

The prospect of replication of human beings through genetic manipulation has engendered one of the most controversial debates about reproduction in our society. Ideology is clearly influencing the direction of research and legislation on human cloning, which may present one of the greatest existential challenges to the meaning of creation. In this article, I argue that, in view of the possibility that human cloning and other emerging technologies could enhance physical and cognitive abilities, there is a need for a different way of thinking about life, new technologies and creation. New scientific discoveries require a shift in the way psychology takes responsibility to help individuals and society. Today, psychology needs to follow the progress that humans are taking toward a transhuman stage of development as a transition to a later posthuman stage.

Introduction

Science and technology are advancing so fast that society has difficulties in keeping pace with the complexities that new developments bring. Human reproductive techniques have progressed rapidly in the past three decades, and other new techniques such as cloning have been introduced (Kirkman, 2001; Roberts, 1998; Williamson, 1999b).

Speculations about the idea of cloning emerged in the early 1960s, and ideas of human cloning in particular were discussed in the 1970s, followed by some innovations in nuclear transfer in the early 1980s. Human cloning represents asexual reproduction, and the critics of human cloning often assume that the result of cloning is not a unique individual. This has led to condemnations of human cloning from the politicians' side and to fear, ignorance, and "clonophobia" from the public's side (Pence, 1998b).

The cloning debate has also been reinforced with ethical, religious, scientific, moral, medical, and political issues, since human cloning became a more plausible prospect in the late 1990s (Baird, 1999; Fiddler, Pergament, and Pergament, 1999; Fung, 2000; Madigan, 1998; Shannon, 1998; Shapiro, 1999; Vastag, 2001; Wills, 1998).

Emotional responses have dominated the debate on human cloning, and although emotions can sometimes be justified, many times they can be caused by prejudice. Gregory E. Pence (1998b) maintains that physicians, bioethicists, and scientists have done poorly in helping to reduce the public's fears and misconceptions. For several years, research on cloning has been placed at the center of interest and debate among scientists of different disciplines. Albee (2002), for example, argues that there is increasing political pressure on science and scientists in respect of issues such as cloning and genetic engineering, whose implications are important and gradually affect major national and political decisions.

The critics of human cloning, however, argue that there are many unaddressed problems, among them the implications of the harm issue (Kassirer and Rosenthal, 1998). Other important concerns are related to family, such as family interactions (in the case of a cloned family member), adults' rights to procreative liberty, children's rights to privacy and equality, and commercial surrogacy. These are only a few of the areas of concern that can be related to human cloning. Some reports have also indicated that it is important to study the possible psychological and emotional state of individuals produced by cloning, the social aspects of their families, and the possible effects on society (President's Council, 2002).

In this paper, I argue that an individual created through the application of human cloning techniques, or other similar techniques, or any other type of genetic manipulation, will not show the donor's characteristics to the extent of compromising uniqueness. The creation of genetically identical individual/s will never lead to the replication of the donor's experiences. In addition, human experiences are not independent of space and time, and, since every human clone, or multiple clones, of an individual will be born in a unique context, cloned human beings' experiences will be unique in each case. Therefore, cloned individuals will be able to develop their own identities, their own personalities, and the uniqueness of any other human being. Furthermore, advances in biotechnology will offer human beings the possibility of enhancing their physical and cognitive abilities, as well as extending their life spans. These changes will not be able to take place without similar advances in the social sciences.

I also argue that a different approach to psychology is necessary to accompany the profound changes in society, and in the concept of human nature, that these biotechnological advances will bring. A new and different approach is imperative, in order to help human beings with new challenges and with the new mental processes they can be expected to face during a transition from a transhuman stage, which is already taking place on our planet, toward a future posthuman stage that appears to be inevitable.

Criticism of human cloning

In regard to criticism of human cloning, Lipschutz (1999) has suggested that the debate should not be labeled with a question about whether cloning is wrong, but rather with the question, "When is cloning wrong?" Some of the objections to human cloning that have been presented are to the effect that it would have compromising effects on the welfare of the child (Burley and Harris, 1999; Yanagimachi, 2001). Burley and Harris (1999) describe the different forms of harm that, according to the critics of human cloning, a cloned child could suffer. The three types of harm they consider are:

1. Clones will be harmed by the prejudicial attitudes people may have towards them.
2. Clones will be harmed by the expectations and demands from parents or genotype donors.

3. Clones will be harmed by their own awareness of their origins.

In addition, Burley and Harris argue that the above objections to human cloning, based on child welfare, are misleading. They do not question the motivation of the objections, but consider that these formulations of the anti-cloning position do not provide a convincing argument. They do not deny that cloned individuals might indeed suffer some welfare deficits. However, they suggest, these deficits are not sufficient to warrant state interference with the choices of people who wish to clone their genes.

From a standpoint very critical of human cloning, presented in testimony to the National Bioethics Advisory Commission on March 14, 1997, Leon R. Kass has questioned whether human procreation will remain human and whether children are going to be made rather than begotten. He suggests that “offensive,” “grotesque,” “revolting,” “repugnant,” and “repulsive” are the words most commonly heard in the street, and from intellectuals, believers, atheists, humanists, and scientists, regarding the prospect of human cloning (Kass 1997, 2002; Kass and Wilson, 1998).

Even though opposition to reproductive cloning is shared by many, the supporters of cloning have pointed out that the arguments presented by Kass are an emotional response to a new technology, and they do not provide a sufficient analysis of the risks, and the technology’s benefits (Caplan 2002/2003; Kimberly, 2002; Reynolds, 2001; Rosen, 2003). In addition, according to Caplan, the arguments against cloning, endorsed by Leon Kass, Francis Fukuyama and others, are presented as if their authors hold the moral high ground in the public debate. Caplan suggests that these arguments are mostly based on pseudoscience, ideology, and plain fear mongering, which are then used to manipulate public opinion.

The implication of the harm issue in human cloning

The implications of the harm issue, as presented by the critics of human cloning, have played an important role in moulding the attitudes of the public. According to Kass, these implications have also played an important role for the policy makers and the researchers themselves (Kass, 1997; Kass and Wilson, 1998). Certainly, harm to offspring needs to be assessed before evaluating the choice of whether to clone in a specific instance, and in evaluating these choices the expected burdens and benefits need to be weighed against each other (Roberts, 1998).

