Similia similibus curentur in nonpharmaceutical medicine. The use of Hippocrates’ healing principle of similarity in clinical holistic medicine: controlled violence and sexual abuse in holistic mind-body medicine

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Abstract: Hippocrates induced healing (salutogenesis) with the “principle of similarity” - like cures like. The similarity principle has been used in the holistic mind-body medicine developed by the Swedish physician Bengt Stern, which recently has been found highly efficient in improving quality of life and normalizing sense of coherence (estimated NNT=2) without any side effects or adverse events. Stern’s therapy mimics the most difficult events in life during role-plays. His unique therapeutic program, “Meet yourself”, takes the participant through the most difficult aspects of life, including birth, death, and neurotic and evil human interactions, also of violent and sexual nature. About 4000 patients have now been trough the “fascist exercise” without getting side effects or adverse events (NNH > 4000). This exercise includes the methods of controlled sexual and psychological abuse (level 8 in tools of clinical holistic medicine). Since Freud it has been known that to rehabilitate a patient’s health the healing of the patient’s sexuality is particularly important. In his therapy Stern has done what Freud could not do for moral reasons hundred years ago: Making the full, painful drama of early life happen again for patients to heal not only their physical, mental disorders and sexual dysfunctions, but their whole life and existence. The therapeutic program is evaluated and found to be ethical and in accordance with the healing principles and traditions of holistic medicine. The healing principles of CAM are used. Stern’s “Meet yourself” course is an effective, nonpharmaceutical medicine that does not cause any harm without side effects or adverse events.

Keywords: CAM, integrative medicine, psychosocial medicine, mind-body medicine, body-psychotherapy, clinical holistic medicine, human development

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INTRODUCTION

The principle of “the same cures the same” was made famous by Christian Friedrich Samuel Hahnemann (1755-1843), who wanted to find more elegant solutions to the rather painful, traditional Hippocratic cure of exposing patients to the same violation that originally made them ill (1). Hippocrates and his students did practically not use drugs for medicine (2). Instead they rehabilitated the patients character by supporting self-exploration—a strategy called “clinical medicine” (3). What needed exploration were all the episodes and events from the patient’s life that was painful, and problematic—traumatic and repressed—in modern psychodynamic language. Hahnemann’s intent was impeccable. If a woman had been raped, we all know how painful it is for her to go back to relive the trauma in therapy to integrate the unbearable feelings of the violation. If a person had been abused or neglected as a vulnerable, little child, we all know how troublesome therapy is when taking the patient back to this painful event. If this could be solved in a more elegant way, this would be extremely valuable.

Homeopathy has been very successful, and today about 10% of all treatments in the world done by a physician are done with homeopathy. Most unfortunately homeopathy has not been very effective, at least according to much recent research. Therefore, therapy has not been able to move away from the strategy of directly confronting patients with the content
of their traumas. This can be done in many therapeutic ways. Some types of therapy only works through the mind, others only through the body, others only through conversation and touch therapy, and still others intervene holistically on all aspects of man at the same time. The latter is called holistic medicine. It exist today as many non-scientific systems i.e. the shamanistic healing ceremonies known from almost all premodern cultures. It is also developed into medical science as in clinical holistic medicine.

There are different styles of clinical holistic medicine: Holistic body psychotherapy (England, Germany) (4-8), holistic mind body medicine (Sweden) (9-13) and the Nordic School of Clinical Holistic Medicine (Denmark) (14-16). The most intensive of these are undoubtedly the Swedish system, which works very directly on healing physical and sexual abuse and violation by use of the similarity principles. How unpleasant this therapy might be felt by the participants, it is known to be absolutely safe, without any significant side effects or adverse events (8,9,13,17). The physical intensity of this therapy is well reflected in the fact that one participant in 1,000 broke a rib (13).

BENGST STERN'S THERAPY
Bengt Stern, MD (1938-2002) was a physician who believed strongly in non-drug medicine. He built his holistic therapy on the most efficient and intense non-drug techniques he could find or invent himself (9). He used the Reichian herapeutic principle of working against the resistance.

