery of the debate.

More concretely, in this paper we will single out three assumptions about the nature and structure of pains that most participants in the philosophical debate on pain start from —quite independently from, and antecedently to, the particular accounts that they choose to defend—, and show that they are false in interesting ways of dysmenorrhea. These three assumptions, which we will respectively call *Adaptiveness*, *Acuteness*, and *Differentiation*, refer to three properties of what is often taken to be the paradigm of painful experience: what we will call the *injury-centered model* of pain. Adaptiveness concerns the relation of pain with bodily damage. Acuteness, in turn, refers to the temporal profile of the typical injury-centered pain: its being relatively short-lived, in contrast to longer-lived chronic pains. Finally, Differentiation concerns the presumed distinctive character of the painful experience with respect to other affective experiences, in particular moods. As we will argue, dysmenorrhea does not neatly conform to any of these three assumptions about the nature and structure of pains.

Reviewing, as this paper does, the various senses in which dysmenorrhea does not conform to the philosophical canon about pain is important for at least one reason: dysmenorrhea is an extremely significant kind of pain, in that it is extremely prevalent, with millions of people suffering from it regularly,[4] and in that it dramatically impacts the well-being of its sufferers: dysmenorrheic women have a much reduced score in the quality of life enjoyment and satisfaction questionnaire (Q-LES-Q-SF)

such as endometriosis or uterine tumors can be clinically identified as the root cause of the menstrual pain. Most studies on menstrual pain focus on primary dysmenorrhea, as do the vast majority of studies referred to in this paper, including the ones that establish the prevalence percentages that we mention in this introduction. For this reason, this paper targets specifically primary dysmenorrhea. Throughout the paper, the expression "dysmenorrhea" will refer to primary dysmenorrhea in particular. However, the symptoms of both types of dysmenorrhea are similar, and we believe that many of the claims that we make here apply to secondary dysmenorrhea as well.

[2] At least since the mid 2000s and after some neglect during the 1980s and 1990s. Murat Aydede's influential (2006) edited volume marks the change of tide, and is an excellent introduction to many of the philosophical issues that are in the background to this piece.

[3] For literature in other traditions addressing menstruation and menstrual experience see Bobel (2010), Bobel et al. (2020), Martin (2001), Stein and Kim (2009), Young (2005). Menstrual pain is mentioned and briefly discussed by a few philosophers in the recent analytic tradition (Klein, 2015; Tumulty, 2009). We discuss their views below.

[4] Probably close to one billion people, given that over two billion menstruate (House et al., 2012, p. 193), and according to conservative estimates almost half of them suffer some degree of dysmenorrhea (Iacovides et al., 2015).

during menstruation compared to their own follicular phase (Iacovides et al., 2014; see also Bajalan et al., 2019). With this piece we intend to stress the existing tension between the centrality of dysmenorrhea as an affective experience and its peripheral position in philosophical theorizing about pain and affectivity — a tension that, we believe, questions the paradigm status of the injury-centered model. We also intend to start rectifying this situation by working out some implications of this change of focus for the current philosophical debate on pain. We take this to be a straightforward application of one of Garry's (1995, p. 8) conditions for a feminist philosophical method, applied here to the study of pain: that this study includes a variety of women's points of view *in virtue of* the very issues and questions it addresses.

We start by briefly introducing the physiology of dysmenorrhea, and why it is painful, in the upcoming Sect. 2. In Sect. 3, we flesh out the injury-centered model by identifying and defining *Adaptiveness*, *Acuteness*, and *Differentiation*. We discuss each of them in turn in Sects. 4, 5, and 6, respectively arguing that dysmenorrhea does not straightforwardly have any of them, and hence concluding that it does not neatly conform to the injury-centered model of pain. The upshot of this analysis is dual. On the one hand, the fact that dysmenorrhea does not conform to the model suggests interesting revisions and novel research avenues *within theoretical debates on affectivity*. In each of the Sects. 4, 5, and 6 we outline one of these possible research avenues. On the other hand, we suggest, the shift of theoretical focus promoted here will plausibly have a positive impact on our general understanding *of dysmenorrhea itself*. We conclude the paper (Sect. 7) by briefly unpacking this suggestion.[5]

2 The physiology of dysmenorrhea

During the stage of the human menstrual cycle called *ovulation*, an ovarian follicle, and usually only one, releases an ovum and then turns into an ephemeral gland called *corpus luteum*. The corpus luteum is essential to maintaining adequate progesterone levels in the organism in the event of a successful pregnancy (Stocco et al., 2007). High progesterone levels after ovulation, together with a host of other necessary biochemical processes (Gellersen et al., 2007), cause the epithelial tissue coating the uterus, the endometrium, to undergo *decidualization*, the process by which it prepares for hosting a fertilized egg: part of the endometrium develops into the *decidua*, which, among other things, protects the newly implanted embryo from immune responses from the mother triggered by paternal inherited factors. Later in the menstrual cycle, if it becomes apparent that the ovum has not been fertilized, the corpus luteum decays (Smith, 2018, 14). This results in a reduction of progesterone levels, which in turn cascades into an inflammatory response in the endometrium that ends with its shedding. Menstruation is the shedding and expulsion of the endometrium (Maybin & Critchley, 2015).

[5] One final caveat before moving forward: it is common to distinguish two different, dissociable aspects of painful phenomenology. On the one hand, a *sensory* dimension that informs us of the occurrence of damage; on the other hand, an affective dimension, namely the characteristically unpleasant kind of sensation associated with pain — its *painfulness*. In this piece, whenever painful phenomenology is discussed, it is the painfulness of pain that we are most interested in.

Uterine contractions, which are actually present throughout the menstrual cycle (Bulletti et al., 2000), aid with clearing menstrual blood and endometrial remains during menstruation. To this effect, they increase dramatically in amplitude, to "labor-like" proportions (Aguilar & Mitchell, 2010, 726). According to a popular medical definition, dysmenorrhea happens when uterine contractions during menstruation are *unnecessarily severe* (Dawood, 2006):[6] dysmenorrheic uterine contractions differ from those seen in non-dysmenorrheic menstruators in that, first, the uterine basal tone is higher (that is to say, the uterus is permanently contracted to a higher degree); second, the frequency of contractions is higher (3–4 every 10 min for non-dysmenorrheic menstruators, 4–5 in dysmenorrhea); third, each of these contractions is more intense (120 mmHg in non-dysmenorrheic menstruators "comparable to the intrauterine pressure during the second stage of labor with pushing" (ibid., 431), versus 150–180 mmHg in dysmenorrhea); and finally, contractions are regular in non-dysmenorrheic menstruation, whereas they are arrhythmical in dysmenorrhea.

