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An evolutionary interpretation of the significance of physical pain experienced by human females: Defloration and childbirth pains

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Summary The phenomena surrounding the pains commonly related to both first coitus and delivery have been addressed rather poorly in previous work, as regards their evolutionary aspects, during the investigation of human sexuality and reproductive behavior. In particular, the function of the hymen and the significance of defloration are largely misunderstood. The present paper aims to analyse the meaning of these two female physical pains in an evolutionary context. Accordingly, childbirth and defloration pains are hypothesized to manifest an adaptation designed to increase inclusive fitness in human evolutionary history. Clearly, the significance of pain as a message is essentially emotional. Indeed, the intense sexual emotions that may precede and/or follow the pain, the breaking and bleeding of the hymen during the first complete sexual act may generate distinctive strong feelings on/from each side of the newly formed couple. As to labor pain, both the shared intimacy with the mother and the emotional background during confinement may create mutual solicitude among the protagonists (i.e. midwifes, father, mother). Such feelings or attitudes may subsequently turn out to be beneficial to all of them, and more particularly to the newborn. As a general consequence, it appears that the two physical pains under consideration may have behavioral implications, in the sense that they contribute to increasing the stability of the connection between partners and thus, indirectly, to the welfare or even the survival (especially in former times) of the newborn child.

Introduction

Most of the studies devoted to defloration [1—7] and labor pains [8—13] focus on the clinical, social, historical or ethnological aspects of these prominent events in a human female's life. Accordingly, very little attention has been paid to the significance and the unconscious meanings of pain as a specific message [14] to either women or men, especially when it occurs within the intimacy of defloration and childbirth.

This paper is an attempt to understand the evolutionary meaning of these physical manifestations, and their implications on the level of the individual, the couple and the whole community. Clearly, the present contribution aims to show that the two types of pain presented in the above-men-

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tioned situations may express physical and/or psychological adaptations that have been designed to increase inclusive fitness in the human species.

However, as a first general remark, note that (i) the presence of a hymen, the pain and bleeding that may usually be connected with disturbance of virginity, and (ii) the pain and need of assistance accompanying most deliveries, are characteristics that seem to be specific to the human (*Homo sapiens*) female, at least to a certain extent. Secondly, and before going any further, it should be pointed out that religious dogmatism concerning virginity and childbirth pain (see for example The Bible, *Genesis*, 3:16) has sometimes been a serious obstacle to providing an objective grasp of the significance of these human attributes. Consequently, their evolutionary meaning or ''usefulness'', as well as their ethological implications in terms of human behavior, are poorly understood, and indeed largely misunderstood.

In the following sections, we shall therefore discuss and try to interpret the significance and meaning of both defloration and childbirth pains in the light of an evolutionary approach to human behavior and sexual psychology [15,16]. To this end, the following questions will be addressed: What exactly is the significance of each of these two pains? Do they have a common meaning? What is the function of the human hymen? Do these human attributes have reproductive purposes? Seen another way, under what circumstances have women, who are subject to experiencing these types of pain, developed an advantage over others (e.g. those without a hymen)? How do these adaptations increase their individual reproductive potential? Finally, do these human attributes have a beneficial action on offspring and thus, indirectly, on the survival capacity of the whole community? However, before answering these questions, we shall give a brief outline of the context of defloration and childbirth pain.

Defloration pain and virginity

Function of the human hymen: the existing hypotheses

According to most sources, human females are the only animal to possess a hymen [17,18] except African elephants, where in fact the hymen is not broken by mating, but only during birth [19]. Curiously, the function of this membrane, which surrounds the vaginal orifice, has never been clearly elucidated [20]. Nevertheless, the existing hypotheses for the likely function of this unique structure have been outlined by Hobday et al. [17]). As a response to the weakness of several explanations for the function of the human hymen, the authors suggest that the hymen is an embryological structure that has been retained into the juvenile period. The persistence of this structure into childhood and beyond is interpreted as a consequence of the natural selection of hymen-possessing females, given the protection this membrane offers the vagina against external sources of infection. However, in addition to this possible physiological function of the hymen, the authors note that the increased fitness of females with hymens may also be enhanced by certain cultural practices and sexual selection, which allow males to determine non-virgin females [17]. Moreover, in a previous paper, Katchadorian [18] points out that although this delicate membrane has no clearly known physiological function, its psychological and cultural significance as a sign of virginity is enormous.