There are numerous implications and consequences of advanced technologies such as human cloning and genetic engineering (Satava, 2002). For instance, what are the implications for individuals’ behavior? What will the societal implications be, and what fundamental ethical principles will be challenged? There are also many unanswered questions related to human cloning, such as possible psychological harm to children, and attitudes toward cloned children (Burley and Harris, 1999; Pence, 1998a). Other aspects linked to the harm issue are identity formation, gender identity, and other topics related to developmental psychology (Annas, 1998; Gonnella and Hojat, 2001).

According to Pence (1998b), cloning can be associated with both physical and psychological harm, and the physical harm can be related to genetic harm to the child. Other scholars, among the critics of cloning, also argue that human cloning could create serious psychological issues, which might include identity and individuality issues, as well as other aspects related to how we define ourselves (Annas, 1998; Andrews, 2000; Baird, 1999; Evers, 1999; Fung, 2000; Kass, 1997, Kass and Wilson, 1998; McGee, 2000a; Williamson, 1999a; Wills, 1998).

Unresolved social and psychological aspects of human cloning

According to McGee (2001), society needs to resolve many questions about human cloning, such as those relating to its social, reproductive, therapeutic, and ethical aspects. For example, concerning social

aspects, cloning might challenge the social responsibility of parenthood and the nature of the family (Andrews, 1999). Children produced by cloning might have psychological problems of identity and individuality (President's Council, 2002).

Many have speculated that human clones would lack the necessary traits for true independence from progenitors. McGee (2001) questions whether a clone could feel that her/his progenitor, who genetically would be its monozygotic twin, might become an appropriate parent. Baird (1999) argues that there would be social consequences from human cloning and questions how to organize and provide financial resources and services for cloned people. So far, there are no developed plans about how to place cloned individuals in society. Broader societal interests also need to be taken into account in designing policies for human cloning, and it would be misleading to view decisions about cloning solely as matters of individual choice. Many aspects of human cloning may bring uncertainties about how the relationship between parent and child will develop. The child's interest should be considered an important factor in human reproductive cloning ("Biological uncertainties", 2001).

Problems related to the concept of uniqueness

Opponents of human cloning have stated that it is problematic because it would deny the cloned person his or her uniqueness and identity. Some of the possible psychological problems that cloned individuals might experience are related to these (Annas, 1998; Baird, 1999; Evers, 1999; Fung, 2000; Kass and Wilson, 1998; McGee, 2000b; Williamson, 1999a; Wills, 1998). Baird (1999) and Robertson (1998b) conclude that it is not known whether cloned humans will have psychological problems; however, Baird mentions some issues related to possible psychological/social harm:

1. In individuals originating from transfer of an adult's nucleus, the knowledge that one is the result of cloning may diminish one's sense of uniqueness.
2. Individuals originating from embryo splitting carried in the same pregnancy, such as twins or triplets, may have problems in defining expectations of themselves and for their future, because they know there is another genetically identical individual.
3. Individuals originating from embryo splitting, where embryos are frozen and implanted at different times or in different women, may have to deal with the knowledge that they have not originated from an undirected combination of two particular genomes (instead, someone has determined who they are genetically).

This position maintains that many adopted children or children born with donor insemination have a need to know about their biological origins. Critics of human cloning argue that cloned children may not have the sense of coming from a maternal and paternal line with attributes coming from both parents, and may not feel that they are unique individuals. In that case, clones will have a psychological need to have a personal history and a sense of self. The first person born through nuclear transfer cloning would have to deal not only with being a genetic copy of another person, but with the fact of being a person who did not come from the joining of egg cell and sperm.

An opposing view to the critics of human cloning is presented by Madigan (1998), who states that a person who has been cloned will not be a simple replica of another human being but a unique person. According to Madigan, a human clone is an identical twin delayed in time. She is a much younger identical twin, reared in a different environment, at a completely different time and with the benefits of not being treated in the same way. The basic fear of cloning is in regards to the nature of a newly created person. Specifically, the fear is that human cloning will be the creation of an identical copy of a particular person; however, this does not have to be so.

Although human clones may have the same nuclear genes as others, as in the case with monozygotic or identical twins, there is no evidence or reason to believe they will not be unique individuals with their own personalities and philosophies of life (Evers, 1999; Madigan, 1998; McConville, 2001; Pence, 1998a; Shannon, 1998; Strong, 2005a; Wills, 1998). Taking into consideration the extensive research on twin studies, especially on monozygotic twins, there is evidence to support the idea that personality differences, identity development and the uniqueness of human clones, created through somatic cell nuclear transfer (SCNT) or by any other type of genetic manipulation, will be shaped by the interaction between genetic and environmental factors.

Some answers related to human cloning, the concept of uniqueness, and twin studies

In regard to the concept of uniqueness, several authors (Elliott, 1998; Jamieson, 1998; Resnik, 2001) emphasize that people with the same genes, such as monozygotic twins, who are supposed to be genetically identical, are not the same people. The same can be said about cloned human beings, who will have physiological differences, as well as different behavioral traits. This led Shermer (1999) to question why moralists are not “crying” for legislation against twinning, when nature has already done the cloning, and the result is called identical twins. In addition, some authors such as Pence (1998a) indicate that a cloned person would not be an exact copy of an adult human being. Although the gene structure would be very similar, at the molecular level there will be many differences. Moreover, Pence (1998a) and Strong (2005b) point out that the brain cannot be cloned or duplicated, and most importantly, the experiences of a human being cannot be replicated at all by cloning. Many of these wrong ideas, such as those to do with the duplication of the mind, are captured from pure science fiction, poorly informed politicians, and irresponsible journalism.