Dysmenorrhea involves physical symptoms beyond pain, but its canonical medical characterization is decidedly pain-focused. It is widely assumed that dysmenorrhea consists in "painful menstrual cramps of uterine origin" (Iacovides et al., 2015, 763), and when symptoms other than cramps are mentioned as part of it, they are almost universally presented as subordinate to lower abdominal cramps, as in the following excerpts:

> "[d]ysmenorrhea or painful menstruation is defined as a severe, painful, cramping sensation in the lower abdomen that is often accompanied by other symptoms, such as sweating, headaches, nausea, vomiting, diarrhea, and tremulousness, all occurring just before or during the menses" (Ju et al., 2014, 104);
> "[t]he most commonly reported manifestation of dysmenorrhea, and the one that virtually defines the condition, is crampy, midline, lower abdominal pain…" (Smith, 2018, 22).

That dysmenorrhea *hurts* is a starting assumption for us in the forthcoming analysis. Testimonies from sufferers show the unambiguous use of the pain concept to qualify their experience, and powerfully reflect what dysmenorrheic pain can amount to (Aziato et al., 2014, 60):

> "This is real pain, real pain! It's like two fresh sores being sawed and you are telling me to keep quiet… maybe 10 plus";
> "it is the most severe pain I have ever felt in my life so I will rate it at 10";
> "I feel like someone is stabbing me with a knife or like using a knife to cut me… it feels like something is radiating in my abdomen from one side to the other".

However, as advanced in the introduction, dysmenorrhea diverges in various respects from the tacit model of pain that philosophers often rely on. In the next section we describe this tacit model.

[6] In Sect. 4 we discuss various ways of unpacking the idea of unnecessary severity.

3 Three common assumptions about pain

One way to start pulling at the threads of the common cluster of assumptions underlying debates on pain in analytic philosophy is to note the central role that what we could call *injury-centered pains*[7] play in the motivation of mainstream views on pain. Injury-centered pains are events in which actual or potential bodily damage generates nociceptive activity in the sensory periphery, which in turn causes further activity in the central nervous system — where this latter activity is identified with, or otherwise taken to ground, the pain.[8] Injury-centered pains, in the intended sense, include the discrete, short-lived episodes of nociceptive pain that usually follow after injury, as well as the pains of recuperation that occur as a result of past damage (Klein, 2015, p. 3), and which help avoid re-injury during and shortly after healing.

Injury-centered pains are often front and center in discussions on the nature of painfulness, and figure as the motivating example in introductions to papers and books. For a few examples, when inviting the reader to evoke a familiar painful experience, Bain (2013, S69) has her suppose that she steps into a bath that, being too hot, causes an unpleasant pain in her foot. In the same vein, Aydede (2017, 441) relates: "in my hurry to the kitchen to check the casserole on the stove, I hit my elbow on the frame of the kitchen door. I suddenly feel a jabbing pain there … The pain is gone and forgotten after a few seconds." And Klein (2015, 1) opens with a relatively similar anecdote: "I have a pain in my ankle —a dull ache, present intermittently for the past few weeks. Before that, there was a hot, throbbing pain for a few days. And before that, there was a brief twinge as my ankle rolled on the pitch."

These motivating examples, of acute thermal pain caused by stepping into scalding water, or of acute mechanical pain resulting from hitting one's elbow on the frame of the kitchen door, or of first nociceptive and then recuperation pain after rolling one's ankle on the pitch, are all examples of injury-centered pains. To be fair, it should be noted that the definition of pain given by the IASP, the main international association of pain researchers, places injury at the center as well, and defines pain as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" (Raja et al., 2020, 1977). Many other prominent attempts at a definition of pain in the scientific literature share this feature (see ibid., Table 1).

Injury-centered pains are typically assumed to have several important properties in common, which jointly make up what we could call the *injury-centered model* of pain. The first is that the bodily condition the pain responds to and helps manage constitutes a threat to bodily integrity, hence being typically described as a damage or a disturbance. To the extent that pain is a response to damage, it is itself beneficial, or, as we will say following common usage in psychology, *adaptive*. We will call

[7] What we are calling "injury-centered pain" is related to, but goes beyond, what physiologists call *nociceptive pain* (Nicholson, 2006). We use "injury-centered" to connote the fact that philosophers typically have come to these examples of pain from common-sense, pretheoretical considerations.

[8] It is sometimes claimed that our concept of pain is ambiguous or polysemous, or alternatively that there are two concepts of pain: one that refers to a kind of bodily event — intense mechanical stimulation of one's leg, say — and another one that refers to a kind of mental event (Liu, 2021; Tye 2006). By "pain", here and throughout the paper, we always mean the latter.

this property of pains, relative to the condition they target, *Adaptiveness*. The second important property of injury-centered pains is that they are *acute* rather than chronic: they are a response to the sudden, often unexpected onset of a deleterious bodily condition, and typically subside as the condition disappears and the potential for re-injury diminishes. We will call this property *Acuteness*.

Adaptiveness and Acuteness flesh out the popular notion of paradigmatic pains as relatively short-lived, mostly adaptive reactions to damage. We believe that these two assumptions also inform the way philosophers think about the broader landscape of affective phenomenology, and how they distinguish pain from other affective states. In particular, among affective states, pains and moods are assumed to be disjoint mental kinds —if something is a pain it is not a mood, and vice versa. At least in part, this taxonomical choice might be implicitly driven by the facts, precisely, that moods do not display Acuteness —as they are substantially longer-lived than injury-centered pains; and that they do not display Adaptiveness —while they may be causally or otherwise related to injury, their connection to the management of bodily damage is in no sense essential to them. Thus, the third and last assumption about injury-centered pains that we want to single out here is that they can be neatly differentiated from other affective states such as, in particular, moods. We will call it *Differentiation*.

