

Spiritual Formation and the Brains of Adolescent Girls
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ABSTRACT

This paper explores how new knowledge about the adolescent female brain lends theoretical support to narrative and contemplative practices of spiritual formation of girls in a religious boarding school in the southern United States. Current brain research supports the use of particular methods of religious formation for teenagers in general, and teenage girls in particular. This paper suggests that spiritual practices of narrative and contemplation – particularly as they become embodied in communal spaces – hold promise to be consistent with development of the teenage female brain. When combined with other nurturing practices, they might help shape contemporary young female leaders who are active contemplatives and contemplative activists.

Introduction

The writers of this paper live and work with a community of girls coming of age in times shaped by US wars in Iraq and Afghanistan in the wake of 9/11, the specter of global poverty, HIV/AIDS, random violence in public places, and quavering world economies. On the personal front, girls deal with the stresses caused by divorce/blended families, long school days, competitive sports and academics, temptations of social addictions, hypersexualization of culture, and the onslaught of material consumption.

The past decade saw a massive explosion in what we know about the human brain. As a result, we know more than ever about the teenage girls' brain – nuances about it how it develops, variations between it and the male brain, and ways it is constantly changed by stimuli in the environment. In the midst of these astounding new scientific discoveries, the church of these girls' grandparents is undergoing massive renovation; what will emerge is still unknown (Tickle 2010).

Religious educators, youth ministers and pastors engage in practices that seek to form girls' spiritual lives. Those of us who seek to form girls' spiritual lives and develop their leadership capacities lose significant opportunities if we do not engage what we know about the brain. How, we wonder, can girls learn the inner skills leaders require – the ability to be still, the capacity to concentrate on complex matters, and the know-how to connect to a deep well of sustenance larger than themselves? In other words, how can girls be placed in proximity with the Holy in ways that will deeply ground them in spirit, emboldening them for the challenging work of healing the world their generation will enact? Our aim in this paper is to seek congruence between knowledge from the field of neuroscience and the practices we use in spiritual formation of girls.

The Writers and Our Goals

Ned Edwards and Dori Baker are the co-writers of this paper. Ned is the chaplain and instructor of religion at an Episcopal girls' boarding school. Dori is a consultant on youth culture and theology to a national non-profit organization engaged in leadership training. In those capacities she uses adaptations of her "Girlfriend Theology" method of theological reflection on life story. Both of us are ordained ministers who have seen that actively developing and encouraging girls to engage in certain spiritual practices results in

girls with a resilient, embodied sense of themselves living in connection to something larger than themselves which inspires awe and gives life purpose.

girls with a sense of compassion whose potential to lead can be grounded in a deep connection to the Holy

girls who can draw upon a ready toolbox of spiritual practices to ameliorate adverse conditions of post-modernity, such as stress, anxiety, and depression.

As part of an ongoing collaboration, we will be introducing Girlfriend Theology to a cohort of girls over the next year in a research-intervention aimed at the three outcomes listed above. Girlfriend Theology is a four-step method of group theological reflection that grows out of age-old practices of Ignatian spirituality and more contemporary practices of liberation theology from Latin America. It begins with gathering a group of girls around a central table, focused around sacred objects. We light a candle and direct attention toward inviting deep, calm, steady breathing. A girl *reads aloud a story* (Step 1) written in advance, that grows from her life. We enter into a playful, interruptive process of *sharing emotions* (Step 2) that the story raised in us, paying close attention to the way our body responded—perhaps with goose pimples, laughter, tears, or clenched fists. Then, using all our capacities for complex abstract thinking, *we wonder where God is in the story* (Step 3) and how this story reminds us of themes in our own or other familiar faith traditions. Finally, after lingering for a while in that place of theological reflection – where our story intersects with the ongoing story of the Holy acting in our world – we move into the future, *wondering what ethical or moral implications this story and our recent reflection upon it require of us* (Step 4). What is our next most faithful action in the world? (Baker 2005)

Currently, this method of religious formation is theoretically grounded in three domains:

Feminist and other emancipatory theologies, particularly as they focus on groups of women reflecting together on life experiences of oppression as the source of theological meaning-making

Developmental theory, particularly the work of Carol Gilligan and others who carved paths for understanding of girls' and women's distinctive developmental trajectories

Critical pedagogy, as it honors the tacit knowledge of the learner as an active meaning-maker

In what follows, we glean additional theoretical grounding for the practices that make up Girlfriend Theology. We also seek ways to adapt the method to make it better fit the adolescent female brain. We ask: How is Girlfriend Theology supported by what we now know about the teenage female brain? How can it be improved? And how does best nestle within a holistic spiritual curriculum?