In the field of psychology, we have no evidence that it is possible to replicate individual human experience in exact detail. Many studies on monozygotic twins (Baker, Mazzeo and Kendler, 2007; Button, et al., 2007; Brent and Melhem, 2008; Eley, et al., 2007; Ge, et al. 2007; Hicks, et al., 2007) indicate that, even when they share a high correlation in terms of intelligence, personality features, and mental disorders, these correlation values are not equal, their behaviors and cognitive functions are not identical, and the twins are different in terms of individual experiences (Bouchard, 1997). The majority of the studies provide evidence of moderate heritability, non-shared environmental influences, and modest shared environmental influences (Asbury, et al., 2008; Hansson, et al., 2008; Harlaar, et al., 2008; Kato and Pedersen, 2005; Kovas and Plomin, 2007; Saudino, 2005; Simberg, et al., 2009; Su, et al., 2005). The experiences of identical twins are individual, unique, and always different, even when they have been reared together, with the same mother, the same father, and in the same environment.

In general terms, there are two kinds of environmental effects to be considered: family effects that are usually shared by siblings, and make them prone to be similar; and nonshared environmental effects. Nonshared environmental effects are the type of environmental influences that affect individuals, and in this case monozygotic twins, in a unique fashion. In spite of the fact that monozygotic twins, like potential human clones, are genetically identical, and although they will typically share the same family environment, these identical twins or potential human clones do not have identical personalities. They are not able to experience or interpret an event in exactly the same manner, even though they are genetically identical. Radical differences between identical twins are caused by nonshared environmental effects.

Nonshared environmental effects are found in most studies of monozygotic twins to be more significant than shared environmental effects. Based on the available evidence, we can conclude that the experiences of monozygotic twins, or the experiences of potential human clones, can be more similar than average. However, there is no evidence in the field of psychology that the experiences of monozygotic twins, or the experiences of future human beings created through genetic manipulation, can be identical or that they

can be replicated. Since most of a human being's personality and identity development is built on experiences of life events, monozygotic twins and potential human beings created through any type of genetic manipulation will have the uniqueness of any other human being.

Furthermore, kinship research that compares identical twins with fraternal twins in regards to the contribution of heredity and environment on complex human characteristics, such as intelligence and personality development, also show no significant results that could be used to support the idea that complex human characteristics would be exactly replicated when using genetic manipulation to create human clones. For example, research based on kinship studies supports only a moderate influence of heredity. Twin studies show that the correlations between the scores of monozygotic twins are higher than the scores of fraternal twins in terms of intelligence, personality characteristics, mental disorders, and disorders usually first diagnosed in infancy, childhood, or adolescence (Kas, et al., 2007; Kato and Pedersen, 2005; Kovas and Plomin, 2007; Polderman, et al., 2007; Scarr, 1997; Van Hulle, Lemery-Chalfant, and Goldsmith, 2007; Wade, Gillespie, and Martin, 2007). However, even when the studies show that the correlations between the scores of monozygotic twins are high, they also show that the scores are not identical correlations, and that gene-environment interaction and nonshared environmental influences are important to explain these differences, which will lead those twins to become unique individuals.

Identity and human cloning

Among the critics of human cloning, Baird (1999) claims that human cloning presents a threat to our concepts of human identity and individuality. Baird argues that when a child of a particular genetic constitution is deliberately made, it is easier to consider the child as a product rather than a gift of providence. Kass (1997) also writes about some of the psychological consequences that a cloned human might experience in her/his life in society. He states that cloning will create serious issues of identity and individuality. According to Kass, a person who has been cloned may experience serious concerns about her or his identity, not only because of identical appearance to another human being, but because her identical twin might be her father or mother. In addition, Kass suggests that people in society will be prone to compare the performances of a cloned person with the performances of her alter ego.

However, according to Caplan (2002, 2003), the arguments against cloning endorsed by Kass and other critics of human cloning are presented as if they possess the moral high ground in the public debate. Caplan argues that the arguments of Kass and others are, instead, mostly based on pseudoscience, ideology, and plain fear mongering, which are used to manipulate public opinion. Evers (1999) has also criticized the opponents of human cloning, and maintains that the concept of identity is ambiguous. Accordingly, the statement that cloning produces identical individuals is not meaningful, unless the concept is clarified.

Identity is defined as an organized conception of the self, in which the person can define his or her own values, goals, and beliefs. It is the immediate perception of one's selfsameness and continuity in time, with the simultaneous perception of the fact that others recognize one's sameness and continuity (Erikson, 1959). Identity is also defined as a clearly expressed theory of oneself as someone who can act on the basis of reason, can explain her or his own behavior and own actions, and take responsibility for these actions (Moshman, 1999). Identity is reached through a series of stages in life (Marcia, 1966, 1980), and each of these is experienced differently by each individual during development and throughout the entire lifespan (Erikson, 1950, 1968).

Identity is also the result of a continuous enriching process in which our entire personality acquires those individual characteristics that differentiate us from others.

The idea that creating another human being with exactly the same genotype would mean creating another human being with the same identity, and the same personality, is fundamentally wrong. At this point, the latter is impossible for us as human mortals. Furthermore, in the hypothetical case that scientists one day could create multiple human beings with exactly the same genotype, the creation of these genetically identical individuals would not lead to the production of individuals with the same identity and personality. The creation or production of human beings with the same personality, and without uniqueness, will not be possible, at least based on all the evidence from research on human beings with identical or nearly identical DNA.

Furthermore, even if two or more human beings could acquire the same brain structures through genetic manipulation, this would not provide a basis for them to develop identical personalities. Even the same brain in those human beings would never allow them to have the same experiences, since events are always experienced in relationship to time and space. Experiences, of course, are also related to perception. However, the perception of time and space is for us human beings, in this universe, a subjective individual experience. Even if space and time are not the ultimate structure of the objective world, they are necessary parts of a framework within which we organize our experiences.

An event is something that happens at a particular point in space and at a particular time (Hawking, 1988), and two or more human beings with the same brains could never have the same experience of an event at the same time and in the same space or location. When I am referring to space, I am also referring to the three-dimensional region in which matter exists. If we include time as a fourth dimension, I note that two or more human beings cannot simultaneously occupy the same temporal and spatial coordinates in the four-dimensional continuum where all events and physical objects are located. As an example, my experience will be different depending on my location on Earth. In addition, the experiences of two identical people who saw the same movie in identical theatres or in the same theater will be *different* experiences.

