Current scientific research on paedophilia: a review

Recenti sviluppi nella ricerca scientifica sulla pedofilia: una review

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Summary

Objective
Child sexual abuse is a very common problem in most parts of the world. Sexually abused children and adolescents are at risk for a wide range of mental health disorders and adjustment difficulties that can persist until adult life. Paedophilia is therefore a major public health issue and a worldwide concern, considering that sex offenders show a preference for children as their primary sexual interest and that this kind of offence has a high rate of recidivism. Although neglected for a long time, research on this topic has increased substantially during the last two decades. In an effort to more clearly understand paedophilia, the aim of this investigation is to conduct a review of recently published articles to identify developments and trends that might be useful in clinical practice with adult patients, and contribute in preventing child sexual abuse.

Methods
The Pubmed database (from January 2010 to February 2012) was queried entering "paedophilia" as keyword. Reports of original data or reviews published in scientific journals addressing assessment, diagnosis and treatment of paedophilia were reviewed. Relevant studies are described herein.

Results
Our search strategy generated 72 records. From these 72 abstracts, 41 met the inclusion criteria. These studies raised many fundamental questions such as the validity of current diagnostic criteria for paedophilia in DSM IV-TR, the proposal of new diagnostic criteria for the DSM-5, influenced by the increasing use of Internet by paedophiles, and the importance of an accurate diagnosis. Findings from neurobiological studies showing neural correlates of paedophilic interest are presented, suggesting new clinical perspectives and rising new questions concerning assessment and treatment.

Conclusions
The theme of paedophilia is currently the subject of important research and productive debate. Recent studies on functional brain response are introducing new perspectives in the assessment of this disorder, and have relevant implications in terms of targeted treatments and prevention. Further studies are needed, with larger samples and more rigorous research methods.

Key words

Paedophilia • Child sexual abuse • Pedophiles • Child molesters

Introduction

Child sexual abuse is very common and represents a serious problem in most parts of the world. According to the Child Maltreatment 2010 report (USDHHS, 2011) [1], 9.2% of children in the USA suffered from sexual abuse.

Sexually abused children and adolescents are an "at risk" population for a wide range of mental health disorders and adjustment difficulties. Apart from physical consequences, the experience of being abused is associated with the development of a wide range of psychiatric disorders, and these associations persist in adolescence and adulthood [2-5]. A recent survey [6] in 28 world countries showed that early adversities (e.g. child sexual abuse) are the strongest predictors of mental disorders in developmental age as well as in adulthood.

Childhood sexual abuse may negatively affect not only the risk of developing a mental disorder, but also course of illness and treatment outcomes: a recent meta-analysis suggested that childhood maltreatment and sexual abuses are associated with an elevated risk of developing recurrent and persistent depressive episodes, and with a lack of (or less) response to treatments [7].

In addition to the long term consequences for child victims, it is known that recidivism rates for child sex offenders are very high, in the range of 10% to 50% for paedophiles depending on the type of offence [8]: men who sexually abuse "boy-victims" are usually considered to be at highest risk of reoffending, compared with heterosexual paedophiles [9].

Identification and treatment of paedophiles should be therefore of primary concern, as paedophiles display a preference for children as sexual interest that seems to play an important role in sexual recidivism of paedophiles [10].

It is difficult, however, to accurately estimate the preva-

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lence of paedophilia, because only a few paedophiles voluntarily seek treatment, and most of the available data come from samples of individuals involved with the legal system [8]. According to recent estimates, when considering different child sex offender typologies [11], the proportion of child sex offenders who meet DSM-IV-TR criteria for paedophilia seem to range from 25% to 45% [10]. Among the few surveys conducted in the general population, a recent German study involving a community sample of about 2000 men aged 40-79 [12] found that a paedophilic pattern of sexual arousal was reported in sexual fantasies by 9.5% of participants and in real-life sociosexual behaviour by 3.8%. Another study [13] found a greater sexual arousal to children than to adults in child pornography offenders if compared with sex offenders against children, sex offenders against adults and general sexology patients.

After a period of substantial neglect, in recent years the international scientific community has been interested in this phenomenon and several studies have been conducted, highlighting the need for an accurate definition of paedophilia, which has several implications for science, clinical practice and public policy. Interesting studies have also been conducted on the effectiveness of treatment protocols for child sex offenders.

