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Growing up with a rare genetic disease: an interpretative phenomenological analysis of living with Holt-Oram syndrome

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ABSTRACT

Background: Holt-Oram syndrome (HOS) is a rare genetic disease characterized by variable radial upper limb and cardiac defects. The aim of this research was to shed light on people's subjective perceptions of their diseases, how these perceptions provide meaning, and the consequences the syndrome can have in daily life and across all life stages.

Methods: Semistructured interviews with ten participants diagnosed with HOS were conducted in France and analyzed using interpretative phenomenological analysis.

Results: Participants' experiences fall under two main themes, namely, "stages of self-construction as different" and "when I am no longer the only one involved", each of which has three subthemes. From childhood onwards, symptoms monopolize the physical and psychological spheres. The feeling of being different is unavoidable until the patient can appropriate his or her condition, and by the end of adolescence, the patient generally feels that he or she has adapted to the syndrome. In adulthood, other concerns arise, such as the fear of rejection, the need to better understand the genetic issues of the condition and the desire for offspring to not experience the same life difficulties.

Conclusion: The findings underscore the specific psychological issues associated with the syndrome at different life stages and the need for holistic genetic treatment with dedicated reference centers to improve care and further address these issues.

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Congenital heart defect; limb anomalies; psychosocial impact; interpretative phenomenological analysis; rare disease

► IMPLICATIONS FOR REHABILITATION

- Holt-Oram syndrome is a genetic disease characterized by abnormalities of the upper limbs and shoulder girdle and associated with a congenital heart defect.
- Specific issues arise at different stages of life: the physical consequences of the syndrome arise during childhood, the self-construction of pervasive difference during adolescence, the fear of being rejected as a young adult, and concerns about future parenthood and the transmission of the syndrome and the desire that one's child not be confronted with the same difficulties in adulthood.
- The complexity and entanglement of medical and existential issues related to HOS requires the development of multidisciplinary consultations that promote holistic care.
- The rarity of the syndrome and the lack of knowledge about HOS among health professionals and the general public make it necessary both to establish reference centers and to create patient associations to support patients.

Introduction

People with rare conditions need holistic support from health care professionals that integrates psychological aspects into the health path [1,2]. Paradoxically, some rare conditions are not or are only rarely studied in the social sciences, including Holt-Oram Syndrome (HOS), the existing research on which is primarily biomedical. To address this lack, this study aims to explore the illness experience of people living with HOS.

Holt-Oram syndrome is a genetic disease characterized by abnormalities of the upper limbs and shoulder girdle and associated with a congenital heart defect [3]. The limb anomalies are

constant and located on the radial ray and include thumb anomalies (triphalangeal, hypoplastic or absent thumbs), carpal bone malformation(s), and radial hypoplasia or aplasia to phocomelia [4]. Cardiac defects, which mainly consist of atrial septum and ventricular septum defects, affect 75% of people living with HOS [5]. In the most severe cases, these malformations require surgical intervention in the first years of life [6].

In Europe, the prevalence of HOS is estimated to be between 0.7 and 1 cases per 10 000 births, which makes HOS a rare disease [7]. This rarity is reported to have a psychosocial impact, since some rare diseases are not well known to the general population

or even to caregivers [2]. For instance, individuals with a rare yet well-known disease, such as hemophilia [8], have a better quality of life than those with a disease that people are largely unaware of. In the latter case, affected individuals often feel isolated, invisible, and powerless [1,9,10]. Moreover, the level of medical knowledge plays an important role. Lack of knowledge among health professionals leads to diagnostic wandering, psychological distress and uncertainty about the quality of care [11].

Though there are no studies on the quality of life of people with HOS, such studies have been conducted for other pathologies that involve both limb deformations and cardiac anomalies. Concerning limb deformations, there have been a number of studies on the quality of life of people with thalidomide embryopathy [12–14]. A study by Ghassemi Jahani et al. [13] examined quality of life associated with limb deformations and found that the physical aspects of quality of life were significantly lower than those of the reference population and correlated with deformation severity. On the other hand, psychological aspects were not significantly impacted. In the different context of muscular dystrophy, which also involves muscle hypertrophies and cardiac abnormalities, afflicted adolescents reported a higher functional quality of life than their unaffected pairs [15]. In these different cases, the participants appeared to have adjusted their expectations for life in accordance with their disease. Thus, the participants did not construct the meaning of their life in connection with their health status [13,15]. Congenital cardiac deformations are associated with an increased prevalence of issues such as depression, dysthymia, and general anxiety [16,17]. Individuals reported feelings of inadequacy and powerlessness and a feeling of being controlled by a disease that dictated their choice of career and leisure activities and the decision to have children [18,19]. It is therefore important to improve the prevention, screening, and treatment of mental disorders in the presence of such pathologies [16,17,20]. When a surgical intervention becomes a priority, there is a risk that the emotional aspect will be temporarily neglected [19].