Moreover, when we mention the environment, we also need to include the participation of the human sensory system. If two or more brains are identical, from a sensory point of view, we could conclude that both brains have the capacity to process sensory stimuli equally. But this would not be possible, since identical sensory systems in human clones would never be able to process the sensory stimuli from the same space, or location, at the same time. In other words, the experiences of human clones in regards to the environmental stimuli will be always individual and unique. As an example, the place and time in which any person on earth is located, let's say person (A), will make person (A) have different perspective and life experiences from those of person (B) or any other persons on earth. Person (B), or any other persons on earth, will never be able to occupy the same time and space of person (A). For that reason, the experiences of events of any human being will be individual, and unique, different from those of anyone else, including those of humans with the same genetic structure or DNA, either monozygotic twins or cloned human beings.

The effects of early experience on brain, body, mind, and behavior in newborns have been shown in different studies (Diamond and Amso, 2008; St. Petersburg-USA Orphanage Research Team, 2008). Furthermore, empirical evidence confirms the role of experience in brain development of newborns. These studies demonstrate how experience induces changes in the developing brain shortly after birth, and how cognitive abilities differ in terms of neural plasticity and the length of time during which experience can affect brain development (Elbert, Heim, and Rockstroh, 2001; Nelson, 2000; Nelson, Thomas, and de Haan, 2006).

In terms of twin studies, no monozygotic twins are born at exactly the same time; and no clone of any person will come to life at the same time or occupy the same space as the person from whom he or she was cloned. Any difference in time and space could make an enormous difference with respect to the way

any newborn, identical twins or eventually human clones, could be stimulated by the environment. As in the case of monozygotic twins, there will always be differences between human clones with respect to the time and space in which they will be born. These particular and small differences could lead to differences in novel experiences which will provide critical input into a nervous system, which in its turn would mean significant differences between these human clones in terms of how their brains will process new signals, and perceive subsequent novel stimuli. This will also lead to considerable differences in terms of self concept, identity and personality development.

The uniqueness of a human being, independently of the method of creation

Fung (2000) states that a main concern regarding human cloning is the loss of individuality in producing genetically identical beings, but argues that, if nobody questions the spiritual uniqueness and individuality of naturally occurring twins, why would one suppose that a clone should suffer from a diminished sense of individuality? Furthermore, studies with identical twins show that having identical DNA does not prevent twins from possessing individuality and freedom of expression (De Melo-Martin, 2002; Robertson, 1998a). In addition, several studies suggest that human cloning represents no threat to personal identity (Brock, 2002; Gross, 2003; Kuhse, 2001). Moreover, McCarthy (1999) looked at various ideas connected with autonomy, and concluded that there is no basis to the claim that clones would have much worse lives than non-clones. McCarthy therefore rejects the claim that cloning human beings is morally wrong.

It is well known in the field of psychology that identical twins reared apart have a high correlation in regards to intelligence and personality features. However, none of these studies has concluded that identical twins may acquire “identical minds,” “identical personalities,” or identical levels of intelligence. Therefore, we can conclude that there is no evidence that human beings created through genetic manipulation or genetic recoding will lack the uniqueness of any other human being. Several twin studies have shown the importance of gene-environment interaction and the importance of non-shared environmental influences to explain personality characteristics, behavior, identity and individuality issues, general intelligence, behavioral adjustment and mental disorders in dizygotic and monozygotic twins, as well as in unrelated siblings reared together (Brent and Melhem, 2008; Button, et al., 2007; Eley, et al., 2007; Ge, et al., 2007; Hicks et al., 2007; Kas, et al., 2007).

Evolutionary psychologist and behavioral geneticist, Nancy Segal (1993, 1999, 2000, 2006), points out that the discussion of behavioral aspects of intergenerational cloning would benefit from reference to the rich psychological literature of twin studies and from the diverse theoretical and methodological analyses that researchers have produced of the unique social features of monozygotic twins and experiential differences between monozygotic and dizygotic twins. In a study of genetic and environmental influences underlying general intellectual development of virtual twins (VTs), Segal, et al. (2007) found decreasing influences of shared environmental factors and an increased influence of genetic and non-shared environmental factors on general mental skills during development. The research included 43 virtual twin pairs between the ages of 8 and 13 years. According to Segal, et al., virtual twins are siblings who are not biologically related; however, they make the equivalent of twinship. These “twins” are of the same age, and have been reared together from infancy.

The study of Segal, et al., shows that the influence of genetic, and non-shared environmental, factors on intelligence, and on the development of general intellectual skills, increases over time, while the influence of shared environmental factors decreases throughout childhood. The study underscores the influence of non-shared factors on mental development, and also underlines the importance of non-shared factors on the general development of unrelated siblings, fraternal twins, and monozygotic twins. In addition, it serves as a point of reference in order to predict the influence of the interaction between environmental and genetic factors on the social, physical, and cognitive development of cloned human beings. The study

is relevant since non-shared factors will also contribute to identity and personality development, as well as the individuality and uniqueness of cloned human beings.

In a study designed to examine children's perceptions of the school environment, as related to academic achievement, Walker and Plomin (2006) found a moderate genetic influence on their perception of the environment of the classroom. The study included 3,020 pairs of identical and fraternal twins aged nine. Data were collected on their perception in six domains: social integration, opportunity, adventure, general satisfaction, negative affect, and teachers. The study found a limited genetic influence on the perception of the children with respect to the environment in the classroom, which was an average of .33, .06, .25, .27, .19, and .20 of the variance, respectively. However, non-shared environmental influences accounted for an average of .58, .78, .64, .60, .69, and .65 of the variance respectively.

According to the researchers, the results imply that the perceptions of the environment in the classroom are influenced by the specific individual experiences of the children. Another finding is that shared environmental influences had no significant impact on the perceptions of the children with respect to the environment in the classroom, even when the twins were living in the same family, attending the same schools, and in the same classroom. According to Walker and Plomin, these findings suggest that children's experiences of the primary school classroom environment are partially mediated by genetics. Moreover, the findings also show that there is an important contribution of non-shared environmental experiences, which indicates that, in spite of genetic similarities, an individual experience of a child in the classroom truly is "an individual experience."