Stern’s therapy was about “raising the patient’s consciousness”. According to his book “Feeling bad is a good start” (9) his therapy combines a number of highly provocative and intense techniques: Body-psychotherapy, psychodrama, gestalt therapy, transactional analysis, and Janov’s primal therapy. Holotropic breath work of the Stanislav Grof type is also used, to make his therapy among the most intensive non-drug therapies in use today. The techniques he included are efficient, because

“They activate painful emotional memories. In processing these memories, one understands the effect these experiences have had on one’s adult life. Sometimes you re-experience very clearly, and in detail, painful emotional memories from early childhood.”

Stern wrote about his body psychotherapy:

“Body-psychotherapy is not psychotherapy in its usual sense, but rather a technique to contact pre-intellectual emotional memories, so called cell memories. Body-psychotherapy is the conscious activation of these cell memories in your body. In its practical application body-psychotherapy consists of hundreds of different breath exercises, body movements, massage techniques, etc. The pioneer of body-psychotherapy was Wilhelm Reich (1897-1957). Other prominent figures within this science are Alexander Lowen, John C Pierrakos, Charles Kelley and David Boodella.”

Bengt Stern was interested in all major aspects of life, especially the three aspects he found most difficult and traumatizing: birth, human interaction and death. To help the participants in his therapeutic course “Meet yourself”, he made everyone go through three most intense exercises, which he labeled the “birth excise”, the “fascist exercise”, and the “death exercise” (9). In all three exercises, he used psychodrama, role-play, and imagination to mimic the emotional reactions in every little detail of a painful and difficult birth, sexual and non-sexual abuse, violation and repression in human interactions, and the transformative crises of the psychological death process—often called “metamorphosis”, see (18-21).

The text below is Bengt Sterns own description of his most central and famous “fascist exercise” from his book (9). Around 1985, when his book appeared in the first edition, a great number of people had already participated in it, and most fortunately this exercise proved to have no side effects of adverse events associated with it, as Bengt Stern stated in his book:

The “fascist” Exercise in the “meet yourself process”
An essential exercise, a kind of psychodrama, is part of the first step. This exercise has the nickname “the “fascist” exercise”. The aim is for the participants to become aware of their fascistic shadow. That is the part which people unconsciously allow to leak out on their daily life. When participants become aware of their fascistic tendencies, these tendencies lose their destructive energy. So these tendencies will, to a great extent, start disappearing.

Just as with other intense exercise in the Meet Yourself Process, this exercise is explained in detail beforehand. No participant is told they must participate in this exercise. Rather, every participant will have to express a wish to take part. Some of them might be advised by the course-leader not to participate in this particular exercise.
In the exercise, participants, working in couples, suppress each other within a given framework. They are, of course, not allowed to hurt each other physically, but within the given framework they are encouraged to participate totally. In the role of oppressor they are to use all their creativity to offend their partner. In the role as victim they use all their creativity to enter the role of being totally invaded. This exercise lasts for about thirty minutes before the partners change roles.

Participants react in a variety of ways. Many participants totally enter both roles. Some are quite capable of handling the role of the oppressed but have difficulties being the oppressor, or vice versa. Occasionally, participants are psychologically paralyzed, mostly in the role as the oppressor, but sometimes even in the role of oppressed.

If participants do become paralyzed they will receive an individual emotional release session with one of the course-leaders. It is then evident that the psychological paralysis is their way of avoiding contact with the memory of the mental, and often physical, violence to which they were subjected by one of their parents early in life.

In such a session the participant has an opportunity to express his pain and rage, because of the violence. The opportunity to complete this exercise through such a session is a great relief for the participant.

After this exercise, the couples share their experience with each other – i.e. how they are now able to identify their oppressive role and their victim role in their everyday life.