Another significant psychosocial aspect of HOS is its genetic character, as it is transmitted in an autosomal dominant manner. Thus, for each pregnancy in an affected individual, the risk of transmission is 50%. The feeling of blame by the parents in regard to the risk is substantial [21]. The disease affects not only the persons living with HOS but also their entire family system. Having to cope with the disease of other members of the family in addition to their own can contribute to an increase in anxiety [21] that becomes more intense when the disease worsens, when genetic testing is performed, and when desiring to have children.

In summary, the literature indicates that several characteristics of HOS may give rise to psychological issues: disease rarity, limb deformations, cardiac deformations, and genetic transmission. The nature and extent of the influence of these various characteristics for this particular syndrome remain to be documented. The

currently available information is insufficient for addressing these issues and for proposing modalities for ensuing treatment. Thus, the aim of this research was to shed light on the subjective perceptions of people regarding their disease, how these perceptions provide them with meaning, and the impacts the syndrome can have on their daily life and as they grow to maturity.

A detailed understanding of people's experiences requires a qualitative approach that puts aside, as much as possible, the preconceptions of the researchers [22] and embraces unexpected outcomes by focusing on the individual's subjective world [23]. A suitable way to accomplish this goal is to apply interpretative phenomenological analysis (IPA) [24] to semidirective interviews. IPA is relevant to studies aimed at understanding a group's perceptions of a dynamic, subjective or poorly studied issue [23]. This approach, idiographic, phenomenological and interpretative, allows a detailed analysis of participants' experiences and the identification of the underlying psychological processes [24]. IPA is idiographic and phenomenological because it examines how each person finds the subjective meaning of his/her particular experience [25]. This approach suggests that the participants' discourse does not represent an objective reality but rather his/her subjective interpretation of the situation experienced. Thus, the researcher must identify as clearly as possible the personal experience of participants as they understand it. This interpretative process implies that the researcher plays a key role in trying to understand the subjective meaning of the participant's own experience [22].

Method

Participants and procedure

This study was approved by the French National Ethics Committee. Eligible participants had HOS diagnosed by a clinical genetics unit in France and molecularly confirmed, had no chronic comorbidities and were older than 18 years. We preferred participants whose geographical location allowed an investigator to visit them to conduct a semidirective face-to-face interview. Sixteen eligible individuals were sent a letter with information about the study. After a period of consideration, ten individuals who volunteered to participate returned a signed consent form. A small sample size is preferred for IPA analysis because it focuses on a detailed analysis of each case [24]. Table 1 contains information on all participants. Overall, seven women and three men (median age 39.8 ± 13.7 years) participated in this study. In the interest of confidentiality, we assigned a fictitious name to each participant. Interviews were conducted in French, and quotations were translated into English for publication.

A researcher then met with the participants at their place of residence to conduct the interviews. A semistructured interview with an interview guide was used, as suggested by Smith et al. [24]. Each interview started with a general question designed to

Table 1. Participant information.

Participants	Gender	Age	Implications of the disease
Alexandre	Male	43	Abnormalities of the hands, arms and congenital cardiac defects
Bruno	Male	44	Abnormalities of the upper limbs and congenital cardiac defects
Chloé	Female	37	Abnormalities of the upper limbs and congenital cardiac defects
Delphine	Female	21	Thumb abnormalities and congenital cardiac defects
Elise	Female	49	Upper limb malformations and congenital cardiac defects
Fabienne	Female	70	Upper limb malformations and congenital cardiac defects
Gaëlle	Female	22	Arm and hand malformations and congenital cardiac defects
Hugo	Male	39	Hand malformations and congenital cardiac defects
Isabelle	Female	39	Shoulder malformations
Justine	Female	34	Upper limb malformations and congenital cardiac defects

Table 2. Interview schedule.