Cultural context

The concept of virginity, and subsequently the attention given to the valorisation of an intact hymen, is a universal feature of humanity in the sense that virginity has always been a major issue in human history. Note that in some countries and cultures, the premium put on female virginity is such that women sometimes choose to undergo a surgical hymen reconstruction before marriage, to ensure that they are seen as pure and thus remain socially acceptable [21—26]. In some societies, girls without intact hymens before marriage have been mistreated or even killed [18]. More generally, the hymen and loss of virginity have sometimes been considered in a context of dominance of men over women, or amongst men. Thus, ritual defloration as a custom in several non-European cultures, or the symbolic gestures developed by the lords in the alleged *jus primae noctis* in force during the European late medieval period, were used as humiliating signs of superiority over the weak. These practices can be interpreted as a male power display, with a basis in the psychology of coercive social dominance and male competition [7]. More generally, we believe that insufficient understanding of the meaning of the hymen, and consequently of the perception of virginity, may induce different forms of oppression (cultural, legal, medical and political) perpetrated against women. An example showing the increased power of medicine and law to adversely function as tools of oppression has been related by Shalhoub—Kevorkian [25].

Need of a better explanation

The exaptation hypothesis of the hymen serving a protective function, as suggested by Hobday et al., is largely unsatisfactorily. This objection is supported by: (i) the absence of reported hymens in any of the great apes and, therefore, its probable hominid origin [17], (ii) the obvious loss of microbial protection following defloration, and (iii) the considerable importance that has been put on female virginity, independently and to a greater or lesser extent, in almost all human societies. This paper therefore, offers a more plausible explanation, given that it seems likely that the function of the human hymen may be manifold.

Childbirth pain

Existing interpretations

Although most women report that labor is painful, most physicians have surprisingly little understanding of the nature of labor pain. In the rare papers devoted to this subject, pain is usually depicted as a subjective experience involving a complex interaction of physiological, psychological, cultural, and environmental factors [9]. Moreover, although pain in childbirth is an often-unwanted element, it is considered fundamental to physiological labor [13]. According to the same author, labor pain is also essential in promoting health, and its suppression could cause considerable complications. Among the various reported psychological functions of pain — e.g. an element of personal transformation, a means that activates the woman's resources and makes her stronger while preparing her to bond with her child, or even the expression of the psychological pain of separation [13] — none evokes the possibility of an adaptation following an evolutionary process. This paucity may find an explanation in the somewhat paradoxical aspect of the association of acute pain with a physiological process like childbirth.

A special case: intense childbirth pain

Referring to the studies about the significance and consequences of reported childbirth pain it appears that intensely painful deliveries seem to be associated with pre- and/or post-delivery mental disturbance. According to Nettelbladt et al. [12], intense childbirth pain is more common in women with mental disorders during pregnancy, or those showing a negative attitude towards the current pregnancy and motherhood. Conversely, serious mental disturbance may also affect women after childbirth. Thus, post-traumatic stress disorder (PTSD) has been reported in women who have undergone obstetric and/or gynaecological procedures [11], the higher levels of distress being associated with feelings of not being in control during delivery [10]. Furthermore, adverse perinatal conditions are associated with an increased risk of suicide by violent means for adult men [8]. Nevertheless, according to the latter case-control study, the risk of suicide in offspring was shown to decrease by giving opiates to the mother during delivery. Consequently, as a remedial measure to the propensity of male offspring to suicide as adults, the authors suggest that obstetric procedures should be chosen (e.g. giving opiates to the mother during delivery) that reduce perinatal trauma to minimise the possible risk of subsequent self-destructive behavior in adulthood. In response to this study, Appleby [27] points out the possibility of indirect causal links between pain experienced by infants during obstetric complications and violent suicide. For example, it can be argued that intense pain during delivery is likely to affect the nature of the relationship, in terms of care and attention, between the mother and her child. However, it must be emphasized that the previous deleterious links between childbirth pain and the various reported aspects of either causal or subsequent mental disturbance are concerned with quite intense pain, which is beyond the ''normal'' level of pain experienced by most women during a non-pathological delivery.