Current Context and Practice

Religious formation at the girls' Episcopal boarding school at which Ned works includes mandatory thrice-weekly chapel attendance. The service closely resembles traditional mainline services in the 1950s. The architecture of the space, with its vaulted ceilings, the priest in proximity to the altar, and the girls facing him, reinforces roles of hierarchy and priestly authority. The liturgy is largely analytical and intellectual, appealing to the left-brain. The implicit symbolism of visual cues, such as gestures of the priest or the colors of liturgical garments, is likely to go entirely unnoticed. For participants unformed by the Episcopal

heritage (well over three-quarters of the population) the services can be bereft of spiritual significance. Even the hymns, which can provide a moment for active worship for girls who love to sing, are often unfamiliar in word and tune. For the most part the girls are non-responsive and non-participatory. The implicit pedagogy of this style is that the girls are empty vessels coming to the sacred space to be filled by the priest with holiness and proper Christian doctrine. One thinks of empty cathedrals in post-Christian Europe. All of the trappings are present; but the Spirit seems to have vacated the premises.

Of course, the Spirit has not vacated the premises. Like a flower pushing through the would-be barrier of asphalt, the power of the Spirit breaks through even the most intellectual and analytical of liturgies. An alum from the 1970s tells how the rote nature of Chapel formed her religious imagination and moved her to become a practicing Buddhist:

“When I was a student the services were so dry and lifeless that they did not speak to me at all. For the first half of the year I just sat there, bored out of my mind. But then I began to use the time to my own advantage. I began to close my eyes and enter into what I now know is a meditative state of mind. Though I did not have the vocabulary for it at the time, I was allowing the Spirit present in the space to move through me as I gradually learned to open myself more and more to it. I have no idea what everyone else was doing during that time, but I can say now that I was learning how meditate. So it was in that Chapel that the seed of my now Buddhist practices was first planted.”

With great care for institutional continuity Ned has introduced diverse expressions of grounded spirituality. Tuesday services are now “listening chapels” in which a different spiritual practice (like silence or guided meditation) is introduced each week. Friday’s service mostly consists of girls articulating their ultimate concerns and spiritual experiences in Senior Chapel Talks. Sunday nights now include stories of possible role models, saints and other women of faith whose lives and spiritual leadership are virtually unknown to the girls. Chapel service, however, is only the most explicit place of spiritual formation. Spirituality is also formed in everyday life, which, in a residential boarding school, encompasses formal teaching, service to others, presence in community, proclamation of Word and liturgy, and the shaping influence of adults around them. The biology classroom where a girl peers down a microscope, the art classroom where she expresses her wildest imagination, and the literature class where she reads Langston Hughes, Toni Morrison and Walt Whitman are all portals to spiritual formation. The athletic field where she learns how to be part of a team and the service day she spends working with Habitat for Humanity; all of this is a curriculum that has powerful shaping influence on a girl’s spirituality and its living out in vocational imagination and choices (Harris, 1989). In addition, discussions in Bible classes, the dorm, dining hall, and hallways indicate that the students are hungry for explorations into the movement of the Spirit, the place of spirituality in their lives, their own theological questions and doubts, and their ultimate concerns. Might even better practices emerge if we mine new findings of the neurosciences to resource the female adolescent mind and spirit?