This is followed by an exercise of emotional expression in which the participants liberate themselves from all the preintellectual pain that has been activated during the exercise.

About two thousand people have been through the “fascist” exercise. They consider this exercise one of the most essential of the course. Although it is demanding, nobody regrets having participated in it. Those who wholly participate in this exercise stand a great chance of avoiding being suppressive or of allowing suppression in the future.

CASE REPORTS
After the documentation of the efficacy of Bengt Stern’s therapy, it has been taken into use in all the Nordic countries. In Denmark the “fascist exercise” is used especially for the training of therapists that works with traumas from violent and sexual abuse, i.e. incest. One training center that uses it is the Nordic School of Holistic Medicine in Copenhagen. The following are descriptions of how two participants experienced this exercise:

Training session, female holistic body psychotherapist, 28 years old
For many years I had vulvodynia with strong daily genital pains and not being able to have intercourse. I had the condition for 15 years and I had been to a large number of experts, physicians, gynecologists, sexologists and complementary therapists and used a lot of money on these treatments, but with almost no results. I had finally given up. As part of my training as therapist I finally encountered the gestalts that had caused my gynecological problems. This happened in the “fascist exercise”. In this exercise it was not difficult for me being the oppressor. I was together with a man around 40 years and I humiliated him totally, but this did very little to me. I just felt like he deserved it. When it was my turn to be the “slave” this was something totally different. I felt from the beginning the most intense anxiety. Just meeting him and seeing him standing there in front of me, sensing his scary, dominating, male, aggressive energy was quite impossible for me to cope with. So the exercise hardly started before I broke down and regressed into an ocean of the old emotions of shame and being abused. The idea that I had to obey him in spite of his intention to abuse me was totally intolerable for me. Without him doing or saying much I felt so abused, so violated. I just had to obey. It was like being buried in an avalanche of shame and humiliation. What really got to me was the idea of not being able to have my own opinion. It was like my will was broken at its very root.

He started calling me names and humiliating me. He did not touch me, but that didn’t matter. If he had raped me this could not have been much worse. I felt like dying. At the same time I was completely aware that this was an exercise and that I just stood and confronted a normal, rather good looking, intelligent and empathic man, who actually had been kind to me just an hour ago. In the normal world I liked him. But in this exercise he was the devil himself. I was not in present time. I was with my parents a long time ago when I was a little child.

The next thing I was asked to do was to dress naked and lie on the floor in front of him. I did it, but I felt like dying every second. He told me I was the most ugly girl he had ever seen and that I had a clammy body. He yielded at me and told me in the meanest way that I was just a pussy. He then ordered me to show him my vulva. This did it for me; it was like an old cinema movie that
suddenly broke. I just disappeared. I found myself in the position typically held by embryos, and felt like vomiting. I felt really sick. After this I was done. And I was through. I felt such an immense relief. Lying there on the floor I realized that this was what had been repressed and what caused my vulvodynia. It was like a huge matrix of negative emotions, thought and beliefs that came from adapting to my sexually rather dysfunctional parents, when I was very small. I felt it like hell at that time. I was not physically abused, but energetically I had been violated again and again. The feelings could not have been worse. They were really unbearable. No wonder I did not have access to them in my normal therapy. The degree of resistance I had made for myself made it necessary for me to get through to myself only in the course of the “fascist exercise”.

The exercise released the most intense bodily emotions and already the next day I felt much better. Since then my vulvodynia has been gone. Sometimes I still have pain during intercourse, but my daily genital pains have disappeared. I feel much more proud of my body (and my genitals) and my self-esteem has improved radically. I was scared of getting men’s attention, but this has also changed. Today I can perform for a crowd with a relaxed attitude. When men say something humiliating to me, as they sometimes do, I don’t care much. It is like it doesn’t get to me anymore. When somebody tells me that I look bad, I simply cannot believe it. My whole experience of myself as woman has improved immensely thanks to this exercise. What from the outside looked like I was being tortured was experienced from the inside the most healing event.