1/Introduction
Could you tell me something about your illness?
2/Diagnosis
Could you tell me how your disease was diagnosed and how did you experience it?
3/Medical follow-up and treatment
How is the medical follow-up of your illness organized? Would you say it is satisfactory?
4/Consequences
Could you tell me something about the consequences of the disease on your life?
5/Entourage and communication
Can you talk about the disease with friends or family members?
6/Feeling
How do you feel about all this?
7/Living with the disease
Could say a few words on the ways you live with the disease?
8/Future
How do you see your future?

encourage the participants to talk in detail about their personal experience with HOS. The interview schedule is presented in [Table 2](#). Each interview was recorded and fully transcribed.

Analysis of the interviews

The analyses were performed according to the process suggested by Smith et al. [24]. Referring to the criteria of Smith [26] with respect to the idiographic process, each of the ten interview recordings was first listened to several times so that the researcher could become familiar with the data. Annotations were then written in the right margin of the transcript to highlight the identified issues and the researcher's interpretations, which were then grouped by topic in the opposite margin, at a higher level of interpretation. These topics were then analyzed to discern the various connections among them. Last, one schema per case was created to chart these phenomena, their grouping and their connections at a detailed and individual level. This approach was repeated for all cases, and when an original aspect emerged from the analysis of a case, previous transcriptions were read again to ensure that this phenomenon did not already appear in a more subtle form that would have escaped analysis. After these idiographic steps of analysis, the ten different schemas were compared and reorganized into a unique diagram to summarize the divergences and convergences of the different themes and sub-themes reflecting the experiences of each of the ten participants with HOS.

To ensure the quality of the interviews and with respect to the double hermeneutic allying the collection of the experience of the participant and the interpretation of the researcher, all of the analyses were supervised by a second researcher to ensure that the interpretations properly matched the interviews that were conducted.

Various quotations were then selected based on their ability to represent the variety of phenomena that were identified and the quality of the interview [26].

Results

Seven women and three men participated in this study. They live in different regions of France. Seven of them are in a relationship and three of them are single. Six of them work, one of them is retired and three of them cannot work because of their illness. Participants' experiences fell into two main themes, *stages of*

self-construction as different and *when I am no longer the only one involved*, and six subthemes.

Stages of self-construction as different

From physical imposition to mental obtrusion

The participants described their history with HOS beginning with their early experiences with cardiac and muscle symptoms and the consequences in terms of medical care and everyday limitations. The majority (6 out of 10: Alexandre, Delphine, Elise, Gaele, Hugo and Justine) had undergone open-heart surgery very early in their lives and had painful memories of this time that were perpetuated by clinical follow-up and the medical devices that they have used ever since.

Alexandre: The deformation, problems really with the hands, arms, chest, heart, shoulder. It's quite a burden to deal with [...] I don't know what other woes I could have (laughs), as I think I have pretty much had it all with my heart condition, the pacemaker, and my shoulder; I think that's enough. [...] So, there you go, it's a genetic disease that you can't shake. You aren't going to forget about it; it's got you no matter what, that's for sure.

The participants then discussed their lives from their childhood to the present *via* the limitations imposed by the cardiac deformation and muscular afflictions that impinge on all areas of the participants' lives and that were generally reported to be experienced as a chronic "handicap" without possible compensation. In addition to this experience of resentment and fatality, the participants also had more specific experiences with particularly painful conditions (5 out of 10: Alexandre, Chloé, Elise, Fabienne and Justine) and reported pain associated with muscle afflictions that was described as being unpredictable and poorly controlled by medications, leading to a greater sense of disability and powerlessness.

Elise: I need to avoid reaching over my head, as doing so is catastrophic and above all painful. [...] It has reduced me to tears. I am in tears now; I cry because I am in pain, and I cry because I have had it. It drains me. [...] It is harder than the rest, which is sort of paradoxical because the heart is actually affected the most.

Following the medical explanations, the participants reported experiencing a daily struggle in which obtrusion is at a more mental than physical level. The participants' existence appears to be marked by successive renuncements, first of leisure activities and then professional aspects, leading to a general and repeated feeling of frustration. Assistance from others may be necessary to perform certain tasks or to continue engaging in certain activities, thereby reinforcing the feeling of disability. In a case involving particularly pronounced distress, a participant (Gaele) described becoming aware as an adult of the way this emotional obtrusion had held sway over her childhood and then adolescence. Their outlook, in terms of affective and professional aspects, was very pessimistic.