Furthermore, these results also suggest that it is impossible to predict the behavior of cloned children, and that, although children's experiences to a large extent are governed by genetics, it is also impossible to predict the behavior of cloned human infants, based on the numerous studies on monozygotic twins. Most of these studies have shown that there is an important contribution of environmental experiences that explain the behavior of twins. This is especially so in regard to the influence of individual experiences and interpretations of the environment, suggesting that even though many people could share an identical genetic structure, these human beings would indeed develop unique identities and personalities.

The experiences of clones will be different from the experiences of a genetically identical other, and will be triggered by the different environments they are exposed to. From this point of view, nonshared factors are a powerful influence for identical twins but also an essential part of what appears to be an inevitable process that shapes the uniqueness of social, cognitive, and physical development of nonbiological siblings, fraternal twins, and identical twins, as well of human beings who could eventually be created by genetic manipulation.

Personality, identity, and uniqueness in human cloning as a result of the interaction between genetics and the environment

It is also important to point out that many similarities in behavior and personality among human beings, including potential human beings created by genetic manipulation, can be explained by the influence of interaction with the environment. The environment, in this case, will be an individual's culture, parents, and neighborhood; the type of social organization and/or social institutions an individual experiences, in the form of education, family, religion, government, and economic system; and the social interactions that they will have with the different groups and individuals in the society. Biological factors, such as nutrition, and maternal factors while in uterus would also influence the overall development of genetically identical clones (Fung, 2000).

According to McConville (2001), the expectations of the parents, the constant comparisons, and the narcissistic motivations, could psychologically affect the cloned child, and this situation could result in a

child suffering constantly oppressive expectations and psychological damage. The actions by these parents could undermine the autonomy of the children as well as their privacy, affecting their sense of dignity and self-worth. However, Shermer (1999) points out that behavioral geneticists and evolutionary psychologists in their research show very specifically how environment and heredity interact to shape personality and behavior, “and all of this happens in a complex interactive feedback loop between genes and environment throughout development and into adulthood” (58).

Behavioral geneticists have pointed out that non-shared factors are important in personality development and a child's uniqueness (Braungart, Fulker, and Plomin, 1992; Crawford, et al., 2007; Emde, 1992; Hansson, et al., 2008; Plomin, 1994; Vink, et al., 2007). As an example, in a study of identical twins (three-year-old monozygotic), the mothers treated each identical twin differently, and the differential treatment by the mothers produced some effects in the twins in terms of psychological adjustment, mood and prosocial behavior (Deater-Deckard, et al., 2001).

Heritability estimates and concordance rates used by behavioral geneticists, and obtained from kinship studies of intelligence, mental disorders and personality traits, are often used to compare identical twins with fraternal twins. These studies support a moderate role for heredity (Braungart, Fulker, and Plomin, 1992; Braungart, et al., 1992; Loehlin, 1992; Subbarao, et al., 2008). Although heritability estimates averaging around .50, and high concordance rates, show the important role of genetic factors for complex human characteristics in identical twins, kinship studies suggest that environment also plays a very important role (Brent and Melhem, 2008; Rothbart and Bates, 1998; Saudino, 2005).

Environmental influences have major effects on the psychological aspects of human individual. Even when genetic factors may account for approximately half of the variance in different aspects of personality, intelligence, and other developmental characteristics, this implies that environmental factors are accountable for the other half. Therefore, to claim that a cloned human being is “less unique” erroneously dismisses the distinctive and dynamic interactions between the human mind and its environment (Hines, 1999).

The environment can be defined as the influence of any external circumstances or conditions that affect physical, social, and cognitive development, such as the culture, the parents, the neighborhood, and the type of social organizations and/or social institutions that shape the experiences of human beings. These external circumstances or conditions can also exert influence on education, family, religion, governments, economic systems, and the social interactions that baby clones, or adolescent or adult human clones, will have with the different groups and individuals in the society. In addition, non-genetic biological factors, such as nutrition, exposure to disease, and maternal factors while in the uterus, are also environmental factors that will influence the overall development of any individual, including genetically-identical twins and/or human clones.

In later development, a clone's sense of style and preference would be influenced by environmental factors, as occurs with natural twins (Fung 2000; Green, 2000). Furthermore, it is important to point out that several twin studies underscore the gene-environment interaction as an important factor that influences physical development, social and cognitive development, and many other specific behavioral tendencies and mental disorders of human beings (Brent and Melhem, 2008; D'Onofrio, et al., 2007; Narusyte, et al., 2006; Saudino, 2005; Simberg, et al., 2009; Tsuang, et al., 2004; Tuvblad, Grann, and Lichtenstein, 2006). Moreover, gene-environment interaction can also be considered to explain identity development, personality and the uniqueness of human beings created through genetic manipulation or genetic reprogramming.

In a recent study of common genetic and environmental influences on conduct disorder (CD) and major depressive disorder (MDD) in adolescents, Subbarao et al. (2008) show moderate genetic and shared

environmental, and substantial nonshared environmental, influences on MDD. The study also shows moderate genetic and nonshared environmental influences, and little or no shared environmental influences, on CD. The study was based on a sample of 570 monozygotic twin pairs, 592 dizygotic twin pairs, and 426 non-twin siblings, aged 12-18 years, who were recruited through the Colorado Twin Registry. In addition, the study found that there was a significant correlation between the non-shared environmental influences on lifetime CD and lifetime MDD. Furthermore, it found that there was no evidence of a significant correlation between shared environmental influences on MDD and CD.

In this study, the researchers conclude that the data demonstrate the importance of nonshared environment in the etiology of disorders diagnosed in adolescence. This study of adolescent psychopathology is valuable, as are many other studies of adult psychopathology and disorders diagnosed in infancy, childhood, and adolescence, because of the focus on the significance of non-shared environment in each of the three areas of developmental psychology, namely cognitive, physical and social development. These three areas will also be relevant in relation to the psychological aspects of human cloning.