The Adolescent Brain is Different; The Adolescent Female Brain is Unique

2007 was a watershed year for adolescent brain research. Using Multi-Resonance Imaging (MRI), Dr. Jay Geidd of the National Institute of Mental Health and colleagues completed a longitudinal study of teenagers’ brain function under a variety of settings (Lenroot et al, 2007). The results led neuroscientists to demonstrate conclusively that the adolescent’s brain

is different from both the child's brain and the adult's brain, exhibiting the most dramatic and important changes in the human lifespan (Steinberg 2010). These findings show the adolescent brain (in distinction from the child brain and the adult brain):

- has an increased capacity for language and short-term memory
- reacts emotionally rather than logically
- responds to music as a vehicle to emotion and information
- experiences emotions before it is able to articulate them verbally
- works hard at developing self-awareness and self-consciousness
- is more vulnerable to stress than the adult brain
- is engaged in a constant struggle between emotion/impulsivity and logic/moral reasoning (Feinstein 2009, 73)

Some researchers also suggest that the earlier onset of puberty today largely due to improved nutrition has caused a gap between a teenager's physical maturity and the brain's ability to regulate and monitor his or her actions. In adults, fully developed frontal lobes regulate impulsiveness, emotionality, and moral decision-making. They "put the brakes on" our impulses. In teens however, the brakes aren't fully developed or functioning, leading teens to be more risk-taking and more vulnerable to peer pressure, stress, and addiction. One researcher speaks to these differences quite dramatically.

The dilemma of adolescence is that puberty is occurring earlier and earlier and the rate at which our regulatory systems and the brain mature has remained the same for thousands of years. So we actually have a longer period in human history today than we've ever had between the onset of puberty and the onset of full maturation of regulatory systems in the brain. (Davidson 2011)

Neuroscientists also point to significant differences between adolescent male brains and adolescent female brains. Avoiding determinism, we understand these gender differences always take into account the roles that the brain, hormones, puberty, and culture play in gender-specific behavior. However, some important neurological distinctions between teenage boys' and girls' brains include:

Female teens have more gray matter; male teens have more white matter.
/Gray matter allows for more efficiency of thought processes and the ability to process information, which may explain the female's strong language skills, the ability to seemingly juggle a number of activities at one time, and a higher ability for both memory and manual tasks.

The hippocampus of girls grows faster than boys, allowing girls to be better at coordinating complex social relationships, recognizing faces, and distinguishing complex emotions. (Feinstein 2009).

The hypothalamus, the part of the brain responsible for emotions, sexual desire, and controlling the body's rhythms, both biological and musical, also regulates the release of the sex hormones. It is smaller in girls, allowing them to sit quietly longer and be less physically aggressive than boys. Yet girls are just as adept at and responsive to musical beats and biological rhythms as boys, perhaps due to their own monthly rhythm being precipitated by a wash of estrogen.

The corpus callosum, which links the two hemispheres of the brain, is significantly

larger in females, allowing for greater information transfer between the hemispheres. In fact, one author compares the corpus callosum between boys and girls to the difference between a dirt road and a superhighway (Deake 2002). The larger size in females allows better communication between the left and the right hemispheres, and thus enhances the ability of women to use both sides of their brain. The left hemisphere is associated with analytical, logical, and sequential actions and processing. The right hemisphere is associated with intuitive, nonlinear, holistic actions and processes, leading to empathy, inventiveness, joyfulness, and meaning (Pink 2006). This may account for the fact that girls are more attuned to details, navigate by landmarks and experience, and why they insist on complicating or dramatizing what, to adults, may seem like simple tasks and relationships. The anterior cingulate cortex, located in the frontal lobe and labeled on the diagram as the cingulated gyrus, is larger in girls than boys. It allows for the weighing of options and making decisions. Often called the “worry-wart” center, it is also where moral decisions and spiritual experiences reside. As a part of the frontal cortex, it is the area of the brain that is often at war with the amygdala, struggling to control its emotional outbursts, sexual desires, and impulsive behaviors. It integrates the activity of different parts of the brain, allows self-consciousness to emerge, especially how we see ourselves in relation to the world (Newberg, Waldman, 2010), and allows women to be more intuitive (e.g., “women’s intuition”) than men, giving a biological basis for what has been for millennia an “old wives’ tale.” Testosterone levels increase in males; estrogen levels increase in females. This leads to an increase in the physical secondary sex characteristics, but also triggers new and powerful feelings of sexual attraction, curiosity, and romantic interests. New research shows that sexual orientation is a function of the brain rather than the gonads (Feinstein 2009).