In an effort to more clearly understand paedophilia, mental health needs of paedophiles and treatment options, the aim of this investigation is to identify research developments that might be useful in clinical practice with adult patients and therefore contribute to child protection.

Methods

The aim of this study is to provide an up-to-date review of scientific articles concerning paedophilia and paedophiles, published in the last two years. We systematically reviewed the literature, using MEDLINE/Pubmed database, with the term "paedophilia" as keyword.

We included studies that (i) were published online between January 2010 and February 2012, (ii) included original data or reviews and (iii) were concerned with assessment and/or diagnosis and/or treatment of paedophilia.

As a consequence, we excluded publications that concerned child sexual offenders who were not recognized as paedophiles. After the search was completed (72 articles), we selected relevant abstracts, according to the inclusion criteria specified above. A total of 41 articles were suitable for this review. The most relevant articles were analyzed and described herein.

DSM-5 and current debate on the diagnosis of paedophilia

Most of the recent literature about paedophilia addresses diagnostic issues. Being able to identify, among child molesters, those individuals who present specific characteristics (i.e. exclusive sexual interest for children, sexual fantasies about children emerging in adolescence) and who may therefore benefit from targeted treatment [14 15] is of particular importance.

At the present time, according to the DSM-IV-TR [16], in order to diagnose paedophilia it is necessary that, over a period of at least 6 months, the person presents recurrent, intense sexually arousing fantasies, sexual urges, or behaviours involving sexual activity with a prepubescent child or children (criterion A); that the person has acted on these urges, or the sexual urges or fantasies cause marked distress or interpersonal difficulty (criterion B); that the person is at least age 16 years and at least 5 years older than the child or children involved (criterion C).

Several authors are now debating about the diagnosis of paedophilia and are concerned about the appropriateness of it, both in terms of its fitting with the current idea of mental disorder as presented in the DSM, and in terms of its usefulness for clinical purposes.

The DSM-IV classification system for paedophilia has been often criticized as unsatisfactory on logical or conceptual grounds [17], and the diagnosis of paedophilia has been modified in every new edition of the DSM. In particular, these changes have been related to the role played by deviant behaviours, distress and impairment of the subject [18] and are highly suggestive of the ambiguity embedded in this phenomenon.

According to Malòn [18], diagnosis of paedophilia as it is formulated in DSM-IV-TR presents two important problems: 1) it is possible, for one person, to be a paedophile (because of the sexual interest in prepubescent children) and at the same time not to be a paedophile (in a diagnostic sense), if the person does not act and feel neither distress nor impairment; 2) apparently it would be possible to act as a paedophile, and be thus diagnosed, even if one does not have paedophilic feelings requested by criterion A.

According to Blanchard's report on paedophilia submitted to the Sexual and Gender Identity Disorders Work Group [17], in the DSM-IV-TR a history of sexual acts involving children is a sufficient condition for diagnosing paedophilia because it would satisfy both criterion A (signs and symptoms) and criterion B (distress and impairment). Repeated sexual acts involving children appear indispensable as a diagnostic sign of paedophilia, due to the general unavailability of phallometric testing and self-reporting in paedophiles. However, this does not take account of those individuals who engage children sexually without an exclusive erotic preference for them, or those who have fantasies or urges towards children but do not act on them, or those not distressed over the urges or fantasies. The existence of such individuals poses a problem, respectively, for the signs/symptoms criterion and for the distress/impairment criterion.

To overcome this problem, Blanchard has proposed to introduce the distinction between *paraphilias* (as a condition, when only criterion A is met) and *paraphilic disorders* (when both criteria A and B are fulfilled) in the DSM-5, and this proposal is currently under debate. The addition of the word "*disorder*" to the condition is meant as a reminder that people who meet criterion A but not criterion B can still be designated as paedophiles, for purposes such as research, even if they do not act on their deviant sexual fantasies or are not impaired by them.

Another criticism towards the traditional definition of paedophilia in the DSM-IV-TR is that of its exclusive reference to prepubescent children. The existence of people showing an erotic interest towards pubescent (from 11-12 to 14-15 years old) rather than prepubescent children (0-11 years old) seems to be ignored. For this reason, Blanchard has proposed to introduce the specification of *Hebephilic Type* in the diagnostic criteria proposed for the DSM-5, underlining the need to recognize not only patients attracted to prepubescent children, but also those attracted to children who entered puberty but are still physically immature.