Identity, individuality, personality development, and all the characteristics that would make a person unique, are the result of the interaction between genetics and the environment. The uniqueness of each human is shaped from the first moment the brain of the particular person is stimulated by the environment through her senses (Elbert, Heim, and Rockstroh, 2001; Nelson, 2000; Nelson, Thomas, and de Haan, 2006). That would also be the case for human beings created through genetic manipulation. With monozygotic twins or cloned human babies, even small differences in the time of birth could lead to differences of handling and treatment by their primary care givers, which in turn would lead to differences in the way the identical twin or baby clone would experience the contact. This initial contact that is part of the attachment process is important, especially in regard to the manner in which monozygotic twins and/or baby clones will be adjusted at home, and will interact with their parents and/or family environments in the first moments of life.

Psychology and other social sciences, as well as the natural sciences, need to work together to find standards of behavior to help the health care system, potential parents, and primary caregivers to interact with human babies created through genetic manipulation (including cloned newborns). Those standards of behavior should be the focus of attention in any further studies related to identity and personality development of human beings created through genetic manipulation. The basis of these standards, designed and prepared to be used during the first moments of life after the birth of children created by genetic manipulation, and for the following period of postnatal care, should not be so different from the standards that have been proven to work best so far for ordinary human beings. The mind of a human being is not only the result of genetic programming, but the result of an interaction between genetics and the stimuli of environmental forces. In other words, a cloned human will be an individual who will have his or her own mind, identity and personality. A cloned individual created by genetic manipulation will be an individual human being.

Society, culture, ideology, forms of government, and the manipulation of the mass media are more a threat to the uniqueness of a human being than human cloning

Society and political systems, cultures and forms of government, certain ideologies, and the manipulation of attitudes and beliefs of citizens by powerful economic, ideological and political structures can induce citizens to have similar attitudes and belief systems, and can influence the way people think, feel, and behave. According to Chomsky (2002), these powerful interests in the society and its political systems use effective mechanisms of persuasion to manipulate the beliefs and attitudes of the individuals in their concrete life; these are the real threats to the independence of thought of the people in a society.

We do not need human cloning to generate similar attitudes, belief systems, and behaviors in society that can make people look and sound similar. Many of us know that when we meet people with similar backgrounds (in terms of culture, education, and religion, among other environmental factors) they have a tendency to appear and sound similar in general terms, since they have a tendency to share similar opinions, attitudes, and interests. Science, biotechnology, and human cloning are not the threat to individuality and the uniqueness of a human being. Foucault (2000) points out that the real threat to individuality and uniqueness comes from institutions of subjugation, new technologies of the exercise of power, and the highly complex systems of manipulation and conditioning that are embedded in the persuasive messages of power structures.

It is not through human cloning that attitudes, beliefs, and behaviors can be replicated in society, and that people can develop a “cloned mind.” The “cloned mind” phenomenon has always existed as the product of oppressive institutions that restrict uniqueness and individuality in order to maintain power and control. Paradoxically, the representatives of power structures in society are the ones who limit new discoveries and technologies, since new discoveries in science and revolutionary technologies often create new scientific paradigms or paradigm shifts (Kuhn, 1962/1996). These are a challenge to the traditional institutions, the elite culture, and the “propaganda model” that indoctrinates, controls society, and supports the existing power structures.

Moreover, the individuality and uniqueness of the person are also affected in societies where the system expects people to sacrifice individual needs and their own expectations in order to satisfy the expectations of institutions or governments. However, even when the individuality and uniqueness of human beings are threatened in this way, the similarities do not make these human beings identical, since genetic and environmental factors interact and influence different areas of human development. This gene-environment interaction creates differences between human beings that are the basis for individuality and uniqueness.

Ideology, human cloning, and social change

The objectivity of science and how the results of science should be applied in society have been always, in one way or another, compromised by the ideology of the scientists. Researchers often find themselves, directly or indirectly, supporting the ideology of the structures of power in society. These structures of power are the major economic, cultural, and political institutions of the given social order, and its dominant ideologies. They are also the dominant institutional network of the established order, which defends, maintains, and protects the social status quo, the self-reproductive mechanisms of society, the ruling class (or classes) of the established order, and the power of its ruling ideology (Althusser, 1971/2001; Chomsky, 2002; Foucault, 1971/1982, 2000; Meszaros, 1989).

The dominant ideologies of the prevailing social order enjoy a privilege, and an important positional advantage, within the framework of the ideological discourse in the society, and they can also dictate the overall conditions, and the rules of the ideological discourse itself (Meszaros, 1989). In the case of the highly controversial issue of human cloning, ideology is playing a very important role. This is not only because of the ethical issues involved, but for the important changes human cloning will bring to this planet at the scientific, social, psychological, economic, and political levels.

Those changes, which can affect the nature of social institutions and change social behaviors, do not have to be negative, but may very well be the result of radical changes in terms of fundamental principles and facts within many sciences. These radical changes can be understood as paradigm shifts that several sciences are experiencing (Kuhn, 1962/1996). Such changes will probably lead to a new perspective in understanding life on this planet.

We will probably experience social change as a result of paradigm shifts and radical and revolutionary changes in sciences. However, even when these changes could be beneficial for humanity, they may create anxiety within the structures of power and dominant ideologies. Reactions to changes as a result of new discoveries may not exclude the possibility that certain groups in the scientific community may actively support the status quo, maintained by existing power structures, or feel threatened by new directions in science that require fundamental changes in the way humans understand the world and interact with it.

We probably cannot expect that these new directions in science will take place without political, economic, and psychosocial changes in the society. These changes will affect the process by which different groups of people make decisions in society, and the new directions in science will lead to psychosocial changes that will entail new patterns of behavior as a result of unique internal processes at individual and group level. These changes will affect the concepts that people have of social institutions, and the way we think about religion, education, family, relationships, welfare, legislation, and forms of government. Defense and policy planning may be also affected by the fast development of science and technology.

Manipulation of the public opinion and attitudes toward human cloning

Research in genetics has been advancing rapidly in the last few years, and it is important that a broader understanding of its possible repercussions or consequences follow these scientific advances. The scientific aspects of human cloning have been affected by the strong beliefs of different groups within society. Ideology is clearly influencing the direction of the societal debate, research, and relevant legislation. Religion, morality, and political and ethical thought are also trying to respond and accommodate to the new challenges presented by human cloning.