Training session, male holistic body psychotherapist, 42 years old

The most intense exercise for me was the “fascist exercise”, where you work with a partner; normally the couples consist of a man and a woman. The idea is that a person of the opposite gender has repressed everybody earlier in life and because of this there has been a sexual element in the repression. Often there has been more than that – a direct violation, physical, mental or sexual. In this exercise the participants are allowed to work with all these painful aspects of unequal human interaction. The instructor told us that he would not guide our experience – we could go where we needed to go in this exercise – but for him, it had been about sexuality, from beginning to end. In this way, everybody who needed to work on their sexuality – and I think we all did – got acceptance to go into this most difficult and painful space of sexual trauma, to heal whatever wound we would have here.

In the exercise the person who feel most violated, start by “getting even” by violating the partner. All energy from old traumas are used, the preparation takes everybody deeply into the feeling of being hurt and wanting go get revenge by repressing the person that hurt you – by proxy, using the partner in the exercise.

The beauty of the exercise is that it really is cooperation, where you mutually allow yourself and your partner to go into the sexually wounded space and express all you anger, grief, fear etc. In the role of the oppressor you do to the other what originally, traumatically, was done to your self. In real life you are never allowed to go into this “evil” space; the strong sexual taboo of our culture also makes this absolutely impossible. But in this exercise you go there together with your partner, who also wants to heal and even more importantly, also wants to help you heal, by giving you the opportunity to express the most dark and dirty sides of your own shadow, and to re-experience being violated and abused. In the exercise this happens in a useful way that helped me to integrate my past and to learn that I today am a strong adult that in reality cannot be so deeply hurt any more. What harmed us happened to us, when we were vulnerable kids, which could not withstand the hard pressure of our parents. Today we are not vulnerable kids any more.

First one is “fascist” and the other is a “slave” for 30 minutes, and after that the partners shift roles. So all the humiliations you just got from the other are given back right away. What a wise and wonderfully balanced design of this exercise!

There are some rules in the exercise: You must promise confidentiality; you are not allowed to touch the other person; you are not allowed to put bodily fluids (spit, sweat etc) on the other person and you most stay in the exercise for the 60 minutes it takes, if you accept to participate. You are supposed to cooperate and help the other person repress and humiliate you by revealing your sore spots and suggesting things that could be done to you that you would feel awful. As people come for healing, everybody engaged surprisingly willingly in this. When you are a “slave” you are supposed to obey your “master”. But you are allowed not to, if what you are asked is too difficult.

Now the idea of the exercise is that the “fascist” uses his or her imagination to abuse and exploit the “slave”. This can be done by asking the “slave” to undress, take humiliating positions and say horrible things about him or herself... The “fascist” may scold
the “slave”, ridicule etc. The art is to find out how to “break down” the partner, as this break is exactly the historical break the partner needs to confront and heal. So the whole exercise is nothing, but support to go back into the core trauma of life, regarding the body, sexuality, self-worth etc. You are allowed to break down and just lie on the floor, crying or whatever you are doing, feeling the old painful emotions again. You are not allowed to leave the room during the exercise. During the whole exercise there is a physician present to ensure that no person is getting “repressed” more that necessary for the healing to happen. The therapists will also moderate the participant’s behavior – tell the “fascist” to go slower, or faster, and the “slave” to let go of fear and engage more fully in the exercise.

I was given a partner by the therapists, a woman about 30 years old and judged from her behavior in the exercise with a personal history of sexual traumatization. I was worried that she would be harmed by this exercise, so I talked to the therapists about my great concern for her future well-being, but they all ensured me that the exercise was harmless, if done correctly. I had heard that this kind of therapy could cause re-traumatization – giving a new similar trauma on top of the old one – but the therapists ensured me that this never had happened in this kind of therapy (which is in accordance with (8,9,13,17)).