Moreover, the DSM-IV-TR definition of "recurrent and intense" sexual features seems to lack clarity and to be open to clinical interpretation. It also seems difficult for a clinician to diagnose a sexual fixation towards children for six months, as required in criterion A, as many paedophiles dissimulate the real object of their sexual impulse [19], especially to avoid legal and interpersonal consequences.

DSM-5 criteria for the Pedophilic Disorder (APA, 2012) could be reformulated as follows*:

a. over a period of at least 6 months, an equal or greater sexual arousal from prepubescent or early pubescent children than from physically mature persons, as manifested by fantasies, urges or behaviours;

b. the individual has acted on these sexual urges, or the sexual urges or fantasies cause marked distress or impairment in social, occupational, or other important areas of functioning;

c. the individual must be at least 18 years of age and at least 5 years older than the children in Criterion A.

Specify type:
Classic Type: Sexually Attracted to Prepubescent Children (Tanner Stage 1)
Hebephilic Type: Sexually Attracted to Early Pubescent Children (Tanner Stages 2-3)
Paedohebephilic Type: Sexually Attracted to Both

* Retrieved July, 9, 2012, from http://www.dsm5.org/ProposedRevisions/Pages/proposedrevision.aspx?rid=186#

Specify type:
Sexually Attracted to Males
Sexually Attracted to Females
Sexually Attracted to Both

Specify if:
In a Controlled Environment
In Remission (No Distress, Impairment, or Recurring Behaviour for Five Years and in an Uncontrolled Environment)

According to the Rationale* for changing the proposed diagnostic criteria, the new formulation would have several advantages. Firstly, the new criterion A "emphasizes that the diagnosis does not apply to individuals who experience or manifest any detectable sexual response to children but rather to individuals who respond as strongly or more strongly to children than they do to physically mature persons". Secondly, the specifications "in a Controlled environment" and "in Remission", introduced here for the first time, underline changes in the individual's status: the first seems to indicate that "the propensity of an individual to act on paraphilic urges may be more difficult to assess objectively when the individual has no opportunity to act on such urges"; the second "was written so as to indicate remission from a paraphilic disorder. It is silent with regard to changes in the presence of the paraphilic interest "*per se*", and this is because of the lack of consensus about whether a paraphilic interest can be removed by therapy or disappear spontaneously.

Several authors have expressed concerns about these new criteria for paedophilic disorder, fueling prolific debate around this topic.

Among others, First [20] is particularly negative towards the general tendency of DSM Workgroups to broaden the diagnostic umbrella of their assigned categories; this is intended to increase diagnostic coverage, by reducing the possibility of false negatives, but inevitably increases the risk of false positives (i.e. erroneously giving a diagnostic label to an individual for whom it is not justified). According to this author, the presence of false positives in diagnosing paedophilia is problematic not only because of the consequent stigma, but also for the inappropriate and indefinite consequences in terms of forensic implications.

Both in the current DSM-IV-TR and in the proposal for the DSM-5, "behaviours" are considered as one of the defining elements of paedophilia (criterion A). With regards to this issue, First [20] underlines that making behaviours and sexual urges/fantasies equivalent, in terms of definition, may lead to false positive diagnoses of paedophilia, given that inappropriate sexual behaviour may be driven by different motivations and different mental states, other than a paedophilic urge.

On the other hand, O'Donohue [21] emphasizes that, rather than the risk of false positives, the problem in diagnosing