These three assumptions loom large in the model of pain with which many prominent contemporary theories of pain approach their target phenomenon. By this we do not mean to imply that pains other than injury-centered ones are completely ignored in the contemporary philosophical literature. They are not. Allodynia, neuropathic pain, and other examples of what Martínez (2015) calls "spammy pains" are common subjects of discussion (see e.g. Donnelly et al., 2020; Bain, 2013). Corns (2020) explores in depth the many ways in which pain-related phenomena go beyond what she calls the "medical/disease model"; and Casser (2020) also criticizes the idea that "pain's primary function is to inform organisms about damage to their bodies" (op. cit., 1). It is not that philosophers and pain scientists are not aware of the complexity of pain phenomena, of course. It is that they often aim at describing this complexity in terms of departures from and amendments to an unquestioned injury-centered default. In contrast with this tendency, and in line with Casser, Corns, and others,[9] we want to stress how this makes pains that do not conform to the injury-centered model —e.g., "headaches, lower-back pain, pain after healing, referred pain, phantom limb pain, … chronic pain"—often be treated as exceptions, which, on sheer epidemiological grounds, they emphatically are not. In particular, we contribute to this critical reaction to the injury-centered model by working out in detail precisely how one specific kind of pain, namely dysmenorrhea, fails to conform with it. Throughout the text, we will also signal those respects in which dysmenorrhea resembles other non-injury-based pains that have already enjoyed some degree of attention in the philosophical literature.

In the upcoming sections we show, in turn, how dysmenorrhea fails to meet, or at least calls for refinement in, Adaptiveness, Acuteness, and Differentiation.

[9] Such as Miyahara (2021), Olivier (2022), Rosàs Tosas (2021).

4 Adaptiveness

Adaptiveness is what makes injury-centered pains an essential tool in the management of threats to bodily integrity. For instance, thermal pain when stepping into a hot bath may result from the overheating of one's foot, and it motivates one to withdraw the foot from the scalding water. This pain is adaptive in that, in mediating between nociception and behavior, it helps reduce the likelihood and severity of injury. In general, pains are adaptive to the extent that they mediate an adequate response to a maladaptive bodily condition *qua maladaptive*.

This idea is developed in slightly different ways depending on the philosophical account on the nature of pain that one holds. For the purposes of our point here, we will consider the two families of intentionalist positions singled out for discussion in Corns' (2018) review of recent work on pain. On the one hand, according to *evaluativists* (Bain, 2013; Carruthers, forthcoming; Tye 2006), the painfulness of pain is grounded on a *representation of bodily damage as bad*: a pain is, perhaps among other things, a mental event that says "this bodily event is bad for you." On the other hand, *imperativists* claim instead that the painfulness of pain depends on a *command* (Barlassina & Hayward, 2019; Kauppinen, 2021; Klein, 2015; Martínez, 2011, 2022). Details vary, but all of these imperativists agree that whatever particular imperative they endorse as underlying the painfulness of pain makes pain and its painfulness useful tools in the management of bodily damage: either because they are a command for the subject in pain to deal with a certain bodily condition (Kauppinen, Klein, Martínez), or because they are a command for the subject to get rid of the pain itself — which, it is then argued, will typically imply getting rid of its underlying bodily condition (Barlassina and Hayward).

In other words, according to both evaluativists and imperativists, Adaptiveness is best cashed out in terms of the *semantic aptness* of pain. Evaluativists and imperativists then disagree on what it means for a pain to be semantically apt. For evaluativists, pains typically are faithful representations of their triggering conditions in that they represent these conditions, which are indeed threats to the organism, as bad (Tye, 2006; Bain, 2013). In turn, according to imperativists, pains are commands worth following, or advice worth heeding, concerning either a (potentially) harmful bodily condition or the pains themselves, to the effect that one should fix, extinguish, or prevent them.

Adaptiveness thus sits at the center of at least two prominent contemporary accounts of pain. As it happens, however, the connection of dysmenorrhea to damage is not as clear-cut as Adaptiveness expects. Uterine contractions that help dispose of endometrial tissue during menstruation are an integral part of the correct functioning of the female reproductive system, and hence not a damage, a disturbance, or a threat to the organism. Yet, they are painful for sufferers of dysmenorrhea.[10]

[10] The analogous point can be made about labor pain (Brownridge, 1995; Labor & Maguire, 2008; Lowe, 2002), for partly overlapping and partly independent reasons. Childbirth is *the* quintessential adaptive event (indeed, the fitness of individuals is usually *defined* as their expected number of offspring), and yet labor-related uterine contraction pain ranges from moderately severe to excruciating for 90% of primiparas (Brownridge, 1995, p. S9). We have chosen to tackle dysmenorrhea first, as the more common condition, and because of its interesting interactions with Acuteness and Differentiation, which are less clearly pres-

In a flat-footed intentionalist analysis, then, dysmenorrhea is a defective kind of pain in the sense that it is not semantically apt. More specifically, for evaluativists, if dysmenorrheic pain is a representation of uterine contractions as bad, then it is an *illusory* pain, insofar as uterine contractions, in the process of dealing with endometrial remnants, are not bad. On the contrary, they help dispose of tissue that could otherwise decay and be a focus of infection. In turn, for imperativists, if dysmenorrheic pain is cashed out in terms of an imperative for the agent to get uterine contractions to stop, then it is a *misguided* imperative, one that should not be heeded, for it invites a course of action not conducive to the well-being of the organism. This is actually how Klein presents dysmenorrhea: in his view, menstrual pain is a command to protect one's uterus, one that makes sense during childbirth, which is the process for which it evolved, but not during menstruation: "[it] promotes something maladaptive, or at least useless, rather than some more adaptive activity" (2015, p. 116f).[11] This is what we meant in the introduction when we said that dysmenorrhea comes across as a problematic case for mainstream intentionalist views. Colin Klein is to be commended for recognizing it more explicitly than other theorists facing the very same problem.