The evolutionary background

From another perspective, one may be surprised by the apparent facility in giving birth, characterising for instance some species of wild herbivores, and similarly the promptitude of the newly-born calves to be able to stand on their legs and move by themselves. It is a matter of course: such animal behavior reflects an adaptation designed to cope with the constant threat from predators. On the other hand, calving is sometimes said to be complicated in cattle. However, if such a difference, in comparison with other mammals, turned out to be confirmed, it should be noted that the animals in question are domesticated, that is animals living in symbiosis with humans. Therefore, they are subject to the interdependence, or even adaptations, which follow this type of relatively harmonic association. Consider-

ing the previous unclear picture of pain, and given that the existing reported explanations [13] seem largely insufficient upon critical consideration, the present paper attempts to highlight another more convincing function of labor pain in human females.

The apparent inconsistency

Pain instead of pleasure

To return to the general context of the two considered types of female pain again, it is interesting to note that they can be viewed in a rather paradoxical way, that is following the classical utilitarian approach for interpreting adaptation. In particular, the inconsistency between acute pain and the physiological process of childbirth has been previously highlighted by Lowe [9]. Indeed, defloration and especially childbirth pains seem to go ''against the stream'', considering all the subterfuges which have been developed by evolution to facilitate human reproduction and survival aptitudes, within the framework of the relationship between the genders. The fear caused by the pain and bleeding which usually accompany defloration seems to be opposed to a number of other more favourable human features (e.g. sexual feelings, sexual pleasure, male and female orgasm) governing human reproduction. This subject has inspired considerable research on adaptive person perception and mate selection. Thus, women have been shown to display enhanced sensitivity to reproductively relevant stimuli during phases of high conception risk [28]. Moreover, ovulation-contingent shifts in desires and behaviors across the ovulatory cycle are sensitive to varying fitness payoffs [29]. More specifically, female attractiveness, in terms of body odour [30] or facial attractiveness [31], increases during the fertile phase of the menstrual cycle. In consideration of such a level of refinement of human reproductive strategies, the presence of a membrane that has been, or still is, responsible for many social problems, or at best is viewed as a simple source of annoyance (i.e. the pain and bleeding during the first sexual relations), is debatable, indeed. Regarding human reproduction effectiveness in general, the first complete sexual act, and more especially childbirth, should logically be painless. Furthermore, one could even expect them to provide a feeling of pleasure, instead of fear and pain, like normal sexual intercourse, to encourage human mating in order to produce young!

Is pain resulting from morphological abnormalities?

The absence of any satisfying interpretation has led some authors to consider the previous sources of suffering as a result of morphological abnormalities. Following this point of view, defloration pain may be regarded as a simple nuisance caused by the presence of a needless membrane, which partially obstructs the vagina. As to childbirth pain, it is caused by the narrowness of the female pelvic outlet and/or an imperfect evolution of early human ancestors during the acquisition of the upright bipedal posture and the concomitant reduction in the size of the birth canal [32]. However, the last arguments in order to understand the meaning of the examined pains appear to be largely unsatisfactorily again, in consideration of either the importance of their implications in human psychology or adaptation procedures in the context of evolution and human behavior.

A common hypothesis

Uncertainty of paternity versus parental care

The previous observations and remarks lead us to put forward the hypothesis that, in human evolutionary history, females may have increased fitness as a result of the physical pain experienced during delivery, and/or defloration, with the breaking and bleeding of the hymen. Before outlining our hypothesis, it should be emphasized that a well-known fundamental rule of nature, which constantly bothers human males, undoubtedly lies in the lack of absolute certainty that may exist about their paternity. Indeed, men are concerned about the uncertainty of paternity, that is, the possibility of raising another man's child while believing that the child is their own [33–35]. Moreover, male parental care is influenced by genetic relatedness to offspring. According to Daly and Wilson [36] human males provide better parental care to genetically-related children. A woman's sexual infidelity could therefore indirectly reduce her reproductive success by losing the male's resources and assistance in raising her offspring. On the other hand, in the case of a male's infidelity, the resource threat following limited paternal investment may become conclusive only if the male partner develops a deep emotional attachment to another mate [37]. As a consequence of these sex-specific reproductive threats, men respond with stronger negative emotions to a mate's

sexual infidelity, whereas women are more distressed by the thought of a partner's emotional infidelity. This hypothesis has received considerable empirical support [33,34,37].