paedophilia is with false negatives, because of the tendency to denial and minimization of paedophiles and the doubtful reliability of self-reports in assessing fantasies.
According to Berlin [22], the new edition of the DSM has the advantage of considering individuals with low sexual urges (not only intense, therefore) towards children as qualified for a diagnosis of paedophilia: the expression "intense" referred to sexual arousal has been removed from the new criteria proposed.
Concerning the proposal to introduce the diagnosis of hebephilia, there are different opinions. O'Donohue [21] considers the differentiation between paedophilia and hebephilia to be a useful and informative distinction; on the other hand, Green [23] criticizes it, considering it as founded on moral standards and with little scientific credibility, arguing that the age of legal consent to have sex is 14 in several European countries (Italy included) and that a sexual attraction for 14-year-olds cannot be viewed as a mental disorder. Regarding this topic, we observe that the specification of Hebephilic Type has been introduced in the new formulation but, "in order to emphasize that pedophilic disorder is defined by psychological reactions to maturational features of the external anatomy, and not by violations of age of consent laws in specific jurisdictions in specific historical periods", in the specification type of the current DSM-5 proposal it is indicated if sexually attracted to prepubescent or early pubescent children, without specifying the age.
One of the most relevant matters of contention among the other proposals for DSM-5 concerned the inclusion of child pornography into diagnostic criteria for paedophilic disorder, as it is considered an indicator of sexual orientation towards children [17 24]. If the Sexual and Gender Identity Disorders Work Group initially considered adding the use of child pornography to criterion B**, in the current proposal the "use of pornography depicting children" is no longer present. According to First [25], this inclusion would have been in direct conflict with the newly proposed distinction between Paraphilia and Paraphilic Disorder. He suggested that the use of child pornography would be better placed within criterion A, as an example of behavioural manifestation of paedophilia.
Other interesting suggestions came from Seto [26]. According to his point of view, paedophilia may be construed as a male sexual orientation with regard to age, rather than with regard to gender (as, for example, hetero- or homosexuality), and not as a choice of the individual or something that can be learned. This hypothesis – admitting the existence of a condition defined in terms of a sexual orientation not necessarily accompanied by behavioural manifestations – fits with the proposal of the DSM-5 to distinguish paedophilia (only criterion A) from paedophilic disorder (both A and B); furthermore, it adds to the discussion about people who may recognize that they are attracted by children (self-identified paedophiles), but do not commit any criminal action.
It is evident that this conceptualization of paedophilia has several implications for scientific research about its aetiology, as well as for clinical practice (bringing new hypotheses about assessment, prognosis and treatment) and for public policy, influencing social perception of this phenomenon and law. However, although the author clearly emphasizes that he is not equating gender and age orientation, it is important to note that this proposal may be seen as a justification by those groups who excuse paedophilia (i.e. *Boy Chat*), or as a sort of recognition of its legitimacy, with reference to the anti-discrimination policy concerning sexual gender orientation.
In addition to the debate concerning the DSM-5 criteria, there is a more general question related to difficulties in the assessment of sexual interests towards children. An interesting study conducted by Wilson et al. [27] – in which 130 child sexual abusers were diagnosed using different methods (phallometric testing, clinical interview with application of DSM-IV-TR criteria, Rapid Risk Assessment of Sexual Reoffending [RRASOR] scores and an experienced clinician's judgment) – suggests that there is a very low level of agreement (concurrent validity) between these different diagnostic tools, with a consequent limited reliability of the diagnosis made. Phallometric testing is widely considered the best psychophysiological procedure for assessing erotic preferences in men. Recently, a study by Lykins et al. [28] on the phallometric test, found a good test-retest correlation. However, this technique has been criticized for its intrusiveness and limited reliability [29].
Other studies recently investigated alternative methods to assess deviant sexual interests, with promising results. Sexual arousal and gaze behaviour dynamics are used to characterize deviant sexual interests in male subjects. Renaud et al. [30] investigated eye movements in individuals exposed to virtual characters showing relevant sexual features. They found significant differences between paedophiles and non-deviant subjects when critical information was processed. Therefore, it seems that this measure can be used to characterize deviant sexual interests in male subjects.
Mokros et al. [31] assessed paedophilic sexual interest by using an attentional Choice Reaction Time (CRT) task, which is an experimental information-processing paradigm based on an interference effect in visual attention. The task requires identification of the position of a dot superimposed

** The initially proposed Criterion B stated: "The person is distressed or impaired by such arousal, or the person has sought sexual stimulation, on separate occasions, from three or more pubescent or younger children (two if both are prepubescent), or has used child pornography for a period of 6 months or longer" (as cited in O'Donohue [21], p. 587).

on a picture of a person. They found that paedophiles took longer to respond to pictures of children rather than to pictures of adults, showing a cognitive interference effect. This result suggests the possibility to use the delay of response time for diagnostic purposes.
Functional brain response patterns to sexual stimuli, as analyzed in functional magnetic resonance imaging (fMRI) studies [29 32] presented in the next section, may be also a viable option for future diagnostic procedures regarding paedophilia, allowing detecting paedophilic orientation before it is being acted out. Even brain disorders may release a predisposition to sexual attraction for children [33]. Understanding this connection could allow differentiating among different subtypes of paedophiles.