We will not address here the meta-theoretical question that this situation opens up: how big a threat is it for the plausibility of a theory about a certain phenomenon — e.g. pain — to deem a clear and very common instance of this phenomenon — e.g. dysmenorrhea — a corner, problematic case? But this is the situation that, we suggest, evaluativists and imperativists find themselves in with regard to dysmenorrheic pain.[12] The peculiarity of dysmenorrhea that we just pointed out — i.e. that its Adaptiveness is at least doubtful —, together with the fact that it is an extremely common type of pain, should compel theorists of painfulness to work on a full exploration of the specificities of this pain in particular, beyond merely registering the fact that it is indeed a problem case for the accounts they defend. To get intentionalists started, we end this section by sketching two ways in which the apparent maladaptiveness of dysmenorrhea could be dealt with from within the intentionalist program, as well as their associated challenges.

As we saw in Sect. 2, according to usual medical definitions, dysmenorrhea results from *unnecessarily* severe contractions. The idea of unnecessary severity is ambiguous, though, and it can be cashed out in at least two ways:[13]

ent in labor pain. An exploration of how labor pain stands in relation to philosophical theories of pain is an extremely interesting project, though, and one that we hope to tackle in the future.

[11] In Klein's (2007) version of imperativism, pain had negative imperative content: e.g., "do not move your leg like that!". As Tumulty (2009) pointed out, this would make menstrual cramps not just useless or maladaptive, but simply absurd: an imperative such as "don't do that with your uterus!" shouldn't be proffered and cannot be obeyed, as we have no voluntary control over our uteruses. This is not a problem for Klein's (2015) view: protecting our uterus is possible even if we cannot do any voluntary action *with* it. We would like to thank an anonymous reviewer for helpful feedback here.

[12] See Coninx (2021), however, on the idea that the apparent abundance of non-veridical pains is a serious problem for evaluativist theories.

[13] We are very much indebted to an anonymous reviewer for prompting us to draw these distinctions, and in general for helping us with the discussion to follow.

Less is enough First, uterine contractions may be unnecessarily severe in the sense that contractions less severe (lower uterine basal tone, less frequent, less intense, more rhythmical contractions) than those of dysmenorrheic women would already suffice to dispose of endometrial remnants during menstruation.

Risk of injury Second, uterine contractions may be unnecessarily severe in the sense that they could possibly cause bodily damage.

Thinking of dysmenorrhea as a pain that tracks the unnecessary severity of uterine contractions in the *less is enough* sense arguably brings it closer to an injury-centered pain amenable to intentionalist analysis: menstrual cramps, according to imperativists, might be saying "Stop having such severe uterine contractions (when less severe would be enough)!". This is now an imperative worth heeding. Similarly, evaluativists can propose that menstrual pains are grounded on a representation of too-severe-for-the-job uterine contractions as bad. This suggestion, however, does not amount to a fully satisfactory intentionalist picture of dysmenorrhea. Among other things, less-is-enough is about resource efficiency: there's no need to drive those uterine muscular fibers so hard if what you want to do is endometrial cleaning. But resource inefficiency is not the kind of "disturbance" intentionalists have typically associated with pain. Pain, as we saw above, is usually hypothesized to be connected to actual or potential tissue damage.[14][15]

The second reading of unnecessary severity is about *risk of injury*. It is not implausible that excessive uterine contractions are dangerous partly for the same kinds of reasons that excessive *muscular contraction in general* is dangerous: (the risk of) fiber rupture and (the risk of) ischemia, among other things (McMahon, 2013, Chap. 45). This would suggest an evaluation of "these uterine contractions (that could result in rupture or ischemia) are bad", or an imperative such as "see to it that this risk of rupture or ischemia disappears!" as possible kinds of representations underlying dysmenorrhea. This improves from the *less is enough* reading in making reference to (potential) bodily damage, and not just to the inefficient management of bodily resources.

One important thing to note here, though, is that, as far as our literature review has shown, these kinds of complications of menstruation-related uterine contractions basically don't happen. So, again, this would land us on illusory or misguided evaluation and imperative territory: for example, there's no credible risk of uterine rupture (which is a very serious, if uncommon, condition during pregnancy (Ofir et al., 2003)) as a result of menstruation.

[14] This is not to say that the idea of a pain grounded on resource inefficiency cannot be make to work—it is to a large extent an empirical issue whether there is a class of bodily events that (1) it makes sense to classify as resource inefficient, and (2) this lack of efficiency results in mental signals that we are willing to classify as pains. To the best of our knowledge this is not a question intentionalists have paid much attention to.

[15] Another potential problem for this suggestion, at least from the point of view of imperativists, is the one indicated in footnote 12, namely that there might be no way to obey the relevant imperative because we have no voluntary control over uterine contractions (even if resting and relaxation might help, see Proctor et al., 2007).

There are some moves for intentionalists to consider at this juncture: perhaps the content attributions to dysmenorrhea-related (imperative or evaluative) representations should not make reference to *uterine* rupture/ischemia in particular, but *muscular* rupture/ischemia in general. That is to say, nociception related to excessive muscular contraction is relatively well understood (Mense, 1993), and perhaps dysmenorrheic pain simply piggybacks on these mechanisms. This is germane to Klein's (2015) strategy, as discussed above: dysmenorrhea as an instance of a pain-inducing mechanism that is adaptive in general, just not in this case. Conceivably, each of these two possible content attributions (uterus-involving or muscle-in-general-involving) could result in different predictions as to how much of a misguided imperative dysmenorrhea is (as imperativists would put it), or how inadequate an evaluation of these spasms as bad it is (as evaluativists would say): it is probably good policy to avoid some level of muscle contraction in general, just not so good when we are dealing with endometrial remnants in particular. Adjudicating this question requires further work on the theory of representation underlying imperative and evaluative contents: what fixes the relevant kinds that should figure in content attributions to mental representations?