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What these neural differences between boys and girls tell us regarding spiritual development is that while some aspects of traditional, mainline church worship are appropriate for girls (sitting still and listening, singing, rote responses that lead to memorization), there is a significant lost opportunity to reach them at their developmental level. Better practices for nurturing and developing their spirits will enhance their overall cognition, communication, and creativity, allowing the spiritual realm to be in service to overall pedagogical goals. For that discussion, we turn from the biology of the brain to the work of experts who are applying new brain science in the social sciences.

The Brain and The Spirit: Neuroplasticity, Mirroring, & the Company of Peers

Various called affective, contemplative, or social neuroscience, new hybrid fields are emerging that help explain the way biological aspects of the brain effect the social and emotional aspects of the human mind, consciousness, and behavior. Based on their findings, we understand neuroplasticity, mirror neurons, and neurotransmitters that flood the brain during social interactions as three important characteristics operating at their peak in the teenage girls’ brain.

The work of Andrew Newberg and Mark Robert Waldman and their labs for integrating neuroscience and spirituality at the University of Pennsylvania confirms that contemplation

of God changes our brains through a process called neuroplasticity. Neuroplasticity is the ability of the human brain to structurally rearrange itself in response to a wide variety of positive and negative stimuli. The plasticity of the human brain is particularly evident and important during adolescence. Myelination, the process by which a fatty layer called myelin accumulates around neurons, allows nerve cells to transmit information faster and enables more complex brain processes. Related to myelination, synaptic pruning is also taking place. Individual connections are removed or restructured, depending on how they are used. The more an activity or thought occurs through repetition and memorization, the more certain neurons are blazing a regular and efficient path. Even more interesting, when new learning is paired with activity and movement (such as repeated religious rituals and practices), the effectiveness of myelination and pruning increases dramatically.

These processes are how new patterns of learning are formed in the brain that, with practice, become second nature. What we do during adolescence stays with us for the rest of our life (Feinstein 2009). Those who practice a particular activity for 10,000 hours during adolescence, like Yoyo Ma or the Beatles, become wonderfully adept at the task (Gladwell 2008). And these processes are just as active for spiritual learning as they are for violin, mathematics, or foreign language. In this light, it makes perfect sense that our Buddhist alum's self-taught meditation during four years of chapel service laid pathways in her brain that thickened with meditative practice far into adulthood.

Indeed “[r]eligious and spiritual contemplation changes your brain in a profoundly different way because it strengthens a unique neural circuit that specifically enhances social awareness and empathy while subduing destructive feelings and emotions” (Newburg and Waldman 2010). Because neuroplasticity is especially enhanced between the ages of 12 and 25, those years are particularly important for exposure to a wide range of spiritual practices.

Just as crucial as neuroplasticity are “mirror neurons”— cells that allow the brain to observe another person with the sole intention of repeating their actions. Mirror neurons are more prevalent in females than males and are most active in the teenage years. What seems like adolescents “trying on” different personalities is thus actually a crucial mimicking of the personalities they are experiencing at the time. This is one of the strongest arguments available for proper adult role models for adolescents. Despite the popularity of John Hughes movies such as *The Breakfast Club*, *Ferris Bueller's Day Off* and *Sixteen Candles* – in which the focus is completely on teens and adults are either nonexistent or incompetent – teen brains need grown-up company. Teens need to see and experience competent adults who exhibit the best in particular practices (including the spiritual) in order for them to “mirror” the behavior. This also corroborates the work of sociologists who have in recent decades reminded parents to remain present and active in their teens' lives, despite the negative reactions such presence might invite (Hearst 1998).

Nicholas Carr, an observer of neuroscience in connection to media, argues that mirroring has had dramatic effect on the post-modern brain of adults and teens alike. The mind with which many people spend most of their time interacting these days is an artificial (digital) one that specializes in scanning and categorizing large amounts of material in highly efficient, time-saving ways. What gets pruned is the capacity to delve deeply into a complex subject matter. While Carr is careful not to discount the benefits of access to the massive amounts of information the Internet puts at our fingertips, he advocates for also observing the losses

so that interventions can occur. Communal spiritual practices of contemplation and narrative are interventions that allow mirror neurons to interact with real human brains for prolonged periods of time. Carr suggests that such practices may be more important for digital natives, young people whose entire lives are shaped by new media.