Recent findings from neurobiological studies

Although human eroticism is extremely complex, the most frequently used test for detecting paedophiles is represented by phallometric or plethismographic procedures. Erotic pictures involving children are presented to adult males and volumetric changes in penile blood are measured and associated with different levels of sexual responses. In addition to these methods, sexual orientation is also assessed through self-report or reaction-time.
Recently, neuroanatomical and biological correlates of sexual orientation have been identified [34], as it is evidenced by recent articles concerning the aetiology of paedophilia.
Neuroscientific studies have found structural and functional differences in brain areas related to sex and suggest the existence of neurobiological correlates of paedophilia.
Some recent studies assessed neurocognition, and specifically executive functioning, in child molesters and paedophiles, in order to identify possible neuropsychological abnormalities that may reflect specific structural and/or functional brain alterations.
Two areas of investigation can be identified within the reviewed articles: on one hand, several studies analyzed executive functioning using neuropsychological tasks to determine whether paedophilic and non-paedophilic child molesters differ in some way; on the other hand, other studies investigated neural correlates of paedophilia, i.e. specific structural and/or functional anomalies in the brain of paedophiles compared to healthy controls, by using neuroimaging techniques.
Regarding the cognitive profile, in a study conducted by Cohen et al. [35] 51 subjects with paedophilia, 53 subjects with opiate addiction and 84 healthy controls were compared using neuropsychological tests assessing executive functions. Subjects with paedophilia differed significantly from those with opiate addiction on several tests, with longer latency to response on the Matching Familiar Figure Test, a measure of reflection-impulsivity (Kagan, 1966), and fewer completed mazes but also fewer errors on Porteus Mazes, a nonverbal test of intelligence made of a set of paper forms in which the subject is required to trace a path through a drawn maze of varying complexity (Porteus, 1955). Thus, while both subjects with paedophilia and those with opiate addiction show executive dysfunctions compared with healthy controls, the nature of those dysfunctions seems to be different between the two groups, with paedophilic subjects being less prone to cognitive impulsivity.
Kruger and Schiffer [36] examined neurocognitive performances and personality profiles in a group of paedophiles and found that, compared to healthy controls, they showed lower intelligence, weaker performances in information processing, high scores for psychopathy and paranoia, and signs of sexual obsessiveness and sexual dysfunction. In contrast to previous reports, these authors emphasize that some of these alterations could have been, at least partly, explained by other factors than paedophilia, such as education level or age.
In another study by Eastvold [37], paedophiles were compared to non-paedophile child molesters and exhibited a more deliberate and planned response style, characterized by greater self-monitoring and better performance accuracy. The lack of cognitive impairments in paedophiles is also confirmed by Schiffer and Vonlaufen [38], who found that paedophilic child molesters exhibit fewer deficits in cognitive functioning than non-paedophilic child molesters.
Coming to the studies focused on the neural correlates of sexual interest among paedophiles, they seem to present an atypical cerebral development: structural and functional brain deficits are present which appear to be correlated to their sexual orientation and behaviour.
Current neuroimaging research, for example, suggests that structural and functional changes in paedophilia appear for the most part in brain regions involved in sexual functions. A few studies, usually referring single cases of patients with paedophilia, reported the activation in the left calcarine fissure, left insula, anterior cingulated cortex and left cerebellar vermis [39] or in the right amygdala and the adjacent parahippocampal gyrus [40] in response to erotic pictures of children. The activation in these areas decreased as a consequence of treatment with leuprorelin or leuprolide acetate, suggesting that anti-androgens may modify brain response to visual erotic stimulation [39].
A fMRI study by Poeppl et al. [32] revealed that the neural response in paedophiles exposed to images of naked children is comparable to that observed in non-paedophilic males stimulated with pictures of naked adults. Group differences were found in the cingulated gyrus and the insular region, areas which seem to have an important role in paedophilic sexual interest: stimulated with erotic

pictures of children (the response was significantly reduced in case of stimuli representing adults) paedophiles showed an increased haemodynamic response in brain areas involved in the processing of visual sexual stimuli. These results seem to be confirmed by another fMRI study in which Ponseti et al. [29] analyzed changes in the blood oxygen level-dependent signals to child and adult sexual stimuli, and found that paedophiles had a typical response pattern (i.e. preference-specific brain activity in areas which are known to be involved in processing sexually arousing stimuli, such as the caudate nucleus, cingulate cortex, insula, fusiform gyrus, temporal cortex, occipital cortex, thalamus, amygdala, and cerebellum) to sexual stimuli depicting children.