It is essential to mention how the manipulation of the public opinion to implant ideology and pseudoscience is facilitated by power structures that use the mass media to achieve their goals (Korten, 2001). I would use not only the term “propaganda,” to explain the negative messages associated with human cloning, but the concept of “fragmentation of information” for the manipulation of attitudes within a social context. Fragmentation better exemplifies the way in which power structures use the mass media to disaggregate and split messages so that incomplete information reaches the public.

It is through the systematic implementation and dissemination of “fragmented information” that the attitudes and the willpower of the population can be manipulated. When important pieces of information do not reach the public, or when that information as a whole is split or separated from other links of information, the audiences cannot properly assess the information and arrive at appropriate conclusions. They cannot exercise their own volition and rational control. When the information is fragmented, the message is always incomplete, out of context, and placed without the important links and pieces of information that would make the material intelligible.

When pieces or fragments of information about stem cell research and human cloning technology are distributed to the public in a “fragmented” fashion, isolated from other pieces of information that are important for the public to understand these technologies, then the information is fragmented and atomized, and becomes unintelligible. Fragmented information about stem cell research and human cloning technology deprives the population of having control over the information received, and of the ability to make a rational and healthy distinction between their values, their interests and beliefs, and to exercise rational control.

When information about controversial, but important, topics relating to science and technology is “fragmented,” the systematic implementation of new practices alienates the population, and takes from

the citizens the right to exercise rational control of the information that they receive. Disinformation, propaganda, and fragmentation of information transform audiences into masses that can be easily manipulated. These extremely powerful practices are not independent of the form of government; they are a central feature of a democratic system and the leading doctrine of modern liberal-democratic intellectual thought (Chomsky, 2002). In countries where the power of the government is centralized, or under the control of a state bureaucracy, the control of the media is under official censorship. When that is the case, it is more clear and evident that the work of the mass media is at the service of the dominant elite. It is much harder to see a propaganda system at work where the media are private and there is no official censorship (Herman and Chomsky, 2002; Chomsky, 2002).

In regards to human cloning, stem cell research, and other advances in biotechnology, the propaganda model and the fragmentation of information involve the manipulation of data related to important developments in biotechnology. This redirects the attitudes of the people, in order to create support for the political, economic, and ideological interests of the existing structures of power, in a manner that is not always in the best interest of the people or of society as a whole.

Human cloning, the mass media, and the social sciences perspective

In an attempt to address these issues from the social sciences perspective, Petersen (2001) designed a study to investigate how the print news media cover stories relating to genetics and medicine, including therapeutic cloning and reproductive cloning. Petersen found that the print news media play an important role in influencing the public response to health problems.

In another study of the public's perception of media coverage of genetic research, Geller, Bernhard and Holzman (2002) also found that the media play an important role in influencing the public response, and that, despite widespread media coverage, the public may not be well informed about new genetic advances. Geller et al. indicate that a lack of accuracy in media coverage, focus on the negative aspects of genetic discoveries, and omission of important facts, can lead to misconceptions and fears about the applicability of genetic advances.

According to Mahowald (2003), there are three key aspects of the debate about educating the public concerning advances in biotechnology. These are the involvement of bioethicists, terminological difficulties, and problematic arguments. Mahowald states that the media educate non-scientists about biotechnological advances. The media have little knowledge of these issues, but rely on the opinions reported from bioethicists. On the other hand, bioethicists have usually not been trained in biological sciences and have only superficial knowledge of the issues addressed. Mahowald also argues that, even when some bioethicists are knowledgeable, the credibility of their conclusions depends on the credibility of their premises and the use of pertinent and current data from respected scientific sources.

Petersen (2001) and Geller et al. (2002) mention that, with the emergence of the new genetic technologies, which are becoming more integrated into preventive medicine and public health, it is important to study how the coverage of these new technologies can help stimulate public debate. Etkin (2002) wonders how scientists should consider the impact of human cloning technology on society. At the same time, it is important that the coverage of these profound issues take place not only in the medical, ethical, and social sciences, but also in the field of psychology. The coverage of new technologies such as human cloning can help to stimulate debate and research on cloning's psychological aspects.

Human cloning and the creation of clones are inevitable

In 1997, Ian Wilmut and his associates at the Roslin Institute in Scotland announced the successful cloning of a sheep that they'd named "Dolly." The announcement created a debate regarding religious,

legal, and ethical views on whether human cloning should be undertaken for the purposes of enhancing the quality of human life, and, if so, how it should be regulated (Andrews 1999; Fung, 2000; Madigan, 1998; Shannon, 1998; Vastag, 2001; Wills, 1998).

There is awareness in the scientific community, including the medical community, that human cloning and the creation of clones are inevitable (Khan, 2003; Murray, 2002; Van Steenberg, 2002). There is also a belief that the medical community will one day have to address the care of and respect for people created by cloning techniques, and that the discussion of issues related to human cloning must begin now, before the first person born in this manner becomes fact (Bonnicksen, 1998; "First principles", 1999).

Psychology and human cloning

Some scientists think that there should be more connection between the behavioral sciences and biology. Harvard University biologist Edward O. Wilson (1999), for example, has long argued for a connection between biology and behavior. He states that psychologists can help bridge the natural and behavioral sciences and that psychology will play a critical role in unifying science during the twenty-first century. He also argues that the natural sciences, social sciences, and humanities are converging, and that their convergence will help solve many of the world's most afflictive problems. At the American Psychological Association's 2000 annual convention, Francis Collins, Human Genome Project Director, suggested that psychologists would play an important role in genomics and genetics. He outlined the need for behavioral scientists to increase their involvement with, and to gain a greater mastery of, the field of genetics (Carpenter, 2000).

The new advanced technologies, such as genetic engineering and human cloning, are bringing unprecedented challenges in terms of their behavioral, political, and ethical implications. These implications must be addressed on time, or society risks the consequences of an uncontrolled future (Resnik, 1998; Satava, 2002). In other fields of learning, such as sociology, history, medicine, genetics, and philosophy, the issues concerning human cloning and its implications on human behavior have been a focus of study. Many scholars in these fields have pointed out the need for debate (Breyer, 2000) and discussed a variety of concerns relating to various aspects of human cloning that include psychological aspects and the perceptions and attitudes of the public.