A related question (at least if one endorses a broadly teleosemantic account of subpersonal representations, like many of the intentionalists quoted in this section do) has to do with the biological function that menstruation is supposed to perform. According to the main contemporary theory on the evolution of menstruation, it is a mechanistic result of the process of decidualization (see Sect. 2), which in turn is the result of conflict between fetus and mother, which have partially divergent evolutionary interests (Emera et al., 2012; but see Nuño de la Rosa et al., 2021). Decidualization protects the mother from the fetus's exercising excessive hormonal control, but also forces fetuses to improve their fitness, so that they can thrive in the comparatively hostile environment created by the endometrium. That we are aware, not much work on teleofunctions in biology (see, e.g., Ariew et al., 2002) discusses the function of traits sitting at the interface of competing evolutionary imperatives. But that is, precisely, the kind of question that needs to be tackled in order to decide if menstruation is "good" or "bad", and for whom.[16]

5 Acuteness

When one steps into scalding water, some bodily tissue overheats or is in risk of overheating. When one's ankle rolls on the pitch, some bodily tissue breaks or is in risk of mechanical damage. These events result in pains that will recede as the tissue heals, or, for recuperation pains, as risk of re-injure becomes less imminent. As we saw Aydede (2017, 441) put it, when "I hit my elbow on the frame of the kitchen door …

[16] It is perhaps also relevant that humans are one of only a handful of species that menstruate (catharrines, some bats, and the elephant shrew, Emera et al., 2012, p. 27). This suggests a recent evolutionary origin for menstruation, and therefore conceivably a lack of adaptations for the suppression of pain caused by uterine contractions. We would like to thank Wayne Christensen for this suggestion. We invite intentionalists worried that their theories deem dysmenorrhea abnormal to explore and flesh out the foregoing considerations, as possible ways to make abnormality verdicts more palatable.

The pain is gone and forgotten after a few seconds." This kind of temporal unfolding, typical of injury-centered pains, is what it means for a pain to be *acute*. Psychologists distinguish acute pain from *chronic* pain, which is typically operationalized, simply, as "pain that persists or recurs for more than three months" (Treede et al., 2019).

In this section we will show that dysmenorrhea does not clearly instantiate Acuteness. In fact, we will argue, while the acute-chronic axis is often taken to exhaust the possible temporal behaviors of pains (Grichnik & Ferrante, 1991; Lavand'homme, 2011), dysmenorrhea cannot be readily categorized as either (cf. Walsh et al., 2003). The broader lesson for medical taxonomy is that acute and chronic are not the only functionally relevant kinds of temporal behavior for pains.

The temporal profile of dysmenorrhea is determined by the menstrual cycle, which makes it a *cyclical* type of pain: it occurs repeatedly, and anew, roughly every 28 days, with each episode extending for a limited period of time.[17] Because of this temporal profile, we will argue, dysmenorrhea actually shares features of both chronic and acute pains. We will suggest that, partly in virtue of dysmenorrhea's *sui generis* temporality, dysmenorrheic menstruators typically hold certain beliefs about their own pain that possibly make it a unique case when it comes to the pain's relation to so-called *pain catastrophizing*.

5.1 Dysmenorrhea and chronicity

Dysmenorrhea is a recurrent pain: it is bound to occur at the beginning of every menstrual cycle, namely at the onset of menstrual bleeding or shortly before. In this sense, just as it happens with chronic pains, pain *management*, instead of pain *curability*, is the relevant medical language when it comes to dysmenorrhea (Przybylo & Fahs, 2018, 218–19).[18]

One crucial feature that dysmenorrhea has precisely in virtue of its recurrence, and which makes it similar to chronic pains, is the fact that it can result in central sensitization. A common consequence of repeated exposure to afferent visceral firing is functional and structural alteration of the central nervous system leading to "the amplification of neural signaling … that elicits pain hypersensitivity" (Woolf, 2011, S5). In other words, repeated, similar afferent nociceptive activity can trigger a long-lasting increase in the excitability of spinal cord neurons that makes them fire in the presence of stimuli that would not have normally elicited a response. This is experienced "as a reduction of pain thresholds (allodynia), an increase in responsiveness and prolonged aftereffects to noxious stimuli (hyperalgesia), and a receptive field expansion that makes input from non-injured tissue produce pain (secondary hyperalgesia)" (ibid., S2).

Conditions that are thought to be at least partly the result of pain sensitization processes include rheumatoid arthritis, fibromyalgia, irritable bowel syndrome, and

[17] Przybylo and Fahs (2018, 219) call it *cyclic chronic*. We prefer the shorter form "cyclical" because, as we will show, the aspects in which dysmenorrhea is similar to acute pains also play an important role in how the pain is experienced.

[18] As an anonymous reviewer has pointed out to us, the fact that *management* is the relevant medical language for dysmenorrhea plausibly also has to do, at least in the case of primary dysmenorrhea, with the absence of an injury identified as the cause of the pain, and hence an injury that one can attempt to cure.

chronic radiating low back pain. Because they involve central sensitization, none of these pains fits cleanly in the mold of injury-centered pains, in the sense that they are not just responses to peripheral noxious stimuli: central sensitization makes pains float relatively free from a triggering damage, amplifying non-noxious activity in the sensory periphery and perduring in activity loops within the central nervous system. This is why philosophers who are critical of the injury-centered mainstream (Corns, Connix, Casser, op. cit.) often present central sensitization pains as problematic for these accounts: these pains take a life of their own, increasingly detached in time, intensity, and patterns of occurrence from whatever injury-related event kicked off the process in the first place.

The development of dysmenorrhea is likely tied to central sensitization. A few studies have uncovered a relation between dysmenorrhea and hypersensitivity to pain (Giamberardino et al., 1997; Granot et al., 2001; Bajaj et al., 2002), in which the differences registered in pain sensitivity between dysmenorrheic and non-dysmenorrheic menstruators are found to be systemic rather than resulting from regional changes in the pelvis (Granot et al., 2001, 409). Although there has been some debate on whether dysmenorrheic menstruators are especially susceptible to pain in general from the start, and hence more prone to experience dysmenorrhea; or whether dysmenorrhea is the cause of the lowering of the menstruator's pain threshold, so that they become more sensitive to pain (ibid., 410), the current consensus is that dysmenorrhea should indeed be classified as a central sensitization syndrome (Iacovides et al., 2015, 763; see also Yunus 2007). Indeed, to the extent that central sensitization syndromes are known to come about as a result of repeated exposure to similar painful stimuli, dysmenorrhea, in virtue of its characteristic recurrence, certainly seems a prime case for a process of this sort to happen. Note, then, that in not conforming to Acuteness, dysmenorrhea's deviation from the injury-centered model is not just a matter of the pain's duration, but strengthens the idea that the pain has some degree of independence from triggering events in the sensory periphery.