Taken together, these results suggest that functional brain response patterns to sexual stimuli could be helpful to predict sexual orientation and to identify paedophiles with higher accuracy and in a less intrusive way than phallometry.

Other studies suggest the concept that paedophilic interest may be associated with specific neurological dysfunctions. A study by Mendez and Shapira [33] on eight patients showing sexual behaviours towards prepubescent children in mid- or late-life, showed that paedophilic behaviour may be the result of frontal lobe executive deficits or subcortical lesions. In particular, these authors observed a lack of inhibition as a consequence of frontal-lobe area deficits, sexual worries deriving from a right temporal-lobe deficits disease and hypersexuality provoked by subcortical disease in non-motor basal ganglia, hypothalamus or septal nuclei.

A recent study by Italian researchers raises a new hypothesis on the biological correlates of paedophilia, revealing a connection between late-onset heterosexual paedophilia and fronto-temporal dementia, in association with a genetic mutation. Rainero et al. [41] report the case of a 49-year-old patient who started to manifest sexual arousal and urges towards his 9-year-old daughter, never being sexually inappropriate before, and later developed fronto-temporal dementia. In this study, these authors discovered an alteration of the progranulin (PGRN) gene, a growth factor implicated, among the other processes, in the development of sexual dimorphic behaviour.

The association of a mutated gene to deviant sexual behaviour is interesting in terms of new horizons and new perspectives of research: for the first time, a genetic anomaly could be correlated with a sexual dysfunction.

Although the reviewed literature focuses on neurobiological aspects to explain the aetiology of paedophilia, it is important to note that there are also psychological theories suggesting different ways leading to child molestation. For example, Marshall and Barbaree [42] proposed an integrated theory of the aetiology of sexual offending, proposing that child sexual abuse occurs as a consequence of different interacting factors, both distal and proximal (e.g. poor parenting, inconsistent discipline, physical abuse). More recently, Ward and Siegert's [43] model of child abuse suggested the existence of four distinct psychological mechanisms whose interaction could result in sexual offenses against children: intimacy and social skills deficits, deviant sexual patterns, emotional and cognitive distortions.

Online paedophiles: a new group of sex offenders?

With the advent of the Internet, new means of communication have emerged. Internet provides ideal cover for online sexual predators searching for potential victims. In fact, the anonymity of cyberspace makes it difficult to understand if an individual who enters in contact with a young person is really what he/she says to be or not. As a consequence, the Net can be the ideal space for paedophiles to get in contact with children as well as with other paedophiles. With regard to this issue, Holt et al. [44] have explored how Internet can be used to promote attitudes and moral justifications for paedophiles, supporting and encouraging sexual exchanges with children and adolescents in virtual as well as in real settings.

At present, there is a significant debate as to whether online offenders are a distinct group of sex offenders or if they are typical sex offenders just using new technologies [45]. One point of view [46] is to consider online paedophilia (or, more in general, online sexual offending) as simply what happens when traditional paedophiles have access to the Internet: individuals who in the past would have looked for child pornography in magazines, now access it online. Similarly, chats and social networks allow contacting children in an easier way than before.

In contrast, some authors consider online paedophiles as a new type of sex offenders with different deviant sexual behaviours. An exploratory study by Briggs et al. on 51 participants convicted of an Internet-initiated sex offense against adolescents [47], for example, suggests that Internet chat room sex offenders may constitute a separate group, characterized by less severe criminogenic factors than other sex offenders (i.e. rapists, offline child molesters): they tend to avoid relationships in the real world, spend a lot of time in online chat rooms looking for social/sexual contacts and engage in other sexually compulsive behaviours. This new group, moreover, could be divided into two subgroups: a contact-driven group motivated to engage in offline sexual behaviours with adolescents, and a fantasy-driven group motivated to engage adolescents in online virtual sex, without an explicit request to meet offline.