A transhumanist psychology and the need for a different way of thinking about life, new technologies and creation

Research on human genetic engineering will facilitate human beings reaching another stage in history where all the expressions of science will be used to enhance our physical, social, emotional, and cognitive abilities. A civilization that uses genetic manipulation to enhance human beings' physical capabilities will make a transition to another stage in human evolution. This will be called a posthuman stage, and is one in which psychology should play a very important role.

With all the changes that human cloning will precipitate, we may conclude that ideology and the convergence of natural sciences with the social sciences will play a fundamental role in the transition from a transhuman society, in which advances in physics, biotechnology and medicine will help the human race to overcome physical and social limitations that hinder humans in their search for harmony within the universe. Psychology should be a science that helps us to understand and incorporate any methods or technologies that help to enhance the physical and cognitive abilities of human beings. It is imperative for psychology to cooperate with other sciences for the incorporation of the responsible use of human cloning techniques, and the use of diverse biotechnological advances, genetic manipulation, and the development of therapies that have the potential to eliminate serious diseases that bring so much pain and suffering.

Advances in biotechnology will bring not only the possibility of using genetic manipulation for physical and mental augmentation. New techniques also have the potential to eliminate the need for organ transplants, and hence the corruption and crime involved in the illegal traffic of human organs. It may also alleviate the psychological suffering of childless couples, who are reluctant to initiate what is sometimes a long and emotionally conflictive adoption process. Advances in biotechnology, and more specifically in human cloning techniques, have countless applications from which humanity can obtain benefits. Contrary to what the critics of human cloning have stated, and paradoxically, the perfection of human cloning techniques could become a safe harbor for the preservation of the human species and the entire human genome. The perfection of human cloning techniques could provide the possibility to preserve and replicate the genetic code of a human being, as it is today, in the case that unwanted or unknown events could mutate, or threaten to mutate, a genomic region, or the entire human genome.

Obviously, for those who believe and trust that advances in science and biotechnology will bring only something positive to humanity, the hope is that human augmentation will help human beings to interact better with our environment and within this universe that we share with other living things. At that point, we will have reached a posthuman stage. Human enhancement is a period of transition, a transhuman stage, in which humans will be able to enhance the capacity of their bodies, in order to cope better with the continuous demands of the environment, and which will bring human beings closer to becoming an integral part of the unity of this universe.

If we are to reach a posthuman stage, all sciences – social sciences and natural sciences together – will have to work through a transitional period in which we recognize and accept that we have reached a point of no return in the course of the human history in this planet. We have already started a transition, a transhuman stage, which we should consider a transition to a posthuman stage, where humans will transcend their inherited body, with all its physical, social, emotional, and cognitive limitations, and convert it to an enhanced body, which will have more chance to deal with the continual pressures and demands of our rapidly developing human civilization.

A transhumanist psychology will examine the internal mental processes that will emerge from the new existential issues that humans will face when confronted with the possibility of using any available technologies to enhance cognitive, physical, and social functions, in order to overcome biological limitations. Human beings who are considering the idea of accepting human cloning, and treatments that will reduce their biological limitations, will experience conflicts, ethical dilemmas, and existential problems that may require short-term or long-term psychological support or even, sometimes, psychotherapy. The psychological support or treatment will not be there to make decisions for the client, but to help the client to find her or his own decisions. This approach will try to reflect the client's feelings, thoughts, and existential dilemmas, will provide and amplify information about the technologies available, and will facilitate support, and reflect existential, ontological, and epistemological issues and questions.

This psychotherapeutic – though sometimes only supportive – approach will use a transhumanist terminology within the framework of a transhumanist philosophy. A transhumanist psychology, although possessing an eclectic character, may need to use, depending on the client's resources, needs, and issues, a psychodynamic, existential, and sometimes cognitive approach, and will make use of extensive information about neuropsychology, biology, basic laws of physics, and philosophy.

A transhumanist psychology should use information from different disciplines in order to inform appropriately, and support psychologically, the client in his or her transition through a transhuman life. Today, the psychology profession is facing unprecedented challenges presented by biotechnology and other practical disciplines such as chemical engineering, robotics, nanotechnology, computational

neuroscience, and information technology. It is imperative to recognize that we are entering a new era, with distinctive events and characterized by particular scientific discoveries. These require a shift in the way psychology takes responsibility to help individuals and society. Psychology needs to follow the progress that humans are taking in transition to a posthuman stage.

Final thoughts

Among the technological advances that have brought the most intensive debates and controversy in society, we find stem cell research and human cloning. They are examples of the types of research that have created strong reactions from different groups within society. The cloning debate has been reinforced with ethical, religious, scientific, moral, medical, and political issues, since human cloning became a real prospect in the late 1990s (Baird, 1999; Fiddler, Pergament, and Pergament, 1999; Fung, 2000; Madigan, 1998; Shannon, 1998; Shapiro, 1999; Vastag, 2001; Wills, 1998).

Technological advances are also affecting human attitudes to the notions of time, space, life span, longevity, spirituality, the meaning of life, suffering, and the concept of death, and the notion of creation. It is precisely when we are confronted with an overwhelming range of new technologies, and with so many possibilities to use them, that different feelings, many new thoughts, different attitudes, and anxiety can all develop.

According to Obermann (1999), creation of human clones is inevitable. Creation is a concept that some view with respect, others with fascination, others with fear (Dyens, 2002/2003; Porter-O'Grady, 2003) or curiosity. McGee (2001) states that human cloning offers an insight into the power of creation. Indeed, attitudes toward cloning may be related to some basic human feelings, such as the fear of facing something as challenging as creation, and from a totally different perspective. Instead of expanding the concept of creation and adapting ourselves to a new reality, with an open mind, and with flexibility, some may choose for a mystification of the concept.

Science may help us get closer to finding new meanings for creation and expanding its concept. That possibility creates many fears, and psychology has its own challenge if it is to be of help. Human cloning may present one of the greatest challenges to humans, which is to deal with a difficult question: What is creation? Perhaps one of the greatest fears humans may have about human cloning is related to the possibility of expanding even more the concept of creation.

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