5.2 The temporality of dysmenorrhea, and catastrophizing

The foregoing considerations speak against taking dysmenorrhea straightforwardly as an acute pain. However, defining dysmenorrhea's temporal profile in full requires acknowledging as well that it is similar to acute pains in that it happens in episodes that, taken individually, are relatively short-lived, each of them lasting roughly from a few hours to a couple of days. One might actually think of dysmenorrhea as a *regular* succession of episodes of *acute* pain. Like menstruation itself, dysmenorrhea comes, and then goes, with a rhythm of its own, a dominant metaphor to describe it being that of a traveler or a visitor (Burbeck & Willig, 2014, 1338). It is in this sense that dysmenorrhea cannot be neatly categorized as either acute or chronic.

Dysmenorrhea's temporal profile implies that each episode of pain has a relatively predictable onset and a relatively predictable offset. On the grounds of past experiences, menstruators can make educated guesses as to when the pain will start and educated guesses as to when the pain will end, all the while being sure that it will end, and all the while being quite sure that it will subsequently start again, but only in due time: the menstruator knows that, once the pain is over, she will not experience

it again for about three weeks. In this sense, dysmenorrhea's temporal profile allows for some degree of "expertise" on the part of the menstruator about the unfolding of her own pain. She can hold informed judgments about when the pain will occur, but also about the pain's habitual quality and intensity and the management techniques that will help her mitigate it.

We suggest that menstruators' beliefs about the unfolding of dysmenorrheic pain connect interestingly with another set of beliefs about dysmenorrhea that menstruators typically hold, namely beliefs about the pain's *normality*. In particular, we speculate that these beliefs jointly influence dysmenorrhea's relation with pain catastrophizing, possibly making it a unique type of pain in this regard, and hence that they need to be carefully considered when assessing this relation.

Indeed, dysmenorrhea is sometimes assumed to be part of normal bodily function, in the sense that it is assumed to come with menstruation almost by necessity, and to be a pain one should simply put up with. In a study based on eighty-eight surveys to female high school adolescents, Wilson and Keye (1989, 329) write that "girls believe that menstrual cramps are a normal female experience, even when accompanied with severe pain, nausea, vomiting, diarrhea, headache, dizziness, and fatigue." In fact, not only menstruators, but also clinicians, sometimes see menstrual pain as mere "female troubles," an irremediable fact of life for those suffering from it. For instance, Przybylo and Fahs (2018) denounce how Przybylo's continual menstrual pain was dismissed as "growing pains" when she was an adolescent, even if on one occasion she suffered from toxic shock syndrome due to her period; and in a qualitative study, Rea et al. (2020) denounce generalized delays in diagnosis of endometriosis, a condition of which menstrual pain is a symptom. They mention the fact that symptoms of endometriosis are considered "almost physiological" as part of the explanation of these delays, and report patients saying, for instance, "I had almost convinced myself that I was just like this" or "I had been told that I was unlucky" (op. cit., 4). As these testimonies suggest, the belief that dysmenorrhea is a mere fact of life for sufferers may be partly explained by the further belief that there is no underlying injury causing the pain — which is accurate in the case of primary dysmenorrhea, but which can lead to negligence in cases of secondary dysmenorrhea. Menstruators need to put up with dysmenorrhea, the idea goes, because it is just inseparable from healthy menstruation.[19] Besides, when held by menstruators, this idea may also be reinforced by the familiarity they have with the pain given its recurrence, since familiarity might facilitate downplaying the pain.

On the face of it, it is reasonable to expect that these attitudes of dysmenorrheic women towards their own pain — their familiarity with the pain's typical unfolding,

[19] To be clear, we do not subscribe to the claim that menstruations with pain qualify as *healthy* menstruations, at least not in a sense that implies that dysmenorrheic menstruators do not deserve medical attention and care. On the contrary, we share concerns with those who have criticized the fact that dysmenorrhea has been socially normalized (see e.g. Salvia 2021). Researchers coming from clinical practice (e.g. Llobet 2020) condemn a gender bias in medical knowledge and therapy that overshadows female health issues, a central case of which is dysmenorrhea. In this sense, sexism would also be part of the explanation of the widespread assumption that dysmenorrhea is an irremediable fact of life that women just need to put up with. The focus of the section, however, is on one of the ways in which this normalization might inform menstruators' experiences of their own pain — in particular, how they catastrophize about it. Thanks to an anonymous referee for urging us to clarify these points.

and their belief that the pain is an inevitable feature of an otherwise healthy physiological process —, which taken together are plausibly specific of dysmenorrhea, influence the degree to which they feel threatened by the pain. In this sense, we speculate that dysmenorrhea poses a special problem for the notion of pain catastrophizing. The standard tool used to assess pain catastrophizing, the Pain Catastrophizing Scale (PCS henceforth; Sullivan et al., 1995), is not adapted to dysmenorrhea's specificities, and for this reason it might actually be ill-suited to capture how dysmenorrheic women actually catastrophize. This suggests, more generally, that there is room for improvement in how psychologists measure catastrophizing.

Pain catastrophizing is the tendency to overestimate the threat that a pain stimulus represents, to feel helpless when in pain, and to be unable to inhibit pain-related thoughts during pain episodes. The PCS includes a list of 13 items for subjects to rate that address the three factors of catastrophizing: magnification, helplessness, and rumination.[20] Studies reveal correlations between pain catastrophizing and temporal summation (Edwards, 2004; George et al., 2007), the phenomenon by which pain ratings increase when painful stimuli are applied repeatedly, which constitutes a marker of central sensitization processes. Hence, it seems that "pain catastrophizing is associated with the development, maintenance and aggravation of persistent pain" (Quartana et al. 2009, 750). In turn, at least one study has been conducted that establishes a correlation between dysmenorrhea and pain catastrophizing. In particular, Walsh et al. (2003) show that menstruators with higher scores in the PCS also score higher in menstrual pain sensitivity.