Some recent research [48 49] has analyzed the profile of online sex offenders, individuating recurrent characteristics that differentiate them from offline sex offenders: they are

more likely to be Caucasian males, coming from different socio-economic contexts, and younger than offline offenders. Compared to offline sex offenders, they seem to have greater self-control (which is consistent with the neuroscientific studies presented in the previous section) and greater empathy for the victim, showing more psychological barriers to acting on their deviant interests.
However, as shown by Wolak et al. [48], online offenders seem to have greater sexual deviancy, having images depicting children younger than 3 years, and having child pornography videos – in particular, p2p users are more likely to have larger and more extreme images (e.g., younger victims, sexual violence).
How many online paedophiles already have a history of offline sexual offenses? What is the probability that an online paedophile will commit a contact sexual offense in the future? It is particularly important to understand the likelihood that online paedophiles using and sharing child pornography will commit sexual offenses involving offline contacts with a victim. A first meta-analysis reported by Seto et al., which examined the contact sexual offense histories of online offenders [50], shows that only a small subgroup (approximately 1 in 8) of online sex offenders had an official record for contact sexual offending. However, this result can be due to a limitation: in a subset of six samples with self-report data, in fact, about half of the online offenders admitted to have committed a contact sexual offense in the past [50].
A second meta-analysis by the same authors, which examined the recidivism rates from follow-up studies of online offenders [50], reveals that only 4.6% of online offenders committed a new sexual offense of some kind during the follow-up period, with new child pornography offenses being more likely than contact offenses. These results would suggest the existence of a distinct subgroup of "online-only" sex offenders who pose a relatively low risk of committing contact sexual offenses in the future and therefore with low rates of sexual recidivism.
Although this subgroup appears to be less dangerous, given the absence of sexual contact with children, it must however be kept in mind that the request for child pornography is the primary requirement of a large market that provides images of sexually abused children and adolescents: therefore, even if online sex offenders do not directly abuse children, they induce others to perpetrate abuses. The risk deriving from this population must not be underestimated.
At present, however, it is not clear whether the possession of child pornography leads to the identification of individuals with paedophilic tendencies who otherwise would not commit sexual acts with minors. More research is needed as at present it is still not clear whether we should assess and treat online offenders the same as other sexual offenders.

Evidence based treatment and new directions

Since the 1970's, paedophiles have been usually treated with psychodynamic therapy, cognitive-behavioural therapy and medical treatment, which are focused on the reduction of sexual interest and on relapse prevention (i.e. further offenses against children), rather than modifying their sexual orientation towards children. As suggested by Seto [51], and supported by recent neurodevelopmental studies, "there is no evidence that paedophilia can be changed".
While the effectiveness of psychodynamic therapies has not been demonstrated [52 53], cognitive-behavioural therapy has been shown to significantly reduce sexual recidivism [54-56]. These interventions are focused on the paedophile's sexual preference and are aimed at changing both sexual responses and cognitive distortions related to this kind of sexual violence. Relapse prevention interventions that target attitudes, beliefs and behaviours related to sexual offenses against children are widely used [57] and very well known in their effectiveness [58].
With regard to promising research in the field of psychotherapy, Renaud et al. [59] proposed to use real-time functional magnetic imaging (rt-fMRI) brain computer interface (BCI) as a new treatment for paedophilia. Neurofeedback mediated by interactive virtual stimuli is presented as the key process in this new kind of intervention. Real-time fMRI can be used to feedback signal changes from the brain to participants such that they can train to modulate activation levels in specific brain areas when facing virtual characters depicting sexual stimuli.
Many recently published articles are focused on medications that lower sexual impulse in paedophiles by interfering with or by suppressing the activity of testosterone [60 61].
A very recent pilot study by Moulier et al. [39] suggests that leuprolelin (a GnRH agonist) may decrease activity in regions known to mediate the perceptual, motivational and affective responses to visual sexual stimuli, such as the left calcarine fissure, left insula, anterior cingulated cortex and left cerebellar vermis. These areas were active in a paedophilic patient's brain in response to pictures representing children, but after 5-months of leuprolin therapy this activation had disappeared. Neither such activations nor decreases occurred in the age-matched healthy control assessed [39].
In the so-called "chemical castration", medroxyprogesterone acetate, leuprolide acetate, cyproterone acetate, luteinizing hormone-releasing hormone and gonadotropin-releasing hormone agonists are used to suppress testosterone levels [10]. The effects of anti-androgen-lowering therapy in paraphilic patients, however, are uncertain and the effects of testosterone-decreasing drugs on brain mechanism and sexual recidivism are poorly known. As far as we know, chemical castration is less effective in

removing sexual impulses when offending is not driven by libido, but rather is the expression of anger, aggression and violence. Therefore, it is often used in conjunction with cognitive behavioural therapies. Moreover, it must be considered that paedophilic patients present alterations not only in testosterone levels but also in other endocrinological and neurochemical parameters, such as hypothalamic-pituitary functions, prolactin, dopaminergic or serotoninergic levels [61].