Gaele: I think that it started when I was in 5th grade [note: 12 years of age]. It started really slowly, I was not aware of the fact. [...] Someone made me think. I will remember it for the rest of my life; they made fun of me and that made me have a breakdown[...]. I did not go out. I had friends, but I did not think they cared about me. [...] I told myself that I could never have a private life. I got it into my head that I would not even be able to get a job. I was afraid that I would end up not being hired. I was never really good at school. I got by, but I was always average. I told myself, if even now I can't make it, then what will I do?

Rather than trying not to give up, the participants' solutions were instead to try to make the most of areas that could be

controlled and that were not affected by their disability to compensate for their physical difficulties.

But, why am I not like others?

Mental obtuseness is fed by social interactions, particularly being made fun of as a child due to one's body. In regard to their adolescence, the participants mainly reported an intense and lasting feeling of hurt, unhappiness, rejection, and stigmatization. They addressed the extremely complex and devalued development of self, centered on the experience of abnormality that they underwent as a result of their disabilities. As young adults, the visible nature of the participants' handicap made it impossible for some to choose when to allow their difference to manifest or, more subtly, to consciously display another difference that could offer a way to form an identity. For Bruno and Justine, this impossibility of defining themselves by another singularity rendered them powerless again.

Justine: The look in people's eyes, no matter what, we will always be judged because when people look at us, they see disabled people; they really view us as being disabled. [...] The first thing that people notice with us, or at least with me it is just that and—say what you want—I maintain that is what people notice first.

Bruno: I think you never get over being disabled and therefore also the fact of being different. Being different, when you try to when you are twenty, when you decide to dress like a Goth, those sort of things, it is a choice, but I have never had a choice; I have always been viewed as someone who is a bit different.

At this stage, some of the participants sought to imagine what might have been. Gaëlle asked herself, "If I had not had these arms, what would my life be like? [...] my life is pretty good, I like my life now, but I have to say, if I had not had this when I was growing up, it could have been very different, I might have been different". The participants also questioned what appears to play part in the integration—always in adulthood—of their differences and the views of others on their identity and their existence.

Gaëlle: It has never held me back. I would even say the opposite; I think that as I have this disease—here, I am more aware of what is going on around me relative to other people. I have more get-up-and-go than others. I am more up for it. I don't know whether it's this disease or not, but I am aware that I am more determined to get over it. I have always been keen to go beyond what I am able to do now.

I made something of it

The discourse of the participants (7 out of 10: Alexandre, Bruno, Elise, Gaëlle, Hugo, Isabelle and Justine) reflected the efforts made to represent the experience of the disease as a means of personal development that had made them stronger, more tolerant, and more demanding of themselves than they would have been if they had not had the disease. This positive reassessment offsets the passive and hopeless position that the syndrome can engender due to its obtrusive nature and the lack of a cure. The participants were unable to control the disease and its consequences and therefore afforded themselves the power to manage their existence based on the direction that the disease provides them and their own choices in regard to the way they live with the disease.

Alexandre: The bottom line is that you are born with it, so either you let it sink in that you need to get on with it or you do not want to deal with it and then you end up doing nothing with your life [...] You need to because otherwise if you let it get you down, then it's over. It is not possible. It's for your own sake, and it is not going to be any better anyhow [...] I get by OK but because I decided to. I had always made up my mind. I was not going to wallow in self-pity.

When I am no longer the only one involved

It can drive people away

With this genetic condition, entering into life as a couple marks a new life stage that now involves others: the partner, the in-laws, and the child who may come sooner or later. The participants who were single (3 out of 10: Gaëlle, Bruno and Justine) voiced their apprehension at having to address this topic, while the participants who were in a relationship (4 out of 10: Alexandre, Elise, Hugo and Isabelle) retained a degree of uncertainty regarding what their partners went through.

Elise: There is also a need to listen to what the partners of those afflicted with this disease have to say; it would be a good idea to find out what they think of it all because he told me "well, either way". But, there are some for whom it could drive them away; I don't know [...] If he was really afraid of having children with deformations, I don't think he would have stayed with me, I just don't think so. [...] At the very start, I let my in-laws know, however, that I, that we could have children with a disability, but—you know—it's not serious. I made it clear that it's not serious, that you can't catch it, that it's not contagious, that it was merely hereditary.

Telling one's partner and then in-laws of the risks linked with the disease was associated with the fear of those individuals leaving and of being rejected. The participants experienced guilt for bringing the disease into the couple relationship, the parent relationship and the relationship with a family that until then had not been affected. Telling others also involves showing a degree of knowledge and avoiding being blamed as a consequence.