It should be noticed, however, that the scores of pain catastrophizing used in Walsh et al.'s (2003) study are the result of a mean from *all* the items in the PCS. We contend that, prima facie, some items in the PCS do not speak to dysmenorrhea's peculiarities. In particular, they do not speak to the beliefs that women hold about dysmenorrheic pain partly on the grounds of the pain's cyclicity, as just described.

The items that do not seem to speak to the cyclicity of menstrual pain are scattered across magnification and helplessness factors. In particular, the items "It's terrible and I feel it's never going to get any better" and "I worry all the time about whether the pain will end" seem, on the face of it, in tension with what experienced menstruators know about the habitual, limited duration of their pain. Similarly, the item "I become afraid that the pain may get worse" appears in need of further qualification, since the menstruators' past experience plausibly influences how much they fear, during each episode of dysmenorrhea, an unexpected worsening of the pain, and at least in some cases might preclude a literal interpretation of the item. In turn, the item "I wonder whether something serious may happen," if interpreted as expressing worry

[20] In particular, the PCS consists in the following items: *When I am in pain*, (1) I worry all the time about whether the pain will end. (H); (2) I feel I can't go on. (H); (3) It's terrible and I think it's never going to get any better. (H); (4) It's awful and I feel that it overwhelms me. (H); (5) I feel I can't stand it anymore. (H); (6) I become afraid that the pain may get worse. (M); (7) I think of other painful experiences. (M); (8) I anxiously want the pain to go away. (R); (9) I can't seem to keep it out of my mind. (R); (10) I keep thinking about how much it hurts. (R); (11) I keep thinking about how badly I want the pain to stop. (R); (12) There is nothing I can do to reduce the intensity of the pain. (H); (13) I wonder whether something serious may happen. (M); Patients rate these items from 0 (not at all) to 4 (all the time), and a total score is obtained (from 0 to 52), along with three subscores corresponding to magnification (M), helplessness (H), and rumination (R);

about the presence of some "serious" bodily damage, seems at odds with beliefs about pain normality and absence of underlying injury.

In sum, our point concerns the application of general categories such as that of pain catastrophizing to a type of pain that, in some respects here reviewed, is not considered standard; and the utility of standardized measures such as the PCS to characterize this pain fairly. The PCS, just as other similar questionnaires in psychology, aims at generating meaningful groups of subjects for further statistical treatment, so as to uncover causally relevant kinds.[21] If dysmenorrheic patients consistently respond to magnification- and helplessness-related items in a *sui generis* way,[22] then it is possible that the discriminations made on the basis of the PCS do not cut populations of dysmenorrheic subjects at causally-relevant joints, which might be significant to the point of having to think of a finer-grained concept of *dysmenorrheic catastrophizer*. In other words, the kind of catastrophizing that accompanies, for instance, chronic back pain might be different from the kind of catastrophizing that accompanies dysmenorrhea, and it is not clear that the items in the PCS can possibly capture this difference because they are tailored to pains that are neither cyclical nor generally regarded as normal.

6 Differentiation

This section addresses the third and last feature of the injury-centered model of pain singled out above, namely Differentiation. A widespread idea in philosophical discussions on affectivity is that pains and moods are disjoint mental kinds, "different species of the same genus of affective states" (Rossi, 2019, 15; see also Bordini 2017, 78).[23] It does not seem far-fetched to say that this taxonomic choice is connected to the pivotal position of injury-centered pains in the affective landscape. Moods are indeed different from them, first, in that they are typically longer-lived, often lasting for days and, in pathological cases, years (Horwitz et al., 2016). Besides, unlike injury-centered pains, moods might be somehow related to injury, but it is in no sense essential that they are: moods "may or may not be triggered by a stimulus, and [are] primarily characterized by subjective feelings" (Lempert & Phelps, 2016, 99).

In this section we will show, however, that a full characterization of the affectivity of dysmenorrhea needs to appeal not only to physical pain, but to moods as well, and that the two elements often appear intertwined in interesting ways in this condition. Dysmenorrhea, we believe, belongs to a class of conditions with a complex affective profile, the phenomenological structure of which is likely to be missed in analyses that neatly separate pain and mood. We propose that the so-called *pain-depression*

[21] Just as we distinguish, for instance, between age groups, and smokers or non-smokers, when talking about stress and anxiety (e.g., Balık et al., 2014, 374).

[22] As said, we are speculating here, since questionnaire data are not widely available.

[23] One possible recent exception is (Coninx, 2022). While she does not discuss Differentiation explicitly, her proposal of a "multidimensional phenomenal space for pain" seems congenial to the ideas we develop in the main text.

dyad offers a useful model to define the mixed affective category to which, we contend, dysmenorrhea as an experience belongs.

As we pointed out above, dysmenorrhea is clinically identified by the presence of painful abdominal cramps. However, mood-related symptoms are also part of the common experience of dysmenorrhea. The mood-related component of dysmenorrhea is recognized by standard questionnaires of menstrual distress such as Moos (1968), which includes items that concern what philosophers would decidedly call mood — e.g., loneliness, anxiety, restlessness, irritability or depression (op. cit., 857).[24] Besides, subjective reports by dysmenorrheic menstruators typically include negative mood states as part of the symptoms that they themselves recognize to be associated with their menses. In a study about the qualitative experience of dysmenorrhea in students, Aziato et al. (2014) identified "altered emotion and interaction" as one of the main themes addressed by the interviewees, which made reports such as "…my attitude changes; I get angry easily and I always want to be left alone"; "I tend to push people away; I become moody"; or "I get irritated when someone comes around me" (op. cit., 62) in their descriptions of menstrual symptomatology. Finally, there are actually very robust results linking dysmenorrhea to anxiety, depression and stress (Bajalan et al., 2019 is a recent review), and not just as benign mood swings: as Endicott (1993, 196) puts it, "some women who have no evidence of other current mental or physical disorders have severe premenstrual or perimenstrual depressive syndromes that meet cross-sectional symptomatic criteria for major depressive disorder."