Virginity as a pledge of future faithfulness

Theoretically, the hymen ensures virginity, and thus guarantees that the desired woman is not bearing a child that could have been conceived with a previous partner. Moreover, the hymen shows that she probably has not been inclined, at least until that specific time, to experience any other previous sexual relationships. Similarly, note that the expected pain associated with defloration is a priori likely to make adolescent or young women reluctant to experience trifling relations, that is, with an ephemeral partner and devoid of any kind of engagement. Undoubtedly, the presence of such traits in the coveted woman may be perceived by the male to be a pledge of future faithfulness with respect to the above-mentioned typical masculine concern. Therefore, sexual selection by males against non-virgin (or lacking a hymen) females, which has been considered an example of exaptation by Hobday et al. [17], seems in fact to be the most likely hypothesis for the evolution of the hymen.

Extreme sexual emotions

However, the major human sexual feature sustaining the above-mentioned theory probably lies in the intense emotional experience, which may accompany the first complete sexual act within the intimacy of the newly formed couple. Indeed, the experience of defloration, with the extreme sexual emotions that may precede and, more often, follow the pain, the breaking and bleeding of the hymen, is liable to increase the stability of the connection between partners. In particular, the male partner can moreover be involved in a distinctive strong feeling, somewhat like a very first privileged penetration into what he may afterwards consider his own marked ''feminine sanctuary''. Therefore, such elements, which contribute to strengthening the relationship between the partners, obviously may also act, through their indirect and subsequent effects, to offer better conditions to the offspring, in terms of harmonious development and/or chances of survival.

Shared intimacy and solicitude

Concerning childbirth, the joint meaning of pain and need of assistance in human females during confinement may have two main explanations, both founded on the shared intimacy with the woman in labor and the emotional background this common experience may create among the protagonists. Firstly, the emotional context developed throughout delivery is likely to promote mutual solicitude among the females, who share the childbirth intimacy and probable pain of the new mother. This concern towards the mother may in turn encourage the other women to look after the physical and spiritual welfare of the newborn, especially in case of an emergency. In particular, they could behave as a substitute to a temporarily incapacitated mother, namely by nursing and feeding the infant. Such behavior from the close female community might have been of vital importance to the newborn, for instance in the event of the mother's death during childbirth. Secondly, the circumstances which are liable to trigger the inclination of the other females to show solicitude towards the new mother, are likely to induce a similar positive attitude in the male partner who has shared the intimacy of birth and the suffering of his female companion in labor. Concretely, the behavioral consequences of his presence at the delivery on the couple's relationship might therefore have the same kind of effect as those induced by defloration. In addition to these beneficial effects within the couple, we may add a possible high regard from the male partner for women in general. That is, a feeling of solicitude from the male, which may be triggered by the females' ability to deal with a difficulty related to life, in comparison with his own passive and somewhat embarrassed attitude during confinement. For all these reasons, and with the exception of the male partner, childbirth appears to be fundamentally a women's business.

Concluding remarks

All the previous attempts to give an evolutionary explanation to both defloration and childbirth pains focus on considering these attributes as adaptations. In this regard, it seems pertinent to hypothesize that these two examples of physical pain experienced in a woman's life, namely childbirth pain and defloration with the breaking of the hymen, are features that have been designed during human evolutionary history. The evolutionary significance of pain as a message relevant to these two specifically human attributes is essentially emotional. It clearly appears in the increased fit-

ness of those human females who possessed these characteristics. Thus, in both cases, physical pain focuses the inclination of individuals to promote the links between them that is, within the couple itself and its close human surroundings, among the community. Concretely, the hymen and the existence of the previous aspects of pain can likely be regarded as adaptations, in the sense that these types of pain are able to enhance the experience of intense sexual emotions, which in turn contribute to strengthening the stability of the connection between partners. Finally, such favorable circumstances suggest that these specific female pains may be considered indirect fitness-increasing factors, which undoubtedly had a beneficial influence, especially in former times, upon the survival of the offspring, and consequently the survival of the whole community. Furthermore, it is worthwhile to note that the previous traits, which are primarily based on an emotional structure, are particularly present in the human species. Previous argumentation suggests that at least one aspect (i.e. the hymen) relative to these traits might have originated in the hominid line, as advocated previously by Hobday et al. [17].

However, the hypothesis stated in this paper should prompt other contributions to the study of the evolutionary foundations of the physical pain caused by either defloration or childbirth and the examination of some of its predictions by means of experimental data and field settings. As an example, comparative studies aiming to examine the stability of the connection between partners who have experienced first-love with an intact hymen versus women having previously had sexual relations with other partner(s) would be valuable in supporting or rejecting one of the aspects of this hypothesis.

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