It is also the adolescent brain that is most sensitive to dopamine and oxytocin, neural hormones that stimulate the motivation and pleasure circuits of the brain. Specifically, as estrogen increases in females, dopamine and oxytocin production is increased, two results of which are relevant to our study.

First, dopamine, as a pleasure neurotransmitter, is released when adolescents are in love and when they take risks, causing teens to seek both, sometimes in ways detrimental to their own development and safety (Feinstein 2009, Steinberg 2010). What these two activities have in common is novelty seeking. In another teen paradox, while the brain is at its peak for learning and memorization, it is hungry for novelty, which is highly rewarded with a large shot of dopamine.

Secondly, oxytocin triggers and is triggered by intimacy and drives girls to form positive social connections. At the same time that her verbal skills are peaking, so is her urge for connection. As those connections are made, she receives a rush of oxytocin, bringing a sense of pleasure and wellbeing. This explains the rabid need for teen girls to communicate through any means possible, whether through cell phones, email, texting, IM-ing, as well as spending time with one another in positive, self-and-other affirming environments. Thus one of the most biologically difficult things for girls to do is not talk or not connect; not only do their brains reward them for communicating and connecting, but their self-esteem is maintained by the ability to form and sustain intimate relationships with others (Brizendine 2006).

Synthesis

All of these processes are happening at once in the adolescent girl's brain: anyone who spends time with a teenage girl can recognize their effects. Spiritual practices "even when stripped of religious belief, enhance the neural functioning of the brain in ways that improve physical and emotional health," Newberg and Waldman maintain. Moreover, they write, "contemplative practices strengthen a specific neurological circuit that generates peacefulness, social awareness and compassion for others" (Newberg and Waldman 2010, 6). For us that means a spiritual curriculum tailored to girls should focus on practices and rituals that are regular, involve adults, offer something new, and allow girls to connect. Best of all are those practices that include physical movement, calm adult mentoring, and stress reduction, and that offer feedback and appreciative challenge by which to form one's self-identity.

Specifically, we see a spiritual curriculum taking shape that incorporates the following guidelines:

1. The use of thoughtful ritual satisfies the need for structure and organization, providing a constant that will influence spiritual practices as adults. Regularly practiced ritual connects with a brain already attuned to rhythms and patterns. Adding physical movement to new learning cements memory, which will enhance some forms of ritual.

2. Novelty, in addition to ritual, is necessary, to sustain the teen brain's interest and allow the frontal cortex to develop, making new connections that can be called forth throughout adulthood.
3. Sitting still and listening is not difficult for teen girls, but without feedback and/or social interaction there is a lost opportunity not only to provide that jolt of rewarding oxytocin, but also to allow the frontal cortex to develop both its reasoning skills and its moral compass.
4. Feedback and social interaction also provide an opportunity to describe and relate emotion, which benefits girls as they practice a growing capacity to understand and regulate emotional terrain. Their heightened sense of self-consciousness and vulnerability to social acceptance and rejection means that feedback is a powerful tool in the hands of caring adults and peers.
5. Centering prayer and breath prayer – both highly teachable practices -- reduce stress associated with the girl-brain's hyper-sensitivity to social connection. The “drama” of the teen-age girl has a basis in biology because to be excluded from a social milieu is interpreted by the brain as having dire consequences. Adult role models who acknowledge the emotional drama while modeling a calm, non-anxious presence reinforce alternatives to high drama.
6. Trusted circles in which girls' ideas and their thoughts about God, self, and others are greeted with both affirmation and appreciative challenge provide an important space for the construction of self-identity, which becomes more complex and nuanced as the brain continues to develop.