It is thus quite uncontroversial that pain- and mood-related symptoms often coexist in the experience of dysmenorrhea. Most importantly, when they coexist, the pain- and mood-related symptoms are often not experienced as completely unrelated, or as merely juxtaposed. To put it plainly, enduring dysmenorrhea is not like feeling a paper cut on one's left pinky while, as it happens, also feeling sad that the summer is ending. Rather, pain and mood disorders in dysmenorrhea are often experienced as somehow related to one another, where this experienced relation arguably goes beyond mere causation: while mood changes can certainly be caused by pain — i.e., one can feel miserable that one is in pain —, and this process might of course be salient in dysmenorrhea too — given, for instance, how much pain affects the menstruators' social life —, menstruators' reports often express something more subtle than that. For one thing, mood-related symptoms are sometimes registered *before* the onset of the pain. As Burbeck and Willig (2014, 1339) report one woman say:

> "I would say, when the period's just about to start, or just before, you know, within an hour before, I feel tearful. It's as if, it's like a central heating clock, you can hear the clunk can't you, when the boiler comes on to give you hot water at 6 o'clock at night? It's like that. It's as if my tears alert me," and

[24] Interestingly, other items in this questionnaire have to do with cognitive symptoms (e.g., forgetfulness, confusion, and lowered judgment). In this piece we focus on the distinction between moods and pains, but, we believe, the distinction between mood and some kinds of transient cognitive states (such as, for instance, states of bewilderment or daze) could also benefit from revision.

> "I would say the pain in my stomach just starts really, erm, could be about part-way through day one [of period]."

This testimony not only talks of her mood change as preceding her pain. More importantly, she talks about it as a warning that the bleeding will start soon. In turn, when pain and negative mood occur simultaneously, sufferers adopt behaviors that target them jointly, as Aziato et al. (2014, 62) suggest when they report that some women "did not answer their phones or watch television (TV) and preferred darker environment when they were in pain due to their altered emotions." In this sense, mood symptoms are interestingly experienced as related to the bleeding just as much, and in much a similar way, as the pain is experienced to be related to the bleeding. It seems that in episodes of menstrual pain that involve mood alteration, fully characterizing the phenomenology of the pain requires mentioning its relation to mood, and vice versa, as components of the overall experience of menstrual discomfort.

Studies about the mechanisms underlying mood and pain symptoms in dysmenorrhea are relatively scarce. However, it is in fact likely that these mechanisms overlap substantially (Iacovides et al., 2015). On the one hand, gonadal hormones are known to intervene in mood-related processes (Endicott, 1993; Fernández-Guasti et al., 2012). On the other hand, there is evidence that the neurophysiology of pain and depression —in general, not just in dysmenorrhea— are intimately related. For example, the top-down component of pain —which is connected to central sensitization, as described above— and depressive moods share biological pathways and neurotransmitters (Bair et al., 2003). This commonality of mechanism is also supported by epidemiological data. A study with 3900 identical twins showed significantly higher than chance comorbidity between central sensitization syndromes and psychiatric conditions —major depression, panic attacks, post-traumatic stress disorder—, suggesting "a common etiology" (Schur et al., 2007).

In order to capture the intimate relation just described between these psychological conditions and pain, some researchers talk of a *pain-depression dyad* (Goldenberg, 2010), examples of which are functional somatic syndromes such as fibromyalgia or irritable bowel syndrome. In coining this notion, researchers aim to capture the commonality of mechanism between pain and depression; and importantly, to do so to contribute to the explanation of certain specific *syndromes*: namely to explain pain and depression's joint manifestation in individual patients for whom undergoing them implies a global, negatively valenced state.

In our view, the case of dysmenorrhea is similar to the cases that fall under the pain-depression dyad in just these respects: the experienced intertwining of often concomitant mood- and pain-related symptoms, plausibly explained by related neurophysiological mechanisms, to make up an across-the-board negative subjective state. Dysmenorrhea is different from functional somatic syndromes, however, in that it is cyclical, and hence involves pains that are not neatly chronic and mood states that are in principle not recalcitrant. In this sense, dysmenorrhea suggests another category as a generalization of the pain-depression dyad, which we could call *pain-mood dyad*.

In sum, to the extent that dysmenorrhea and other conditions falling under this dyad have an important affective component, they suggest a revision of our assumed, basic affective types towards more flexible notions of pain and mood that allow for

substantive interaction between the two. Even more than that, they suggest the need to think of hybrid categories such as the pain-mood dyad as basic affective types in their own right.[25]

7 Conclusion

In the foregoing pages we have argued that dysmenorrhea does not conform to the injury-centered model of pain. We have done so by showing that it does not feature, or at least it calls for a refinement of, the three properties that we have singled out as central to injury-centered pains, namely Adaptiveness, Acuteness, and Differentiation. The discussion of each of these properties in dysmenorrhea respectively opens up research avenues that we deem worth exploring. Pursuing these avenues promises to contribute to a model of pain capable of encompassing an experience that, although different from injury-centered pain, is extremely prevalent.

As we pointed out in the introduction, shifting, or broadening, the theoretical focus in a way that meaningfully includes dysmenorrhea plausibly goes some modest way towards improving general understanding of the condition. We have referred above to the apparently widespread idea that menstrual pain is a "fact of life" for menstruators, namely a pain that menstruators have to go through as part of their nature (see Sect. 5.2). This idea is misguided. Yet, if the allegedly paradigmatic kind of pain, the one from which philosophical theorizing departs, is one that leaves menstrual pain aside, this can only contribute to neglecting menstrual pain, possibly consolidating that misguided idea. An important lesson of recent philosophy is that, in order to make meaningful philosophical progress, we need to pay special attention to lived experiences that, for whatever reason, have not managed to contribute to shaping the mainstream. This paper is an invitation to purposely take a look at the philosophical significance of menstrual pain. This might help to underpin the pathological status of dysmenorrhea, and hence advancing towards its solution.

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[25] Melzack's McGill Pain Questionnaire (Melzack & Raja, 2005), the most widely used pain questionnaire, asks subjects to rank pain descriptors such as "miserable" or "cruel", that arguably make better sense when thought of in the context of the kind of states we have discussed in this section.

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