More generally, all the reviewed articles have reinforced that treatment of paedophilia is a relevant issue, because of its implications not only for personal reasons but also for social security and child protection. It is worth noting that, although paedophilia is recognized as a mental disorder, paedophiles are usually punished without receiving any treatment.

In addition, as noted by Seto [26], treatment and support services for paedophiles, where provided, are mostly available to individuals who have already committed sexual abuse against children and have been detected by the legal system. This raises an important question: how to treat those who have never acted on their paedophilic fantasies, but report an attraction towards children? In order to effectively prevent child sexual abuse, treatment should not only be administered to those who have already committed an abuse, but also to those who are at risk for offending.

Other questions concern on one hand the need to develop different treatment options for different targets, and on the other the prevention of paedophilia. Concerning the former, different treatments should be developed for child molesters (whose sexual preference is not exclusive for children) and for subjects who show a paedophile orientation. Similarly, it might be useful to have different approaches to sexually motivated paedophiles and paedophiles with antisociality or impulsivity [62].

Regarding prevention, few resources are currently available to help-seeking, self-identified paedophiles to detect and treat them before they commit abuse. Potential offenders (i.e. individuals who have not yet abused any children but may be at risk of doing so, because they recognize they feel attracted by them) and *Dunkelfeld* offenders (i.e. undetected child molesters with a sexual attraction for children, not officially known and therefore not persecuted by the law) may indeed represent the ideal target group for primary prevention of child sexual abuse, even if at present it is difficult to individuate them [63]. In this regard, the Dunkelfeld Project in Germany is a very interesting example of a nationwide media campaign to inform potential child abusers of treatment solutions specifically addressed to them. Schaefer et al. [63] used a telephone screening procedure to conduct research with these groups, finding that many participants reported recurrent sexual fantasies involving children, as well as related distress, and that more than half feared they would sexually abuse a child.

Conclusions

In the last years, an increasing number of research related to paedophiles and paedophilia has been published in international journals. Currently, there is an interesting debate concerning the diagnosis of paedophilia, as new criteria have been proposed for the DSM-5. Several authors have expressed their view on proposals, but professional opinions are still divided. Progresses in neuroscience allow clinicians to identify neural correlates of paedophilia and, possibly, new forms of assessment that are not exclusively based on behavioural indicators. These neurobiological findings, supported by further studies, could help in early identification of deviant sexual interests. Recent studies on single cases have documented an association between anti-androgen therapies and brain response, opening new possibilities for treatment. However, even in this case further studies with larger samples are needed.

Furthermore, there has been increasing interest in exploring the link between the Internet and paedophilia. There is an interesting debate about online paedophiles, and whether they are a distinct group of sex offenders or typical sex offenders. Recent studies have suggested that online offenders seem to constitute a specific group that is different from other offenders. It also seems that this specific subculture of paedophiles is not at great risk of committing offline child sexual abuse, but further studies are needed to confirm this hypothesis.

While presenting these findings, we must consider that research on paedophilia is also affected by many limits: the majority of studies are based on biased samples of persons who have committed criminal offenses and have been detected. The majority of paedophiles are men, and most studies are based on male participants [26].

Given the highest risk of reoffending in individuals who sexually abuse male victims [9], this information is particularly important while considering that more than 80% of clergy abuse victims are males [64]: further studies and targeted efforts are warranted to understand and treat this specific subgroup of paedophiles, which may be qualitatively different from the general sex offender population.

Research concerning relapse prevention should be enhanced, particularly focusing on specific factors that may influence recidivism.

Little is known about those individuals who feel paedophilic interest, but who do not act on it and thus are not involved in the criminal justice system. In fact, as for other paraphilias, most people presenting paedophilia probably do not seek treatment unless they are in legal trouble. Paedophilia is not common in clinical contexts,

because paedophiles tend to remain hidden, and more information is needed about those with paedophilic interests *per se*. For these reasons, several findings reviewed herein derive from single-case reports, and further studies with wider samples are needed. Additional resources are requested to facilitate the access to treatment for paedophiles independently of the juridical course, as well as additional efforts for early detection of potential offenders and develop targeted interventions to effectively prevent child sexual abuse.

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