Now I have a need to know

Some participants, such as Delphine, who was single, appeared to have postponed concerns and even the need to know about the genetic nature of the syndrome. For others (4 out of 10: Alexandre, Elise, Isabelle and Justine), the prospect of becoming pregnant triggered the need to have concrete answers in regard to the implications of the disease, and it prompted a request for a genetic consultation: is there a risk of transmission, what is the likelihood of this risk, and what is the risk that the clinical manifestations of the syndrome will be more pronounced than the participant's own?

Isabelle: It has never been an issue for me, as I always wanted to have children. Until then, everything was going along fine; it was a wake-up call when I wanted to have children. [...] I was 25–26 years old when my partner, and I thought that it was perhaps time to have children; I wanted to, but I did not want to get into it without knowing. I really wanted to know.

The information received then marked a change in the path of these participants, as they became aware of their lack of knowledge and naivety about the medical implications of their own illness. This process led them to question the consequences that the disease could have on their care path and the daily life of a future child and gave rise to ethical dilemmas related to procreation choices.

Alexandre: It is hard to manage because I in fact saw myself as being a bit naive in that regard. I told myself "anyhow, if it is affected like me, the arms or the heart, we are in 2015 and there is no need for concern, it's nothing really" [...] But, in fact no, that is to say that I had not actually seen all the ... the disease, all of the degeneration, that is to say no arms, no this, no that. It's not something to take lightly; it's something else all-together.

I would not wish this on my children

This awareness led the participants who were in a relationship to the decision not to have children afflicted with the disease. This outcome manifested in several ways.

Three participants decided not to have children (Bruno) or opted for adoption (Gaelle and Hugo). Despite their own adjustment and the trivialization of the impact that their care had on them, particularly cardiac surgery for these three participants, they did not wish to be responsible for their child having to suffer a compromised life. Each of these participants expressed concerns about specific scenarios. Gaelle and Hugo feared that they might conceive a child considerably more deformed than they were and that the child would have to endure a childhood of continuous medical treatment from a young age that would involve a series of surgical interventions. Bruno imagined a more extreme scenario of having a child with a diminished and unbearable existence that would end in suicide.

Hugo: Personally, I do not want children with the syndrome; that is out of the question. [...] It can take on severe forms, and they are not necessarily able to detect these [...] For sure they can be treated by surgery; maybe there is something to be gained, going under the knife for twelve hours; it's not for me.

Some participants (4 out of 10: Alexandre, Chloé, Isabelle and Justine) wished to try to have a child unaffected by the disease. These participants reported a process marked by emotionally difficult pregnancy terminations. These pregnancy terminations led to a feeling of guilt toward their partner because they felt they had imposed these failure on their partners and guilt toward other family members living with the disease who the participants feared might interpret this choice as representing a rejection of what they were. Nonetheless, this guilt was still more acceptable than the risk of transmitting the disease to their child when that could be avoided.

Alexandre: And, then, we went back to see the geneticist [...] He told us that he would handle it, that it would not go on and on and that at the end of two months if there was concern, then that would be it. We therefore did that; my wife did an amniocentesis, and indeed, I therefore obtained the result; my little one was in the clear. Everything was spot-on. Awesome, fabulous. [...] I would not want to tempt fate again, however, by having another child. That is to say, that when you are born without arms, without anything, life is hard for the little one and then also for you. It's not possible. I can't see myself doing that; it's impossible! I could not live with it.

In this context, a single participant (Justine) was undergoing a preimplantation diagnostic assessment, which at the time of the interview had only recently been approved in France. This option was not available to her older sister. She was therefore fortunate, although it also brought her anguish, as her family and friends could not advise her. Participating in a discussion forum established for people who, like her, wish to avoid transmitting their disease to their children, provided her with a sense of not having to face this rare disease and her pregnancy on her own.

Justine: At the time, this was not available for my sister. [...] I am now on forums a lot; I have discussions with women who also have a disease, who are also going through this, and it really helps; one feels less alone, you realize that there are many... I have not met women who have the same syndrome as me, nor their partners, but it's the same process.

Discussion

This study sought to document the experiences of people with HOS and the impacts that the syndrome may have on their growing up and day-to-day lives. Two main themes were identified. The participants experienced the syndrome as an agent that forces them to construct themselves differently from non-afflicted individuals. Then, at specific stages of their lives, conjugal, family,

and genetic issues come into play, and these are added to the individual experience.