Finally we engaged in the exercises and the things she got me to do gave me a feeling of shame so badly that I felt I should die. I was exactly like a little boy that was ridiculed and humiliated by his mother, who hated men and sex. I had no recalling of my mother doing this to me, but as the exercise went on I felt more and more that I had been harmed by my mothers energy and her sex-negative attitude, that had colored my relation to my own body and sexuality. It was a deeply healing experience, in spite of it being ugly.

When it was my turn, I asked her to undress and show herself to me. She had extreme resistance and finally she broke down and cried as a little child. The most difficult thing was that I liked it! I had never seen myself as a sexual sadist, but I realized that I contained so much hatred and anger toward the woman (= my mother). I was very surprised of all the repressed sexuality this exercise released for both of us. It was a small miracle and Bengt Stern was right. Confronting this was not yet another trauma on top of the other. The principle of similarity took us straight back to some of the most difficult and most efficiently repressed feelings and events in our lives. The exercise did not turn me into a sexual sadist, but it made me own my sexual aggression, which had been repressed since early childhood. I felt that I finally became a man. It was wonderful. My partner revealed she had a similar experience, and that she finally dared to be sexual again.

I was obviously one of the participants that became paralyzed from the exercise and was therefore offered a special session (as described above), which I accepted. This was a session with three female therapists at one time. The three women intended to help me free my life energy and sexuality further. They did this by tempting me with their bodies, moving sexually around me, inviting my interest in them, flirting and revealing parts of breasts, stomach and other intimate parts of their bodies and whenever I revealed the slightest interest they scolded and humiliated me for being a pig, a horny, dirty man, totally worthless and good for nothing, a pervert and a real lowlife scumbag. The double action of tempting and humiliating me took me into the most difficult feelings of male repression by dominant women, like being castrated – the “vagina dentata” from Freud’s writings. It was really amazing what it did to me to confront the most evil aspects of the feminine – it was like dancing with the good Kali from Indian mythology. The energy was totally wild and animalistic. Little by little I came to peace with the shadow of the female.

Not so long time after this exercise I was able to take a big step forward in my own relationship and surrender to my own woman. I finally was able to choose her as my partner for life. The exercise had helped me confront the most dark side of my “own inner woman” and finally taught me to let go of my fear and bond devotedly to my own women. I also felt like being a much better therapist after this. I found new trust in the female and I dared to help women who had been raped or sexually violated in their childhood in a much more open and intimate way. I got better results and much better feedback from the female victims of sexual abuse and incest that I had in therapy. I realized that sexual torture, the most harmful kind of torture there is, is damaging because it repeats the child’s reality, where the victim must adapt him- or herself to the reality of the offenders – similarly to the child’s need to adapt to its parents reality for survival. As adult human beings we do not need to adapt in this way, hence we are not vulnerable.

ELEMENTS OF BENGT STERN’S HOLISTIC PHILOSOPHY

One very important aspect of Stern’s therapy is forgiveness (9):
“In forgiveness, man moves beyond his intellect and explores his greatest vulnerability. He encounters the pain of his unprocessed emotional memories. Only by stopping and encountering this pain may it be released and allowed to disappear. Clearly, forgiveness is not a superficial, intellectual process, but an energy release at one’s very depth.”

Another aspect is that sexuality is the basic energy in life. Our culture strongly represses, which leads to prostitution, pornography, child abuse and incest. On the latter subject Bengt wrote: “Incest: The reason behind incest is suppressed sexuality. A culture, which is dominated by feelings of guilt, because of sexuality and/or intercourse before marriage, encourages early marriages. Before marriage neither the woman nor the man is allowed to have intercourse. As their marriage continues the two partners might find that they are not compatible, although they now have children and refrain from having sex with each other. In the vacuum that then arises, a father who suffers from perverted sexuality may approach his daughter and a mother who suffers from perverted sexuality may approach her son. Both parents are always responsible for the incestuous act by not taking responsibility for having a mature and satisfying sexual life with other or with new partners.”