Bringing New Insights to Old Practices: Implications for Further Research

What we now know about the female adolescent brain confirms many of our hunches about Girlfriend Theology, the narrative practice of theological reflection described above. Indeed, Girlfriend Theology, as developed by Dori and adapted by other practitioners, incorporates most of the spiritual practices to which the adolescent female brain seems particularly poised to respond. One can see here potential fit with brain's characteristics of neuroplasticity, mirror neurons, and the neurotransmitters dopamine and oxytocin. In Girlfriend Theology, a girl grapples with complex, interrelated concepts and rehearses her knowledge about Christian scripture and other religious traditions in light of her own experience – providing the practice that prevents pruning and creates pathways for future use. Girlfriend Theology allows for sustained interaction with other brains, both of peers and adult mentors. Additionally, it provides girls with the ever-important connections of deepening social relationships. Nestling these practices, then, within an already rich spiritual ecology points toward the possibility of nurturing girls' spirits in ways that meet their brain development at its evolving peaks.

As we embark on a research-intervention over the following year, we will recruit a group of eight to ten girls to learn the Girlfriend Theology method and take part in eight sessions. Two girls who have previous experience with the method will be youth facilitators. These sessions – each focused around a story from a girl – will begin and end within the space of a few hours. But because girls will gather after having dinner with an advisor, spending two hours on horseback, or engaging their competitive selves on the soccer field, they will bring into the space all of the day. Much like “theology at sunset” practiced in Latin American communities, the method incorporates the whole being and body of its participants. The girls will bring their ways of being and knowing into the space where we expect them to encounter the Holy.

We will both tweak the method so that it meets what we know about the girl's brains and look for ways that it strengthens already occurring spiritual practices within the ecology. One anticipated outcome, for example, is evidence of a larger theological vocabulary and deeper capacity for engaging doubt and unknowing in Senior Chapel Talks. Girls may – in the course of a session of Girlfriend Theology– enter into a conversation about a labyrinth and decide to build one on campus. In a Sunday night chapel service, a girl might learn about Catherine of Siena, a youthful saint whose vocational journey she might choose to reflect upon in the next session of Girlfriend Theology. She may tell a story about a time when a friend provided a calming influence during a driving mishap and come, in the course of theological reflection, to an awareness of holy friendship. This anticipated back-and-forth holds promise to enrich the method even as the method enriches the environment.

In addition to doing Girlfriend Theology as a small cohort, participants will share portions of their stories and theological findings with their peers and faculty through a designated chapel service and community-wide interactive lecture, giving them the opportunity to practice in front of others their newfound capacity as meaning-makers. As other girls express interest, new cohorts of practice may form, these leaning more heavily on peer facilitation. As girls become familiar with the method, they are apt to change it, adapting it in ways that may stretch our imagined norms for innovation and will entail negotiation.

All of this is the focus of our ongoing research as we spend a year with teenage girls' brains, bodies, spirits, learning how they story their lives in light of God's story.

Conclusion

Many of the women to whom our institution intentionally exposes girls each year call to mind the adage “well-behaved women rarely make history.” Through our Leaders-in-Residence program, our girls have spent time with Jane Goodall, Benazar Bhutto, Judith Jamison, Gloria Steinem, and Ellen Sirleaf Johnson. Our alums have gone on to launch environmental education and energy conservation projects, have cared for and repatriated thousands of refugees, have worked with international organizations to prevent human trafficking, and have established Planned Parenthood Offices under hostile conditions. The girls with whom we now work will follow similar paths, or be artists, poets, journalists and theologians: some will break ground as “first women” in positions of leadership all over the world.

In addition to contributing to the shaping of girls who are “smart, strong and bold,” we hope to provide young women with a capacity to wrestle deeply with the heart-breakingly difficult issues of their day. The best leaders for this world will be those who know how to be still, have the capacity to concentrate on complex matters, and know how to connect to a deep well of sustenance larger than themselves. This paper suggests that spiritual practices of narrative and contemplation – particularly as they become embodied in communal spaces – hold promise to quite aptly meet the adolescent female brain. When combined with other nurturing practices, they may help shape contemporary young female leaders who are active contemplatives and contemplative activists.

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Growing research in the field of organizational development and leadership studies documents the importance of tending the inner lives of leaders. See, for instance, Scharmer (2009), Senge (1999).

These adaptations are part of VocationCARE, an approach that trains congregations and related organizations in spiritual practices that tend the vocations of all people, but particularly youth and young adults.

VocationCARE is the work of The Fund for Theological Education (FTE), www.fteleaders.org.

Personal interview conducted April 30, 2011