Imposition was a central component in the participants' discourse. The primary aspect was the physical aspect, with a childhood marked by cardiac symptoms and limb defects that could not be offset. The mental aspect acquired prominence, as the participants increasingly had to forego things in their lives, and this led the participants to assume a chronic sense of disability, powerlessness, and frustration. These findings are consistent with those of other studies, for instance, studies on people with congenital pathologies for whom surgical intervention is a foremost priority, which have highlighted that the accumulation of emotional difficulties is associated with the feeling of living in isolation and being controlled by the disease [18,19]. In the present study, HOS was shown to be associated with distinct features for the participants experiencing the most pain. The pain was associated with physical afflictions and its unpredictable character, and the lack of medical solutions to alleviate it exacerbated the participants' sense of disability. These results are comparable to what is typically experienced with chronic pain, i.e., a negative impact on physical functioning, mental health, and quality of life [27]. In the absence of pain control, feelings of disability [28] and a sense of frustration [29] increase.

The specificity of our findings lies at the core of self-construction with HOS. The discourse of the participants revealed a sense of stigmatization and unhappiness that developed through the looks they received and by being made fun of by others. These experiences engendered a distinct decrease in self-worth and impeded social relationships due to the fear of being judged or rejected. This finding is consistent with those of other studies on the self-worth of adolescents with a chronic physical disease. The experience of being rejected by one's peers is deleterious to one's self-worth [30]. Rejected youths have more trouble integrating and accepting their bodies, and the visible nature of a disability has been identified as a factor that exacerbates these difficulties [31,32]. The present study showed that the inability to choose an identity or to display a difference was also a major issue for some people with HOS. These individuals felt that it is unfair to be labeled solely through the prism of the disease without being able to choose, as other people can, how to define themselves and be seen as individuals. Thus, there appears to be a gap between the stated acceptance of this difference in adulthood and the actual suffering associated with these persistent questions on how life would be without the disease.

Minimization and positive re-evaluation are two strategies that are used simultaneously to deal with the imposition and the feeling of being different. In the present study, the majority of the participants compensated for the limitations accompanying the disease by investing to the greatest extent possible in the controllable dimensions of their existence. This investment can be expected to enable increased self-worth by minimizing the consequences for oneself without hiding the disease, and Nario-Redmond [33] identified this as an effective strategy. Moreover, the majority of the participants re-evaluated their journey with the disease as a beneficial experience that made them stronger than they would have been had they grown up without it. This positive re-evaluation was not by choice but stemmed from necessity and led to a progressive acceptance of HOS. The participants either managed to find positive aspects of their situation or let themselves become overwhelmed by the difficulties. This re-evaluation is highly adaptive; it allows participants to transform their disease into a positive event, and as a result, leads them to evaluate their new hardships more positively [34]. Acceptance has

been identified as a factor associated with fewer depressive symptoms and better quality of life and social functioning in the presence of pain and physical disability [35].

The genetic aspect of the disease is at the core of the concerns that arise with passage into adulthood. At this life stage, the experience is no longer just individual, as it starts to involve people around the person suffering from the syndrome. For all the participants, the hereditary nature of HOS appears to be one of the main issues, as the genetic aspect of the disease intervenes in the various stages of being part of a couple. The discourse of the participants revealed that hiding this information was not a consideration despite the fear of being rejected [36]. Revealing the disease and its consequences from the very beginning of the relationship, both to one's partner and to in-laws, brought clarity regarding whether or not those people would accept the participants. This finding is consistent with a literature review that noted that during this critical time of disclosing the genetic nature of the syndrome, individuals make a decisional assessment regarding the pros and the cons of providing information to their partner [37]. The information can be provided despite the fear of rejection, as the need for trust is essential to a trouble-free outlook. Indeed, disclosure allays feelings of guilt by leaving it up to one's partner to decide whether or not to pursue the relationship. This process results in better adjustment for the couple and greater closeness in the relationship between the partners [38].