Stern was a strong believer in self-insight as the primary outcome of psychotherapy: “The role of psychotherapy: Profound self-insight is knowing oneself, which is dominated by feelings of guilt, because of sexuality and/or intercourse before marriage, encourages early marriages. Before marriage neither the woman nor the man is allowed to have intercourse. As their marriage continues the two partners might find that they are not compatible, although they now have children and refrain from having sex with each other. In the vacuum that then arises, a father who suffers from perverted sexuality may approach his daughter and a mother who suffers from perverted sexuality may approach her son. Both parents are always responsible for the incestuous act by not taking responsibility for having a mature and satisfying sexual life with other or with new partners.”

DISCUSSION
The principle of similarity has been used to an extreme degree in Bengt Stern’s therapy, which is why it has been so effective in inducing salutogenesis (22,23). Recent analysis of the effects of Bengt Stern’s therapy has proven it highly efficient with people who have the most severe mental and existential problems including suicidal patients (8,9,13,17). Not only the principle of similarity is taken into use in this therapy; all five healing principles of holistic medicine are used (8) and this is done impeccable, without any of the medical errors it is easy to make in this kind of therapy (24). This is making the therapy highly effective with NNT-2 for improving of quality of life and sense of coherence estimated from the non-dichotomous data in (2-4).

There might potentially be an ethical problem in making the participants engage in repressing, abusing and violating each other, but it is important to understand that all participants as described by Stern above was fully informed about the purpose of the exercise, how it would be practiced and what the expected benefits were for the participants, based on experience with at least 4000 participants who had been through the therapy during the 24 years, since it was invented by Bengt Stern (13). All participants are free not to participate in an exercise if they do not feel up to it or do not see how this exercise could help them. Therefore everything is happening with consent after full information. The purpose of it is clear and everybody who is participating is doing this to help him or herself and the partner in the exercises. Having a physician present to exclude patients that are not likely to benefit from the therapy is an extra precaution that we do not believe is necessary anymore based on the complete lack of side effects and negative events with the fascist exercise. We know of no cases where the physician prohibited a patient from participating.

We have evaluated the therapy according the Ethical Rules for International Society for Holistic Health and found all the exercises in Bengt Stern’s “Meet Yourself” course to be in accordance with the ethical standards of holistic medicine (25). Controlled sexual and violent abuse and repression are well known tools of holistic medicine (categorized as “level 8 tools” in (26)). They have been used since Hippocrates and cause no side effects or adverse events if used correctly (1,3,9,13,17). They are especially useful in the training of therapists that work with healing traumas of incest, violent, sexual or mental abuse, repression and violation.

The principle of similarity, which has been known since Hippocrates, has been cultivated into its purest form in Bengt Stern’s therapy. Because of the courage of Bengt Stern to mimic the most difficult events in life in role-plays in his therapy, he has created a unique therapeutic program that in one single process takes the
participant though all the most difficult aspects of life, including birth, death, and neurotic and evil human interactions, also of violent and sexual nature. People who would judge this kind of therapy as bad and unethical are the people who haven’t understood the basic rules of holistic non-drug therapy. Bengt Stern’s “Meet yourself” course is candidate to be among the most effective types of holistic mind-body medicine in use to day, thanks to his thorough understanding of the principle of similarity and consequently his inclusion of controlled sexual and violent abuse into the therapeutic program. Since Freud it has been known that to rehabilitate a patient’s health the healing of the patient’s sexuality is particularly important. Stern did what Freud could not for moral reasons do hundred years ago: Making the full, painful drama of early life happen again for the patients with physical and mental disorders and sexual dysfunctions, who need to confront the most intense and difficult of traumas to heal life and existence. The program is evaluated and found to be ethical and in accordance with the traditions of holistic medicine. Stern’s “Meet yourself” course is effective nonpharmaceutical medicine that do not cause any harm, neither side effects nor adverse events (estimated NNT = 2 and NNH > 4000).

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REFERENCES

16. Ventegodt S, Kandel I, Merrick J. Principles of