Following the issues associated with being part of a couple are those related to the potential for parenting for people with HOS who wish to have a child. The impact of the disease on parental intentions was reported to often prompt a request for a genetic consultation [37]. Concerns for the children (risk of transmission, actual incidence of the disease) created a need to know everything about the disease [21]. While avoidance sometimes provided protection at the individual level, it appeared to no longer be a consideration, and the desire to have a child led to a reconfiguration of the strategies adopted to deal with this desire. The search for information led to an awareness of the disease, which until then had been minimized. In this context, couples faced with the risk of transmission sought to determine their options, and their considerations were dependent on the values of each person and their personal experiences with HOS. The participants who underwent a care process marked by surgical interventions and hospitalizations either decided not to have children or opted to adopt. Their difficult experiences prompted these participants to perceive that modern medicine is unable to provide certainty that their child would not be affected by the syndrome [39]. Other participants opted for fetal diagnosis and termination of the pregnancy if the child had malformations that were deemed too severe. This option is the most often selected for all genetic conditions combined [39]. Nonetheless, this process marked by pregnancy terminations was particularly traumatizing and guilt-laden in regard to the person's partner and family. Prenatal tests can give rise to the impression of non-acceptance of the disability [39], a difficult position to adopt in a family in which siblings are also afflicted. Thus, in the present study, the couples who had a healthy child forewent the idea of having another child. As already shown in the literature [40], this decision reflects a desire to avoid once again experiencing the stress of having to terminate a pregnancy. With HOS, undergoing a preimplantation diagnosis appeared to be rare, troublesome, and marked by many failures, which would explain the substantial need for social support, as the process is marked by major fluctuations in anxiety [41].

The psychological difficulties and issues experienced by people living with HOS are arguments in favor of support at different levels: clinical, family and societal. The feeling of isolation due to the disease and the negative associated emotions are striking results in this study. People with rare diseases for which a treatment is not available need emotional support and holistic treatment that integrates psychological aspects into the health path [42]. Competence centers for HOS could meet such needs. People with rare diseases treated in such centers report greater satisfaction with their care pathway [43,44]. Sensitizing parents during genetic counselling to the risks of stigmatization, low self-esteem and exclusion for children and adolescents could make it easier to identify the types of difficulties highlighted in this study. Offering psychological support could then promote the acceptance process observed in adulthood. Another important step to better support patients would be the creation of an association, such as by means of forums, for people living with this disability that would allow them to share their experiences and tips and break their isolation. The current networks are very restricted, at least in France. In the same vein, since the quality of information on the Internet is often questionable, the creation of a website by health professionals and a patient association would make it possible to disseminate relevant information, provide emotional support for patients and allow patients to share experiences with peers with similar conditions.

While this study is one of the first in human and social sciences to highlight the psychological impact of HOS, it nonetheless has limitations that need to be noted.

The main limitations are related to the sample population. It is small in size and does not aim to be representative of adults living with HOS. The symptoms and therefore the care pathways of the participants are highly heterogeneous, especially in terms of heart disease. The extent of physical malformations also varies. Moreover, the sample population was French, and the findings fall within the context of the French healthcare system. The results of such a study design are therefore not intended to be generalizable because the priority is to understand how individuals give meaning to their personal experience and to identify the psychological processes involved. In future studies, it will be interesting to refine the results by applying a similar design, for example, with adolescents, but also to conduct studies on larger samples in order to study the representativeness of the phenomena highlighted. Broadening the sample to an international scale would allow comparisons of the reported issues in different cultures and care systems.

Another limitation of this study is the lack of quantitative information about participants, particularly with regard to their quality of life. In future studies, using questionnaires soliciting information on the quality of life in its various physical, psychological, and social dimensions would allow these variables to be quantified and then tested more thoroughly as part of clinical genetic consultations.

The consequences of the hereditary nature of the disease at the conjugal and family level are consistent with the issues identified for other genetic diseases [21,45,46]. A qualitative follow-up study at the level of the couple [47] would allow an exploration of the impact of the syndrome on the non-affected partner and the consequences of this experience on couple dynamics and the dyad's adjustment to the syndrome. Similarly, at the family level, a follow-up study could provide insights into the processes that occur between individuals who are carriers and those who are not and the consequences that this family functioning can have on the treatment of the syndrome.

Conclusion

This study showed that self-construction in HOS is characterized by various psychological and emotional difficulties: powerlessness, frustration and feelings of inadequacy, malaise, and low self-esteem. The question of transmission, which lies at the core of participants' concerns, is often the trigger for genetic consultation and shows that individuals with HOS have a tendency to initially ignore their own treatment. The health consequences of ignoring treatment can be substantial [21,48]. Future research will allow for more accurate testing of the various issues raised by the present study, which will support the development and provision of interventions adapted to the difficulties of individuals with HOS during their care pathway.

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